

Fluid Coils

Cooling applications are most commonly used in chilled fluid systems for comfort conditioning of a forced air stream and in process systems for dehumidification processes. A large variety of drainable circuiting options makes this a good choice for most general heat transfer applications. For use with water, glycols, brines, thermal oils or ammonia.

Desaturation Coils

TWO COILS IN ONE. A combination cooling/reheat coil is one common case that will both dehumidify the air and reheat that same air to the desired leaving air temperature and humidity level in low comfort cooling applications such as hospitals, clean rooms, and science or research laboratories. A single supply and return connection is used thus saving end users and installing contractors' significant equipment, piping and labor costs. One coil is required thus saving the end user the cost of purchasing a second coil. Also, potential reduction in APD.WPD = Reduced Hp=Energy Savings = Bottom Line Dollar Savings

FLUID COIL CONSTRUCTION

Tubing	3/8" or 1/2" O.D. Copper, 5/8" O.D. Copper, Cupronickel, Stainless Steel, Carbon Steel or Admiralty Brass
Circuiting	Quarter, Half, Three Quarter, Single, One and one half, Double, Triple or Custom
Rows	Quarter, Half, Three Quarter, Single, One and one half, Double, Triple or Custom
Fin Surface	Sine Wave (corrugated), New Ripple (peak and valley) or Flat
Casing	Galvanized Steel, Stainless Steel, Carbon Steel, Copper or Aluminum
Connections	Carbon Steel, Stainless Steel, Red Brass, or Copper Sweat (MPT, FPT, Victaulic, Grooved or Welded)
Vents & Drains	Standard on all coils.

Hot Water Coils

Heating applications are most commonly used in hot fluid systems for comfort conditioning of a forced air stream and in process systems for drying processes. The collector header design with internal baffles provides circuiting flexibility while eliminating the need for return bends, while the splayed header design uses return bends for circuiting in lieu of a collection header. The term "splayed" means that the coil headers are offset outward from the coil tubes. The splayed header coil always has same end connections.

Cleanable Fluid Coils

Cleanable applications are commonly used where mechanical cleaning of the coil tubes is required. One and two row coils are furnished with removable brass threaded plugs on either or both ends. Multi-row coils utilize a removable steel head plate in lieu of coil headers. This plate contains baffles to provide coil circuitry and is removable for easy access to coil tubes. Cleanable options include cleanable from the supply connection end, cleanable from the end opposite the supply connection, or cleanable from both ends.

HEATCRAFT FLUID COIL SPECIFICATION

1.0 CERTIFICATION

Acceptable coils are to have ARI Standard 410 certification and bear the ARI symbol. Coils exceeding the scope of the manufacturer's certification and/or the range of ARI's standard rating conditions will be considered provided the manufacturer is a current member of the ARI Air-Cooling and Air-Heating Coils certification program and the coils have been rated in accordance to ARI Standard 410. Manufacturer must be ISO 9002 certified.

1.1 FLUID COIL DESIGN PRESSURES AND TEMPERATURES

Coils shall be designed to withstand 250 psi maximum operating pressures and a maximum fluid temperature of 300°F for standard duty copper tube coils. Optional high pressure construction will include cupronickel tubes and headers to increase maximum operating pressure to 350 psi and maximum operating temperature to 450°F. For cleanable coils with removable heads, coils shall be designed to withstand 100 psi maximum operating pressures and a maximum fluid temperature of 150°F. Higher limits are available, depending on coil construction and/or materials used.

1.2 FACTORY TESTING REQUIREMENTS

Coils shall be submerged in water and tested with a minimum of 315 psi air pressure for standard copper tube coils and 125 psi for cleanable coils with removable heads. A 500 psig hydrostatic and shock test is required for high pressure cupronickel construction. Coils must display a tag with the inspector's identification as proof of testing.

1.3 FINS

Coils shall be of plate fin type construction providing uniform support for all coil tubes. Stainless steel fins shall be constructed of 304 & 316 stainless. Carbon steel fins shall be constructed of ASTM A109-83. Coils are to be manufactured with die-formed aluminum, copper, stainless steel or carbon steel fins with self-spacing collars which completely cover the entire tube surface. The fin thickness shall be 0.0075 +/- 5% unless otherwise specified. Manufacturer must be capable of providing self-spacing die-formed fins 4 through 14 fins/inch with a tolerance of +/- 4%.

1.4 TUBING

Tubing and return bends shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High pressure construction shall use seamless 90/10 Cupronickel alloy C70600 per ASTM B111. Stainless steel tubes shall be ASTM A249. Carbon steel tubes shall be W&D / ASTM A214 & seamless A179. Copper tube temper shall be light annealed with a maximum grain size of 0.040 mm and a maximum hardness of Rockwell 65 on the 15T scale.

Design permits in-tube water velocities up to 6 ft/s for the standard seamless copper tubing, and up to 8 ft/s for optional seamless alloy C70600 cupronickel tubing.

Tubes are to be mechanically expanded to form an interference fit with the fin collars. Coil tube size and wall thickness' are 5/8"x0.020 and 1/2"x0.016 and 1"x.035 standard for copper, with other options available. Steel tubes are offered as 5/8"x0.035 or 0.049.

1.5 HEADERS

Headers shall be constructed from UNS 12200 seamless copper conforming to ASTM B75 and ASTM B251 for standard pressure applications. High-pressure construction is to incorporate seamless 90/10 Cupronickel alloy C70600 per ASTM B111. Stainless steel will be constructed of 304L & 316L (ASTM-A240) Sch-5 or Sch-10. Carbon steel headers shall be constructed of Sch-10 (ASTM-A135A) or Sch-40 (ASTM A53A) pipe.

Coil return headers are to be equipped with factory-installed 1/2" fpt air vent connection placed at the highest point available on face of the header.

Tube-to-header holes are to be intruded inward such that the landed surface area is three times the core tube thickness to provide enhanced header to tube joint integrity. all core tubes shall evenly extend within the inside diameter of the header no more than 0.12 inch.

End caps shall be die-formed and installed on the inside diameter of the header such that the landed surface area is three times the header wall thickness.

1.6 CONNECTIONS

Standard construction fluid connections are male pipe thread (MPT) and constructed from red brass conforming to ASTM B43 or Schedule 40 steel pipe as a minimum. Stainless steel will be 304L or 316L (ASTM-A240) Sch-40 or Sch 80. Carbon steel will be A53A Sch-40, A106A Sch-40 or Sch-80 or A53B Sch-80 pipe.

1.7 CLEANING

All residual manufacturing oils and solid contaminants are removed internally and externally by completely submersing the coil in an environmentally and safety approved type degreasing solution, which is also chemically compatible with the coil material. This may vary for steel tube coils, depending on the application and/or customer specifications.

1.8 BRAZING

Oxyfuel gas brazing, using fillet rod material of minimum 5% silver, is used for all non-ferrous tube joints to headers and connections. Depending on the application, ferrous to non-ferrous brazing material may contain upwards of 35% silver, or may be Tobin bronze.

1.8.1 WELDING

Gas shielded arc welding is used for welded vessels constructed of stainless steel. Gas welding is used for welded vessels constructed of carbon steel.

1.9 CASING

Coil casing and endplate shall be fabricated from Galvanized steel, as a standard construction, meeting ASTM and UL G90U requirements, Aluminum, 0.080" thick, optional, Copper, 0.063 " thick, optional, 16- or 14-gauge carbon steel or stainless steel, optional. double-flange casing shall be provided when coils are specified as vertical stacking.

Standard coil intermediate tube sheets (center tube supports) shall be fabricated from the same gauge sheet stock and material as the end plates, and to the following schedule:

Finned Length (inches)	Number of Tube Sheets
6.00 – 48.00	0
48.01 – 96.00	1
96.01 – 144.00	2
144.01 and greater	4

1.10 CERTIFICATION

Performance certified coils that are ARI Standard 410 listed bear the ARI symbol. Coils exceeding the scope of the certification and/or the range of standard rating conditions are also rated to the extent possible by the ARI Std. 410 method. Luvata continues as a current and active member of the ARI Air-Cooling and Air-Heating Coils certification program, with original coil line certification and computerized selections dating back to 1969.

1.11 AGENCY APPROVAL

Luvata Grenada LLC was facility registered by UL in 1994 to ISO 9002 (ANSI/ASQC Q92). Applicable commercial coil models are UL Standard 207 registered as Refrigerant Containing Components and Accessories; non-electrical. CRN, category H.

Note: Luvata Grenada LLC can provide ASME code stamped vessels.

1.13 INSTALLATION

Coils to be installed in accordance with manufacturer's instructions and any applicable piping codes.

1.14 LEAD TIME

Standard lead-time for custom made retrofit fluid coils of standard construction with OEM circuiting shall be 11-15 working days, with reduced lead-time emergency shipment options of 10 working days and 5 working days from order placement date and based upon production approval.

Standard lead-time for custom made fluid coils of manufacturer's own standard design and circuiting shall be 10 working days, with reduced lead-time emergency shipment options for 5 working days, 48-hours and 24-hours from order placement date.

All coils shall be quoted and offered as FOB Factory, Full Freight Allowed to any and all destinations within the Continental United States.

Customer _____ Customer P.O. Number _____

Job _____

Written by _____ Date _____

Approved by _____ Date _____

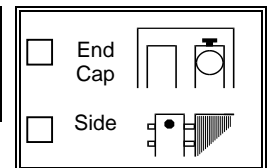
#	TAG	QTY	MODEL NUMBER						
			TYPE	FPI	ROWS DEEP	FIN	FH	FL	
1									
2									
3									
4									

#	DIMENSIONAL DATA														
	CONNECTION					H	I	J	L	M	FLANGES				W
	SIZE	A	B	C	E						R	S	T		
1															
2															
3															
4															

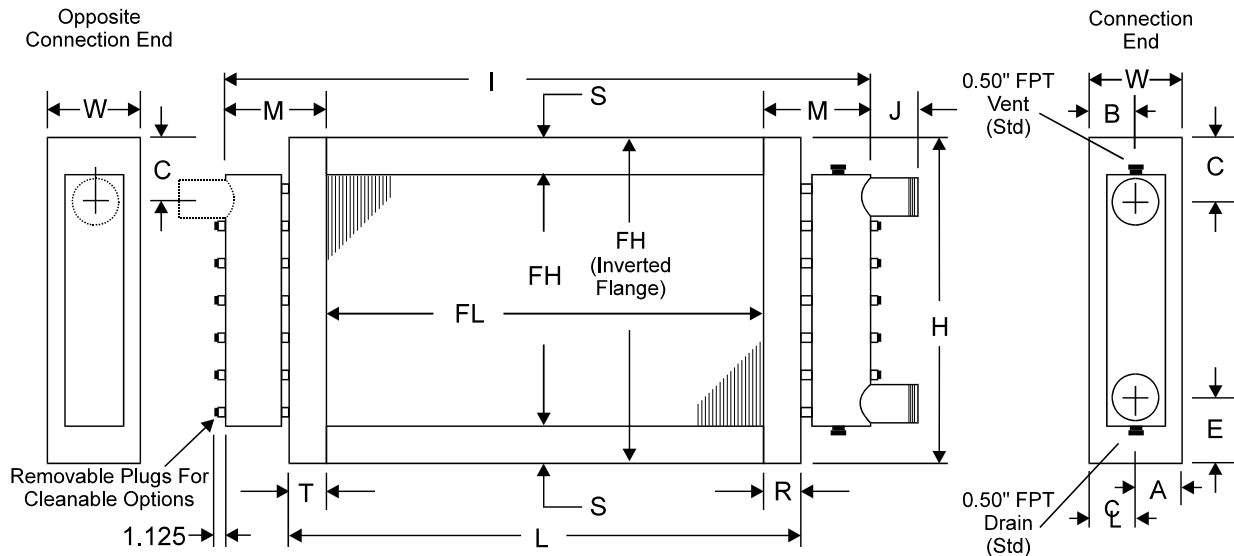
MATERIALS OF CONSTRUCTION	
FINS	AL CU CS St Stl
TUBES	CU CuNi CS St Stl
HEADERS	CU CuNi Carbon Stl St Stl
CONN	CS Red Brass Cu Sweat St Stl
CASING	AL Galvanized Steel CU Stainless Steel

GENERAL OPTIONS	
<input type="checkbox"/>	Inverted Flanges
<input type="checkbox"/>	End Plates Only
<input type="checkbox"/>	Label Kit
<input type="checkbox"/>	Mounting Holes
<input type="checkbox"/>	Phenolic Coating
<input type="checkbox"/>	Turbospirals

CONN. & V/D OPTIONS	
<input type="checkbox"/>	End Cap 0.125" Tee
<input type="checkbox"/>	Side 0.50" FPT Cpl.
<input type="checkbox"/>	FPT Connections



REMARKS:



GENERAL NOTES

1. Coils will vent and drain through factory-installed vent and drain fittings when mounted level for horizontal flow.
2. If $S < 1"$ or End Plates Only Case, vents and drains will be located on the side of the header. Connection locations other than standard could affect vent and drain locations. Consult factory.
3. Mounting holes are optional. 0.375" diameter holes on 6" centers from the centerline of the fin height and finned length are typical for all flanges. Not available with Inverted Flanges or when $S < 0.75"$.
4. All dimensions are in inches.
5. Type K coils have removable plugs on both ends.
6. Type P coils have removable plugs on connection end only.
7. Type Q coils have removable plugs on opposite connection end only.
8. With Inverted Flanges or End Plates Only construction, headers will extend a maximum of 0.375" above and below the casing. Vents and drains will be located on the side of the headers.
9. Intermediate tube supports are fabricated from heavy gauge stock and supplied per the chart below.

Finned Length (FL)	≤ 48	$> 48 \leq 96$	$> 96 \leq 144$	> 144
Tube Supports	0	1	2	4

Customer _____ Customer P.O. Number _____

Job _____

Written by _____ Date _____

Approved by _____ Date _____

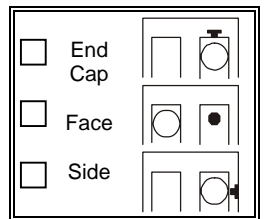
#	TAG	QTY	MODEL NUMBER						HAND Left, Right Universal
			TYPE	FPI	ROWS DEEP	FIN	FH	FL	
1									
2									
3									
4									

#	DIMENSIONAL DATA															
	CONNECTION								FLANGES							
	SIZE	A	B	C	D	E	F	H	I	J	L	M	R	S	T	W
1																
2																
3																
4																

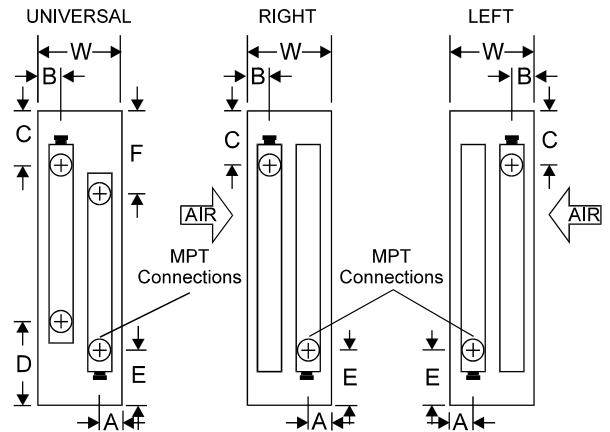
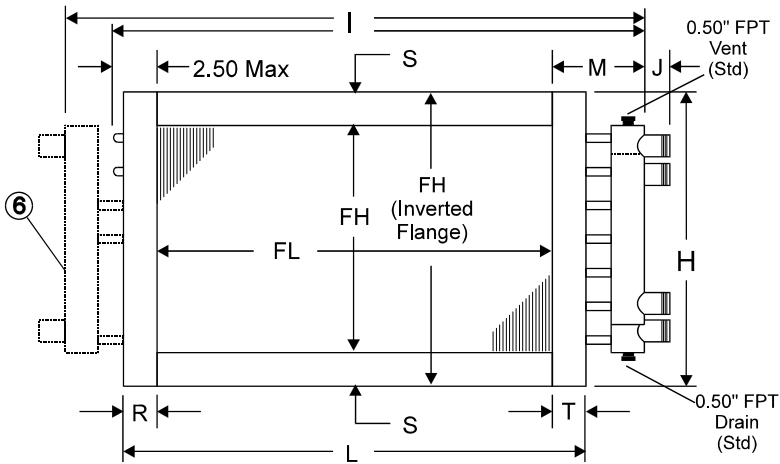
MATERIALS OF CONSTRUCTION	
FINS	AL CU CS St Stl
TUBES	CU CuNi CS St Stl
HEADERS	Cu CuNi Carbon Stl St Stl
CONN	CS Red Brass Cu Sweat St Stl
CASING	AL Galvanized Steel
	CU Stainless Steel

GENERAL OPTIONS	
<input type="checkbox"/>	Inverted Flanges
<input type="checkbox"/>	End Plates Only
<input type="checkbox"/>	Label Kit
<input type="checkbox"/>	Mounting Holes
<input type="checkbox"/>	Phenolic Coating
<input type="checkbox"/>	Turbospirals

CONN. & V/D OPTIONS	
<input type="checkbox"/>	End Cap 0.125" Tee
<input type="checkbox"/>	Face 0.50" FPT Cpl.
<input type="checkbox"/>	Face 0.25" Tee
<input type="checkbox"/>	Face 0.50" MPT 7" Ext.
<input type="checkbox"/>	Side 0.50" FPT
<input type="checkbox"/>	FPT Connections



REMARKS:



GENERAL NOTES

- Coils will vent and drain through factory-installed vent and drain fittings when mounted level for horizontal flow.
- If $S < 1"$ or End Plates Only Case, vents and drains will be located on the face or side of the header. Connection locations other than standard could affect vent and drain locations. Consult factory.
- Mounting holes are optional. 0.375" diameter holes on 6" centers from the centerline of the fin height and finned length are typical for all flanges. Not available with Inverted Flanges or when $S < 0.75"$.
- All dimensions are in inches.
- 1.5 and 2 serpentine 3, 4 and 5-row coils. 3 serpentine 6-row, and 5M (splayed header) coils are available only as left- or right-handed.
- 1 serpentine 3- and 5-row coils, 2 serpentine 6- and 10-row coils, and

- 9-row coils have supply and return connections on opposite ends. All other serpentine and row configurations have same end connections.
- The supply line should be connected to the lower connection on the leaving air side for counterflow operation.
- With Inverted Flanges or End Plates Only Case construction, headers will extend a maximum of 0.375" above and below the casing. Vents and drains will be located on the face of the headers.
- Intermediate tube supports are fabricated from heavy gauge stock and supplied per the chart below.

Finned Length (FL)	≤ 48	$> 48 \leq 96$	$> 96 \leq 144$	> 144
Tube Supports	0	1	2	4

Customer _____ Customer P.O. Number _____
 Job _____
 Written by _____ Date _____
 Approved by _____ Date _____

TAG	QTY	MODEL NUMBER	HAND (Left or Right)

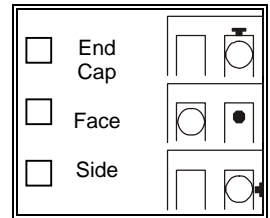
PATENT PENDING

DIMENSIONAL DATA														
CONNECTION					H	I	J	L	M	N	FLANGES			W
SIZE	A	B	C	E							R	S	T	

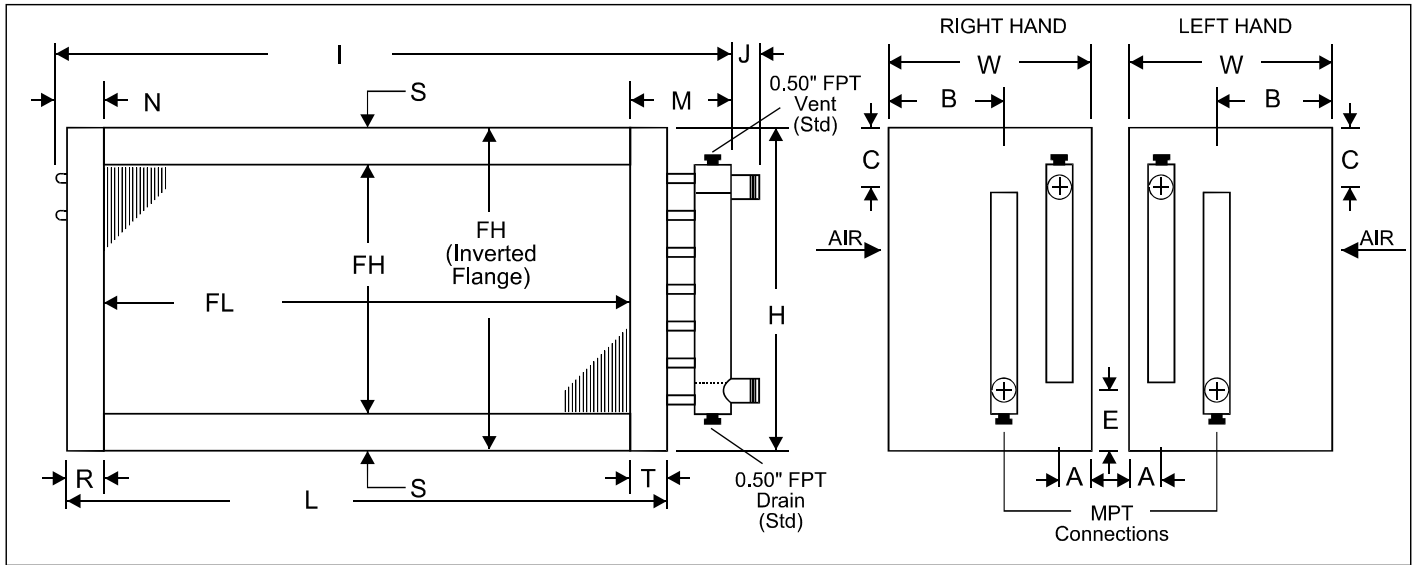
MATERIALS OF CONSTRUCTION			
FINS 1	AL	CU	
FINS 2	AL	CU	
TUBES	CU	CuNi	Adm Brass
HEADERS	CU	CuNi	Carbon Stl
CONN	CS	Red Brass	Cu Sweat
CASING	AL	Galvanized Steel	
	CU	Stainless Steel	

GENERAL OPTIONS	
<input type="checkbox"/>	Inverted Flanges
<input type="checkbox"/>	End Plates Only
<input type="checkbox"/>	Label Kit
<input type="checkbox"/>	Mounting Holes
<input type="checkbox"/>	Corrosion Resistant Coating
<input type="checkbox"/>	Turbospirals

CONN. & V/D OPTIONS	
<input type="checkbox"/>	End Cap 0.125" Tee
<input type="checkbox"/>	Face 0.50" FPT Cpl.
<input type="checkbox"/>	Face 0.25" Tee
<input type="checkbox"/>	Face 0.50" MPT 7" Ext.
<input type="checkbox"/>	Side 0.50" FPT
<input type="checkbox"/>	FPT Connections



REMARKS:



GENERAL NOTES

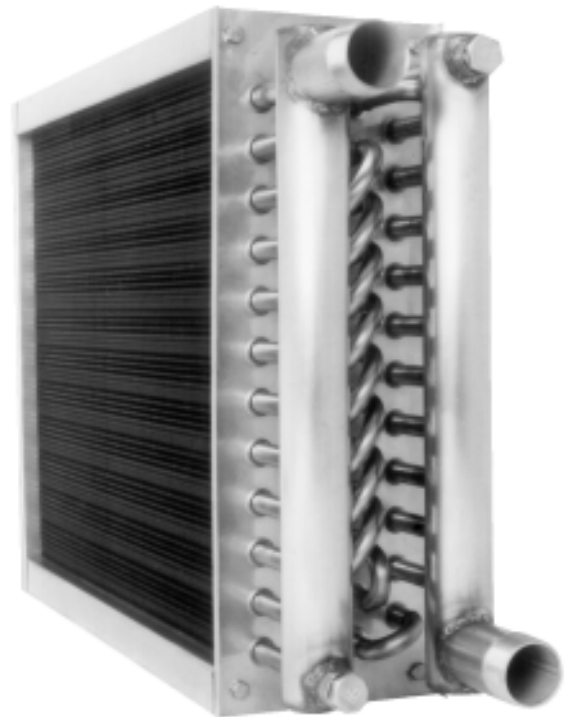
- All dimensions are in inches.
- Coils will vent and drain through factory-installed vent and drain fittings when mounted level for horizontal flow.
- If $S < 1"$ or End Plates Only Case, vents and drains will be located on the face or side of the header. Connection locations other than standard could affect vent and drain locations. Consult factory.
- Mounting holes are optional. 0.375" diameter holes on 6" centers from the centerline of the fin height and finned length are typical for all flanges. Not available with Inverted Flanges or when $S < 0.75"$.
- The supply line should be connected to the lower connection on the entering air side for counterflow operation.
- With Inverted Flanges or End Plates Only Case construction, headers will extend a maximum of 0.375" above and below the casing. Vents and drains will be located on the face of the headers.
- Intermediate tube supports are fabricated from heavy gauge stock and supplied per the chart below.

Finned Length (FL)	≤ 48	> 48 ≤ 96	> 96 ≤ 144	> 144
Tube Supports	0	1	2	4

LUVATA

HEATCRAFT

Fluid Coil
Installation
Operation
and
Maintenance



LUVATA GRENADA LLC

PO Box 1457 / 1000 Heatcraft Drive, Grenada, MS 38902-1457

Tel: 800-225-4328 / 662-229-4000 Fax: 662-229-4212

Email: coils@luvata.com

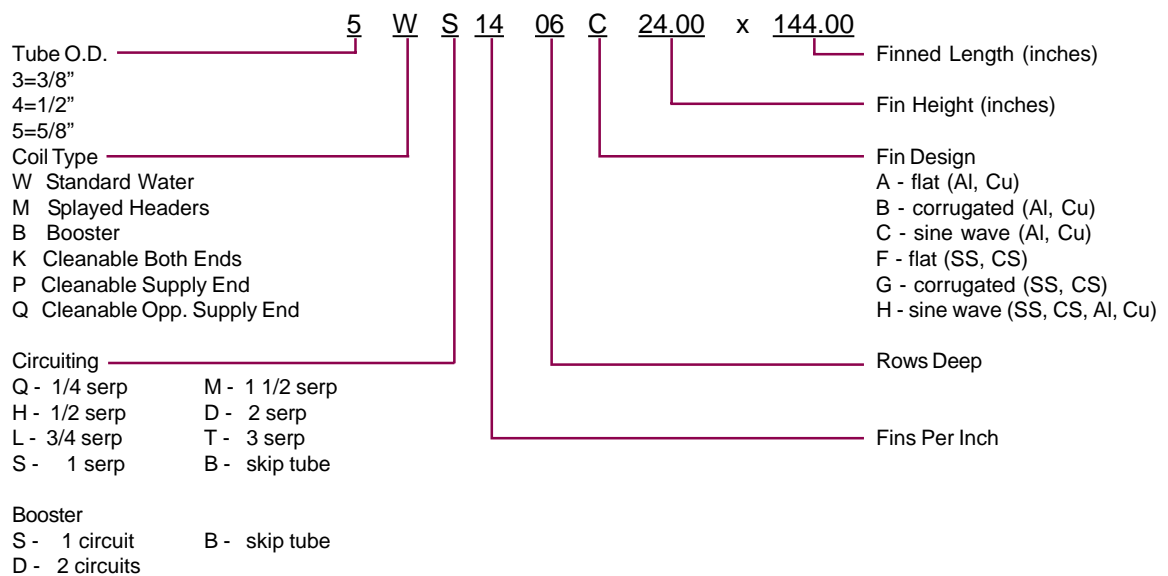
Web Site: www.luvata.com/heatcraft

Guidelines for the installation, operation and maintenance of Heatcraft cooling and heating coils have been provided to help insure the proper performance of the coils and their longevity. These are general guidelines that may have to be tailored to meet the specific requirements of any one job. As always, the installation and maintenance of any coil should be performed by a qualified party or individual. Protective equipment such as safety glasses, steel toe boots and gloves are recommended during the installation and routine maintenance of the coil.




Receiving Instructions

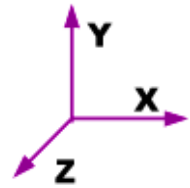
1. All Heatcraft coils are factory tested, inspected and carefully packaged.
2. Damage to the coils can occur after they have left the factory. Therefore, the coils should be inspected for shipping damage upon receipt. The freight bill should also be checked against items received for complete delivery.
3. Damaged and/or missing items should be noted on the carrier's freight bill and signed by the driver.
4. For additional assistance, contact your local Heatcraft coil representative.

Nomenclature



Mounting

	Horizontal Air Flow Horizontal Tubes	Level with the y-axis and x-axis.
	Vertical Air Flow ² Horizontal Tubes	Level with the z-axis and x-axis.
	Horizontal Air Flow Vertical Tubes	Level with the y-axis and x-axis.

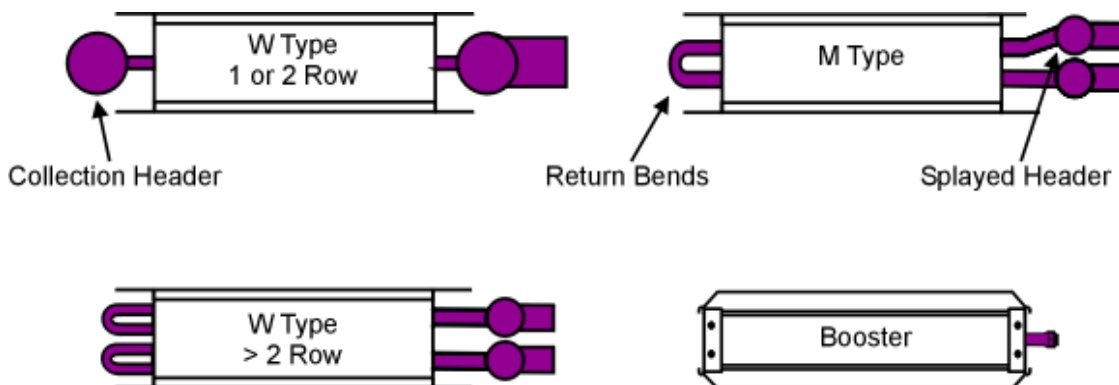


1. All Heatcraft water and glycol coils are designed to be fully drainable when properly mounted.
2. Vertical air-flow is not recommended for dehumidifying coils.

Coil Types

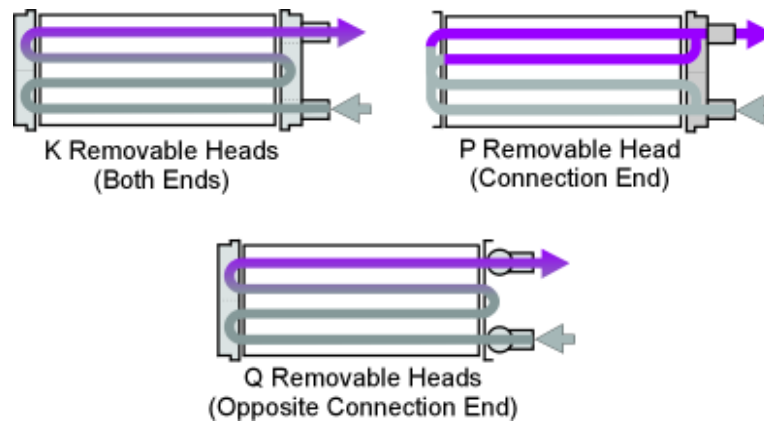
Standard Fluid Coils

Heatcraft fluid coils are specifically designed for your particular application. Flexibility is built into our manufacturing processes, offering variations in fin type, fin density, circuitry arrangement, coil casing and materials of construction. Standard fluid type “W” coils utilize a collection header for one and two row applications and return bends for applications that require three or more rows. Type “M” coils are used for one and two row applications that require same end connections. For type “M” coils the supply and return headers are offset or “splayed.” This orientation allows for the supply and return headers to be placed side by side. Booster coils, type “B,” are also available for one and two row applications.



Cleanable Fluid Coils

We offer cleanable fluid coils for applications where mechanical cleaning of the internal surface of the tubes are required. Our cleanable coils utilize a box-style head in lieu of cylindrical headers. The head contains baffles for circuiting and is removable for easy access to coil tubes. Type “P” coils are cleanable from the supply end of the coil. Type “Q” coils are cleanable from the end opposite the supply. Type “K” coils are cleanable from both ends of the coil.



Installation

1. Carefully remove the coil from the shipping package to avoid damage to the finned surface area. Damaged fins can be straightened using an appropriate fin comb. If a mist eliminator was purchased, remove it before installation.
2. For coils with removable heads, check the torque on the nuts before installing. Refer to **Maintenance** on Page 6 for recommended torque values.
3. Heatcraft recommends cleaning the coil with a commercially available coil cleaner prior to installation. Refer to **Maintenance** on Page 6 for cleaning recommendations.
4. Check the coil hand designation to insure that it matches the system. Water and glycol coils are generally plumbed with the supply connection located on the bottom of the leaving air-side of the coil and the return connection at the top of the entering air-side of the coil (Figure 2 - Connection Diagram). This arrangement provides counter flow heat exchange and positive coil drainage. If a universal coil is supplied, cap off the two unused connections.
5. Standard coils must be mounted level to insure drainability. Refer to **Mounting** on page 2 for leveling requirements. Coils with intermediate headers and coils with removable box style headers can be pitched 1/8" per foot of coil finned length towards the coil's header/connection end.
6. Proper clearance should be maintained between the coil and other structures such as the fan, filter racks, transition areas, etc..
7. Once installed, the coil should be pressurized to 100 psig with dry nitrogen or other suitable gas. The coil should be left pressurized for a minimum of 10 minutes. If the coil holds the pressure, the hook-up can be considered leak free. If the pressure drops by 5 psig or less re-pressurize the coil and wait another 10 minutes. If the pressure drops again, there is more than likely one or

more small leaks which should be located and repaired. Pressure losses greater than 5 psig would indicate a larger leak that should be isolated and repaired. If the coil itself is found to be leaking, contact your local Heatcraft coil representative. Unauthorized repair to the coil may void the coil’s warranty (see Luvata’s warranty policy on back cover).

8. All field brazing and welding should be performed using high quality materials and an inert gas purge (such as nitrogen) to reduce oxidation of the internal surface of the coil.
9. All field piping must be self supporting. System piping should be flexible enough to allow for thermal expansion and contraction of the coil.
10. General piping diagrams can be found in Figure 1 - Horizontal Airflow and Figure 3 - Vertical Airflow.
11. (If a mist eliminator was purchased) With the coil installed, place the mist eliminator into its brackets. Make sure the mesh is aligned with the coil face area (finned area).

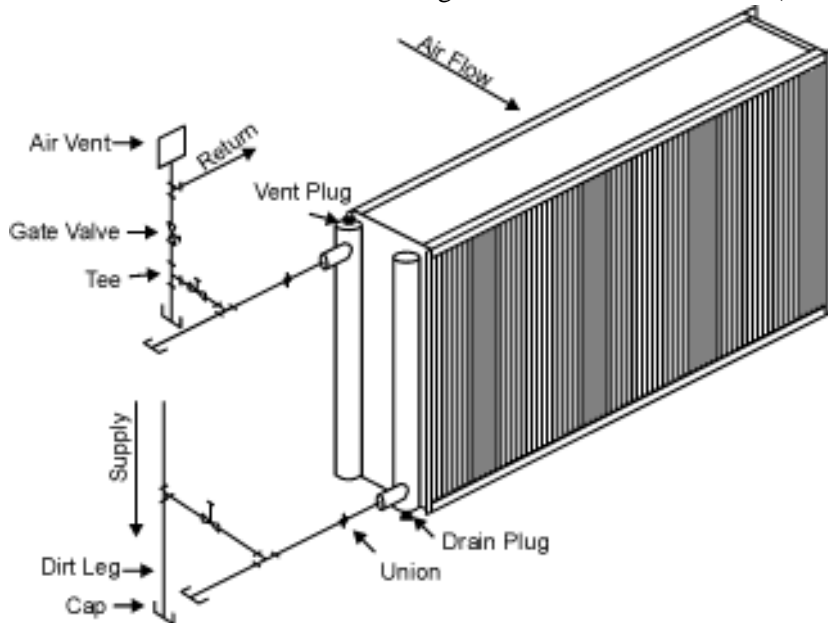


Figure 1 - Horizontal Airflow Diagram

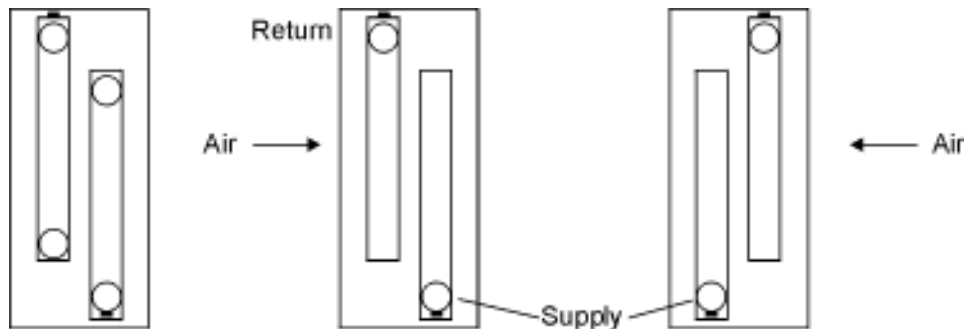


Figure 2 - Coil Diagram

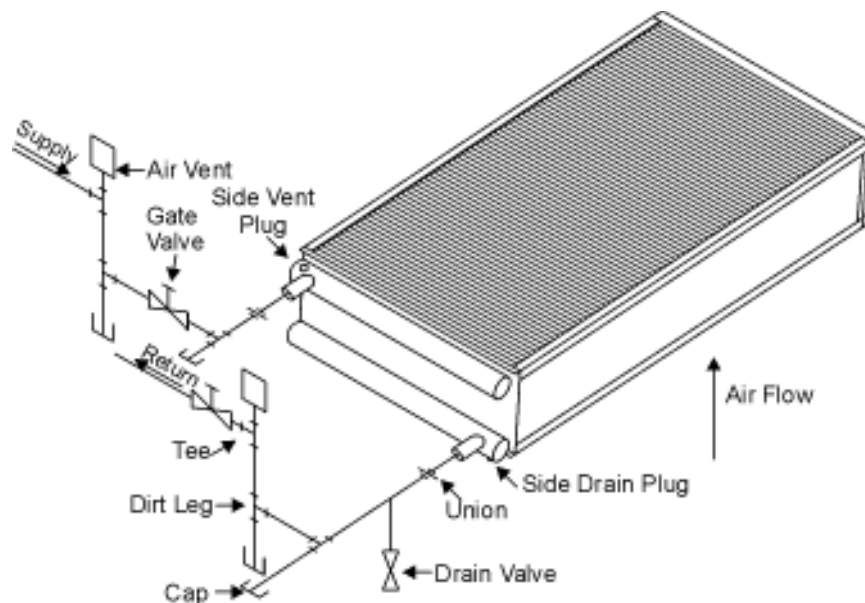


Figure 3 - Vertical Airflow Diagram

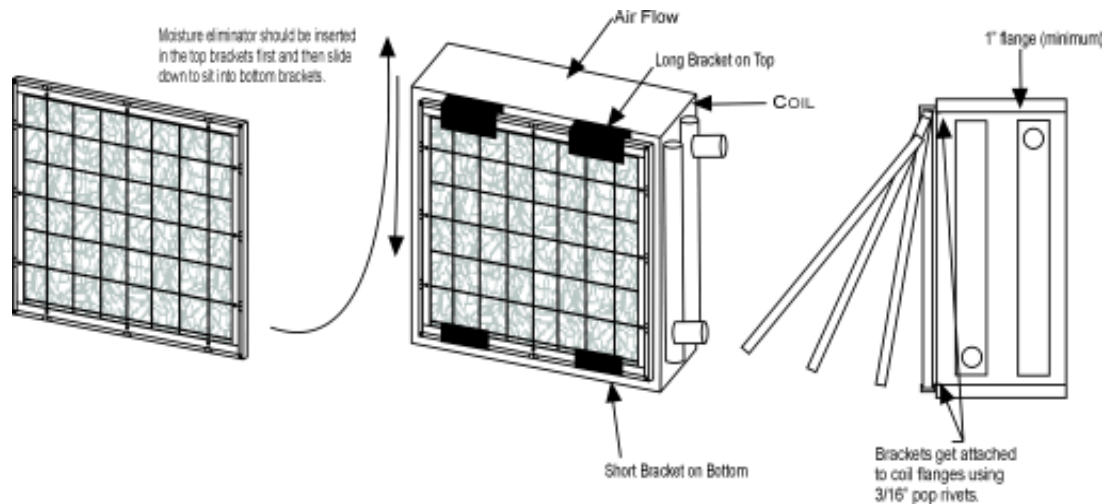


Figure 4 - Mist Eliminator Installation

Operation

Initial Start-Up

1. Open all air vents so that air is eliminated from within the coil circuitry and headers. Verify that all vents and drains are not obstructed and do discharge a stream of water.
2. Fill the coil with water then close all vents.
3. Perform an initial hydrostatic leak test of all brazed, threaded or flanged joints, valves and interconnecting piping. Recheck the coil level and correct if necessary. When the setup is found to be leak free, discharge and discard initial water charge. It is important that all grease, oil, flux and sealing compounds present from the installation be removed.

General

1. Proper air distribution is vital to coil performance. Air flow anywhere on the coil face should not vary by more than 20%.
2. The drain pan and associated piping (drain line and trap) should be installed so that there is no standing water in the drain pan and that no blow-through occurs.
3. Fluid and air velocities should be maintained within our recommended values.

Table 2a

Fluid Velocity	
Water	1 to 8 fps
Glycol	1 to 6 fps

Table 2b

Maintenance

General

1. Filters and mist eliminators should be inspected on a regular basis and changed as needed. Maintaining clean filters and mist eliminators is a cost effective way to help maintain maximum coil performance and service life.
2. Periodic inspection of the coil for signs of corrosion and/or leaks is recommended. Repair and replacement of the coil and the connecting piping, valves, etc., should be performed as needed by a qualified individual(s).
3. Should the coil surface need cleaning, caution should be exercised in selecting the cleaning solution as well as the cleaning equipment. Improper selection can result in damage to the coil and/or health hazards. Clean the coil from the leaving air-side so that foreign material will be washed out of the coil rather than pushed further in. Be sure to carefully read and follow the manufacturer’s recommendations before using any cleaning fluid.
4. Maintain the circulated fluid free of sediment, corrosive products and biological contaminants. Periodic testing of the fluid followed by any necessary corrective measures along with maintaining adequate fluid velocities and proper filtering of the fluid will help to satisfy this goal.
5. If automatic air vents are not utilized, periodic venting of the coil is recommended to remove accumulated air. Caution should be exercised to avoid injury. High pressure and/or high temperature fluids can cause serious personal injury.
6. Heatcraft’s cleanable coils with removable box headers should be cleaned using a suitable brush or its equivalent. Dislodged debris should be flushed from the coil and drain pan. Be sure that debris does not clog the drain. After the coil has been cleaned, the old gaskets should be discarded and replaced with new ones (contact your local Heatcraft coil representative for replacement gaskets). The box header should then be reinstalled. The recommended instal-

lation procedure is as follows.

- a. Nuts and weld studs should be coated with thread lubricant.
- b. Tighten all nuts per Figure 5 - Torque Pattern, to 35 ft-lb torque. After the initial torque has been applied retorque them to 50 ft-lb, again using the pattern shown in Figure 5. The permissible range of final torque values are as follows:

maximum torque:	53 ft-lb
design torque:	50 ft-lb
minimum torque:	47 ft-lb

- c. Pressure test coils per the installation instructions.
- d. After the coil has been leak tested and found to be free from leaks, let it sit for 24 hours. Retorque to 50 ft-lb per Figure 5 - Torque Pattern.
- e. Refill the coil per the operation instructions.

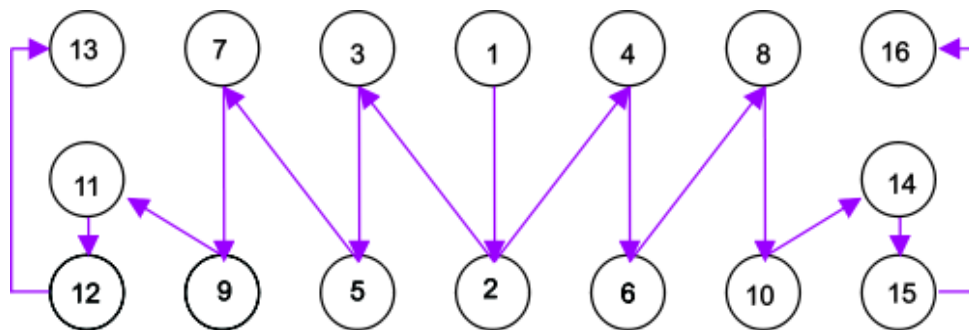


Figure 5 - Torque Pattern

Freeze Protection

During the winter, chilled water coils need to be protected against freezing. The two predominant protective measures are covered below.

Blowing-Out Coils

1. Isolate the coil from the rest of the system by closing the valves on both the supply and return lines (gate valves in Figure 1 - Horizontal Airflow and Figure 3 - Vertical Airflow).
2. Drain the coil by opening all drain valves and/or the drain plug. Remove the vent plug to aid the draining process.
3. Once the coil has been fully drained, the blower can be hooked-up. Caps installed in the piping on straight runs going to the supply and return connections are ideal points to hook-up the blower. The air vent and drain plug are not suitable locations for hooking-up the blower. *Caution should be exercised when installing the blower. The blower operator must take precautions to insure that water does not come into contact with any*

of the electrical components of the blower. Failure to do so may result in damage to the equipment and serious injury.

4. Close the vent or drain plug on the header which the blower is connected and open the drain valve or cap on the other header.
5. Operate the blower for 45 minutes and then check the coil to see if it is dry. A mirror placed in the discharge will become fogged if moisture is present. Repeat this procedure until the coil is dry.
6. Let the coil stand for several minutes then blow it out again. If water comes out, repeat the blowing operation.
7. Leave all plugs out and drains open until the threat of freezing has passed.

Flushing Coils

1. We recommend the use of inhibited glycol designed for HVAC applications for corrosion protection. The use of uninhibited glycol has produced formicary corrosion in copper tubing. The complete filling of water coils with an inhibited glycol solution for freeze protection can be expensive. In some instances, it is more cost effective to flush the coils with an appropriate concentration of inhibited glycol solution. Residual fluid can be left in the coil without the threat of freeze damage provided the correct concentration of inhibited glycol was used. The recovered fluid can then be used to flush other coils. Select an inhibited glycol solution that will protect the coil from the lowest possible temperatures that can occur at the particular coil's locality. The following tables have been provided for your convenience.

¹Freeze points may vary from product to product.

2. Estimate the volume of the coil in gallons.
 - For 5/8" tubes (1.5" face tube spacing)*
(finned height in inches)x(finned length in inches)x(# of rows)x 0.0011 = gallons
 - For 1/2" tubes (1.25" face tube spacing)*
(finned height in inches)x(finned length in inches)x(# of rows)x 0.00083 = gallons
3. Isolate the coil from the rest of the system by closing the valves on both the supply and return lines (gate valves in Figure 1 - Horizontal Airflow and Figure 3 - Vertical Airflow).

4. Drain the coil by opening all drain valves and/or the drain plug. Remove the vent plug to aid the draining process.
5. Close the drain valve(s) and drain plug.
6. Connect the flushing system to the coil. A typical system is shown in Figure 6 - Flushing System Diagram.
7. With the throttling valve closed, start the pump and operate until the air is vented from the coil. Next, close the air vent.
8. Open the throttling valve about half-way and circulate the fluid through the coil for 15 minutes. Check the strength of the fluid. A hydrometer or test kit from the fluid manufacturer is suitable for this application.
9. Adjust the solution strength as needed and circulate the fluid for another 15 minutes.
10. Repeat steps 8 and 9 until the desired concentration is reached.
11. Shut the pump down and drain the inhibited glycol from the coil.
12. The recaptured fluid can be used to flush other coils.

Note: Be sure to follow the manufactures' recommendations before utilizing any glycol based anti-freeze solution. Additional fluid will be required for the pump, connected piping and fluid reservoir. Formulae are for estimation purposes only.

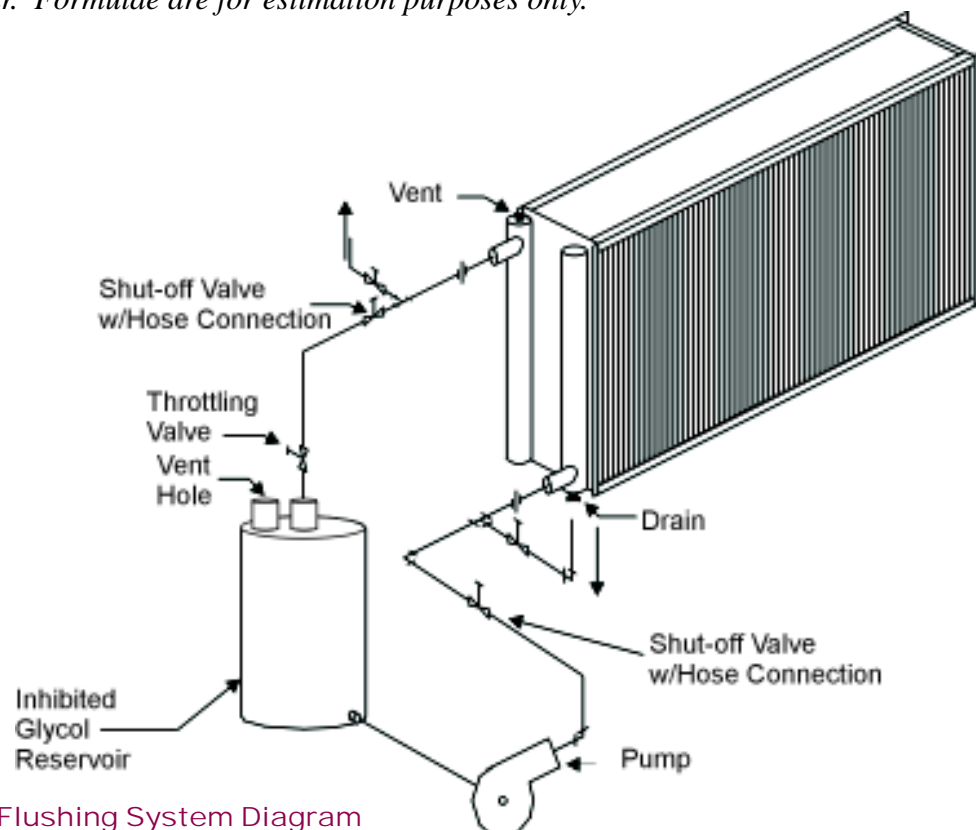


Figure 6 - Flushing System Diagram



COMMERCIAL PRODUCTS WARRANTY

Luvata Grenada LLC, hereinafter referred to as the "Company", warrants that it will provide free suitable repair or replacement of coils in the event any coil of its manufacture used in the United States proves defective in material or workmanship within twelve (12) months from the date shipped by the Company.

THIS WARRANTY CONSTITUTES THE BUYER'S SOLE REMEDY. IT IS GIVEN IN LIEU OF ALL OTHER WARRANTIES. THERE IS NO IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT AND UNDER NO CIRCUMSTANCE SHALL THE COMPANY BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER THE THEORY BE BREACH OF THIS OR ANY OTHER WARRANTY, NEGLIGENCE, OR STRICT TORT.

This warranty extends only to the original purchaser. Of course, abuse, misuse, or alteration of the product in any manner voids the Company's warranty obligation.

This warranty does not obligate the Company to pay any labor or service costs for removing or replacing parts, or any shipping charges.

No person (including any agent or salesman) has authority to expand the Company's obligation beyond the terms of this express warranty, or to state that the performance of the coil is other than that published by Luvata Grenada LLC.

June 2006

LUVATA GRENADA LLC

PO Box 1457 / 1000 Heatcraft Drive, Grenada, MS 38902-1457

Tel: 800-225-4328 / 662-229-4000 Fax: 662-229-4212

Email: coils@luvata.com

Printed in U.S.A.