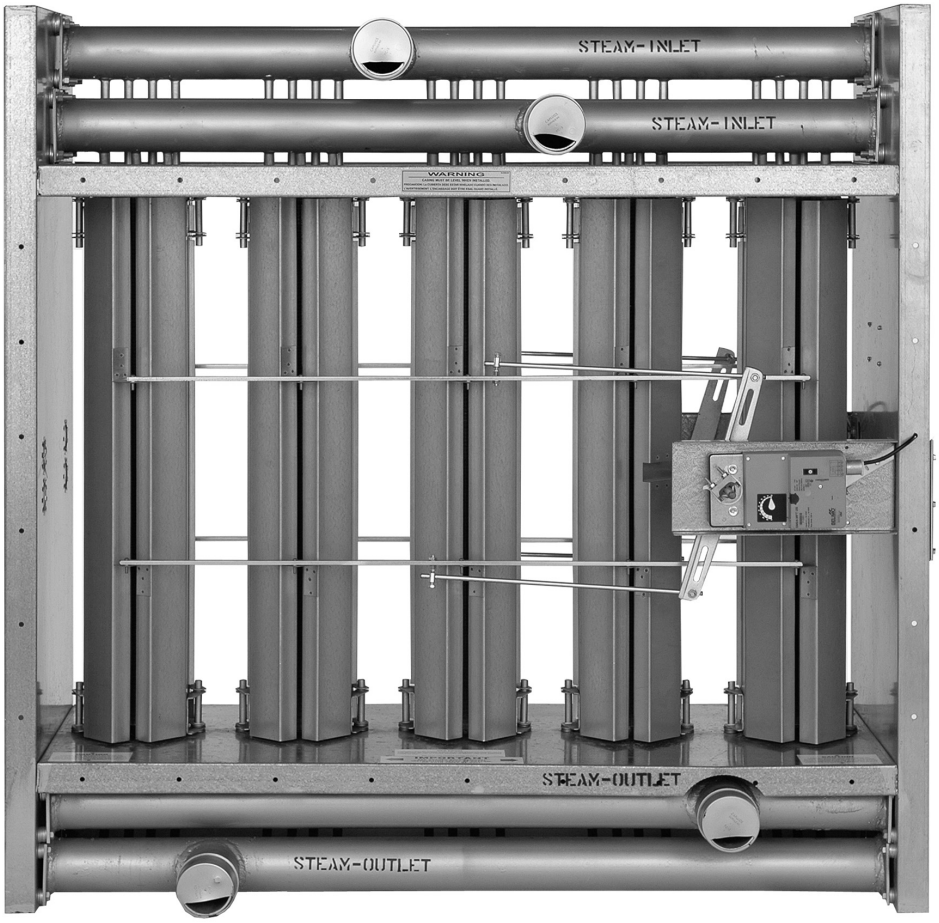
MV Coil
TECHNICAL GUIDE



VERTICAL TUBE INTEGRAL FACE AND BY-PASS HEATING COILS FOR AIR PREHEATING WITH ENHANCED TEMPERATURE CONTROL

LJ ING®

Since 1875, the L.J. Wing Company has been a leader in providing innovative solutions for difficult HVAC problems. Wing MV integral face and by-pass coils provide reliable air preheating for air handling systems. This technical guide will help you size, select and specify the proper MV model to satisfy your project's make-up air preheating requirements. If you have questions, please contact your local L.J. Wing representative; he will be glad to assist you.

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www.ljwing.com

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OPERATION

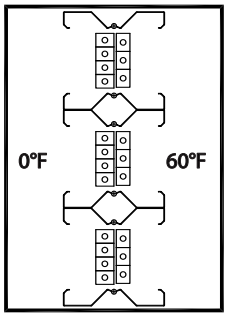
How the MV Coil Works

The MV series introduces the next generation of Wing's integral face and bypass coils. It offers all the benefits of Wing's two-row VIFB coils, including vertical tubes for positive condensate drainage in steam systems, plus the additional benefit of enhanced temperature control. Instead of a common header for both rows, the MV series utilizes separate supply and return headers for each row. During part load conditions that occur during mild winter weather or in VAV systems, the discharge air thermostat can disable the second coil row. This enables the dampers to readjust to a more fully open position, such that the face and bypass airstreams are more equal in size and temperature, facilitating improved mixing and better temperature control.

With the second row disabled, additional energy savings can be obtained in hot water systems with variable pumping capacity.

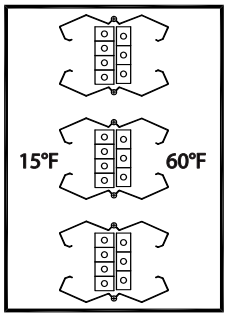
The outside air temperature at which the first row alone develops sufficient heating capacity to achieve the desired supply leaving air temperature is called the **"2nd Row Control Temperature"**. Once this temperature is reached, the second row of tubes can be shut off using a slow-acting on/off valve, and the MV coil delivers improved temperature control.

The example below demonstrates a typical operational sequence for the MV Coil.



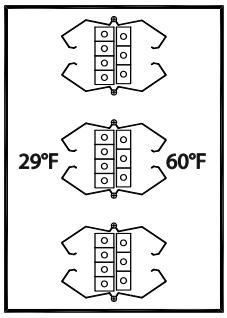
For 0° Entering Air

Both coil circuits are fully active. The clamshell damper blades are completely open to the face to allow maximum temperature rise.



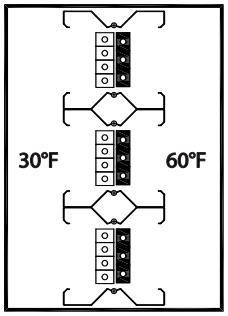
For 15° Entering Air

Both coil circuits are fully active and the clamshell damper blades are partially closed to allow the proper proportions of face and bypass air to achieve the desired leaving air temperature.



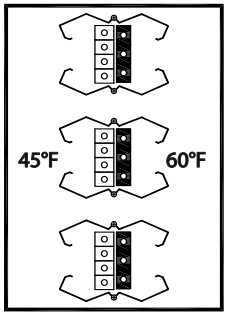
For 29° Entering Air

Both coil circuits are fully active. The clamshell damper blades are mostly closed to allow more bypass air than face air to achieve the desired leaving air temperature.



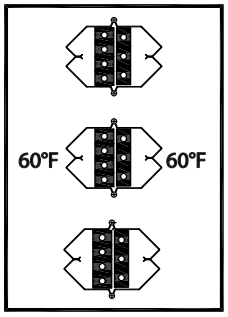
For 30° Entering Air

The second coil circuit is no longer active. The clamshell damper blades go to the full-open position as the first row alone provides sufficient capacity to achieve the desired leaving air temperature.



For 45° Entering Air

The second coil circuit is no longer active. The clamshell damper blades are partially closed to allow the proper proportions of face and bypass air to achieve the desired leaving air temperature.



For 60° Entering Air

Both coil circuits are no longer active. The clamshell damper blades are completely closed to allow full bypass airflow with no temperature override.

PERFORMANCE AND CERTIFICATION

Performance

Performance ratings for MV coils can be obtained from the L.J. Wing Coil Specifier program that can be downloaded from the L.J. Wing website: ***www.ljwing.com***

With a menu-driven format, the Coil Specifier program is quick and simple to use. Input and output values are conveniently shown on a single screen, enabling you to instantaneously evaluate the effect of changing input variables such as fin spacing or coil size.

The Specifier program offers two printed reports: “Coil Rating” and “Specification”. The “Coil Rating” report includes not only the coil performance rating, but also a dimensional drawing and piping diagram. The “Specification” report generates a dynamic specification for the coil selected.

Along with the MV series, L.J. Wing’s other two integral face and bypass coil product lines, the IFB and VIFB series, may be also selected and rated with the Coil Specifier.

Certification

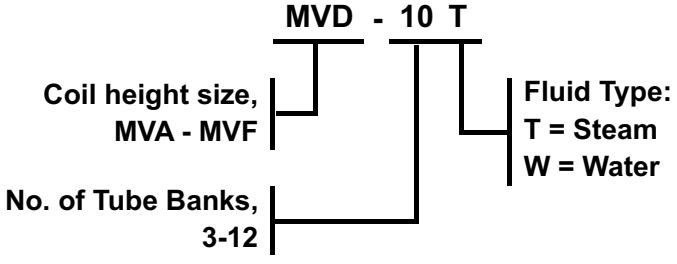
AHRI CERTIFIED™
www.ahridirectory.org
Air-Cooling and Air-Heating Coils
AHRI Standard 410

ETL®
SINCE 1896

Wing MV coil performance generated with the Wing Specifier program is certified by the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) under AHRI Standard 410. Having the AHRI label provides assurance that AHRI certifies the accuracy of the MV coil performance ratings. To earn and maintain AHRI certification, randomly selected MV coils must annually pass through the AHRI design performance certification process. For best performance, always select an AHRI-certified coil.

All L.J. Wing MV coils are listed by Engineering Test Laboratories (ETL) to Underwriters’ Laboratories (UL) Standard 1995. This standard assures that MV coils are safe to operate up to a design pressure of 100 psig. The standard further stipulates that each coil must withstand a hydrostatic pressure equal to five times the rated design pressure, such that each MV coil is hydrostatically tested to 500 psig. For quality products, always look for the ETL mark.

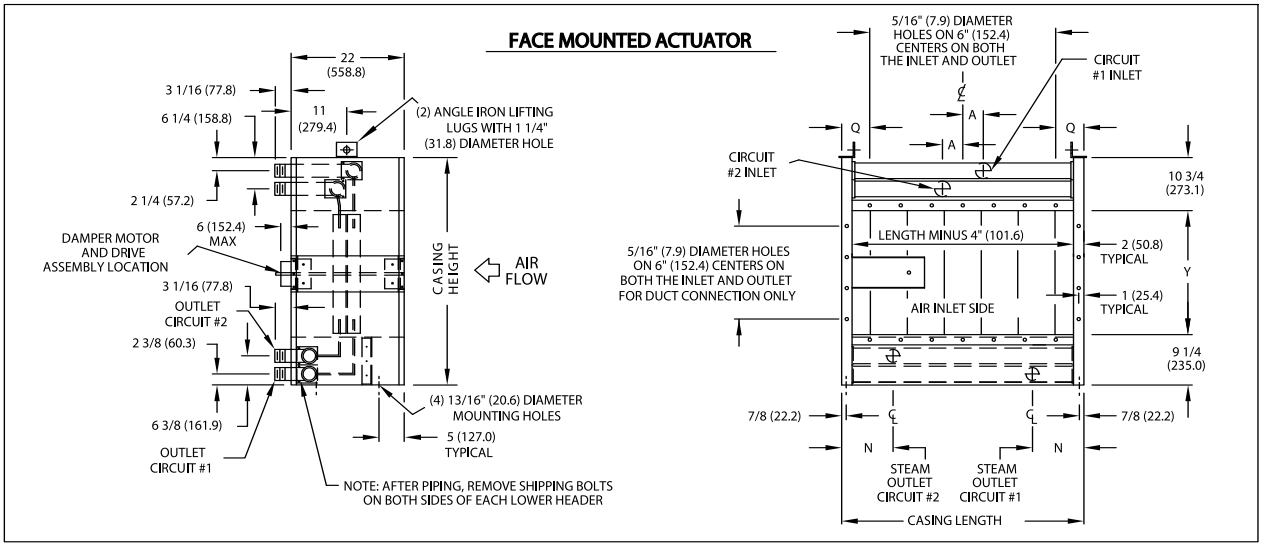
Model Number Description

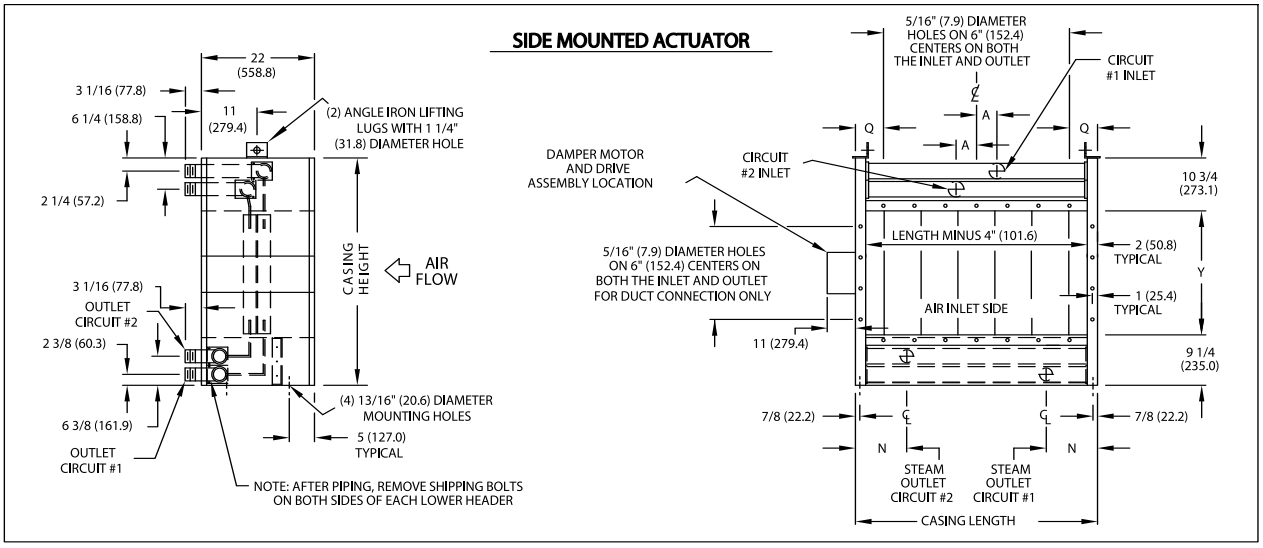


DIMENSIONS

Steam Coils

D000708





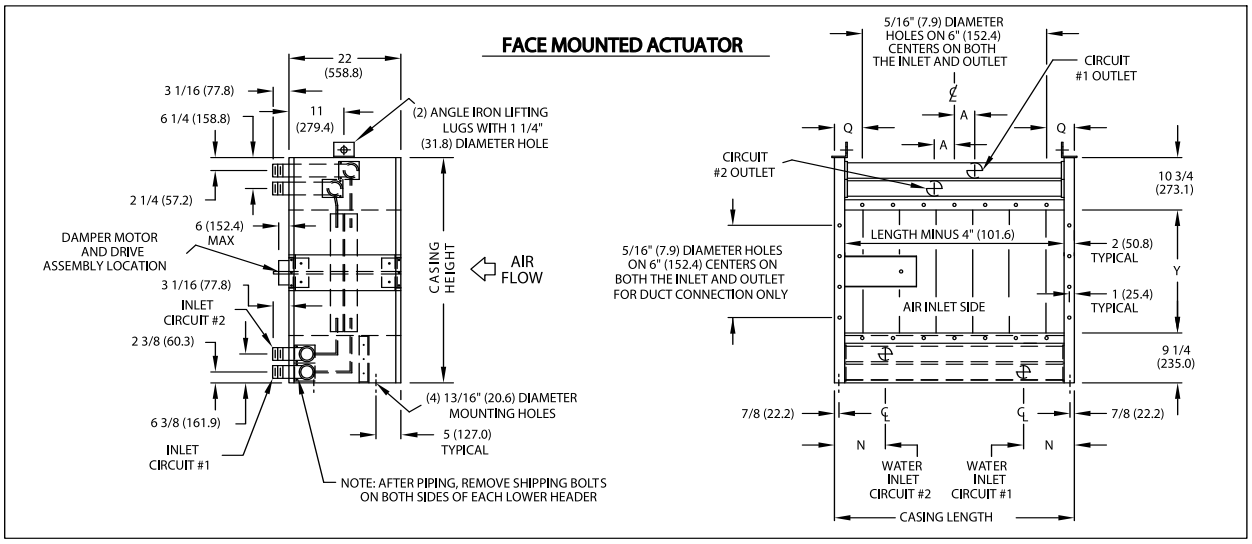
SIZE			3T		4T		5T		6T		7T		8T		9T		10T		11T		12T	
CASING LENGTH			36.188		46.875		57.625		68.313		79.063		89.750		100.500		111.188		121.906		132.625	
INLET/OUTLET			3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT	
A			5.688		10.719		5.688		10.719		5.688		10.719		5.688		10.719		5.688		10.719	
N			12.750		12.750		12.750		12.750		12.750		12.750		12.750		12.750		12.750		12.750	
Q			3.094		5.438		4.813		4.156		3.531		2.875		5.250		4.594		3.953		3.313	
SIZE	CH	Y	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT
MVA	44	24	5.39	385	7.15	471	8.94	556	10.7	697	12.5	782	14.3	868	16.1	953	17.9	1039	19.7	1125	21.4	1210
MVB	56	36	8.08	426	10.7	524	13.4	621	16.1	773	18.8	870	21.4	967	24.1	1064	26.8	1161	29.5	1259	32.2	1356
MVC	68	48	10.8	468	14.3	577	17.9	685	21.4	849	25.0	958	28.6	1066	32.2	1175	35.8	1284	39.3	1393	42.9	1501
MVD	80	60	13.5	509	17.9	630	22.3	750	26.8	925	31.3	1045	35.7	1166	40.2	1286	44.7	1406	49.1	1527	53.6	1647
MVE	98	78	-	-	-	-	29.0	847	34.8	1039	40.6	1177	46.5	1315	52.2	1452	58.1	1590	63.8	1728	69.6	1865
MVF	116	96	-	-	-	-	-	-	42.9	1154	50.1	1309	57.2	1464	64.4	1619	71.5	1774	78.7	1929	85.8	2084

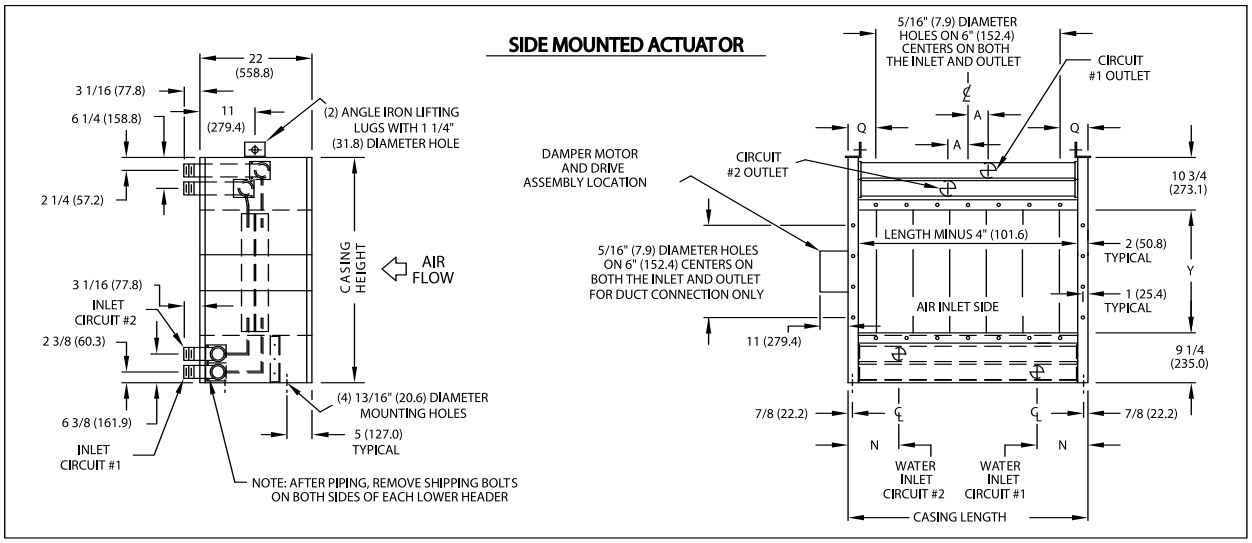
Notes:
1. CH = Casing Height; OA = Outlet Area in square feet, WT = Weight in pounds.
2. All dimensions in inches.

DIMENSIONS

Hot Water Coils

D000707





SIZE			3W		4W		5W		6W		7W		8W		9W		10W		11W		12W	
CASING LENGTH			36.188		46.875		57.625		68.313		79.063		89.750		100.500		111.188		121.906		132.625	
INLET/OUTLET			3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT		3" MPT	
A			5.688		10.719		5.688		10.719		5.688		10.719		5.688		10.719		5.688		10.719	
N			12.750		12.750		12.750		12.750		12.750		12.750		12.750		12.750		12.750		12.750	
Q			3.094		5.438		4.813		4.156		3.531		2.875		5.250		4.594		3.953		3.313	
SIZE	CH	Y	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT	OA	WT
MVA	44	24	5.39	385	7.15	471	8.94	556	10.7	697	12.5	782	14.3	868	16.1	953	17.9	1039	19.7	1125	21.4	1210
MVB	56	36	8.08	426	10.7	524	13.4	621	16.1	773	18.8	870	21.4	967	24.1	1064	26.8	1161	29.5	1259	32.2	1356
MVC	68	48	10.8	468	14.3	577	17.9	685	21.4	849	25.0	958	28.6	1066	32.2	1175	35.8	1284	39.3	1393	42.9	1501
MVD	80	60	13.5	509	17.9	630	22.3	750	26.8	925	31.3	1045	35.7	1166	40.2	1286	44.7	1406	49.1	1527	53.6	1647
MVE	98	78	-	-	-	-	29.0	847	34.8	1039	40.6	1177	46.5	1315	52.2	1452	58.1	1590	63.8	1728	69.6	1865
MVF	116	96	-	-	-	-	-	-	42.9	1154	50.1	1309	57.2	1464	64.4	1619	71.5	1774	78.7	1929	85.8	2084

Notes:
1. CH = Casing Height; OA = Outlet Area in square feet, WT = Weight in pounds.
2. All dimensions in inches.

PIPING

Recommendations

The integrity of the system depends in part on proper piping. The following recommendations should be diligently observed:

Steam Systems

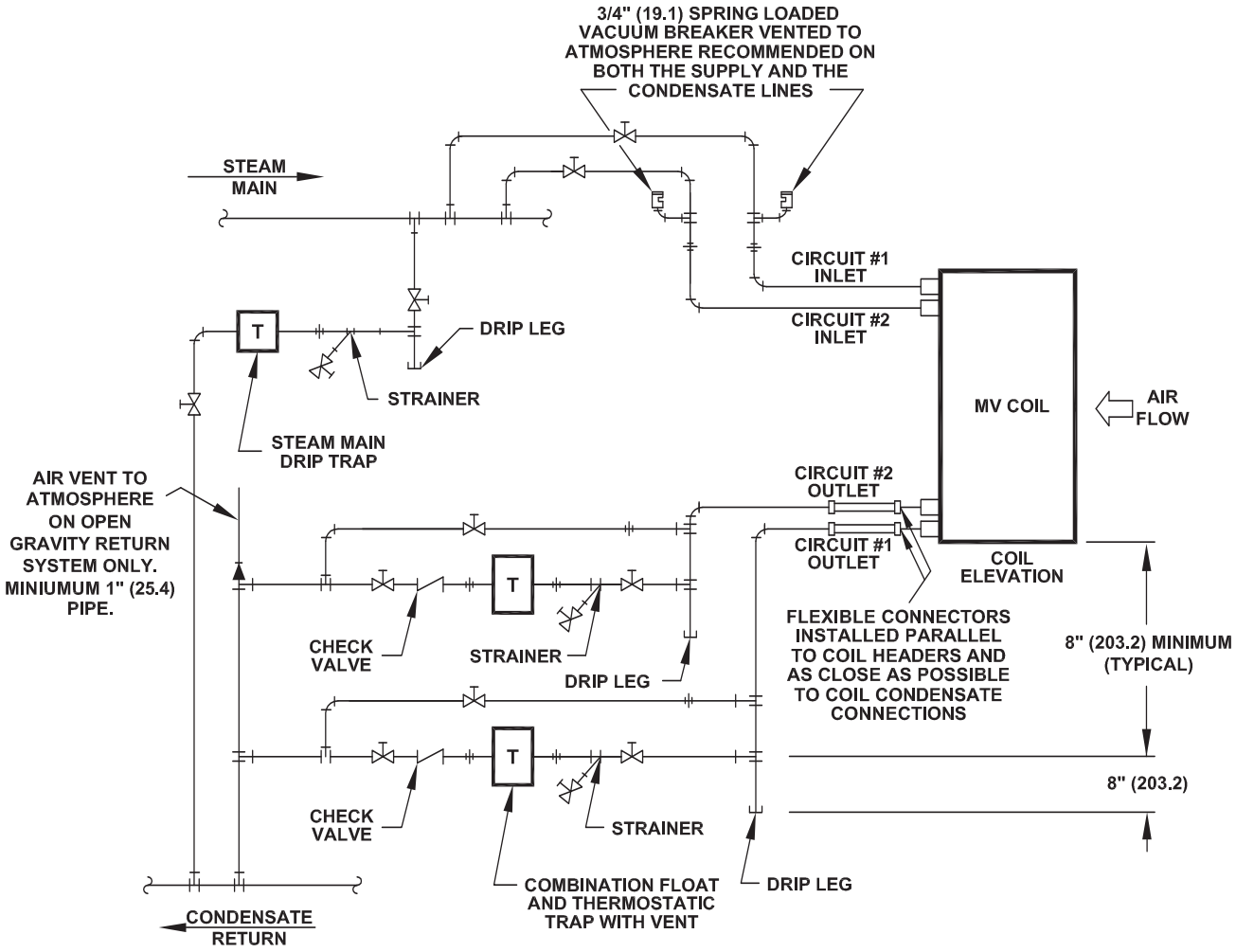
1. All piping in contact with airflow or inside an air handler should be insulated.
2. Install casing level; tubes must be vertical.
3. Full steam pressure must be supplied to the coil at all times; modulating valves must not be used.
4. Steam mains, return mains and traps should be anchored and supported independently of the MV coil. Traps and condensate piping must be supported on spring-loaded hangers or pads to isolate forces from the return header.
5. Return piping must incorporate a flexible connector to insure at least 3/8" tube expansion and contraction, and to allow the return header to float.
6. A drip trap should be installed in the steam supply line and drip into the return main. This will prevent steam line condensate from entering the unit with the steam. Avoid dripping steam mains into the MV coil or into the line between the MV coil and traps.
7. Use only bucket or float and thermostatic traps for condensate removal. Thermostatic traps should be used for venting only.
8. Steam traps should be sized for three times the calculated condensate loading at the coil design conditions, based on the pressure differential across the trap rather than the boiler pressure. Each trap should be selected for the actual pressure differential across the trap, not the boiler pressure. Pressure differential is herein defined as the gauge pressure at the trap minus the pressure in the return main.
9. The return connection should be full size of the coil header and reduced at the trap. Use of a reducing bushing on the coil return connection is not recommended. (If shutoff valve, strainer and trap are piped together with pipe nipples, then the pipe can be reduced to the trap inlet size at the shutoff valve).
10. Strainers should be installed ahead of traps to prevent dirt and sludge from affecting trap operation.
11. When the "closed circuit gravity return system" leads directly to the boiler, the coil traps should be located at least two feet above the water line of the boiler.
12. Risers should <u>not</u> be installed in condensate return lines.
13. Each coil in a coil bank or in series should be individually trapped and vented.
14. The steam trap should have provisions for air venting. If the trap is non-venting, proper air vents should be provided for each coil section to eliminate condensable gases. All air vent lines should be minimum one-inch diameter and properly pitched to assure free venting of air. The venting device should be located at least 12 inches above the bottom of the coil casing. In low-pressure steam systems (15 psig and below) in which a non-venting trap is used for condensate removal, a thermostatic air trap should be installed in a one-inch diameter air line bypassing the condensate trap to the atmospheric return main. An automatic air vent should be installed in a one-inch diameter air line before the condensate trap on systems with a vacuum return system. In high- pressure steam systems (above 15 psig) in which a non-venting trap is used for condensate removal, an automatic air vent should be installed in a one-inch diameter air line before the condensate trap. Do not return vented air to the condensate return main.
15. A bypass line with valve should be installed around the trap to permit operation of the coil during trap maintenance. This feature will also provide better coil start-up conditions when temperatures are below freezing.
16. If condensate must be lifted above the coil return level into overhead mains or if return mains are pressurized, then a pump and receiver should be installed between the condensate traps and return mains.
17. Proper vacuum breakers should be furnished as shown on the piping diagrams.
18. Swing check valves of 15-degree type should be utilized to prevent condensate backup in the case of steam system failure. Vertical lift check valves or 45-degree swing check valves should <u>not</u> be used as they require a higher head pressure of water for opening.

Hot Water Systems

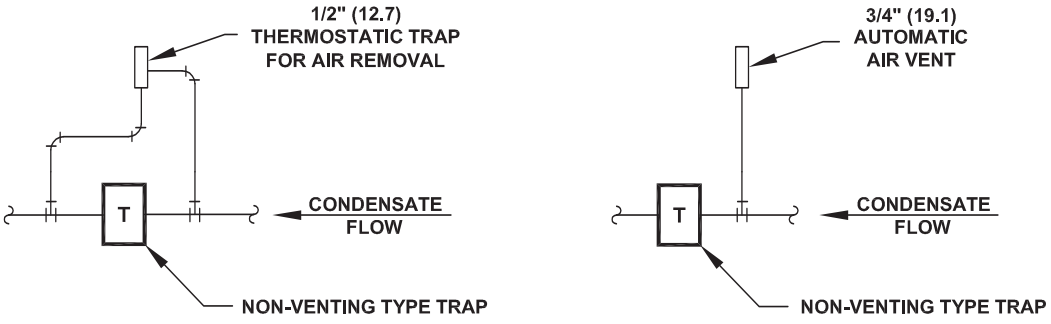
1. Install the casing level; tubes must be vertical.
2. Inlet and outlet mains should be anchored and supported independently of the MV coil.
3. Inlet piping must incorporate a flexible connector to provide for at least 3/8" tube expansion and contraction, and to allow the return header to float.

Steam Coil Piping Diagram – 15 psig and below

W27



Additional Piping Required For Non–Venting Type Steam Traps

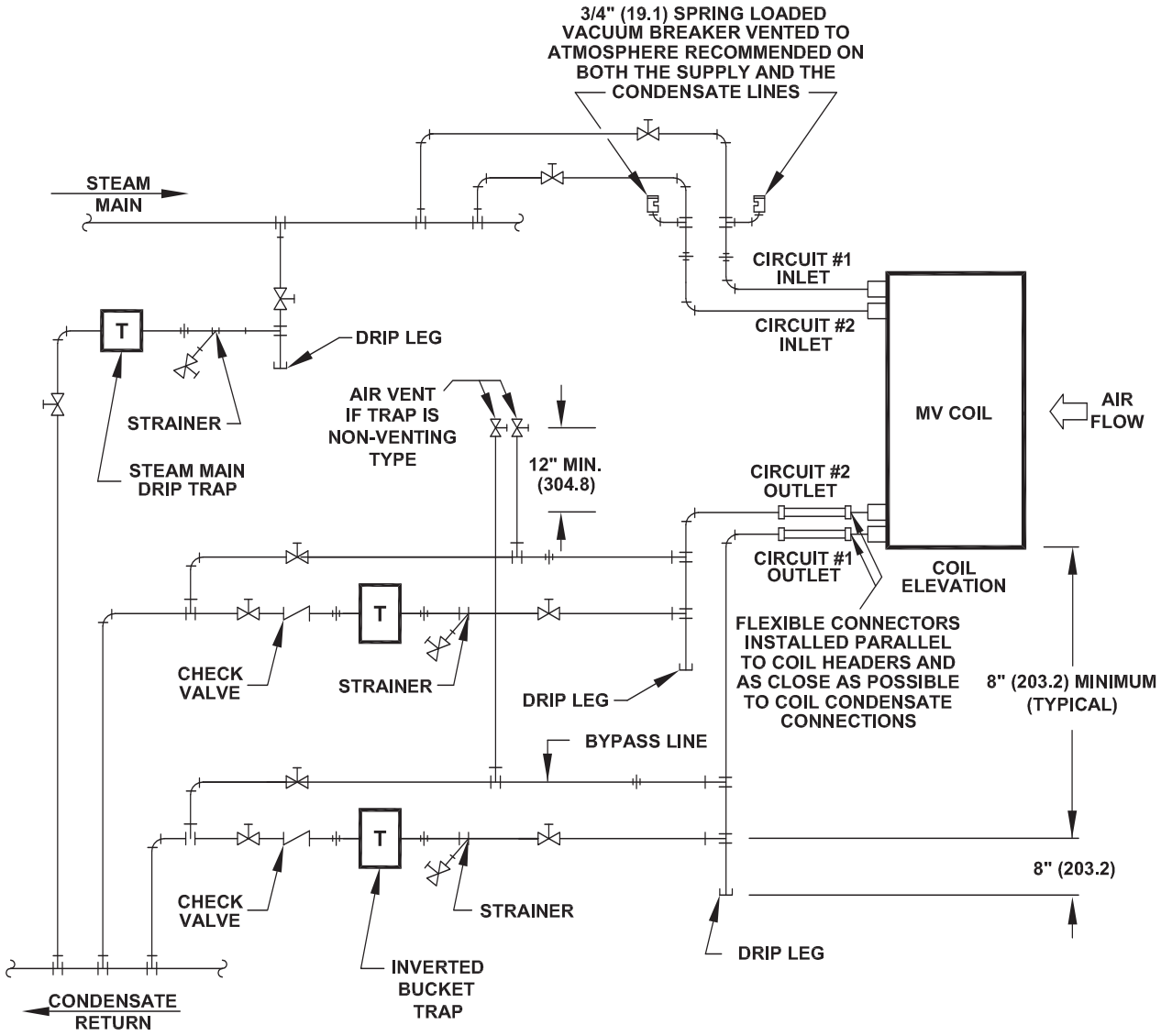


NOTES :

A. STANDARD MV COIL STEAM INLET AND CONDENSATE LINE SIZE IS 3" (76.2) NPT.
B. STEAM MAIN NEEDS TO BE SIZED TO HANDLE THE STEAM FLOW RATE FOR THE TWO CIRCUITS TO BE PIPED IN PARALLEL.
C. CONDENSATE LINE NEEDS TO BE SIZED TO HANDLE THE CONDENSATE FLOW RATE FOR THE TWO CIRCUITS TO BE PIPED IN PARALLEL.
D. DIMENSIONS ARE IN INCHES. DIMENSIONS IN PARENTHESIS ARE IN MILLIMETERS.

Steam Coil Piping Diagram – 15 psig and above

W28



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A. STANDARD MV COIL STEAM INLET AND CONDENSATE LINE SIZE IS 3" (76.2) NPT.

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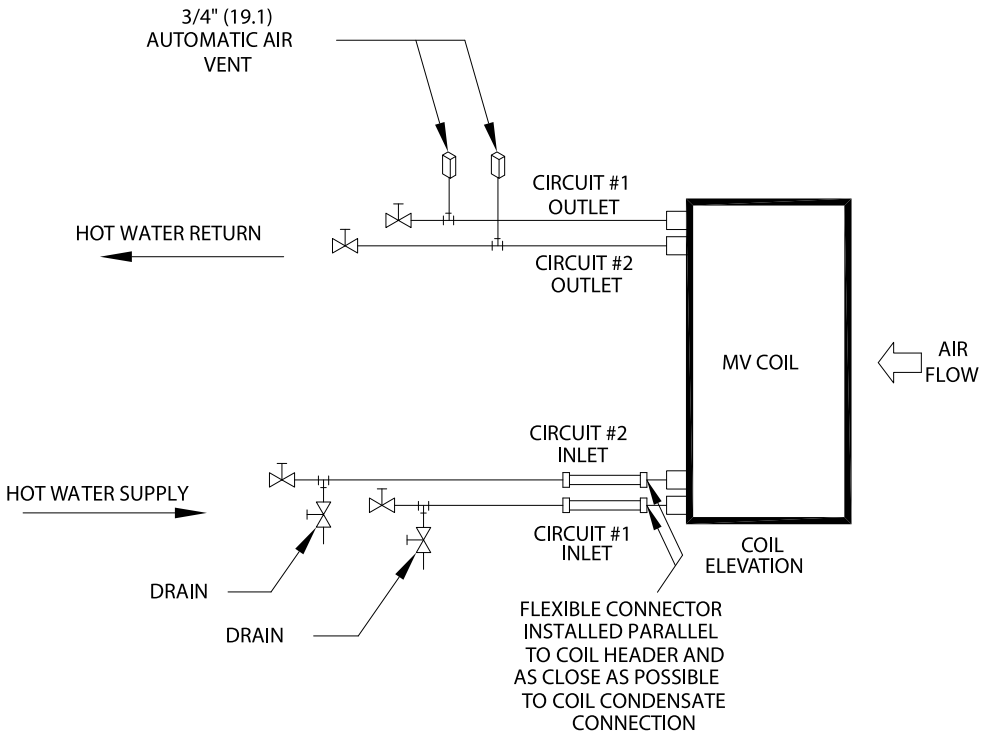
D. DIMENSIONS ARE IN INCHES. DIMENSIONS IN PARENTHESIS ARE IN MILLIMETERS.

Hot Water Coil Piping Diagram

W29



NOTE : DIMENSIONS ARE IN INCHES.
DIMENSIONS IN PARENTHESIS ARE IN MILLIMETERS.

Electric and Pneumatic

Wing's MV coil meets the most exacting requirements of accurate temperature control. Air stream temperature is controlled by an air stream thermostat that operates in conjunction with an electric or pneumatic actuator to properly position the dampers to achieve the proper balance of face and bypass airflows.

Electric actuators may be mounted either on the coil face (direct-coupled type only) or on the side of the coil (indirect-coupled type only). Pneumatic actuators are side-mounted as standard. In some instances, pneumatic actuators may be face mounted; consult factory for details.

Standard mounting location for damper actuators is on the left hand side of the unit casing (when looking in the direction of air flow). Right hand damper actuator mounting is optional.

Integral face and bypass coils are subject to some temperature override, i.e., a rise in air stream temperature above the desired set point in the full bypass mode. Coil temperature override occurs as a result of heat picked up from the hot damper blades. In the event that any temperature override is undesirable a slow-acting two-position (i.e., fully open or fully closed) valve should be installed on both rows.

All motorized shut-off or pressure reducing valves should be of the normally-open type, so that in the event of a malfunction, they will fail in the open position.

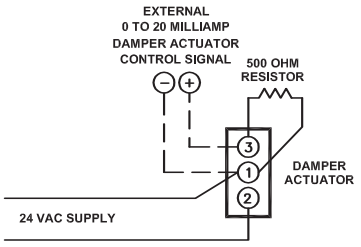
Damper actuators furnished by L.J. Wing are factory-mounted to ensure precise adjustment and to provide a complete package that is ready for installation and operation.

On pneumatic control installations, the actuators close the bypass dampers on spring return stroke to protect the system in event of control air pressure failure. (Pilot positioners are required).

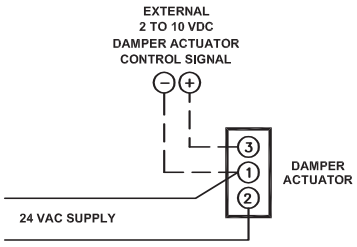
On electric control installations, electric proportional damper motors are used which, if a control failure occurs, will remain at the last controlling position.

The air stream or low limit thermostat bulb should be located in the air stream a minimum of three feet downstream (two feet if anti-stratification baffles are installed) of the coil. The thermostat bulb should be positioned parallel to the headers across both the face and bypass sections. When coils are installed in banks, each coil should have its own thermostat for positive temperature control.

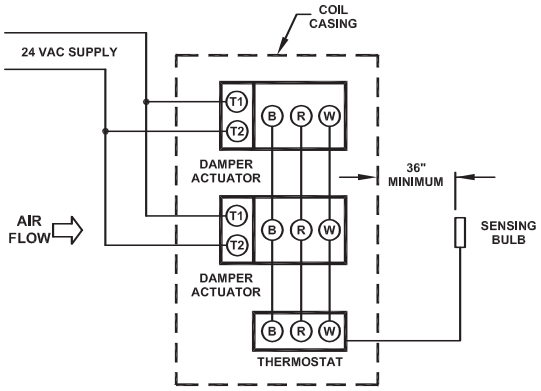
Typical Face Mounted Electric Control (Belimo Standard - 0 To 20 mA)



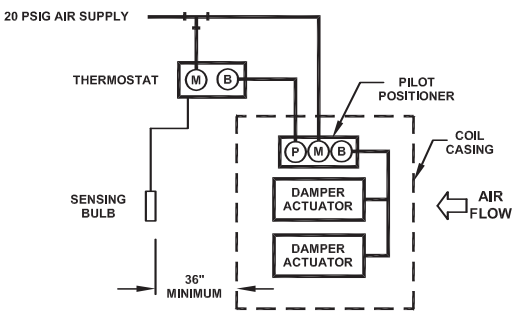
Typical Face Mounted Electric Control (Belimo Standard - 2 To 10 VDC)



Typical Side Mounted Electric Control (Honeywell Standard - 0 To 135 Ohm)



Typical Face And Side Mounted Pneumatic Control (Barber Colman Standard) Pneumatic Face Mount Available Only On Model MVC Or Larger.



INSTALLATION TIPS

Control Valves
Full steam pressure or water flow must be supplied at all times – modulating valves must not be used. A modulating steam valve on a preheat coil can actually cause the coil to retain the condensate due to a reduced pressure in the coil, thus exposing condensate in the tubes to freezing conditions. With modulating steam below 5 psig (near valve closure) the steam may not be fully distributed in all of the tubes in the coil, causing the outer tubes to cool abnormally. This will create thermal stress that can lead to possible “outer tube failure”.

To isolate the coils in the off-season, slow acting on/off steam valves may be used. If motorized stream valves are employed, they should be of the normally open type so if the actuator fails, the valve will go to the open position.

Temperature Override
The amount that the delivered air temperature exceeds the thermostat setting is called temperature override. To minimize temperature override:

Insulate the top and bottom headers and/or at least isolate them on both sides of the coils. Eliminate airflow over the supply and return headers by installing sheet metal isolation plates on the top and bottom upstream of the coils.

Inlet and outlet mains should be fully insulated.

To eliminate coil temperature override, use slow –acting on/off valves to close at desired set points.

The installation of humidifiers with steam manifolds internal of an air handler may provide a temperature override to the system. Internal steam manifolds and piping should be insulated.

Shipping Bolts
Return condensate headers and hot water supply headers are securely bolted to the coil casing to prevent damage to header and tubes during shipment and piping of the coils. These bolts **MUST** be removed before applying steam or hot water but after all piping connections are made

Flexible Connectors
Return steam condensate headers and hot water supply headers must be free to float. A flexible connector **MUST** be installed parallel to the coil header, as close as possible to the coil connection and be able to provide a minimum of 3/8” vertical and lateral movement of the headers.

Failure to install flexible connectors will restrict expansion of the headers. This can result in bowing of tubes, bending of fins, interference with damper operation, or eventually tube breakage.

Steam and hot water mains must be supported separately after the flexible connector to isolate piping strains and additional expansion from the coils.

Temperature Controls
The airstream thermostat control to the coils should be located a minimum of 36” downstream. Each coil should have its own temperature control system.

Freezestats mounted on the face of the cooling coils should be located a minimum of 36” downstream of the VIFB coil flange. Optional anti-stratification baffles are available to reduce this spacing to 24”.

Coils operating at lower or higher than recommended air velocities or in VAV systems should be fitted with optional anti-stratification baffles.

Piping and Start-Up
Steam pipes must be sized to handle desired steam flows at the lowest pressures.

Where more than one (1) coil is used, each coil should be piped independently.

To avoid freezing of pre-heat coils when applying steam or hot water in very cold locations, first raise the tube metal temperature above freezing by applying steam or hot water to the coil prior to passing airflow over it.

OPTIONS AND ACCESSORIES

There are a number of available options for MV coils, including:

Steel Tubes
Available for applications where the job requirements preclude the use of copper or 90/10 cupronickel tube materials.

90/10 Cupronickel Tubes
Available for applications with higher steam pressures up to 350 psig.

0.049" Wall Copper Tubes
Available for applications with higher steam pressures.

Copper Headers
For systems requiring extra cleanliness in the boiler return water.

Anti-Stratification Baffles
For applications where the heated and bypass air must be mixed within a reduced area. Allows reduction of the downstream mixing length from 36" to 24".

Flexible Connector
Required to provide a minimum of 3/8" expansion and contraction of the free-floating bottom header(s).

Casing Flange Extensions
For applications where it is desirable to match coil casing to a fixed duct or an air handling unit in the field.

Raised Face Flanges on Header Connections
For applications where coil piping must match existing field piping. Both threaded and welded designs are available.

Insulated Headers
Provides sheet metal cover with 1", 1-1/2# fiberglass insulation over headers to reduce temperature override.

Inter-Connecting Linkage
Allows two side-by-side coils to be operated from one set of side-mounted damper controls

Painted Finish
Unit casing and dampers can be fabricated of galvannealed steel painted inside and out with an air-dried alkyd enamel finish.

Epoxy Coating
Entire coil can be provided with a durable epoxy coating for applications in corrosive atmospheres.

Stainless Steel Construction
Casing, damper blades, and most of linkage can be furnished in type 304 stainless steel for applications in corrosive atmospheres.

Electric Freezestat
Shuts off fan if freezing temperatures are sensed. Provided factory-mounted on the downstream face of one tube bank.

Electric Fan Cut-Off Thermostat
Mounts on fan inlet to shut off fan if supply air temperature is too cold.

Pressuretrol®
Safety device for steam applications only. Shuts off power to system if inlet steam pressure drops below set point. Shipped loose for field mounting on steam main.

Aquastat®
Safety device for hot water applications only. Shuts off power to system if inlet water temperature drops below set point. Shipped loose for mounting on inlet water main.

Weatherproof Housing
For outdoor installations to protect the linkage controls. Housing includes a removable panel for easy access.

SPECIFICATIONS AND SCHEDULE

Typical Specification

General
Furnish type MV integral face and bypass coils as manufactured by L.J. Wing, Dallas, TX, to heat air using steam or hot water as the heating medium. Performance shall be as shown in the schedule. Each heating coil shall consist of built-in series of finned heating elements and bypasses with interlocked dampers controlled by optional electric (or pneumatic) damper motor(s) and air stream thermostat. Dampers are to be arranged so as to completely enclose and isolate the heating coil passes when no temperature rise is required. Each coil shall be capable of maintaining a constant discharge air temperature regardless of variations in entering air temperatures with full steam pressure or water flow at all times. Actuators are to be **(face-mounted, side-mounted)**.

When the outside air temperature reaches the second row control temperature as shown in the schedule, a slow-acting on/off valve (by others) shall shut off the steam or hot water flow to the second row of tubes so that the scheduled leaving air temperature can be achieved with only the first row operational.

Proportioning of the air shall be such that the temperature at any point in a plane parallel to the face of the coil three feet **(two feet if optional anti-stratification baffles are installed)** downstream from the leaving air side will not vary more than +/- 5° F from the average discharge air stream temperature.

Finned heating elements shall be fabricated of seamless return bend type 5/8" o.d. copper **(optional: 90/10 cupronickel, steel)** tubes of 0.035" **(optional: 0.049")** wall thickness with rectangular fins of 0.010" thick aluminum. Fins shall not be spaced closer than 12 fins per inch. Each tube shall be secured to the steel **(optional: copper)** headers by a brazed joint with provision for 3/8" inch individual tube expansion and contraction by means of an optional flexible connector. Finned elements shall be factory tested with 500 psig hydrostatic pressure.

Unit casing and dampers shall be fabricated of heavy gauge galvanized steel **(optional: type 304 stainless steel)**.

Options:
Painted Finish – Unit casing shall be fabricated of galvannealed steel; dampers shall be formed from cold-rolled steel. Both casing and dampers shall be painted inside and out with an air-dried alkyd enamel finish.

Casing Flange Extensions – Coil casing shall be furnished with extended flanges to match a fixed duct connection.

Epoxy Coating – Coil shall be furnished with a baked epoxy coating for corrosion protection.

Raised Face Flanges on Header Connections – Raised face flanges shall be supplied on the header connections.

Inter-Connecting Linkage – Two coils mounted side-by-side shall be fitted with inter-connecting linkage so that both coils can be operated from a single set of side-mounted damper controls.

Insulated Headers – Headers shall be insulated with one-inch thick, 1.5# fiberglass insulation then covered with sheet metal to reduce temperature override.

Weatherproof Housing for Side-Mounted Actuators – A weatherproof housing shall be furnished on the side-mounted actuators to protect them from the outdoor elements

Electric Freezestat – Provide factory-mounted electric freezestat on the downstream face of one tube bank of the coil.

Electric Fan Cut-Off Thermostat – Furnish electric fan cut-off thermostat to shut off fan if supply air temperature is too cold. Thermostat is to be shipped loose for field mounting by others.

Typical Schedule

Model no.	Airflow Rate (scfm)	Ent. Air Temp. (^{o}F)	Leav. Air Temp. (^{o}F)	Steam Pressure (psig)	Condensate load (lbm/hr)	Air Pressure Drop (inches w.c.)	2nd row Control Temp. (^{o}F)
MVD-6T	17,000	-11	55	5	1,267.6	0.16	17.6

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