HSFAS High Static Fresh Air Supply Units

Technical Guide

HIGH STATIC STEAM AND HOT WATER MAKE-UP AIR HEATERS WITH INTEGRAL FACE AND BYPASS COILS FOR EFFECTIVE TEMPERATURE CONTROL

Since 1875, the L.J. Wing Company has been a leader in providing innovative solutions for difficult HVAC problems. Wing HSFAS High Static Fresh Air Supply units provide heated make-up air for buildings. This technical guide will help you size, select and specify the proper HSFAS model, incorporating EC fan technology for high static applications, to satisfy your project's make-up air heating requirements. If you have questions, please contact your local L.J. Wing representative; he will be glad to assist you.

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MAKE-UP AIR HEATING

Why the HSFAS Unit is Needed

Make-up air is needed to replenish air being exhausted from buildings. Without sufficient fresh air, a negative pressure is created inside the building, starving the flow of air through the exhaust system and hindering its performance. Wing HSFAS High Static Fresh Air Supply units offer a solution to this problem by delivering a constant volume of fresh tempered air.

HSFAS Units maintain effective temperature control by using integral face and bypass coils with steam or hot water as the heating source. The integral face and bypass coil concept eliminates the need for modulating control valves.

Ten sizes of HSFAS Units with energy efficient EC (Electronically Commuted) fans are available to cover a range of airflows from 855 to 10,000 CFM with static pressure capabilities up to 2.5” W.C. total static pressure. The EC motor and direct drive plenum fan provide energy efficiency at all operating speeds, higher static capabilities, and are superior to standard induction motors in their wide operating range, quiet operation, and long lifespan. Design is available for horizontal air flow.

Horizontal Air Flow - Type HSFAS units are designed for installation in wall openings. Fresh air is drawn in through optional weatherproof hoods or wall louvers (with or without optional filters) and discharged through adjustable vanes to achieve the desired airflow pattern. Discharge vanes may be horizontal, vertical, or both.

Type HSFAS units are ideal for preheating make-up air for boiler rooms; for further information on this application, please request Application Manual AMCAP-1.

Internal Heater Loss										
HSFAS Size	13	17	19	22	24	25	27	30	33	36
Pressure Drop	0.17	0.21	0.21	0.17	0.31	0.19	0.29	0.26	0.27	0.26

Calculating Total Static Pressure (TSP)	
Duct Static	
Heater Loss	
Filters (0.25” W.C.)	
Mixing Dampers (0.13” W.C.)	
TSP (Maximum 2.5” W.C.) =	

ETL Coil Operating Parameters:
Maximum elevation is 9,000 ft. (2,743.2m).
Maximum operating temperature is 250°F (121.1°C).
Minimum operating temperature is 0°F (-17.8°C).
Maximum operating pressure is 100 PSIG (689 kPa).
Minimum operating pressure is 2 PSIG (13.8 kPa).

Model Number Description

HSFAS - 30 - HV

HSFAS = Horizontal airflow unit

Discharge Type: V, H, HV

Size

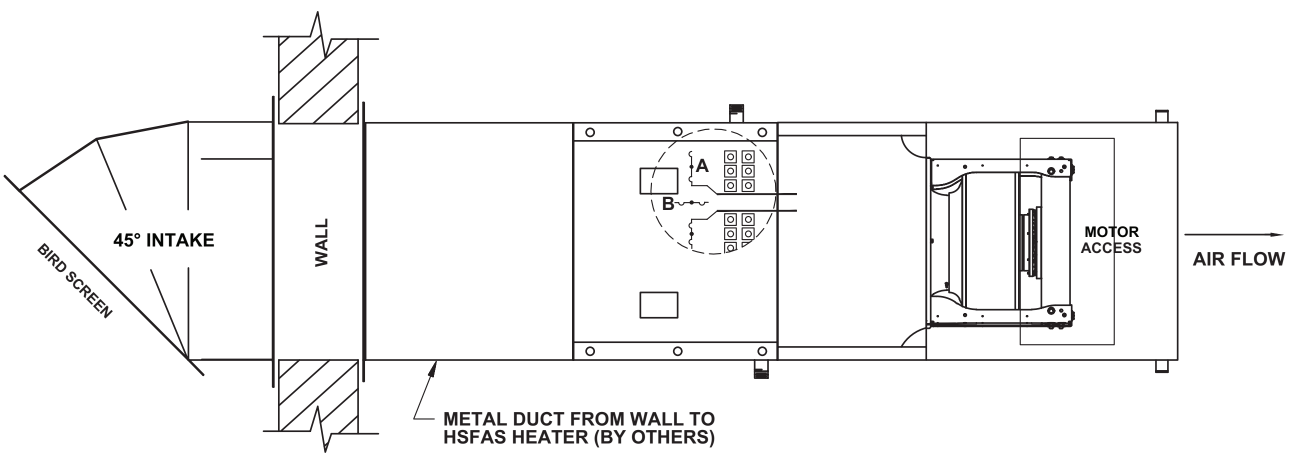
Integral Face and Bypass Coil Operation

C000796

The integral face and bypass coil design incorporated into the HSFAS heater consists of a number of alternate heating passages (A) and bypass passages (B). Full steam or water flow is maintained in the heated, or “face”, section at all times, while air flowing through the bypass passages is not heated. The integral face and bypass design allows discharge air to blend into a single stream of uniform temperature to satisfy design requirements. Each passage is provided with a volume control damper.

Two synchronized spring-return damper motors are provided, one to operate the face set of dampers and one to operate the bypass set of dampers. The damper motors are actuated by either an airstream or room thermostat as required.

When no fresh air supply is needed, such as during non-operating hours, the fan motor will be off and the damper motors close both sets of dampers to prevent infiltration of cold outside air into the room.



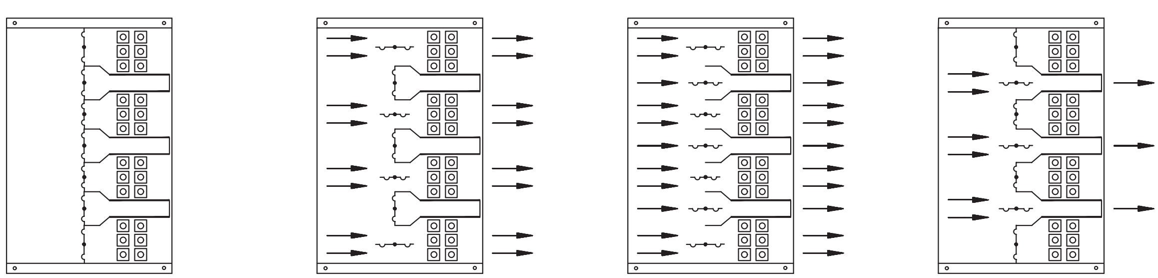


FIGURE 1
WHEN THE UNIT'S FAN IS NOT RUNNING, ALL THE DAMPERS REMAIN CLOSED TO PREVENT INFILTRATION OF OUTSIDE AIR.

FIGURE 2
WHEN MAXIMUM HEAT IS REQUIRED, THE BYPASS DAMPERS ARE COMPLETELY CLOSED AND ALL OUTSIDE AIR IS DIRECTED THROUGH THE HEATING CHANNELS.

FIGURE 3
AS THE OUTSIDE AIR TEMPERATURE RISES NEAR THE THERMOSTAT SETTING, FRESH AIR PASSES THROUGH BOTH THE HEATING AND BYPASS CHANNELS.

FIGURE 4
WHEN THE OUTSIDE AIR TEMPERATURE EXCEEDS THE THERMOSTAT SETTING, THE AIR IS DELIVERED THROUGH THE BYPASS CHANNELS ONLY.

DESIGN AND CONSTRUCTION

Construction Details

Heating Element
Type: Fin and tube, extended surface type.
Tubes: 3/8" O.D. copper, 0.028" thick wall for service to 200 psig and 400 degrees F. (Optional 90/10 cupronickel and steel are available for higher working pressures and temperatures).
Fins: Smooth, rectangular aluminum fins, 0.010" thick; mechanically bonded to the tubes. (Optional: carbon steel fins).
Headers: Schedule 40 steel, connected to tubes by a brazed joint.

Casing Assembly
Material: 14 gauge galvanized steel.
Attachment to heating elements: By heavy key plates welded to the headers. Tube ends are guided, spaced and secured against vibration by channel–shaped retainers.

Face and Bypass Dampers
Material: 16 gauge galvanized steel. The heater coil banks and by-pass passages are alternated for proper air proportioning.

Fan
Type: Plenum fan with motorized impeller.
Material: Aluminum impellers, galvanized sheet steel inlet cone and support structure.

Motor
Type: Electronically commutated (EC) motor.
Electronics housing material: Die-Cast aluminum.

Finish
Unpainted as standard. (Optional: Air-dried enamel paint).

Motor Data

HSFAS SIZE	MOTOR HP			FAN RPM
	SINGLE PHASE	THREE PHASE		
		200-240V	460V	
13	3/4	2	2-1/4	3,700
17	1-1/2	2	2	3,500
19	1-1/2	2	2-1/4	2,400
22	N/A	4-1/4	4	1,750
24	N/A	4-1/4	4	1,750
25	N/A	4-1/4	4	1,750
27	N/A	4-1/2	5	1,750
30	N/A	4	4-1/2	1,180
33	N/A	N/A	8-1/4	1,450
36	N/A	N/A	8-1/4	1,450

Notes:
1. Single-phase units through size 19, available in 230V.
2. Single-phase and 3-phase units feature EC motorized impeller fans.

PERFORMANCE

Steam Units

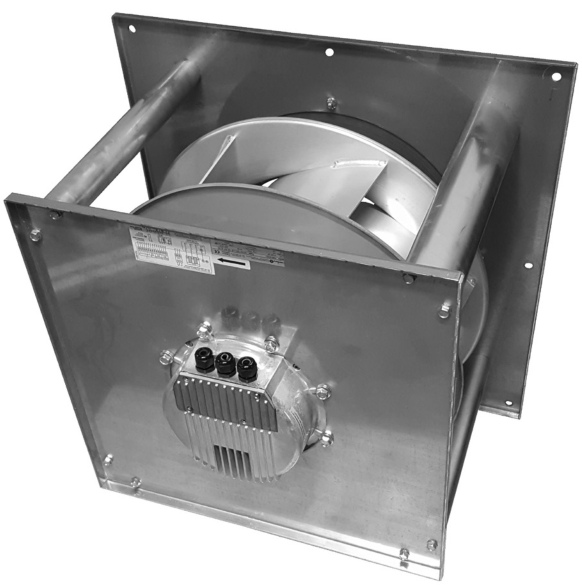
TABLE 1

HSFAS	BASE PERFORMANCE	
	CFM	BATRS (1)
13	855	96.3
17	1,400	92.4
19	2,000	92.2
22	2,750	96.0
24	3,700	84.3
25	4,300	93.8
27	5,300	85.6
30	7,000	87.9
33	8,500	87.2
36	10,000	87.9

Note:
1. BATRS = Base Air Temperature Rise for Steam units at 15 psig steam pressure, in degrees F.

TABLE 2

STEAM PRESSURE (PSIG)	SATURATED TEMP., SST (DEGREES F)	LATENT HEAT (BTU)
5	227	960
10	239	953
15	250	946
20	259	939
30	274	929
40	287	919
50	298	911
60	307	904
70	316	897
80	324	891
90	331	886
100	338	880
120	350	870
140	361	861
160	372	851
180	380	846
200	388	840



Due to the performanec characteristics of the Direct Drive SWSI BC Plenum Fans, the same CFM and BATRS from Table 1 can be used for all steam units, whether the unit has filters or not. The fan adjusts based on static pressure to keep a constant CFM in the unit.

SELECTION

Steam Units

1. Select HSFAS Unit with or without filters to meet project make-up air requirements from Table 1.
2. Read the base air temperature rise for steam units, BATRS, from Table 1.
3. Calculate the air temperature rise correction factor, ATRS: ATRS = (SST-EAT)/250
   where SST = Saturated steam temperature from Table 2 and EAT = Entering air temperature as given.
4. Calculate heat transfer, Q:
   Q = 1.085 x CFM x ATRS x BATRS
   where CFM = Airflow from Table 1.
5. Calculate the air temperature leaving the HSFAS unit, LAT: LAT = EAT + (BATRS x ATRS)
6. Calculate the condensate load, CL: CL = Q/LH
   where LH = Latent heat from Table 2.

Example: Select HSFAS unit without filters for 7,000 CFM of make-up air using 5 psig steam to heat outside air at –12 degrees F.

Solution:

1. For 7,000 CFM, choose an HSFAS-30 from Table 1.
2. Also from Table 1, BATRS = 87.9 degrees F for an HSFAS-30.
3. From Table 2, SST = 227 degrees F, so:
   ATRS = (227 –(-12))/250 = 0.956
4. Q = 1.085 x 7,000 x 87.9 x 0.956 = 638,200 BTUH.
5. LAT = -12 + (87.9 x 0.956) = 72.0 degrees F
6. From Table 2, LH = 960, so:
   CL= 638,200/960 = 664.8 lb/hr.

PERFORMANCE

Hot Water Units

TABLE 3

HSFAS	BASE PERFORMANCE CFM	BASE PERFORMANCE BATRW (1)	GPMB (2)	WPDB (3)
13	855	71.7	13.5	3.7
17	1,400	67.8	14.8	4.4
19	2,000	67.6	17.6	5.0
22	2,750	71.4	23.5	6.9
24	3,700	60.1	23.5	6.9
25	4,300	69.2	35.0	10.0
27	5,300	61.3	35.0	10.0
30	7,000	63.4	49.0	5.8
33	8,500	62.8	58.0	7.7
36	10,000	63.4	70.0	9.4

TABLE 4

WATER FLOW RATE/BASE WATER FLOW RATE	ATR CORRECTION FACTOR, ATRF	WPD CORRECTION FACTOR, WPDF
1.5	1.040	2.25
1.2	1.020	1.44
1.0	1.000	1.00
0.8	0.965	0.64
0.6	0.910	0.36
0.5	0.860	0.26

Notes:
1. BATRW = Base air temperature rise for water units at 200 degrees F entering water temperature, in degrees F.
2. GPMB = Base Water Flow Rate, in gallons per minute.
3. WPDB = Base Water Pressure Drop, in feet H2O.

TABLE 5: COIL CORRECTION FACTORS FOR GLYCOL / WATER SOLUTIONS

MASS PERCENTAGE OF GLYCOL IN WATER SOLUTION	SOLUTION FREEZE POINT	ATRG (1)	WPDG (2)	WATER TEMPERATURE DROP CORRECTION FACTORS (WTDG): FOR SOLUTION TEMPERATURES OF 150°F TO 250°F	WATER TEMPERATURE DROP CORRECTION FACTORS (WTDG): FOR SOLUTION TEMPERATURES ABOVE 250°F
COIL CORRECTION FACTORS FOR ETHYLENE GLYCOL					
30% ETHYLENE	6.7°F	0.92	1.18	1.11 (463.6)	1.03 (485.4)
45% ETHYLENE	-17.5°F	0.89	1.26	1.14 (445.3)	1.06 (471.7)
50% ETHYLENE	-28.9°F	0.84	1.31	1.17 (438.4)	1.08 (462.9)
60% ETHYLENE	-54.9°F	0.83	1.61	1.20 (422.6)	1.14 (438.6)
70% ETHYLENE	<-60.0°F	0.79	1.81	1.23 (404.5)	1.19 (420.2)
COIL CORRECTION FACTORS FOR PROPYLENE GLYCOL					
30% PROPYLENE	9.2°F	0.96	1.30	1.05 (476.6)	1.01 (495.0)
45% PROPYLENE	-16.1°F	0.93	1.36	1.07 (458.7)	1.02 (490.2)
50% PROPYLENE	-28.3°F	0.88	1.38	1.09 (452.0)	1.03 (485.4)
60% PROPYLENE	-59.9°F	0.87	1.46	1.13 (434.1)	1.07 (467.3)
70% PROPYLENE	<-60.0°F	0.83	1.50	1.20 (413.3)	1.08 (462.9)

Notes:
1. ATRG = Air Temperature Correction Factor due to Glycol
2. WPDG = Water Pressure Drop Correction Factor due to Glycol
3. WTDG = Water Temperature Drop Correction Factor due to Glycol
4. If 100% water is used (no glycol), all glycol-related correction factors will be 1.00.

SELECTION

Hot Water Units

1. Select HSFAS Unit with or without filters to meet project make-up air requirement from Table 3.
2. Read the base air temperature rise for water units, BATRW, from Table 3.
3. Calculate the air temperature rise correction factor, ATRW:
   ATRW = (EWT- EAT)/200
   where EWT= Entering water temperature as given and EAT = Entering air temperature as given.
4. Using the given water flow rate, calculate the ratio to base water flow rate from Table 3.
5. Using the ratio of step 4, look up the air temperature rise correction factor due to gpm, ATRF, from Table 4.
6. Using the given glycol mixture, look up the Air Temperature Rise correction factor for glycol, ATRG, from Table 5.
7. Calculate the heat transfer, Q:
   Q = 1.085 x CFM x (BATRW x ATRW x ATRF x ATRG)
   where CFM = Airflow from Table 3.
8. Calculate the air temperature leaving the HSFAS unit, LAT:
   LAT = EAT + (BATRW x ATRW x ATRF x ATRG)
9. Read the base water pressure drop, WPDB, from Table 3 for the unit selected.
10. Read the water pressure drop correction factor due to flow, WPDF, from Table 4 using the flow ratio of Step 4.
11. Read the water pressure drop correction factor due to glycol, WPDG, from Table 5 at the given glycol mixture.
12. Calculate the water pressure drop, WPD:
    WPD = WPDB x WPDF x WPDG
13. Calculate the water temperature drop, WTD, Using the correction factor due to glycol from Table 5:
    WTD = (Q x WTDG)/(500 x GPM)

Example: Select HSFAS unit without filters for 4,300 CFM of make-up air using 42.0 gpm of 210 degrees F water to heat outside air at 0 degrees F.

Solution:

1. For 4,300 CFM, choose an HSFAS-25 from Table 1.
2. Also from table 1, BATRW = 69.2 degrees F for an HSFAS-25.
3. ATRW = (210-0))/200 = 1.05
4. From Table 3, base water flow rate = 35 gpm. Water flow rate/base water flow rate = 42.0/35 = 1.20.
5. From Table 4 at water flow rate/ base water flow rate = 1.20: ATRF = 1.02.
6. Since there is no glycol used, ATRG = 1.00 from Table 5.
7. Q= 1.085 x 4,300 x (69.2 x 1.05 x 1.02 x 1.00) = 345,800 BTUH.
8. LAT = 0 + (69.2 x 1.05 x 1.02 x 1.00) = 74.1 degrees F.
9. From Table 3 for HSFAS-25: WPDB = 10.0 feet H_20.
10. From Table 4 at a water flow ratio of 1.20: WPDF = 1.44.
11. From Table 5 at 100% water: WPDG = 1.00.
12. WPD = (10.0 x 1.44 x 1.00) = 14.4 ft. H20.
13. From Table 5 at 100% water: WTDG = 1.00.
    WTD = (345,800 x 1.00)/(500 x 42.0) = 16.5 degrees F.

Glycol Example: Select the same HSFAS as above but with 45% Propylene Glycol, 55% Water Solution.

Solution:

Same steps 1-5 as above.

6. From Table 5 at a mixture of 45% propylene glycol, ATRG = 0.93.
7. Q= 1.085 x 4,300 x (69.2 x 1.05 x 1.02 x 0.93) = 321,600 BTUH.
8. LAT = 0 + (69.2 x 1.05 x 1.02 x 0.93) = 68.9 degrees F.
   Same steps 9-10 as above.
11. From Table 5 at 45% propylene glycol: WPDG = 1.36.
12. WPD = (10.0 x 1.44 x 1.36) = 19.6 ft. H20.
13. From Table 5 at 45% propylene glycol between 150°F and 250°F: WTDG = 1.14.
    WTD = (321,600 x 1.14)/(500 x 42.0) = 17.5 degrees F.

DIMENSIONS

Horizontal HSFAS UnitS

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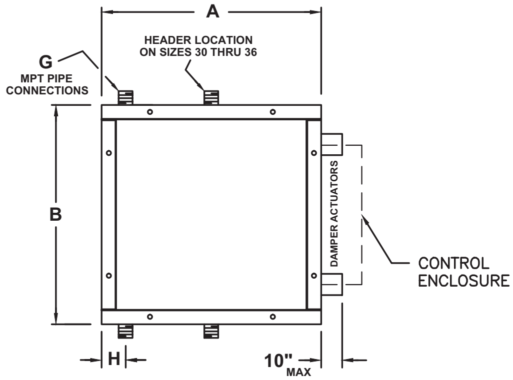
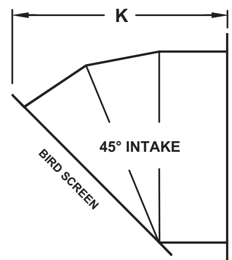
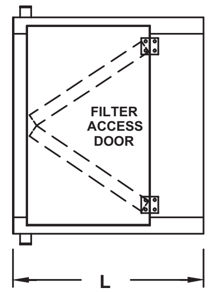


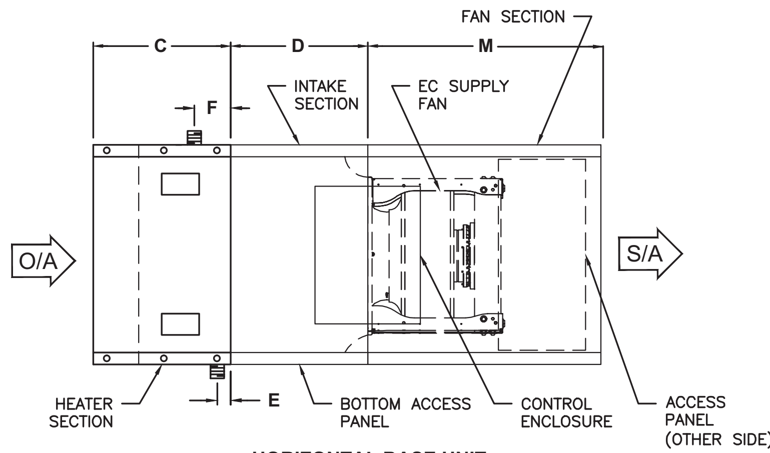
END VIEW



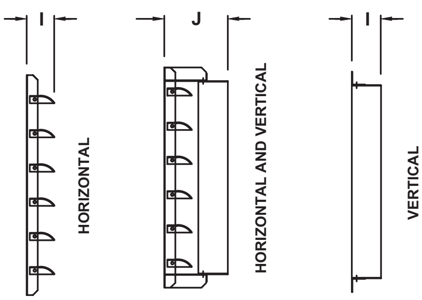
WALL INTAKE HOOD



FILTER BOX



HORIZONTAL BASE UNIT
RIGHT SIDE VIEW
EC PLENUM FANS
SIZES 13 THRU 36



DISCHARGE LOUVER ASSEMBLY FURNISHED AND MOUNTED ON THE UNIT AT THE FACTORY

C = STANDARD HEATER CASING DEPTH

HSFAS	DIMENSIONS (INCHES)													WEIGHTS (LBS)			
	A	B	C	D	E	F	G	H	I	J	K	L	M	B1	B2	WI	FB
13	19 3/4	19 3/4	17	12 1/2	3 9/32	1 5/32	1 1/2	2 9/16	3 5/16	6 1/2	19 1/16	26 1/2	22	141.7	152.8	30	40
17	22 3/4	22 3/4	17	12 1/2	3 7/16	1 15/16	1 1/2	2 9/16	3 5/16	6 1/2	21 7/32	21	22	166.3	177.9	40	45
19	27 3/4	27 3/4	21	12 1/2	3 25/32	1 15/32	1 1/2	2 3/4	3 5/16	6 1/2	24 3/4	28	30	244.6	261.7	55	65
22	32 3/4	32 3/4	21	12 1/2	3 27/32	1 13/32	1 1/2	2 3/4	3 5/16	6 1/2	28 9/32	31	34	330.2	353.9	70	80
24	32 3/4	32 3/4	21	12 1/2	3 27/32	1 13/32	1 1/2	2 3/4	3 5/16	6 1/2	28 9/32	31	34	391.6	415.3	70	80
25	39 1/8	39 1/8	22	12 1/2	4 5/16	1 11/16	2	3 7/16	4 5/16	8 1/2	32 3/32	37	40	397.2	431.2	95	120
27	39 1/8	39 1/8	22	12 1/2	4 5/16	1 11/16	2	3 7/16	4 5/16	8 1/2	32 3/32	37	40	401.9	435.9	95	120
30	50 1/8	45 1/8	28	12 1/2	5 3/8	2	2 1/2	25 1/16	4 5/16	8 1/2	35 5/16	42	44	702.6	753.6	125	150
33	60 3/4	45 1/8	28	12 1/2	5 3/8	2	2 1/2	30 3/8	4 5/16	8 1/2	36 5/16	50	48	1071.6	1132.3	150	180
36	60 3/4	49 3/4	32 1/8	12 1/2	8 1/4	4 1/4	3	30 3/8	4 5/16	8 1/2	39 19/32	44	48	1168.8	1234.3	165	200

Note:

1. Weight nomenclature: B1 = Base Horizontal Unit with Horizontal or Vertical blade discharge; B2 = Base Horizontal Unit with Horizontal and Vertical blade discharge; WI = Wall Intake Hood; FB = Filter Box.

DIMENSIONS

Mixing Box

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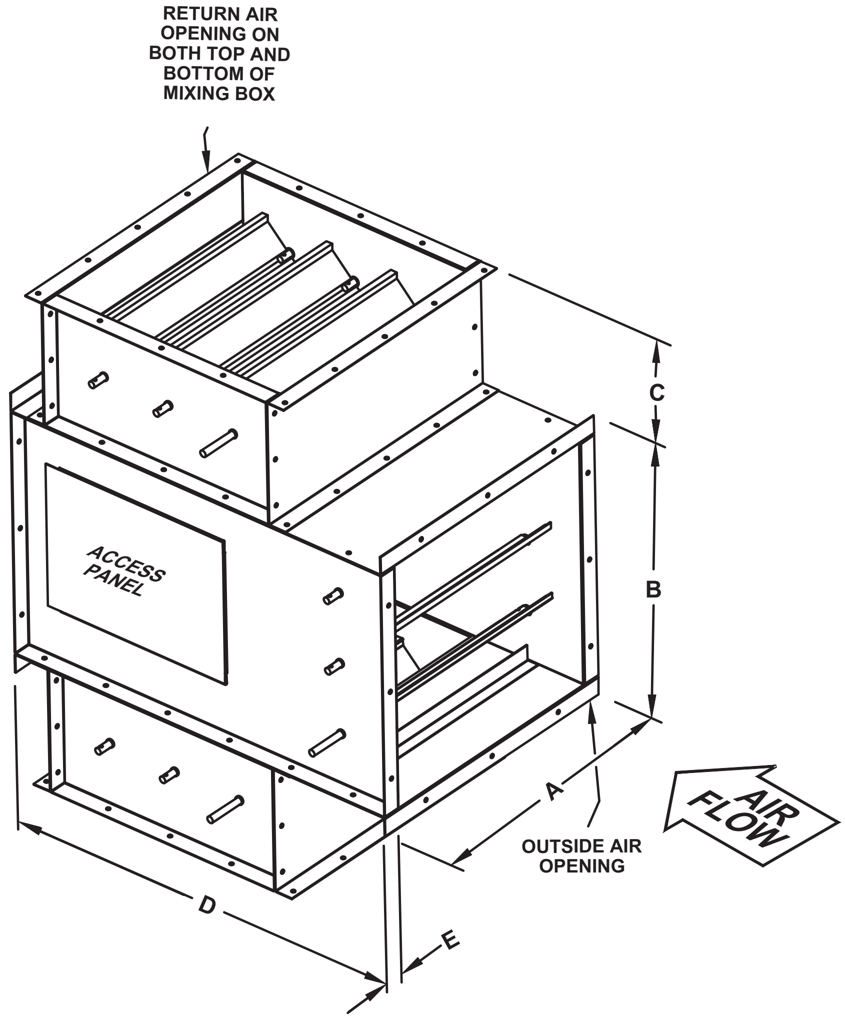


HSFAS	DIMENSIONS (INCHES)					WEIGHTS (LBS)
	A	B	C	D	E	MB
13	19 3/4	19 3/4	8 1/2	30	1 1/2	115
17	22 3/4	22 3/4	8 1/2	33	1 1/2	140
19	27 3/4	27 3/4	8 1/2	33	1 1/2	185
22	32 3/4	32 3/4	8 1/2	30	1 1/2	195
24	32 3/4	32 3/4	8 1/2	30	1 1/2	195
25	39 1/8	39 1/8	8	34	2	250
27	39 1/8	39 1/8	8	34	2	250
30	50 1/8	45 1/8	8	34	2	330
33	60 3/4	45 1/8	8	34	2	340
36	60 3/4	49 3/4	8	34	2	355

Note:
1. Weight nomenclature: MB = Mixing Box

CONTROL SYSTEMS

Controls

Methods of Control
The HSFAS is available with either of two methods of control: The first is a basic HSFAS with Airstream or Room with Low Limit that uses a Neptronic controller for fan control. Both methods control the discharge temperature of the unit by modulating the face and bypass dampers. With Airstream control, the controller is mounted on the unit and has a single sensing element located in the discharge airstream. Room with Low Limit control uses the Airstream controller as its low limit and adds a room thermostat as the primary control.

The second offering is a HSFAS with DDC controls. The methods of control include MDT Touch and MRT Touch control system.

MDT Touch Control System
The MDT Touch Control System includes a discharge air sensor mounted in the unit with remote mounted equipment touch touchscreen controller to set discharge temperature, operating schedules, optional damper control setpoints, and fan control which is one of either manual control, building pressure control, piezometer ring control or building pressure with piezometer control. Service information, operating feedback and alarm status can also be monitored.

MRT Touch Control System
The MRT Touch Control System includes a discharge air sensor mounted in unit discharge with remote mounted Equipment Touch Touchscreen controller to set space temperature, operating schedules, optional damper control setpoints, and fan control which is one of either manual control, building pressure control, piezometer ring control or building pressure with piezometer control. Service information, operating feedback and alarm status can also be monitored. Also includes a ZS-Standard room sensor.

Electric Actuators
Both methods of control are available in only electric versions. The standard electric version uses direct-coupled 24 volt damper actuators with compatible controllers.

Controller Setpoints
The HSFAS heater is a make-up air system and, as such, the delivered air temperature should be at or near that of the room ambient temperature. On the basic HSFAS unit with Room with Low Limit control, this insures that if the Room thermostat is satisfied, the Low Limit controller will not allow the unit discharge to fall below the desired temperature. Without this, or if the Low Limit were set well below the Room, unheated air could be introduced into the room, driving the ambient temperature down and requiring the unit to bring it back up. The Room with Low Limit Control prevents this unwanted temperature cycling.

This principle applies to the DDC Controls as well with all the logic built into the program and downloaded on to the controller.

Sequence of Operation
When maximum temperature rise is required, the face dampers are fully open to the heating sections while the bypass dampers are fully closed. With electric actuators, as the discharge temperature approaches the controller set point, the bypass dampers will begin to open. Once the bypass dampers are fully open, if even less temperature rise is required, the face dampers will begin to close.

Shutoff Feature
When the unit is shut down, both the face and bypass dampers close to prevent the infiltration of cold outside air. There is no need for a separate motorized shutoff damper.

Additional Control Options
Included among the additional control options are:

- Freeze stat – The freeze stat will either stop the fan from starting or automatically cycle the unit off should the coil temperature drop below the freeze stat setpoint for any period of time. The freeze stat itself is a separate thermostat with the capillary section strung across the coil face.
- Fan Cut-Off Thermostat - Uses a single sensing bulb to shut down the unit upon sensing a temperature that could potentially lead to a frozen tube or coil. This option is optional for the basic HSFAS unit and standard for HSFAS units with DDC controls.
- Discharge Dampers – Can be installed on the leaving side of the face sections to minimize temperature override.
- Clogged Filter – The clogged filter switch automatically notifies the user of a dirty filter condition. A clogged filter notification will either be a light indicator on a standard HSFAS unit or it will appear on the equipment touch for HSFAS units with DDC controls.

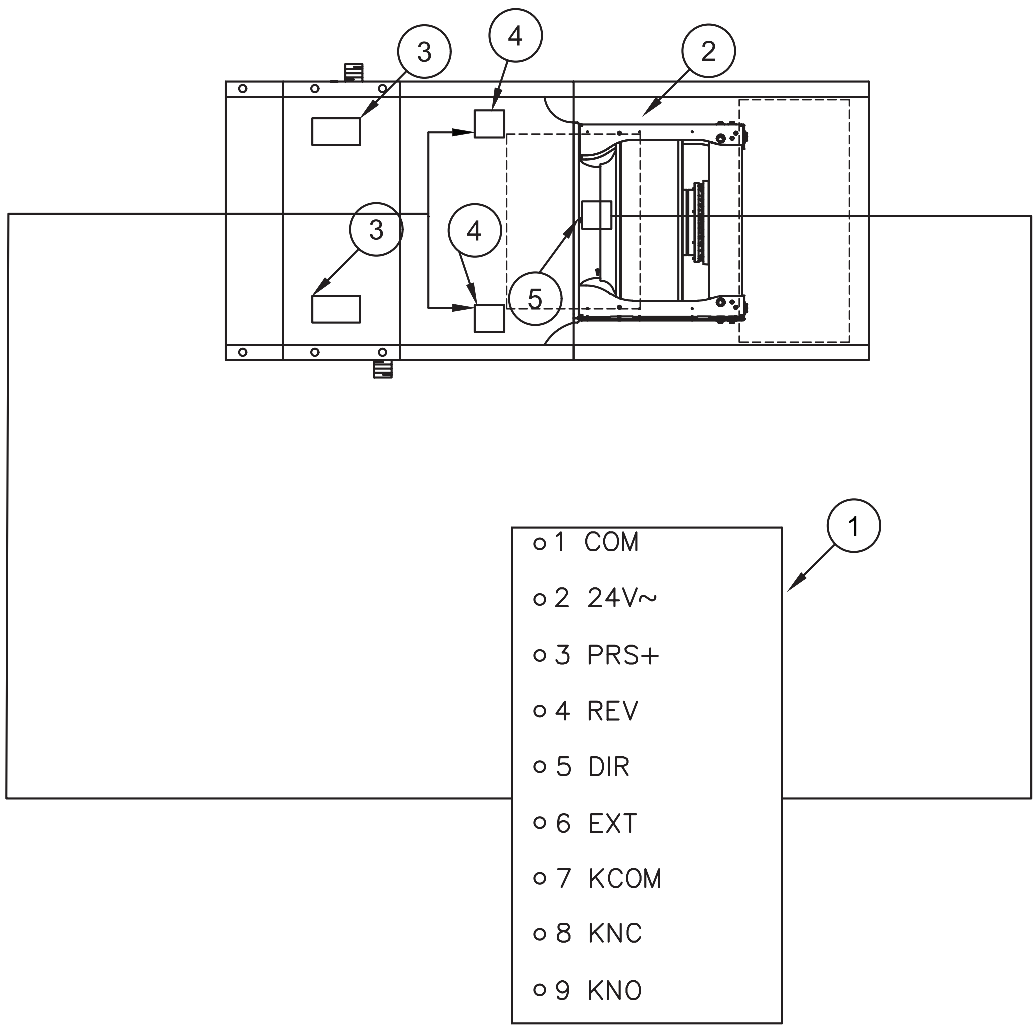
Neptronic Control System

C000800

Application:	Includes:
Neptronic controller allowing fan control and discharge temperature control. Room with Low Limit adds a room thermostat for primary control.	Discharge air sensor mounted in the unit with unit mounted Neptronic Controller to control the fan and dampers. If Room with Low Limit is selected, a room thermostat is also included.

COMPONENT I.D.

1. Neptronic Controller
2. EC Motorized Impeller
3. Face/Bypass Actuators
4. Static Pressure Probes
5. Piezometer Ring



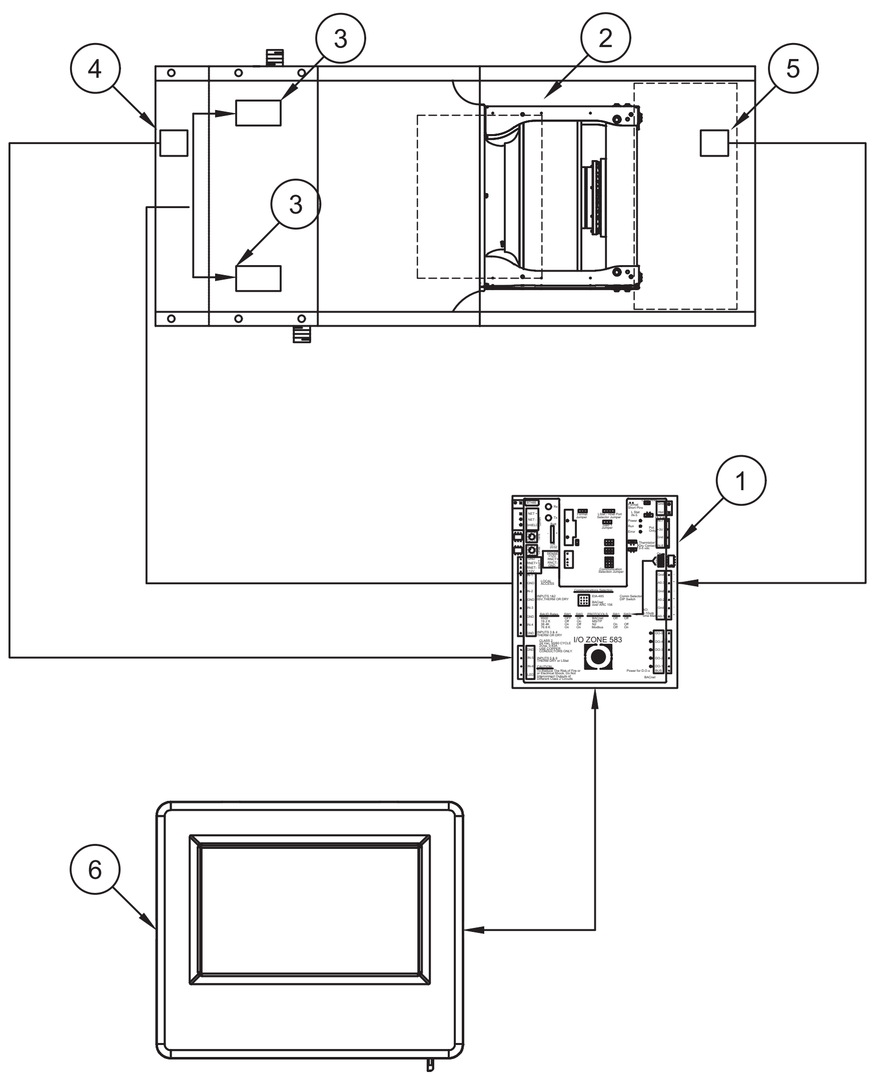
MDT Touch Control System

C000791

Application:	Includes:
Modulating Discharge Temperature Control with Equipment Touch Touchscreen controller allowing after hours unit enable, discharge setpoint adjustment, operating feedback, monitoring of alarm status and digital temperature readout.	Discharge air sensor ⑤ mounted in the unit with remote mounted Equipment Touch Touchscreen controller ⑥ to set discharge temp., operating schedules, optional damper control setpoints, and fan control. Service information, operating feedback and alarm status can also be monitored.

COMPONENT I.D.

1. Unit DDC Controller
2. EC Motorized Impeller
3. Face/Bypass Actuators
4. Inlet Air Sensor
5. Discharge Air Sensor
6. Equipment Touch Touchscreen Interface



Discharge Temperature
SET Here

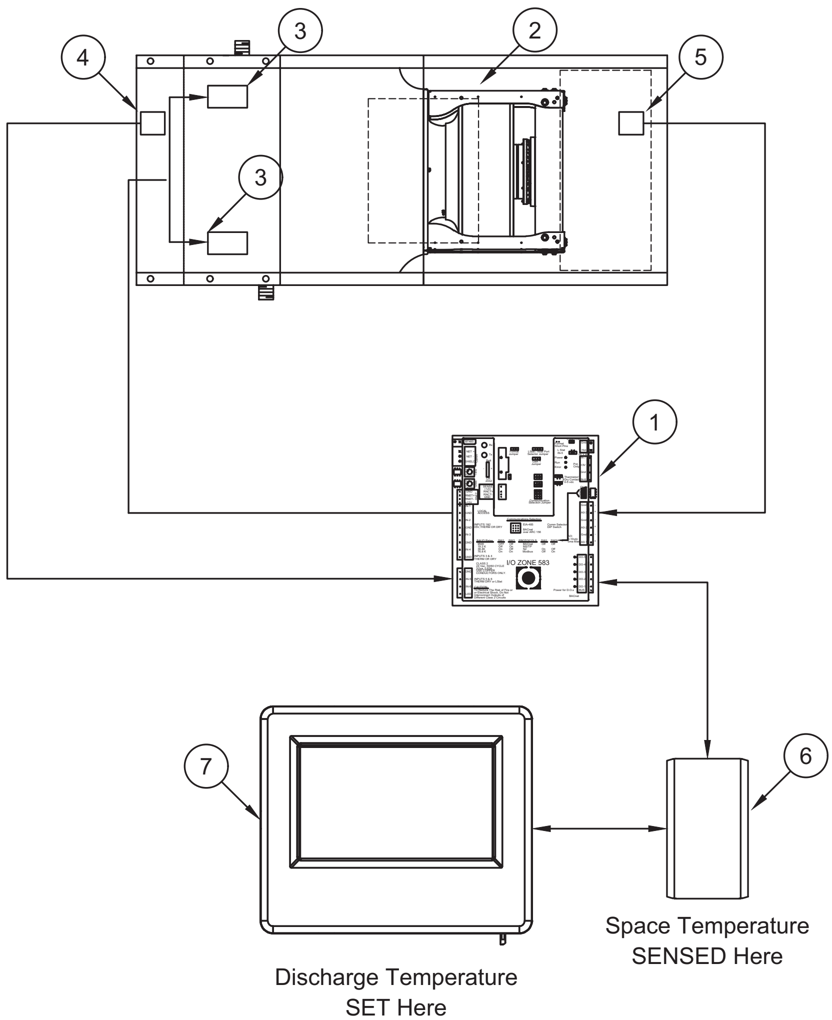
MRT Touch Control System

C000792

Application:	Includes:
Modulating Room Temperature Control with Equipment Touch Touchscreen controller allowing after hours unit enable, room setpoint adjustment, operating feedback, monitoring of alarm status and digital temperature readout with ZS-std room sensor.	Discharge air sensor ⑤ mounted in the unit with remote mounted Equipment Touch Touchscreen controller ⑦ to set space temp., operating schedules, optional damper control setpoints, and fan control. Service information, operating feedback and alarm status can also be monitored. Also includes a ZS-std room sensor ⑥.

COMPONENT I.D.

1. Unit DDC Controller
2. EC Motorized Impeller
3. Face/Bypass Actuators
4. Inlet Air Sensor
5. Discharge Air Sensor
6. Room Thermostat
7. Equipment Touch Touchscreen Interface



ELECTRICAL

Amp Draw Table

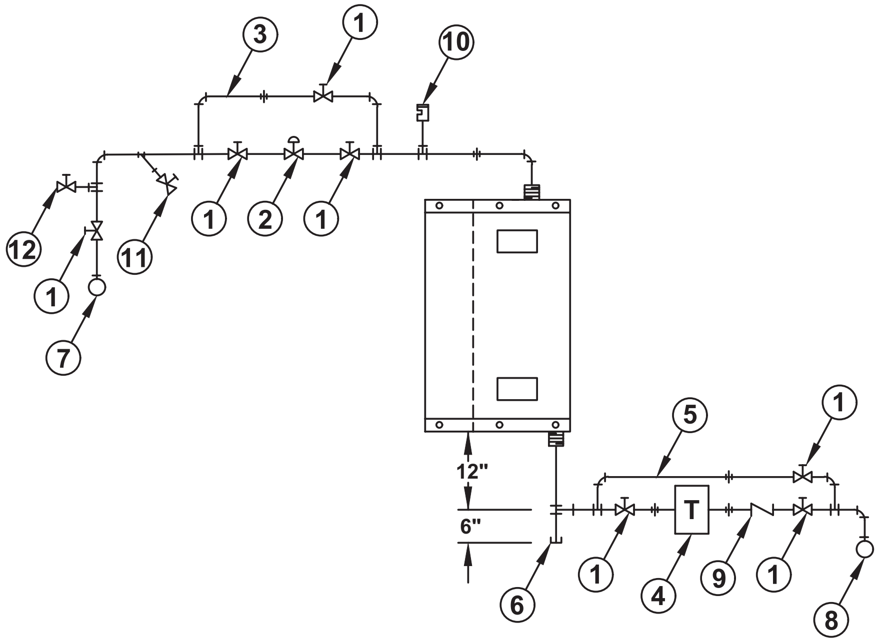
ITEM	SOURCE	ELECTRICAL SERVICE	MOTOR AMPS AT GIVEN MOTOR HORSEPOWER								
			3/4	1-1/2	2	2-1/4	4	4-1/4	4-1/2	5	8-1/4
A	Fan Motor	208V 1 Ph	3.0	6.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		230V 1 Ph	2.8	6.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		208V 3 Ph	N/A	N/A	4.4	N/A	8.3	8.8	9.3	N/A	N/A
		230V 3 Ph	N/A	N/A	3.9	N/A	7.7	8.5	8.8	N/A	N/A
		460V 3 Ph	N/A	N/A	2.1	2.3	4.6	N/A	4.3	4.6	9.9
B	Control Transformer	ELECTRICAL SERVICE	CONTROL CIRCUIT AMPS								
		208V 1 Ph	0.5								
		230V 1 Ph	0.4								
		208V 3 Ph	0.5								
		230V 3 Ph	0.4								
		460V 3 Ph	0.2								

Notes:

1. Above motor amps are based on the latest fan manufacturer data.
2. Control circuit amps are based on standard controls.
3. Steps to size optional disconnect switch:
   A. Using the required fan motor HP from page 5 and the given electrical service, look up the fan motor amp draw from Item A in the above chart.
   B. Look up the control circuit amps from Item B in above chart.
   C. Add Fan Motor amps from Step A to Control Circuit amps of Step B, then multiply result by 1.25 to get required size of optional disconnect switch.

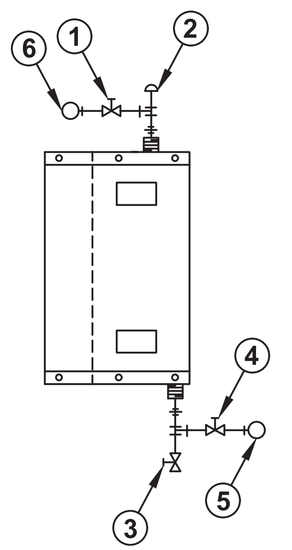
Steam and Hot Water Systems

C000799



STEAM PIPING LEGEND
(FOR GRAVITY ATMOSPHERIC RETURN SYSTEMS)

1. GLOBE OR GATE VALVE
2. OPTIONAL MOTORIZED SHUT-OFF VALVE
3. BY-PASS TO ALLOW SERVICING OF MOTORIZED VALVE. BYPASS LINE TO BE THE SAME SIZE AS MOTORIZED VALVE.
4. INVERTED BUCKET OR COMBINATION FLOAT AND THERMOSTATIC TRAP WITH VENT.
5. BY-PASS TO PERMIT SERVICING OF TRAP. BY-PASS TO BE ONE PIPE SIZE LARGER THAN TRAP ORIFICE.
6. DIRT POCKET AND DRIP LEG. TO BE THE SAME SIZE AS THE HEATER CONDENSATE RETURN LINE.
7. STEAM SUPPLY MAIN.
8. CONDENSATE RETURN MAIN.
9. 15° SWING CHECK VALVE.
10. 1/2" SPRING LOADED VACUUM BREAKER VENTED TO ATMOSPHERE.
11. STEAM STRAINER WITH BLOW-DOWN VALVE.
12. 1/2" DRAIN VALVE. TO BE OPENED WHEN GLOBE OR GATE SHUTOFF VALVE IS CLOSED.



HOT WATER PIPING LEGEND

1. GLOBE OR GATE VALVE
2. AUTOMATIC AIR VENT
3. COIL DRAIN VALVE
4. WATER FLOW CONTROL VALVE
5. HOT WATER SUPPLY LINE
6. HOT WATER RETURN LINE

SPECIFICATIONS AND SCHEDULE

Typical Specification

General
Furnish a factory-assembled HSFAS High Static Fresh Air Supply unit as manufactured by L.J. Wing, Dallas, TX, to heat outside air. Performance shall be as shown in the schedule. Unit shall be capable of maintaining discharge air temperature regardless of fluctuations in inlet air temperature. Each unit shall consist of a heater section containing an integral face and bypass coil consisting of built-in multiple alternate finned heating elements and bypasses. Separate dampers shall control the airflow through these face and bypass sections. Each set of dampers shall be interlocked and controlled by a separate electric damper motor as scheduled. Finned heating elements shall be fabricated of seamless return bend type 3/8” o.d. copper (Optional: 90/10 cupronickel or steel) tubes with rectangular 0.010” thick aluminum (Optional: steel) fins. Each tube shall be secured to the headers by a brazed joint. The opposite end of the tubes shall be secured by channel–shaped retainers that permit expansion and contraction. Finned elements shall be factory tested with 200 psig steam and 500 psig hydrostatic pressure. Unit shall have an EC fan with motorized impeller with characteristics as scheduled. Casing and discharge shall be constructed of galvannealed sheet metal.

Controls
Unit shall be furnished with ________________ (indicate either “Airstream Control with a thermostat to provide a constant discharge temperature regardless of inlet air temperature fluctuations”, or “Room with Low Limit Control having a room thermostat and overriding low limit thermostat to prevent the unit’s discharge temperature from falling below the desired minimum.”)

Discharge – Horizontal Units
Unit shall have a discharge consisting of _______________ (indicate either “horizontal vanes for maximum horizontal airflow projection”; “vertical vanes for maximum airflow spread”; or “horizontal and vertical vanes for adjustable airflow projection and spread”). Discharge shall be attached to and supported by flanged brackets bolted to outlet of the unit for easy vane positioning.

Intake Hood (optional)
Unit shall be furnished with an intake hood fashioned of heavy gauge sheet steel with 45 angular degree overhang and turned-up flange to prevent water from entering the unit. Intake shall be covered with bird screen to keep out animals and debris.

Filter Box (optional)
Unit shall be equipped with a filter box fabricated of heavy gauge sheet steel, complete with __________ (indicate “throwaway” or “cleanable”) filters.

Painted Finish (optional)
Unit casing and discharge shall be painted inside and out with an air-dried alkyd enamel finish.

Typical Schedule

Model No.	Airflow Rate (SCFM)	Entering Air Temp. (°F)	Leaving Air Temp. (°F)	Steam Pressure (PSIG)	Condensate Load (lbm/hr)	External S.P. (inches W.C.)	Electrical Service (volt/ph./Hz)	Motor Horsepower (HP)
HSFAS-30-HV	7,000	-12	72	5	664.8	2	208/3/60	4.5

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