DH Door Heaters
Technical Guide

STEAM AND HOT WATER HEATERS TO PROVIDE A COMFORTABLE ENVIRONMENT IN LOADING DOCK DOOR AREAS

LJ ING®

Since 1875, the L.J. Wing Company has been a leader in providing innovative solutions for difficult HVAC problems. Wing type DH Door Heaters offer efficient steam and hot water heating in dock door areas. This technical guide will help you size, select and specify the proper DH model to satisfy your project's door protection requirements. If you have questions, please contact your local L.J. Wing representative; he will be glad to assist you.

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OPERATION

Typical Installation Arrangements

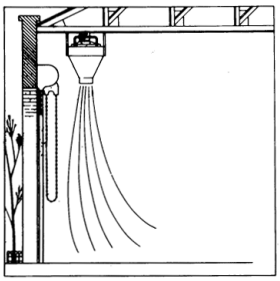
Wing DH door heaters are steam and hot water heaters designed to blanket an open loading dock doorway with a stream of high-velocity heated air that thoroughly penetrates and tempers the cold incoming air. This keeps workers comfortable and protects plant heating systems from sudden overloads. Designed for installation over any door, Wing DH door heaters can be arranged to cover one or several doors as needed.

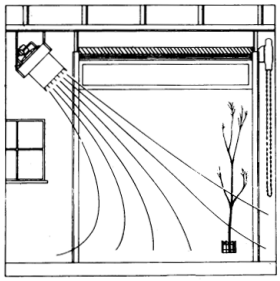
Units are available with either of two high performance discharges: the High-Velocity (type HV) discharge for door heating only applications, or Wing's unique Vari-Jet (type VJ) discharge for a combination of door heating and area heating. (Operation with the Vari-Jet discharge is described more fully on page 7).

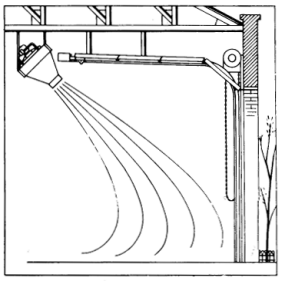
Control Methods
A thermostat, a door switch, or both may be used to control DH units for straight door heating applications.
A thermostat, when used, is mounted just inside the door where cold incoming air will strike it. This arrangement offers the advantage of keeping the heater operational after the door is closed if the area is still cold. In warm weather, or when cold air is not flowing into the door opening, the thermostat will not start the heater.

A door switch is often utilized because it starts the heater quickly as soon as the door opens. The door switch also is necessary if a thermostat cannot be properly located. A manual cut-out switch may be installed with the door switch, so that the heater will not be operated when the door is opened in warm weather.

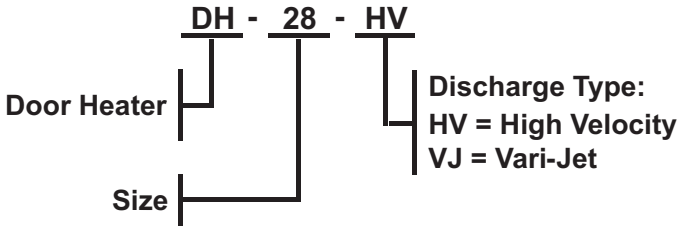
When both a thermostat and a door switch are employed, they should be connected in parallel so that either one will start the heater.


Vertical installation for use with rolling or sliding doors


Angular installation for low ceilings or folding doors


Angular installation for canopy or overhead doors

Model Number Description



SELECTION AND PERFORMANCE

Selection Procedure

Use the following Selection Table to find the recommended heater size for average conditions with doors facing prevailing winter winds, and not allowing for negative pressures caused by exhaust systems. For doors not facing prevailing winds, heaters one size smaller can be used. If negative pressure exists, consult your local Wing representative for assistance.

For optimum performance, the door heater should be located in the center of the doorway, with the bottom of the discharge directly above the top of the door. If necessary to mount the heater away from the door, a specially designed discharge is available with a 45-degree cant towards the door.

Example: Select a DH door heater for a 12' x 14' door that faces the prevailing winds with an outdoor design temperature of –10˚ F.
Solution: From the Selection Table below, a size 40 heater is required. From the Fan Performance Table, it can be seen that a size 40 heater handles 16,500 cfm and uses a 3 HP motor operating at 850 rpm.

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).

Selection Table

DOOR SIZE	REQUIRED HEATER SIZE FOR LISTED OUTDOOR TEMPERATURE (DEGREES F)				
W x H	**20**	**10**	**0**	**-10**	**-20**
14' x 24'	40	43	44	(2) - 40	(2) - 43
14' x 20'	38	40	43	44	(2) - 40
12' x 16'	36	38	40	43	44
12' x 14'	33	36	38	40	43
10' x 12'	30	33	36	38	40
8' x 10'	26	30	33	36	38
8' x 8'	25	26	30	33	36
6' x 8'	25	26	26	30	33

Motor Data

SIZE	CFM (AT INLET)	DIRECT DRIVE MOTOR				BELT DRIVE MOTOR			
		SINGLE PHASE		THREE PHASE		SINGLE PHASE		THREE PHASE	
		HP	RPM	HP	RPM	HP	RPM	HP	RPM
25	4,300	1/2	1140	1/2	1140	NOT AVAILABLE			
26	5,500	3/4	1140	3/4	1140				
28	6,500	NOT AVAILABLE		3/4	850	3/4	1725	3/4	1725
30	7,000			3/4	850	3/4	1725	3/4	1725
33	8,700			1-1/2	860	1-1/2	1725	1-1/2	1740
36	10,000			1-1/2	860	1-1/2	1725	1-1/2	1740
38	13,000			2	855	2	1725	2	1725
40	16,500			3	850	3	1725	3	1725
43	21,500			5	855	5	1725	5	1750
44	27,000			7-1/2	1160	7-1/2	1725	7-1/2	1760

NOTES:
1. Integral OSHA-approved fan guards are furnished as standard on all units up to and including size 26. For larger sizes, OSHA-approved fan guards are optional.
2. Contact you local L.J. Wing representative to obtain sound data when required.

Steam and Hot Water Performance

DH Series heaters utilize seamless 3/8" diameter copper tubing mechanically expanded into 0.010" thick aluminum fins. This construction is suitable for pressures up to 200 psig pressure and temperatures to 400° F. Optional 90/10 Cupronickel tubes are available for pressures up to 350 psig. Carbon steel tubes are also available as an option.

Steam Performance

For 5 psig operation:

1. Read the heat transfer, Q, and leaving air temperature, LAT, directly from the table below.
2. Calculate CL = (Q x 1,000)/LH (where LH = Latent Heat from Latent Heat table).

For 2 psig operation:

1. Multiply the table value of Q by 0.95
2. Calculate CL = (Q x 1,000)/LH
3. Calculate Air Temperature Rise, ATR:
   ATR= (Q x 1,000)/(1.085 x CFM), where CFM is obtained from the Motor and Sound Data table.
4. Calculate LAT = EAT + ATR.

For operation at pressures higher than 5 psig:

The heating surface is factory adjusted so the heater will deliver the same Q and LAT as shown in the table.

1. Read Q and LAT from table for 5 psig.
2. Calculate CL = (Q x 1,000)/ LH.

Example A: Calculate the performance for a size 28 heater at 5 psig and EAT = 50° F.
Solution:
1. Q = 465.4 MBH and LAT = 116° F.
2. CL = (465.4 x 1,000)/961 = 484 lbm/hr.

Example B: Calculate the performance for a size 28 heater at 2 psig and EAT = 50° F.
Solution:
1. Q = 0.95 x 465.4 = 442.1 MBH.
2. CL = (442.1 x 1,000)/966 = 458 lbm/hr.
3. ATR = (442.1 x 1,000)/(1.085 x 6,500) = 63° F.
4. LAT = 50 + 63 = 113° F.

Example C: Calculate the performance for a size 28 heater at 60 psig and EAT = 50° F.
Solution:
1. Q = 465.4 MBH; LAT = 116° F.
2. CL = (465.4 x 1,000)/904 = 515 lbm/hr.

Hot Water Performance

1. Given the Water Temperature Drop, WTD, through the heater, read the standard heat transfer, QS, and standard water flow rate, GPMS, from the Hot Water Performance Table at EWT = 200° F and EAT = 60° F.
2. Look up the Hot Water Performance Correction Factor, WPF, from the table on page 6 at the given EWT and EAT.
3. Calculate Q = WPF x QS
4. Calculate WTD = (Q x 1,000)/(495 x GPMS)
5. Look up the CFM for the unit from the Motor and Sound Data table.
6. Calculate ATR = (Q x 1,000)/(1.085 x CFM)
7. Calculate LAT = EAT + ATR.
8. Read Water Pressure Drop, WPD, from the Hot Water Performance table.

Example:
Determine the performance of a size 33 heater with EWT = 180° F, EAT = 55° F, and WTD = 20° F.
Solution:
1. QS = 370.9 MBH and GPMS = 37.5.
2. WPF = 0.90.
3. Q = 0.90 x 370.9 = 333.8 MBH.
4. WTD = (333.8 x 1,000)/(495 x 37.5) = 18.0° F.
5. CFM = 8,700.
6. ATR = (333.8 x 1,000)/(1.085 x 8,700) = 35° F.
7. LAT = 55 + 35 = 90° F.
8. WPD = 7.7 ft. H2O.

Note: For performance with other tube materials, or with other water flow rates, or with glycol solutions, please consult your local Wing representative.

Steam Perfomance - 5 psig

DH SIZE	Entering Air Temperature, EAT (deg. F)									
	50		55		60		65		70	
	Q (MBH)	LAT (deg. F)	Q (MBH)	LAT (deg. F)	Q (MBH)	LAT (deg. F)	Q (MBH)	LAT (deg. F)	Q (MBH)	LAT (deg. F)
25	338.5	120	326.8	123	315.0	126	304.3	130	293.5	133
26	406.0	116	392.0	120	378.0	123	365.0	126	352.0	129
28	465.4	116	454.9	120	444.3	123	426.7	126	409.0	128
30	486.1	114	474.7	118	463.3	121	448.1	124	432.9	127
33	585.3	112	571.1	116	556.9	119	538.1	122	519.2	125
36	694.4	114	678.1	118	661.9	121	640.2	124	618.5	127
38	789.9	106	768.8	110	747.6	113	726.4	117	705.3	120
40	1,056.3	109	1,020.5	112	984.6	115	957.8	119	930.9	122
43	1,306.3	106	1,271.4	110	1,236.4	113	1,201.4	117	1,166.4	120
44	1,494.0	101	1,450.1	105	1,406.2	108	1,362.3	112	1,318.3	115

Steam and Hot Water Performance

Latent Heat

SP	LH	SP	LH	SP	LH
2	966	**40**	919	**100**	880
5	961	**50**	911	**120**	870
10	953	**60**	904	**140**	861
15	945	**70**	897	**160**	851
20	939	**80**	891	**180**	846
30	929	**90**	886	**200**	840

Note: SP = Steam Pressure in psig; LH = Latent heat of steam in BTU/lbm.

Hot Water Performance

DH SIZE	WTD (deg. F)	QS (MBH)	GPMS (GPM)	LAT (deg. F)	WPD (feet water)
25	15	198.8	26.8	103	3.8
	20	189.8	19.2	101	2.0
	30	167.8	11.3	96	0.7
26	15	254.2	34.2	103	7.4
	20	242.5	24.5	101	3.8
	30	223.8	15.1	98	1.4
28	15	298.3	40.2	102	7.5
	20	284.5	28.7	100	3.8
	30	262.7	17.7	97	1.5
30	15	309.1	41.5	101	8.0
	20	295.2	29.8	99	4.1
	30	273.5	18.4	96	1.6
33	15	381.8	51.5	101	14.5
	20	370.9	37.5	99	7.7
	30	347.0	23.4	97	3.0
36	15	449.0	60.3	101	14.3
	20	435.9	44.0	100	7.6
	30	408.0	27.5	98	3.0
38	15	510.8	69.0	96	18.7
	20	499.6	50.5	95	10.0
	30	469.1	31.6	93	3.9
40	15	652.9	87.8	97	5.1
	20	623.0	63.0	95	2.6
	30	565.9	38.1	92	1.0
43	15	805.2	108.5	95	5.9
	20	767.7	77.5	93	3.0
	30	705.5	47.5	90	1.1
44	15	896.7	121.0	91	7.4
	20	857.7	86.5	89	3.8
	30	797.7	53.7	87	1.5

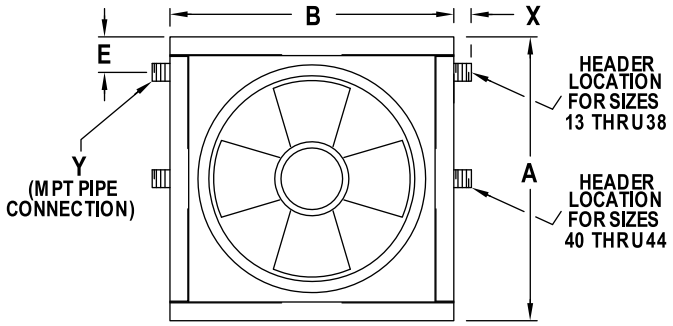
Hot Water Performance Correction Factors, WPF

EWT (deg. F)	ENTERING AIR TEMPERATURE, EAT (deg. F)				
	50	**55**	**60**	**65**	**70**
140	0.64	0.61	0.57	0.54	0.50
150	0.71	0.68	0.64	0.61	0.57
160	0.79	0.76	0.72	0.68	0.63
170	0.87	0.83	0.79	0.75	0.70
180	0.94	0.90	0.86	0.82	0.77
190	1.01	0.97	0.93	0.87	0.80
200	1.08	1.04	1.00	0.99	0.97
210	1.16	1.12	1.07	1.03	0.99
220	1.23	1.19	1.14	1.10	1.06

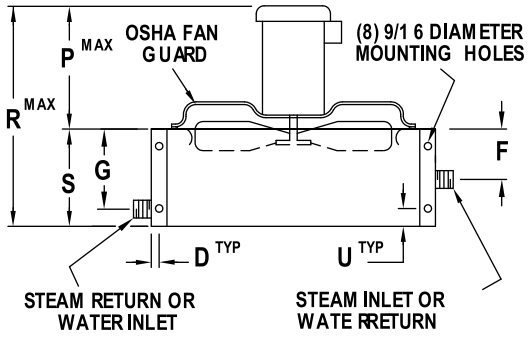
DIMENSIONS

Basic Unit and Discharges

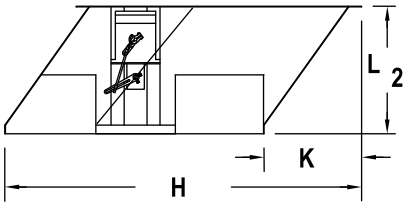
C000651



PLAN VIEW

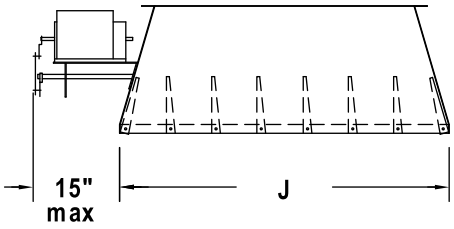


SIDE ELEVATION VIEW

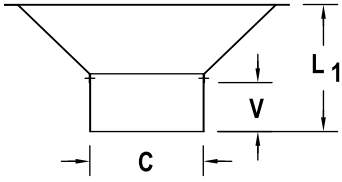


END VIEW

VARI-JET

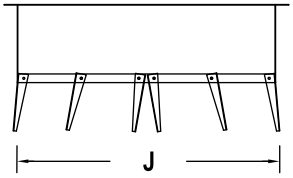


ELEVATION VIEW



END VIEW

HIGH VELOCITY



ELEVATION VIEW

DIMENSIONS																		WEIGHT	
	HIGH VELOCITY & VAR-JET										HV ONLY			VARI-JET ONLY				WITH	WITH
DH	A	B	D	E	F	G	R	S	U	Y	C	L1	V	H	J	K	L2	HV	VJ
25	32 3/4	32 3/4	5/8	2 5/8	5	7 7/16	28	9	1	1 1/2	13 1/4	15	6	40 1/2	37 3/4	10 1/2	14 5/8	189	232
26	38 1/8	32 3/4	5/8	2 5/8	5	7 7/16	28	9	1	1 1/2	13 1/4	15	6	40 1/2	37 3/4	10 1/2	14 5/8	209	253
28	39 1/8	39 1/8	7/8	3 3/8	7	9 5/8	29	12	1 1/2	2	16 3/4	24	7	40 1/2	44	12	16	314	338
30	39 1/8	39 1/8	7/8	3 3/8	7	9 5/8	29	12	1 1/2	2	16 3/4	24	7	40 1/2	44	12	16	314	338
33	45 1/8	39 1/8	7/8	3 3/8	7	9 5/8	30	12	1 1/2	2	16 3/4	24	7	40 1/2	44	12	16	353	387
36	45 1/8	45 1/8	7/8	3 3/8	7	9 5/8	30	12	1 1/2	2	24 3/4	18	7	50 5/8	50 1/2	12	17 5/8	369	426
38	45 1/8	45 1/8	7/8	3 3/8	7	9 5/8	30	12	1 1/2	2	24 3/4	18	7	50 5/8	50 1/2	12	17 5/8	400	457
40	63 1/8	51 5/8	7/8	31 9/16	11 1/4	15 1/4	43	24	1 1/2	3	29 3/4	24	8	54 1/2	48	12 1/4	15 1/4	673	736
43	63 1/8	51 5/8	7/8	31 9/16	11 1/4	15 1/4	43	24	1 1/2	3	35 1/8	20	9	56 3/4	56	7 1/4	15 1/4	811	883
44	63 1/8	51 5/8	7/8	31 9/16	11 1/4	15 1/4	43	24	1 1/2	3	41 1/8	16	9	56 3/4	56	7 1/4	15 1/4	834	918

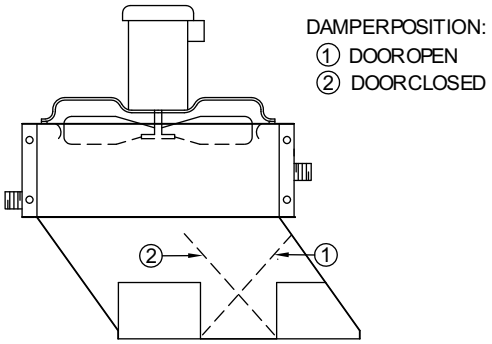
Notes:
1. Sizes 25 and 26 provided with OSHA fan guard as shown. OSHA fan guard is optional on sizes 28 through 44.
2. All dimensions in inches.
3. All weights in pounds.

VARI-JET DISCHARGES

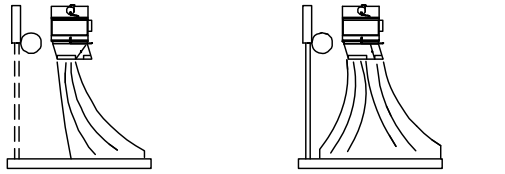
Operation and Arrangements

C000653

When equipped with Wing's exclusive Vari-Jet discharge, the DH units can function as combination door and space heaters to provide area heating as well as door heating. The Vari-Jet discharge is fitted with an electrically controlled damper. As shown in the schematic below, when the door is opened, the damper is automatically moved to position 1 to direct a high velocity curtain of air over the opening. When the door is closed, the damper is automatically repositioned to position 2 so that the air is widely diffused at normal velocity to provide room or perimeter heating. A room thermostat controls the Vari-Jet discharge, shutting off the unit when the heating requirements are satisfied. If the door is subsequently reopened, the door switch automatically starts the unit.

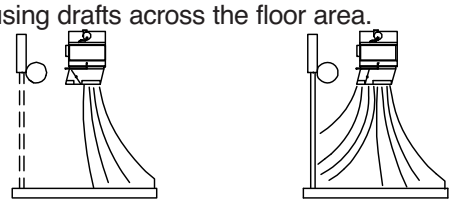


The table below presents the floor coverage for the Vari-Jet discharge along with the maximum allowable mounting height under normal conditions. Consult your local Wing representative when conditions require greater mounting heights or greater coverage. **Space Heating**
The unit is mounted with the slant of the Vari-Jet discharge section facing away from the door. With the door closed, the heated air is discharged outward into the room to improve heating of nearby areas.

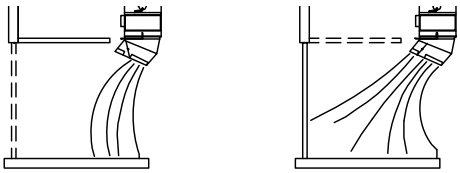


OPEN DOOR **CLOSED DOOR**

Perimeter Heating
The unit is mounted with the slant of the Vari-Jet discharge facing towards the door. The Vari-Jet discharge can be mounted vertically for rolling or sliding doors or at an angle for overhead doors. With the door closed, a perimeter heat flow pattern spreads for a long distance along the wall, preventing cold air from cascading down the wall and causing drafts across the floor area.



OPEN DOOR **CLOSED DOOR**

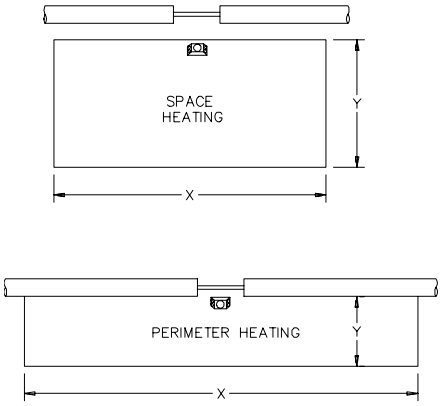


OPEN DOOR **CLOSED DOOR**

Floor Coverage with Vari-Jet Discharge

DH Model	Space Heating X	Space Heating Y	Perimeter Heating X	Perimeter Heating Y	Max Mounting height
25	57	26	82	14	8
26	62	30	90	16	8
28	67	33	97	18	9
30	73	34	104	19	10
33	78	35	112	20	12
36	82	38	119	21	13
38	96	44	139	24	15
40	114	52	150	28	16
43	122	55	165	30	23
44	137	62	186	34	23

Note: Coverage is in feet with door closed.

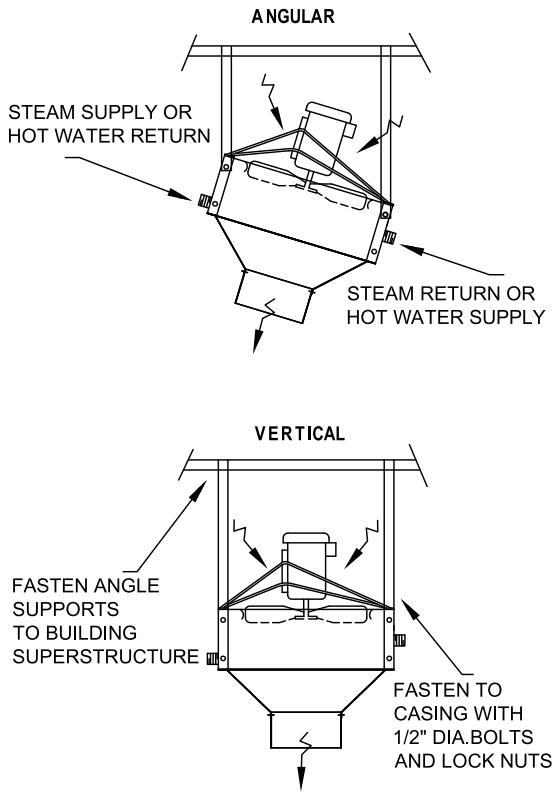


MOUNTING DETAILS

Mounting Details

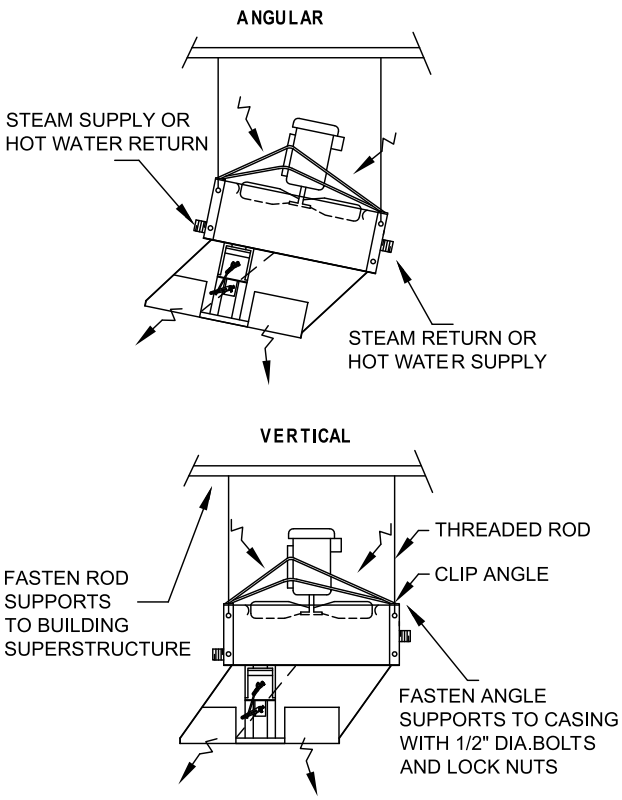
C000644

HIGH VELOCITY DISCHARGE WITH ANGLE IRON SUPPORT



NOTE: USE 1 1/2" x 1 1/2" x 1/8" ANGLES MINIMUM FOR SIZES 25 & 26; USE 2" x 2" x 3/16" ANGLES MINIMUM FOR SIZES 28 AND LARGER.

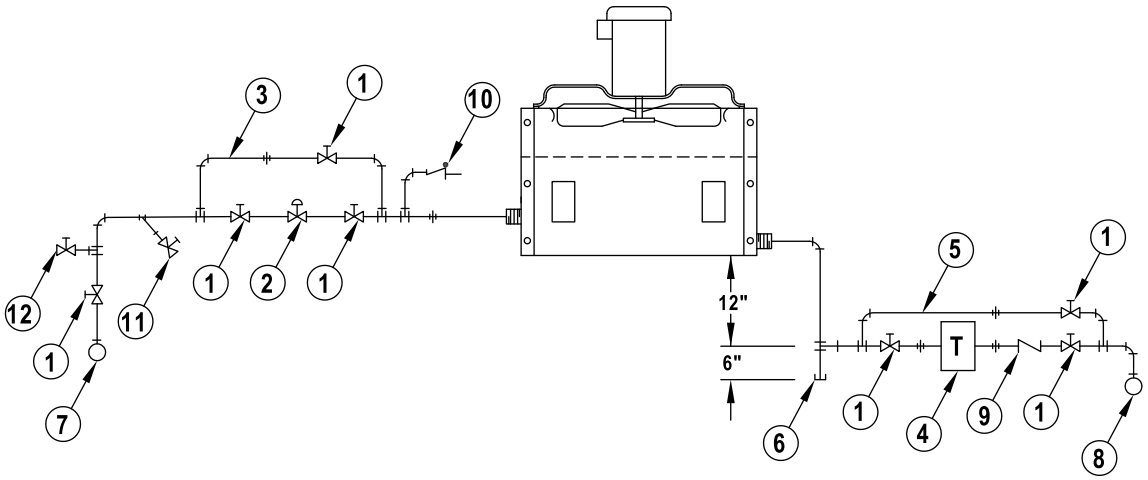
VARI-JET DISCHARGE WITH ROD SUPPORT



NOTE: USE 1 1/2" DIAMETER RODS MINIMUM FOR SIZES 25 & 26; USE 5/8" DIAMETER RODS MINIMUM FOR SIZES 28 AND LARGER.

Steam and Hot Water Piping Diagrams

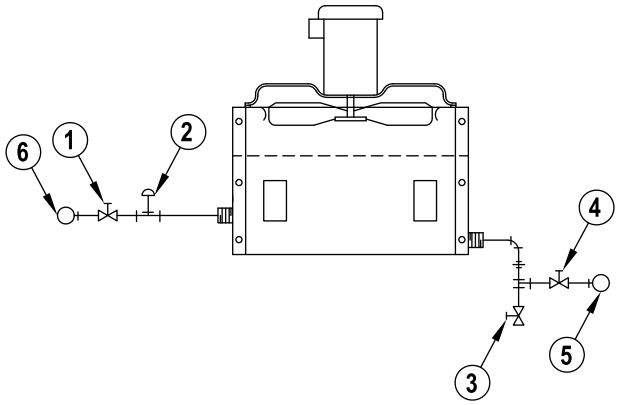
C000645



STEAM PIPING LEGEND

(FOR GRAVITY ATMOSPH ERIC 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. 15° VACUUM BREAKER CHECK VALVE 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.



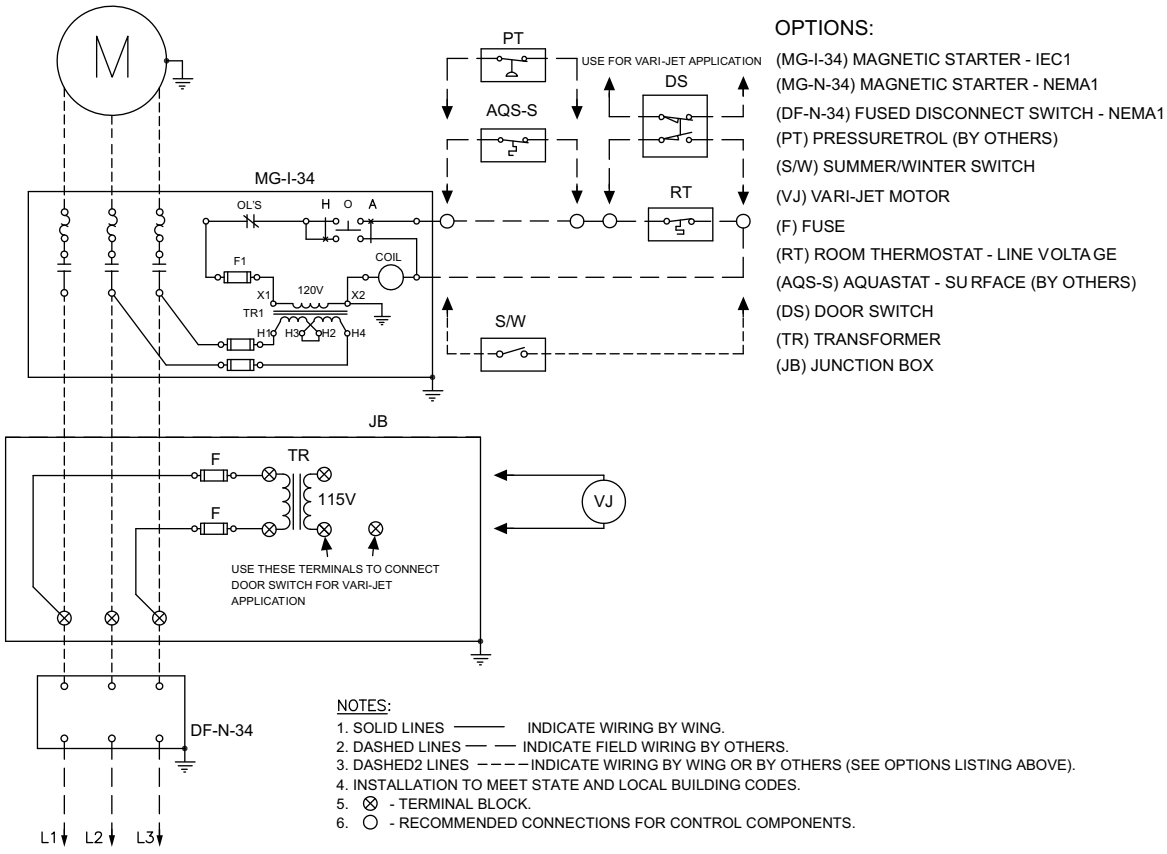
HOT WATER PIPING LEGEND

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

ELECTRICAL

Wiring Diagram – Typical Type 3- Phase

C000646



NOTES:
1. SOLID LINES ——— INDICATE WIRING BY WING.
2. DASHED LINES — — INDICATE FIELD WIRING BY OTHERS.
3. DASHED2 LINES – – – – INDICATE WIRING BY WING OR BY OTHERS (SEE OPTIONS LISTING ABOVE).
4. INSTALLATION TO MEET STATE AND LOCAL BUILDING CODES.
5. ⊗ - TERMINAL BLOCK.
6. ○ - RECOMMENDED CONNECTIONS FOR CONTROL COMPONENTS.

Amp Draw Table

ITEM	SOURCE	ELECTRICAL SERVICE	MOTOR AMPS AT GIVEN MOTOR HORSEPOWER							
			1/2	3/4	1	1 1/2	2	3	5	7 1/2
A	Fan Motor	208V 3 Ph	2.4	3.5	4.6	6.6	7.5	10.6	16.7	24.2
		230V 3 Ph	2.2	3.2	4.2	6.0	6.8	9.6	15.2	22.0
		460V 3 Ph	1.1	1.6	2.1	3.0	3.4	4.8	7.6	11.0
		575V 3 Ph	0.9	1.3	1.7	2.4	2.7	3.9	6.1	9.0

B	Control Transformer	ELECTRICAL SERVICE	CONTROL CIRCUIT AMPS
		208V 3 Ph	0.5
		230V 3 Ph	0.4
		460V 3 Ph	0.2
		575V 3 Ph	0.2

Notes:
1. Above motor amps are based on the latest edition of the National Electrical Code.
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 4 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.

SPECIFICATIONS AND SCHEDULE

Typical Specification

General
Furnish a factory-assembled DH model door heater as manufactured by L.J. Wing, Dallas, TX, to heat air in the loading dock door area using steam or hot water as the heating medium. Performance shall be as shown in the schedule. Finned heating elements shall be fabricated of seamless return bend type 3/8" o.d. copper tubes with rectangular 0.010" thick aluminum 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 a propeller type fan blade driven by a TEFC motor (optional: explosion-proof direct drive motor) with electrical characteristics as scheduled. Casing and discharge shall be constructed of galvannealed sheet metal.

Discharge
(A) Unit shall be provided with a Vari-Jet discharge with integral electrically controlled two-position discharge damper complete with factory assembled damper actuator and linkage. The Vari-Jet discharge shall be arranged for (space)(perimeter) heating as shown on the drawings.
(B) Unit shall be provided with an adjustable vane High Velocity discharge designed specifically to heating air in dock door areas.

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

Controls (optional)
(A) Unit fitted with High Velocity discharge shall be operated from a (door switch; explosion-proof door switch) activated whenever the door is opened.
(B) Unit fitted with Vari-Jet discharge shall be operated from a (door switch; explosion-proof door switch) and (room thermostat; explosion-proof room thermostat).
(C) Furnish a remote control panel with NEMA 1 housing, contactors, overload relays, line voltage to 120-volt transformer, line and control terminal strips.
(D) Furnish magnetic motor starter that is (shipped loose; mounted and wired).
(E) Furnish (non-fused; fused) disconnect switch that is (shipped loose; mounted and wired).

Typical Schedule

Model no.	Airflow Rate (CFM)	Ent. Air Temp. (deg. F)	Leav. Air Temp. (deg. F)	Steam Pressure (psig)	Heat Transfer (MBH)	Condensate load (lbm/hr)	Electrical Service (volt/ph./Hz)	Motor Horsepower (HP)
DH-36-HV	10,000	60	121	5	661.9	689	230/3/60	1 1/2

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