READ AND SAVE THESE INSTRUCTIONS

VAPORSTREAM®

ELECTRIC STEAM HUMIDIFIERS

FOR APPLICATIONS
WITHOUT A STEAM BOILER –
COMMERCIAL, INSTITUTIONAL,
INDUSTRIAL AND
LARGE RESIDENTIAL

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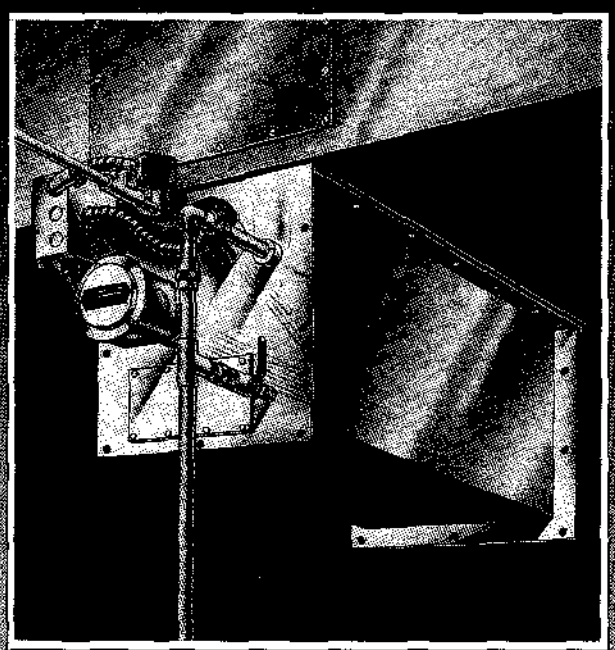

Installation Instructions

Maintenance Operations Manual

DRI-STEEM®
HUMIDIFIER COMPANY
BOX 128 • HOPKINS, MINNESOTA 55343

TO THE PURCHASER AND THE INSTALLER

Thank you for deciding to purchase Vaporstream equipment.

We have applied our best efforts to design and build this equipment to give you total satisfaction and many years of trouble free service.

Avoiding certain pitfalls during installation and observing proper operating practices thereafter will assure you of achieving that objective.

We therefore respectfully urge you to familiarize yourself with the contents of this bulletin.

Dri-Steem Humidifier Company

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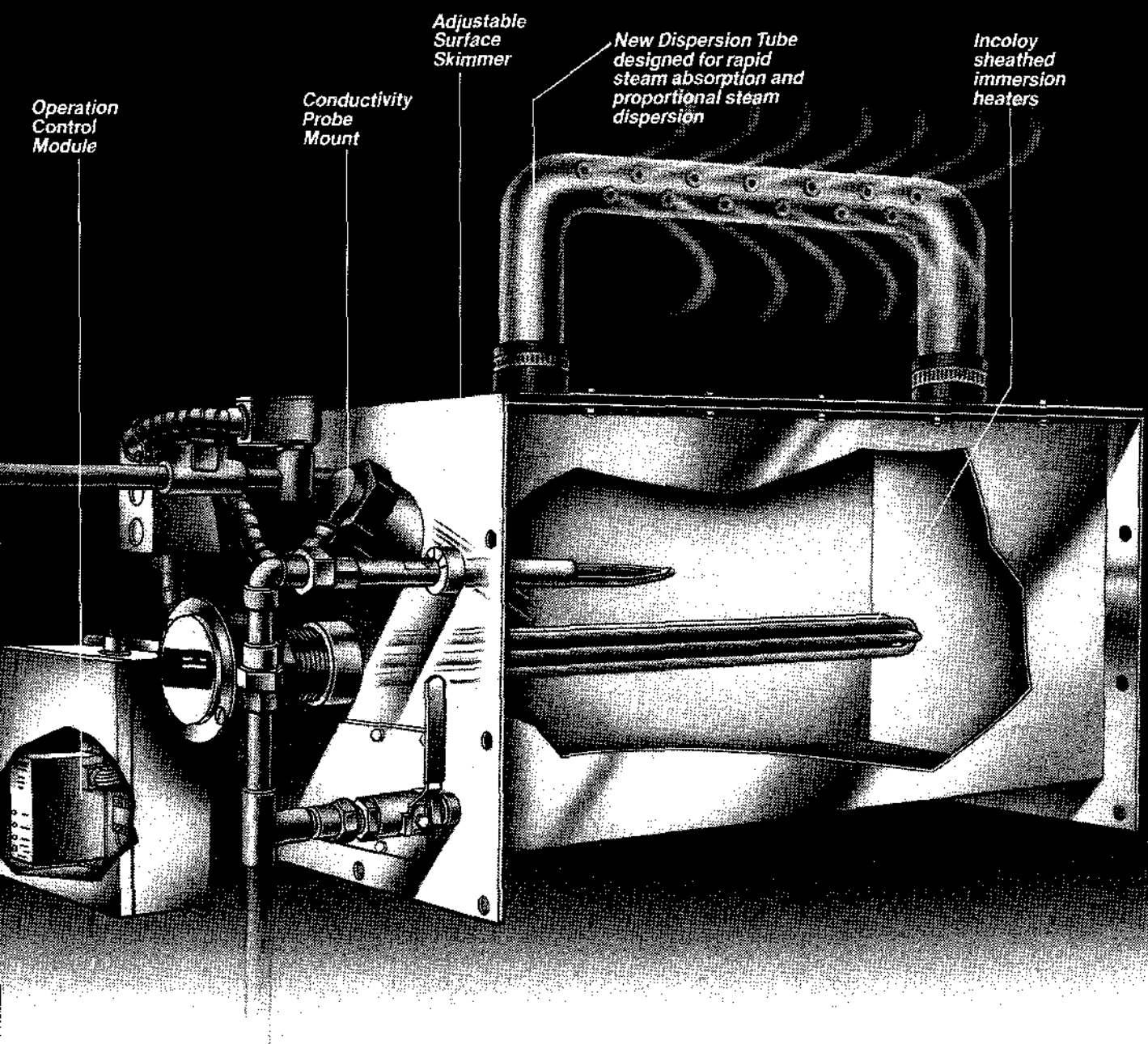
Please Note:

***This humidifier is designed for use with* either softened or unsoftened water. Its probe type level control system requires water *conductivity to function and* therefore will not operate on water treated by the reverse osmosis or deionizing process. However, *special design* Vaporstream humidifiers are available for use with these water types.**

VAPORSTREAM®

Sophisticated state-of-the-art technology in a simple, low maintenance humidifier.



VAPORSTREAM®

Seven reasons you can count on Vaporstream Electric Steam Humidifiers to do the job reliably, efficiently and economically.

(1) Exclusive water-level conductivity probe control system

Conductivity probes have long been established as a highly dependable method of controlling liquids and fill functions. The *exclusive* VAPORSTREAM probe system consists of 3 stainless steel probes, molded in a Thermoset plastic threaded plug. The stainless steel probes are Teflon® coated for easy cleaning. Both the probe mounting fixture and the plug are indexed for proper and easy remounting after cleaning.

The 3 probe sensors perform all of the necessary functions of water level control.

Probe A provides low water protection for the heating element(s). When the water level is below Probe A no conductivity is established thus preventing the heater(s) from being energized.

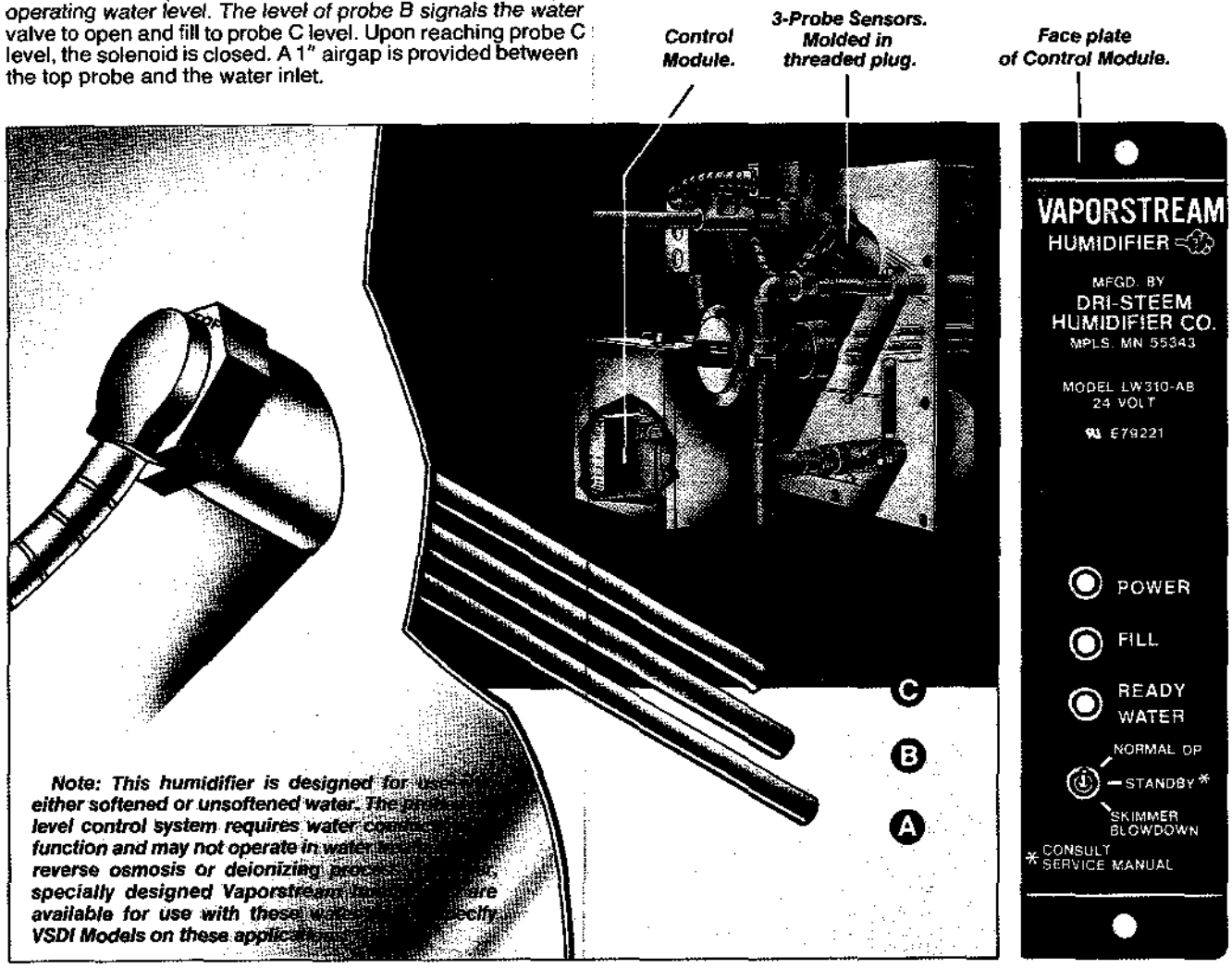
Probes B and C perform the functions of maintaining proper operating water level. The level of probe B signals the water valve to open and fill to probe C level. Upon reaching probe C level, the solenoid is closed. A 1" airgap is provided between the top probe and the water inlet.

Liquid level control

The Control Module is a liquid level control designed for VAPORSTREAM Humidification Systems. The Control Module performs all of the necessary logic and timing functions to provide total level control and heater interlock. Additionally, the Control Module incorporates a manual Skimmer Blowdown cycle.

The Control Module monitors the three probes and uses the information to determine if the heater(s) should be allowed to come on and whether the Fill valve should be open or closed.

The control automatically maintains the water level between the upper two probes. A two second delay is incorporated in the upper probe to insure that splashing does not cause an incomplete fill. The heating elements continue to stay 'ON' during the fill cycle thus providing continuous out-put when there is a call for humidification.



Note: This humidifier is designed for use with either softened or unsoftened water. The [illegible] level control system requires water conductivity to function and may not operate in water [illegible] reverse osmosis or deionizing processes. [illegible] specially designed Vaporstream [illegible] are available for use with these waters. Specify VSDI Models on these applications.

Operation control module

Power Light:
Indicates that power to the humidifier is ON.

Fill Light:
Indicates that the water solenoid valve is OPEN

Ready Water:
Indicates that the unit has sufficient water level present to allow the heater(s) to operate safely. The function of this interlock is not to control the heater, but to serve as a means to disable the heater control circuit if the water level drops below bottom probe.

Three position manual switch

NORMAL OPERATION When the switch is in normal operating position, humidifier is in full operation, automatically maintaining water level and capable of generating steam on the call for humidity.

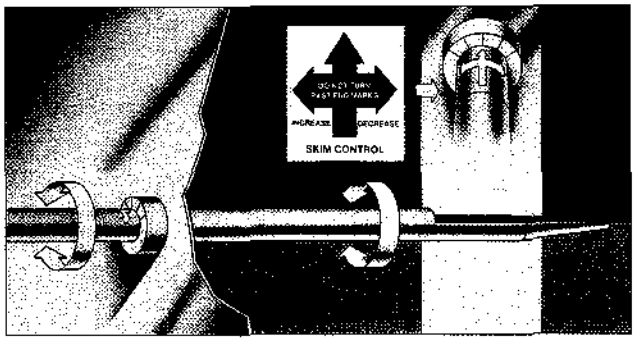
STANDBY Switch is moved to 'STANDBY' position for regular inspection. The Standby Switch interrupts the control circuit voltage to the humidifier only.

SKIMMER BLOW-DOWN In 'SKIMMER BLOW-DOWN' mode the HEAT relay is locked out and the FILL valve is opened. The system is then overfilled and the skimmer is flushed. If the switch is left in this position for five minutes, a 'safety timer' terminates the function to prevent wasting water.

After flushing, switch must be returned manually to NORMAL OPERATION.

(2) Exclusive, adjustable water surface skimmer

A simple ingenious system that removes surface minerals continuously and automatically.



A simple outside adjustment control permits the increase/decrease of skimming flow. The skimmer also serves as an overflow standpipe. The continuous skimming of the surface mineral accumulation reduces the need to clean.

(3) Maintenance-free stainless steel construction

Type 304, 14 gauge stainless steel eliminates corrosion and rusting. Compact design permits easy mounting directly on, or in air ducts (or in air handling unit).

(4) Incoloy sheathed immersion heating elements

All units now come with Incoloy sheathed immersion heating elements constructed within a specification range of up to 90 watts per square inch.

(5) Access, clean out plate

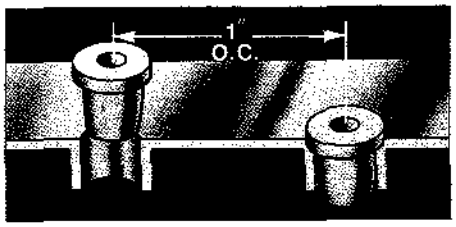
Bottom opening for fast, simple cleaning and regular inspection. Bolted cover may be quickly and easily removed by regular maintenance staff using standard tools.

(6) Dispersion tubes custom designed to fit each application

1½" diameter, custom designed tube or tube arrangement disperses steam throughout the active zone of the air stream.

(7) Exclusive snap-in inserts provide proportional steam dispersion

All VAPORSTREAM dispersion tubes utilize inserts with precision orifices of varying diameters to provide proportional dispersion across the entire length of the tube.



OPTIONAL: Timer-Operated Drain/Flush Operation

This option which is in addition to the features of the standard control module, provides a drain and flush sequence at preset intervals. This feature very effectively reduces the frequency of cleaning associated with all electric evaporating humidifiers. It is recommended when the water supply contains a high quantity of dissolved minerals.

An integral electronic timer accumulates the "on" or "humidifying" time of the unit. When this accumulated time reaches the hours pre-selected by the user (field adjustable between 5 and 50 hours) an electronic programmer automatically activates the drain/flush cycle.

When this cycle, which is also field adjustable (between 1 and 30 minutes) is activated the drain valve opens thus beginning the drain off of the humidifier water.

When 50% of the preset drain duration time has elapsed, the fill valve opens for the remainder of the time thus completing the flushing action.

At the end of the flushing time the control module closes the drain valve, keeps the fill valve open which refills the unit, restarts the cumulative timer and allows the humidifier to resume operating normally.

When draining the humidifier prior to servicing, the "manual drain" feature of this control module is used. Placing the three-position switch in the "manual drain" position deactivates the heater elements and fill valve and opens the drain valve. The drain valve contains a built-in drain lever. If draining is desired during an electrical power outage, this feature can be used.

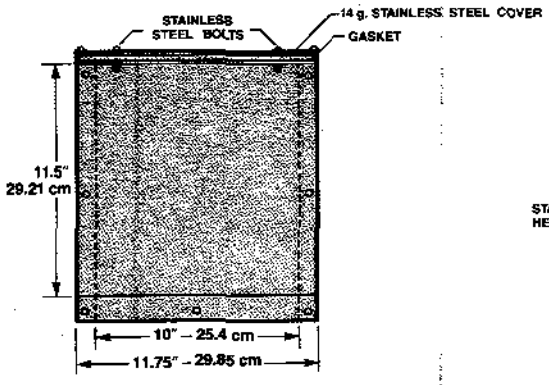
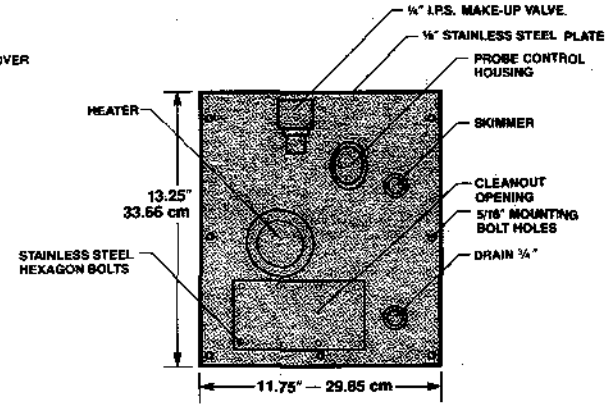
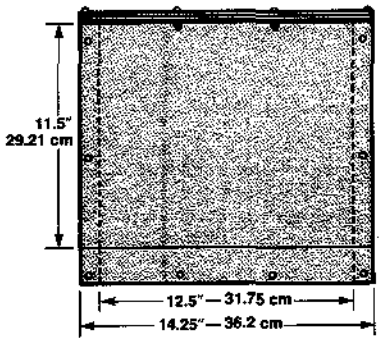
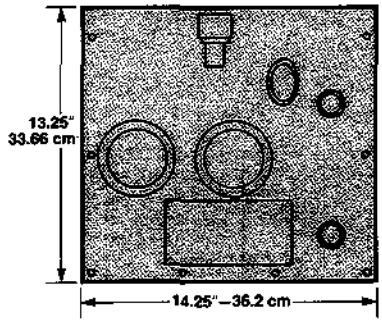
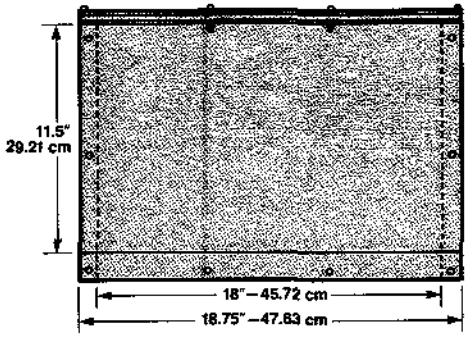
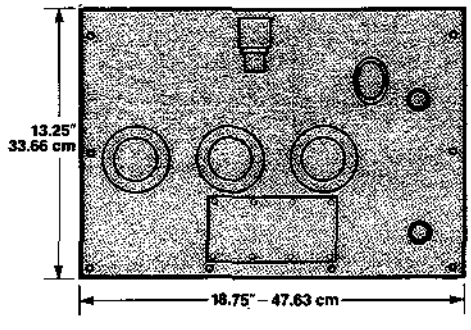
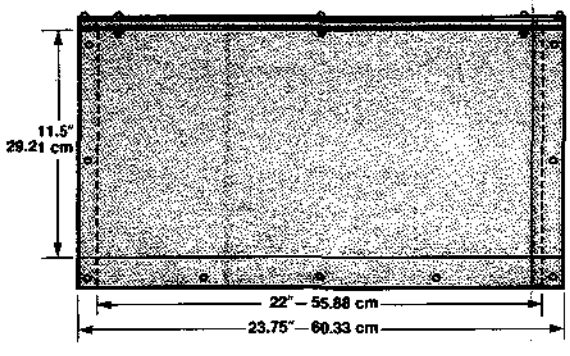
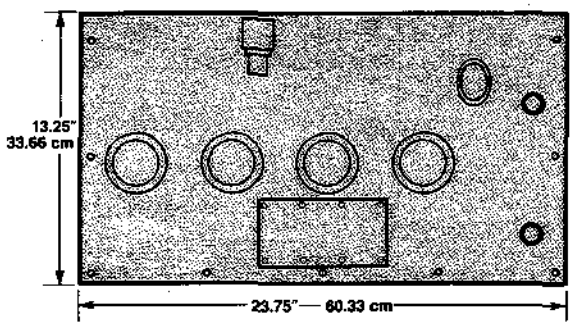
Charts below show recommended operating time for various degrees of water hardness and drain duration of different size units.

GR./GAL.	Hours of operating time*
14	24
16	22
18	19
20	18
22	16
24	14
26	13
28	12
30	11
32	10

Total KW	Drain Duration (minutes)
2-8	5
9-24	10
28-40	15
42-60	20
64-80	25

*** NOTE: Due to various waters, these are starting points. Field adjustments may be made to suit a particular water condition.**

VAPORSTREAM®

	Back View	Front View
One Heater Units		
Two Heater Units		
Three Heater Units		
Four Heater Units		

Mechanical Specifications

Electrical Specifications

1	2		3		4	5	6		7		8	9	10	11	12	13	14	15	16	Capacities-Hr. 17 See Notes	
											Single Phase ☐				Three Phase ☐						
	Dim. "A"		Dim. "B"		U-Tubes	HK	Wt. Empty		Wt. Full		120V	208V	240V	480V	208V	240V	480V		Control		
Model	in.	cm	in.	cm	▲	■	lbs.	kg	lbs.	kg	Amps	Amps	Amps	Amps	Amps	Amps	Amps	KW	Cabinets	Lbs.	KG
VPC-2	8	20.32	✓	✓	1	1	28	12.4	50	22.7	16.6	9.6	8.3	4.2	5.5	4.8	2.4	2	S	5.7	2.59
3	8	20.32	✓	✓	1	1	28	12.4	50	22.7	25.0	14.4	12.5	6.3	8.3	7.2	3.6	3	S	8.5	3.86
4	8	20.32	✓	✓	1	1	28	12.4	50	22.7	33.3	19.2	16.7	8.3	11.1	9.6	4.8	4	S	11.4	5.17
5	16	40.64	10.5	26.67	1	1	36	16.3	79	35.8	41.6	24.0	20.8	10.4	13.9	12.0	6.0	5	S	14.2	6.44
6	16	40.64	10.5	26.67	1	1	36	16.3	79	35.8		28.8	24.9	12.5	16.6	14.4	7.2	6	S	17.0	7.71
7	16	40.64	10.5	26.67	1	1	36	16.3	79	35.8		33.7	29.1	14.6	19.4	16.9	8.45	7	S	19.9	9.03
8	16	40.64	10.5	26.67	1	1	37	16.8	80	36.3		38.5	33.3	16.7	22.2	19.2	9.6	8	S	22.7	10.30
9	24	60.96	20.5	52.07	1	1	47	21.32	112	50.8		43.2	37.5	18.8	25.0	21.7	10.8	9	S	25.5	11.57
10	24	60.96	20.5	52.07	1	1	47	21.32	112	50.8		48.0	41.7	20.8	27.7	24.1	12.1	10	S	28.4	12.88
12	24	60.96	20.5	52.07	1	1	47	21.32	112	50.8				25.0	33.3	28.9	14.5	12	S	34.1	15.47
14	40	101.6	32.5	82.55	1	1	54	25.0	162	73.5				29.2	38.8	33.7	16.9	14	S	39.7	18.01
16	40	101.6	32.5	82.55	1	1	54	25.0	162	73.5				33.3	44.4	38.5	19.3	16	S	45.4	20.59
18	40	101.6	32.5	82.55	1	1	54	25.0	162	73.5				37.5		43.3	21.7	18	S	51.1	23.18
20	40	101.6	32.5	82.55	1	1	55	25.0	163	73.9				41.7		48.0	24.1	20	S	56.8	25.76
VPC2-2	8	20.32	✓	✓	1	1	35	15.9	62	28.1	33.2	19.2	16.6	8.4	11.0	9.6	4.8	4	M	11.4	5.17
3-3	8	20.32	✓	✓	1	1	35	15.9	62	28.1	50.0	28.8	25.0	12.6	16.6	14.4	7.2	6	M	17.0	7.71
4-4	8	20.32	✓	✓	1	1	35	15.9	62	28.1	66.6	38.4	33.4	16.6	22.2	19.2	9.6	8	M	22.7	10.30
5-5	16	40.64	10.5	26.67	1	1	46	20.9	100	45.4	83.2	48.0	41.6	20.8	27.8	24.0	12.0	10	M	28.4	12.88
6-6	16	40.64	10.5	26.67	1	1	46	20.9	100	45.4		57.6	49.8	25.0	33.2	28.8	14.4	12	M	34.1	15.47
7-7	16	40.64	10.5	26.67	1	1	46	20.9	100	45.4		67.4	58.2	29.2	38.8	33.6	16.9	14	M	39.7	18.01
8-8	16	40.64	10.5	26.67	1	1	48	21.78	102	45.3		77.0	66.6	33.4	44.4	38.4	19.2	16	M	45.4	20.59
9-9	24	60.96	20.5	52.07	1	1	56	25.4	137	62.1		86.4	75.0	37.5	50.0	43.4	21.7	18	M	51.1	23.18
10-10	24	60.96	20.5	52.07	1	1	56	25.4	137	62.1		96.0	83.4	41.7	55.4	48.2	24.1	20	M	56.8	25.76
12-12	24	60.96	20.5	52.07	1	2	56	25.4	137	62.1				50.0	66.6	57.8	28.9	24	M	68.2	30.94
14-14	40	101.6	32.5	82.55	2	2	77	34.9	212	96.2				58.4	77.6	67.4	33.7	28	M	79.5	36.06
16-16	40	101.6	32.5	82.55	2	2	77	34.9	212	96.2				66.6	88.8	77.0	38.5	32	M	90.9	41.23
18-18	40	101.6	32.5	82.55	2	2	77	34.9	212	96.2				75.0		86.6	43.3	36	M	102.0	46.27
20-20	40	101.6	32.5	82.55	2	2	79	35.8	214	97.1				83.4		96.0	48.0	40	M	113.6	51.53
VPC-2-2-2	8	20.32	✓	✓	1	1	44	20.0	83	37.6	49.8	28.8	24.9	12.6	16.5	14.4	7.2	6	M	17.0	7.71
3-3-3	8	20.32	✓	✓	1	1	44	20.0	83	37.6	75.0	43.2	37.5	18.9	24.9	21.6	10.8	9	M	25.5	11.57
4-4-4	8	20.32	✓	✓	1	1	44	20.0	83	37.6	99.9	57.6	50.1	24.9	33.3	28.8	14.4	12	M	34.1	15.47
5-5-5	16	42.64	10.5	26.27	2	1	62	28.1	140	63.5	124.8	72.0	62.4	31.2	41.7	36.0	18.0	15	M	42.6	19.32
6-6-6	16	42.64	10.5	26.27	2	1	62	28.1	140	63.5		86.4	74.7	37.5	49.8	43.2	21.6	18	M	51.1	23.18
7-7-7	16	42.64	10.5	26.27	2	1	62	28.1	140	63.5		101.1	87.3	43.8	58.2	50.7	25.3	21	M	59.6	27.83
8-8-8	16	42.64	10.5	26.27	2	2	64	29.0	142	64.1		115.5	99.9	50.1	66.6	57.6	28.8	24	M	68.2	30.94
9-9-9	24	60.96	20.5	52.07	2	2	72	32.7	188	85.3		129.6	112.5	56.4	75.0	65.1	32.4	27	M	76.7	34.79
10-10-10	24	60.96	20.5	52.07	2	2	72	32.7	188	85.3		144.0	125.1	62.4	83.1	72.3	36.1	30	M	85.2	38.65
12-12-12	24	60.96	20.5	52.07	2	2	72	32.7	188	85.3				75.0	99.9	86.7	43.2	36	M	102.0	46.27
14-14-14	40	100.6	32.5	82.55	2	2	96	43.6	290	131.5				87.6	116.4	101.1	50.7	42	M	119.3	54.11
16-16-16	40	100.6	32.5	82.55	2	3	96	43.6	290	131.5				99.9	133.2	115.5	57.8	48	M	136.3	61.83
18-18-18	40	100.6	32.5	82.55	3	3	96	43.6	290	131.5				112.5		129.9	65.0	54	M	153.3	69.54
20-20-20	40	100.6	32.5	82.55	3	3	99	44.9	293	132.9				125.1		144.0	72.3	60	M	170.4	77.29
VPC 14-14-14-14	40	100.6	32.5	82.55	3	3	110	49.9	347	157.4				116.8	155.2	134.8	67.6	56	L	159.0	72.11
VPC 16-16-16-16	40	100.6	32.5	82.55	3	3	110	49.9	347	157.4				133.2	177.6	154.0	77.2	64	L	181.8	82.46
VPC 18-18-18-18	40	100.6	32.5	82.55	3	3	110	49.9	347	157.4				150.0		173.2	86.8	72	L	204.0	92.53
VPC 20-20-20-20	40	100.6	32.5	82.55	4	3	114	51.7	351	159.2				166.8		192.0	96.0	80	L	227.2	103.06

✓ L-Tube

▲ Number of U-Tubes furnished with standard unit.

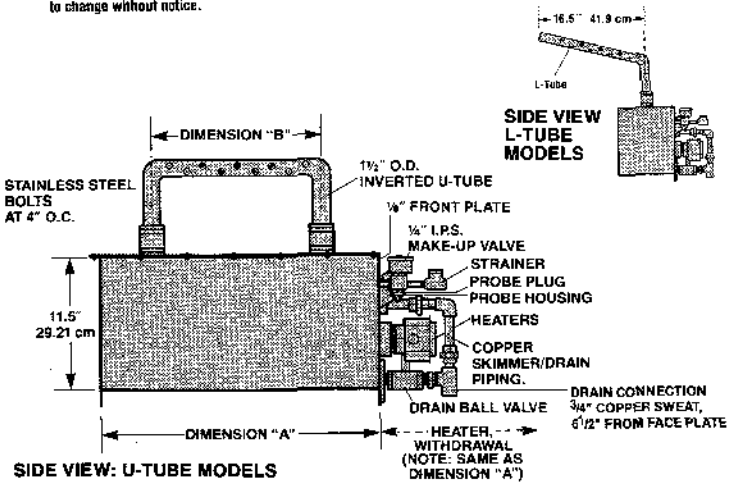
■ Recommended minimum quantity of Steam Hose Kits (when used)

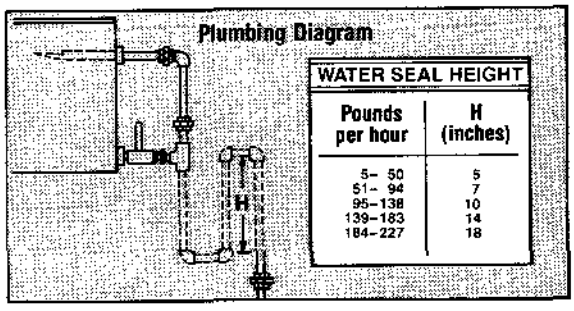
☐ Alternate voltages available upon request.

Dimensions and specifications subject to change without notice.

Control Cabinets

	inches	cm	Shipping Wt.	
Series S	10"W 12"H 5"D	25.4W x 30.8H x 12.7D	22 lbs.	10KG
Series M	14"W 16"H 8"D	35.56W x 40.64H x 15.24D	32 lbs.	14.5KG
Series L	20"W 20"H 8"D	50.8W x 50.8H x 15.24D	55 lbs.	25KG





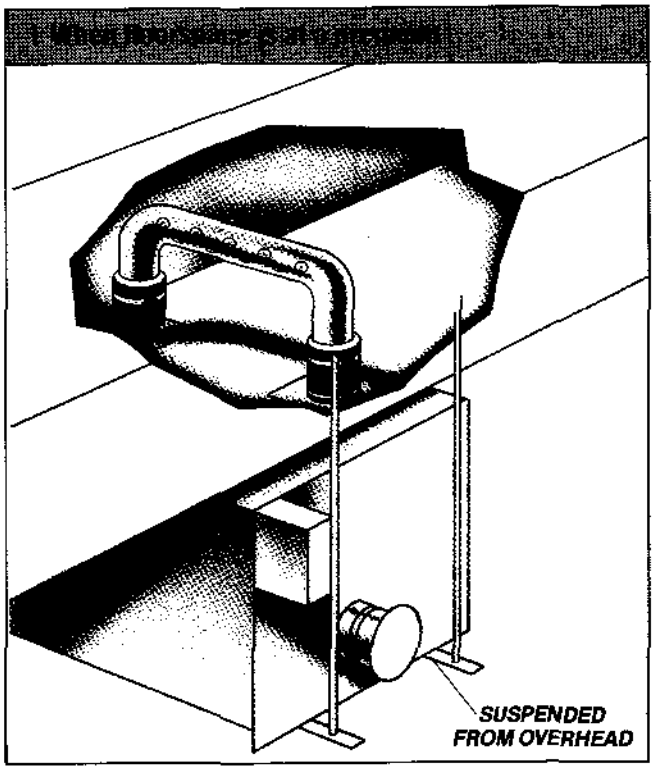
Notes: Capacities. Approximately 172 BTU's are required to raise the temperature of one pound of water from 40°F to 212°F. An additional 970 BTU's are required to change this one pound of water to water vapor.

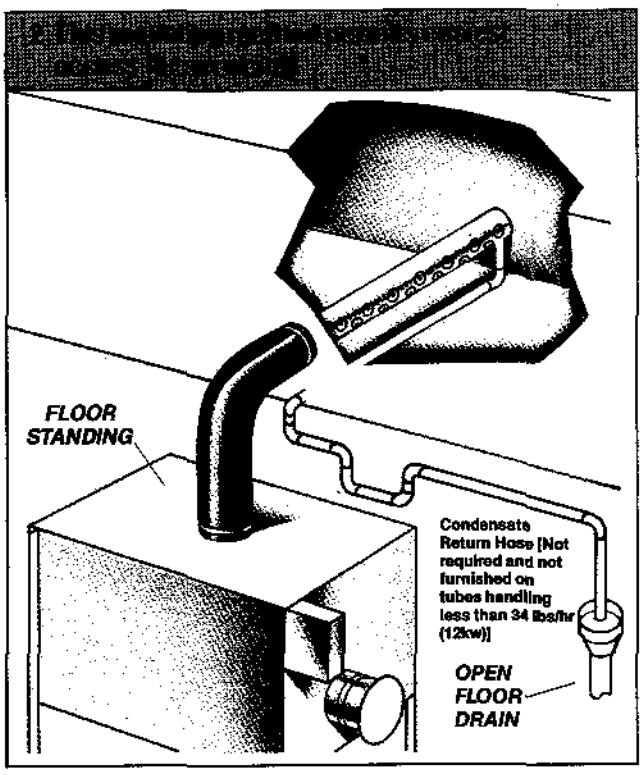
A factor to consider when calculating humidifier capacity is the heat loss from the humidifier chamber to the air surrounding it. This will vary with air temperature and velocity. Calculations show that for a condition of 70°F. air and 1500 feet per minute velocity, the loss will be about 5%.

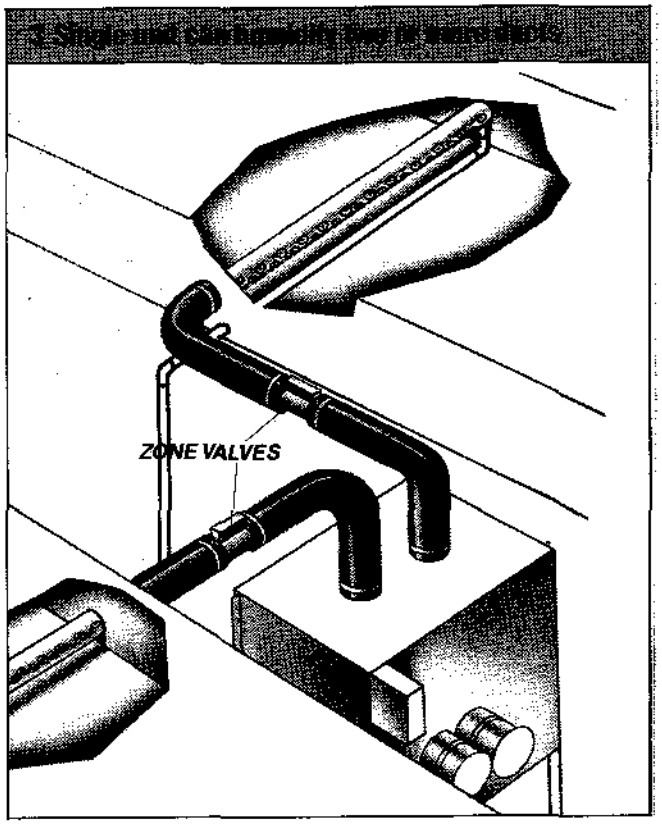
The addition of ¾" of rigid foam insulation on all surfaces except top and front will cut this loss to about 1%.

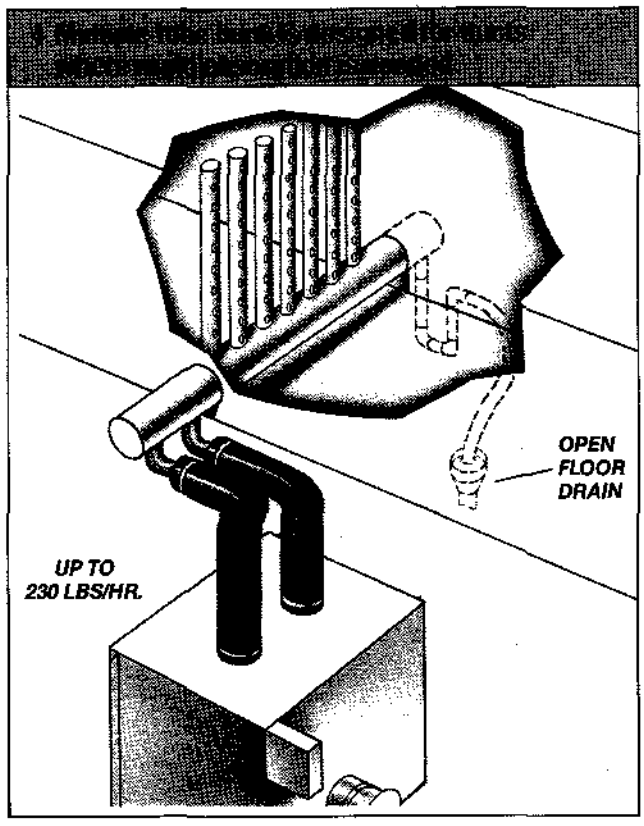
VAPORSTREAM®

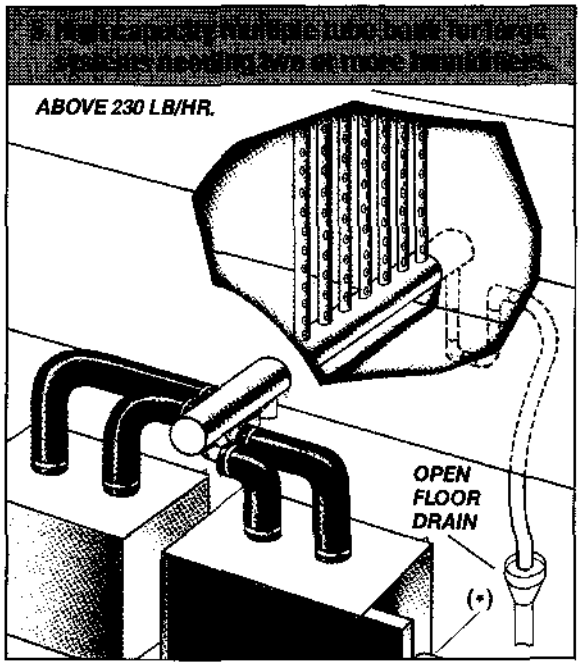
Designed to Work Anywhere











* Connect condensate return below water line

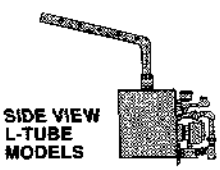
To put VAPORSTREAM humidifiers to work, you need just three things: available tap water, available electricity and a drain system. VAPORSTREAM humidifiers are not built to fit rigid, set situations, but are made to adapt to any existing physical condition.

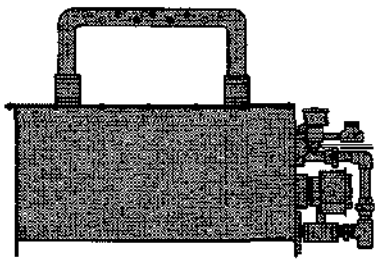
1: Mounting on Underside of Duct Conserves Floor Space

Trapeze hangers and rods support the weight of the humidifier.

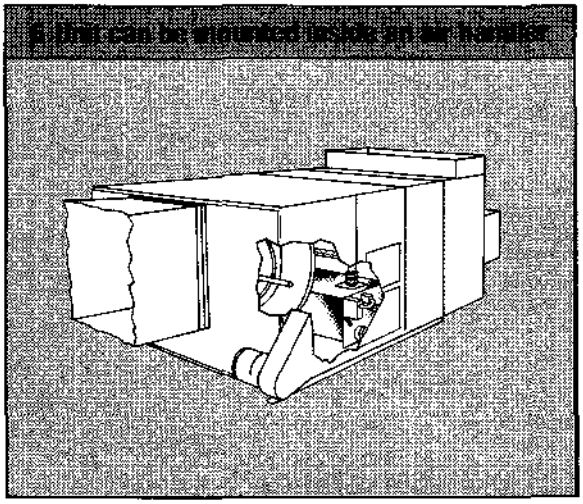
Models VPC 2, 3 and 4 require only a single opening in the bottom of the duct for the L-shaped dispersion tube (See Figure 3, page 6).

Larger models require two holes in the air duct, to accommodate the inverted U-tube which extends into the active area of the air stream.





SIDE VIEW: U-TUBE MODEL



2-3: Floor or Wall Mounted Unit with Steam Hose for Obstructed Ducts

The unit may be a free-standing (leg or wall bracket options) in an accessible location with a steam hose leading to the duct. 1½" O.D. stainless dispersion tube(s) delivers steam to the active air stream.

Illustration 3 shows how two or more ducts can be served by a single humidifier. When ducts have similar humidity loads, zone valves can be omitted.

A solid, practical solution to providing humidification in existing buildings.

4: Multiple-Tube Configurations for Rapid-Absorption Applications

Total absorption of steam with no wetting of the duct interior is difficult to attain in some cases. Cool duct air and/or short absorption space are the causes. A multiple tube bank that creates rapid and thorough absorption is the answer to this problem.

5: Usually Large Systems Often Require Two or More Humidifiers to Satisfy the Load

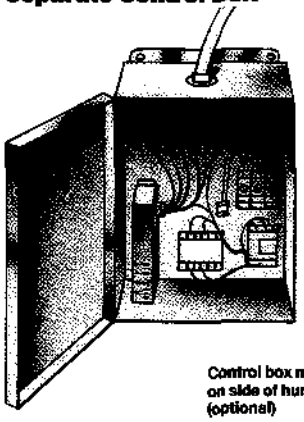
Specially designed tube banks for additional hoses and with larger diameter header are available for these applications.

6: Vaporstream Can Fit Directly Inside An Air Handling Unit

The inverted U-tube(s) are located within the most active part of the air stream.

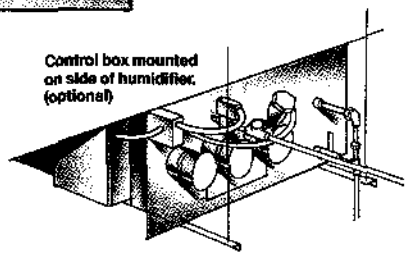
Also adaptable to roof-top units.

Separate Control Box



NOTES:

1. In humidifiers having more than one heater, one contactor will be required for each heater.
2. Due to control options, where space is critical, consult factory for exact size of cabinet.



Control Panels Are Mounted In Separate Control Box

VAPORSTREAM humidifiers are furnished with pre-wired UL-listed Control Panels. Panels are mounted in a 14 gauge steel control box.

Connecting conduit and wire field mounted by installer.

Detailed wiring diagrams are available from your VAPORSTREAM representative or direct from the factory.

OPTIONAL: Control boxes can be mounted directly to the humidifier unit. Connecting conduit and wiring are then factory supplied.

SELECTING THE LOCATION

A. It is very important that the humidifier be located where the water vapor being discharged will be carried off with the air stream and will not cause condensation or dripping from the duct.

B. In general, the electric evaporative humidifier is best placed where the air can most readily absorb the moisture being added without causing condensation at or after the unit. This will normally be after the heating coil or where the air temperature is highest.

C. Do not place in an outside air intake unless air is tempered with a preheat coil.

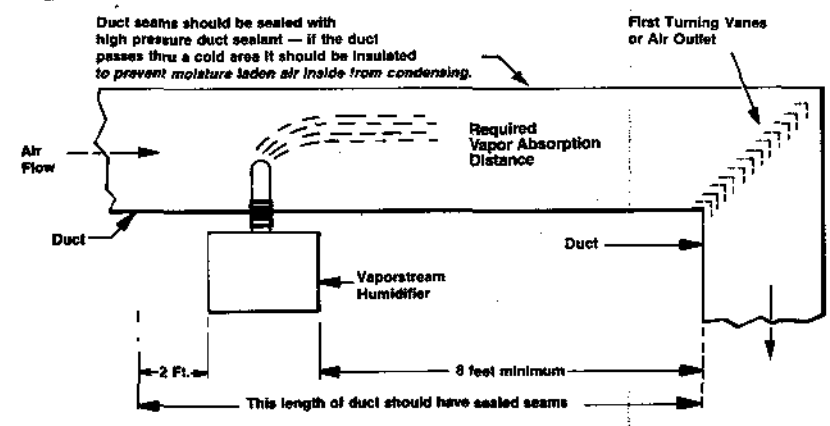
D. Do not place the unit too near to the intake of a high efficiency filter. The filter will remove the visible moisture and become waterlogged. Allow at least 8 feet from the humidifier to the filter.

E. Do not place unit where discharged vapor will impinge on a metal surface. Allow at least 8 feet from the humidifier to such a surface.

F. Do not place the unit too close to a split in the duct. The unit may put more moisture in one branch than the other. Allow at least 8 feet from the humidifier to the split and center the humidifier upstream from the split.

When adequate absorption distance is not available, you should use a rapid absorption tube bank. Refer to pages 12 - 15 in the regular product catalog VSH 0186, or contact Dri-Steem or your Dri-Steem representative.

VAPOR ABSORPTION DISTANCE



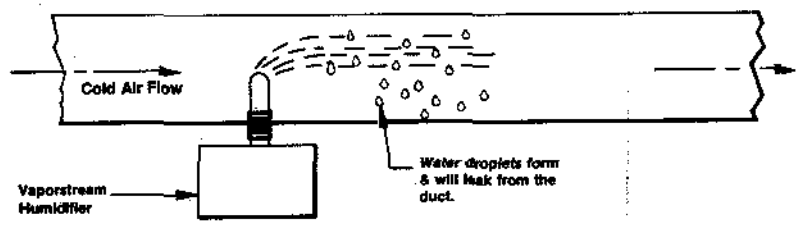
A distance of air travel is required for the steam to "disappear" or go into the gaseous state.

While visible, the steam will collect on internal devices such as turning vanes resulting in dripping.

A minimum of 8 feet is recommended.

Note: If desired, unit need not be tight to duct

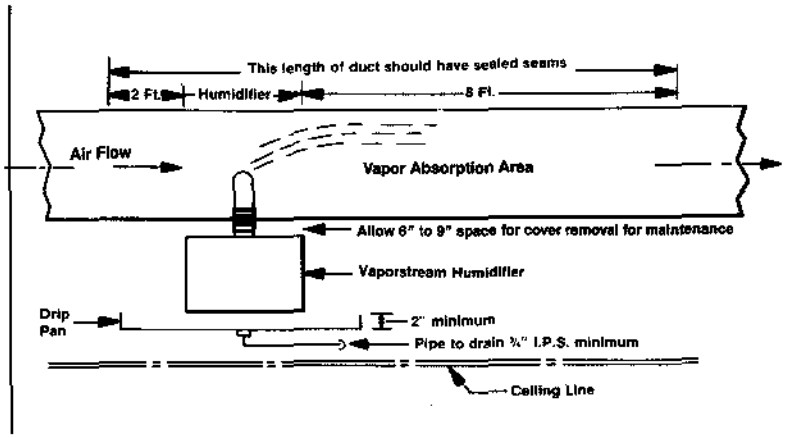
INSTALLATION IN COLD AIR STREAM



When a humidifier is installed in a duct that will carry cold air periodically, the dew point temperature should be determined.

If the psychrometric chart reveals that saturation may occur, protection should be provided. A high limit humidistat or a thermostat, set to cut off the humidifier at a safe temperature, can be used for this purpose.

INSTALLATION ABOVE VALUABLE EQUIPMENT

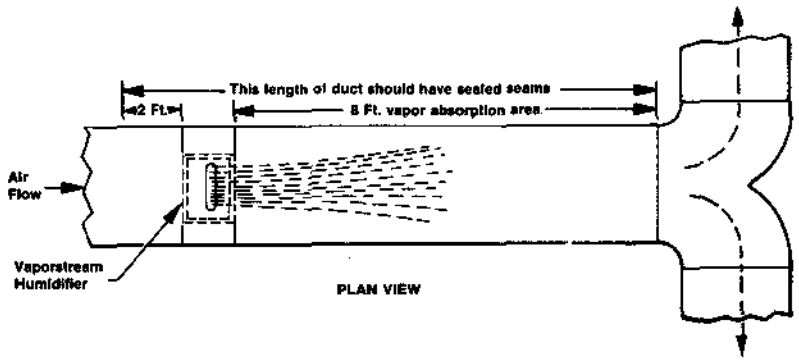


Water piping and humidifiers should not be installed above expensive apparatus or equipment. A broken water pipe, leaking valve gland, condensation or other water leaks may occur causing serious damage and costly repairs to the equipment below.

Where this type of installation cannot be avoided install a drip tray constructed of galvanized sheet steel under the humidifier, valve, etc. to catch any possible water drip.

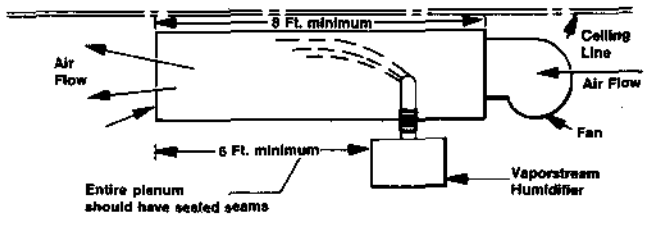
It is advisable to end the drain above an open floor drain. The overflow from the Vaporstream should be piped to a floor drain rather than the drip pan.

INSTALLATION AHEAD OF DUCT SPLIT



When a Vaporstream humidifier is installed upstream of a duct split, a minimum distance of 8 feet should be provided between the humidifier and the split. The humidifier should span most of the duct width or be centered upon it to equalize the humidifying effect between the two branches.

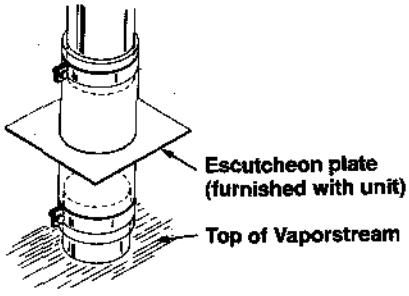
RECIRCULATION UNIT

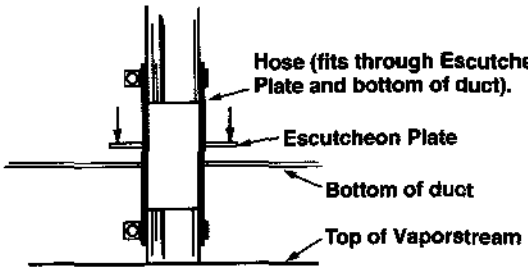


In an application where no duct system exists, or if the duct air is too cool for proper humidity absorption, a recirculation fan can be used. The fan circulates room temperature air across the Vaporstream humidifier and discharges humidified air into the space. The point of discharge should be carefully selected to avoid condensation on surfaces of the building or equipment.

MOUNTING UNIT ON UNDERSIDE OF DUCT–

Manufacturer recommends mounting humidifier 6" below duct to facilitate cover removal (see note)





All units ordered with U-tube or L-tube covers *are shipped with one set of trapeze type* mounting brackets. Each bracket set comes with 4 rods 3 feet in length, trapeze bars, nuts and washers. When longer length mounting rods are required (field supplied by others) use ⅜" material.

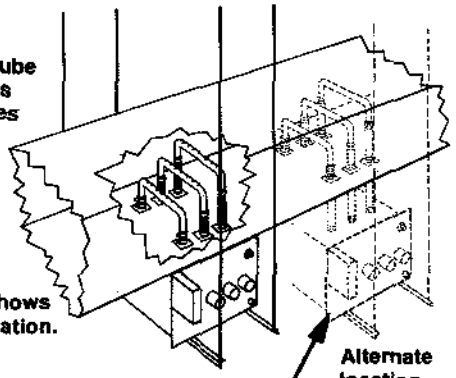
MULTIPLE INVERTED U-TUBES FOR "TALL" AIR STREAMS

Recommendation

Up to 24" tall–one tube
24" to 48"–two tubes
Over 48"–three tubes

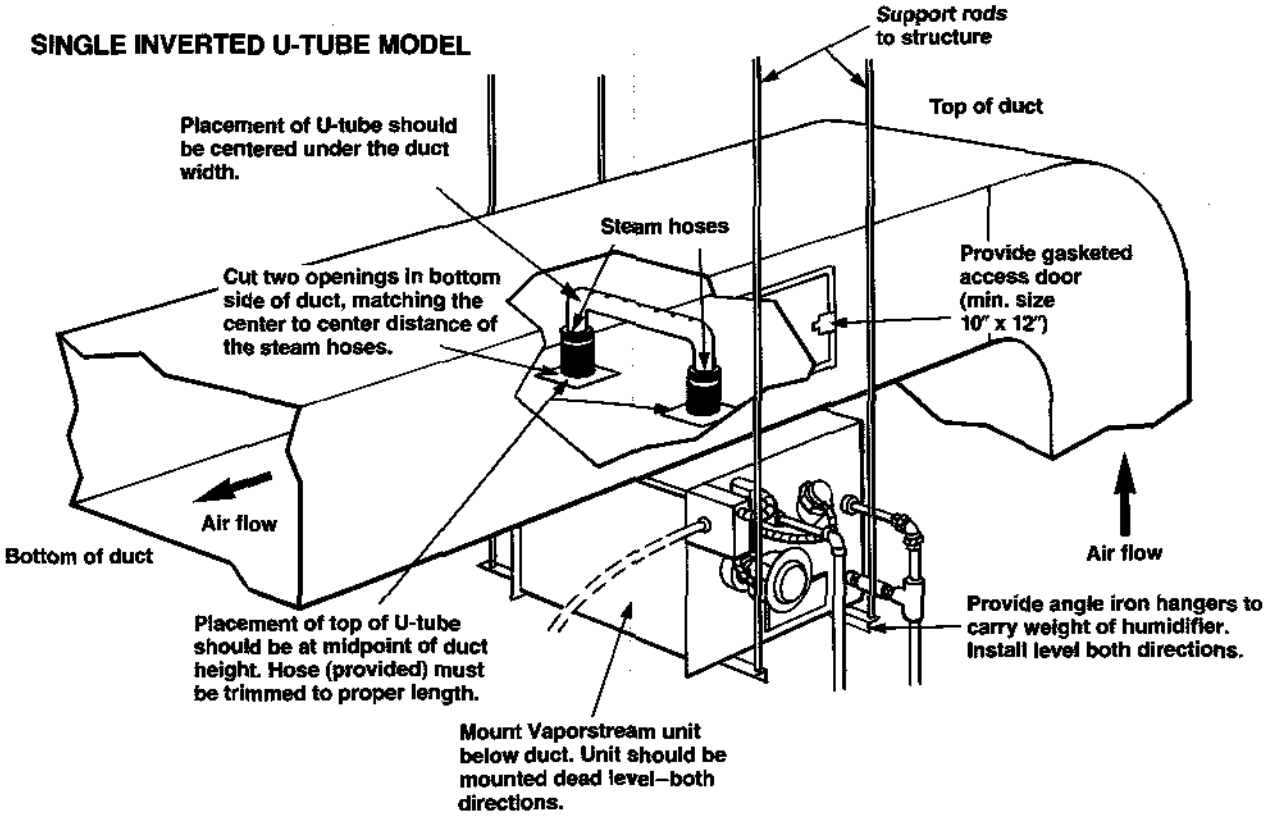
U-tubes extended upwards over 12" should be secured to duct.

Ghosted version shows alternate lower location.

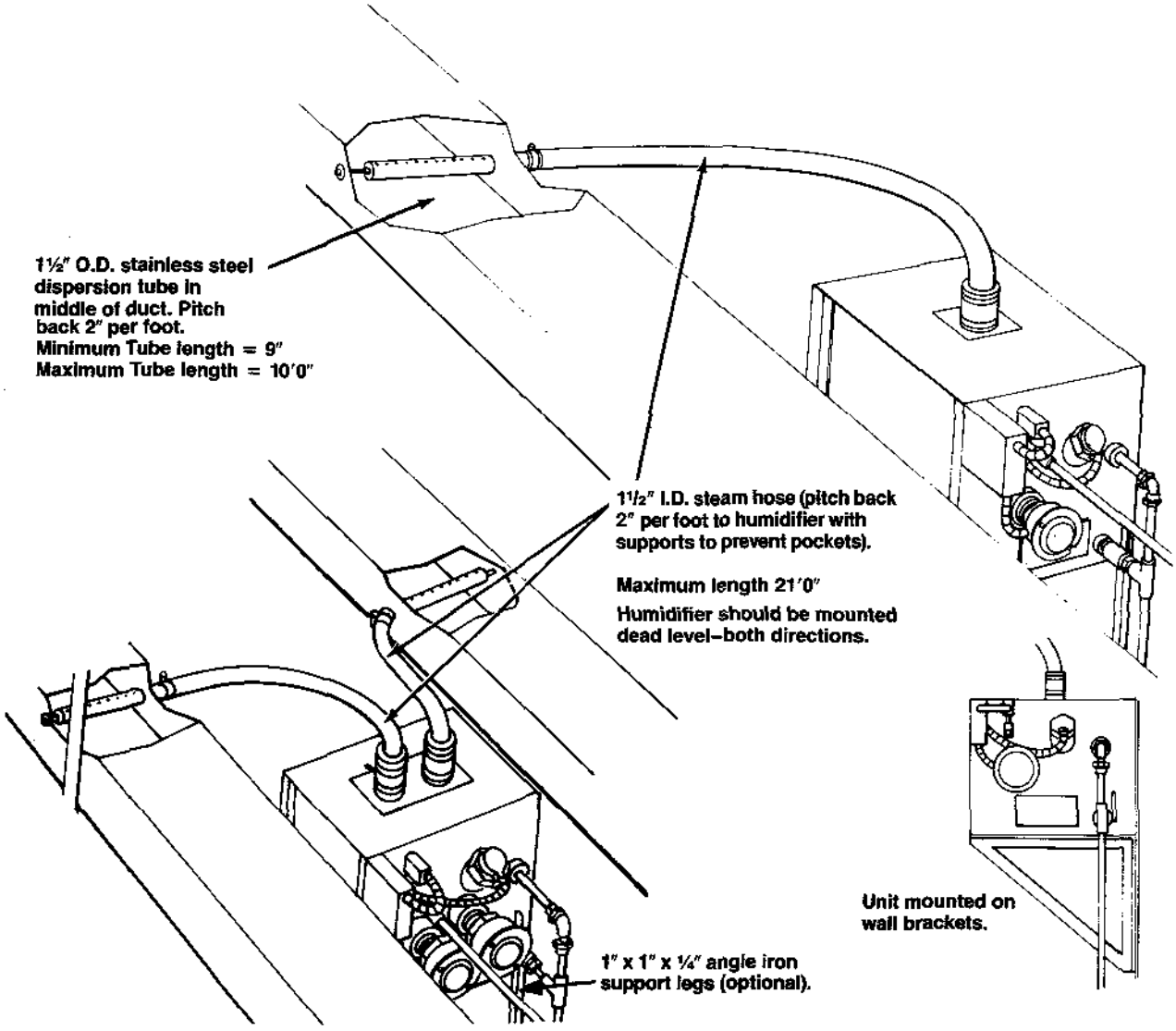


NOTE: Where space permits, mounting the humidifier 6" below bottom of duct facilitates removal of cover for periodic inspection.

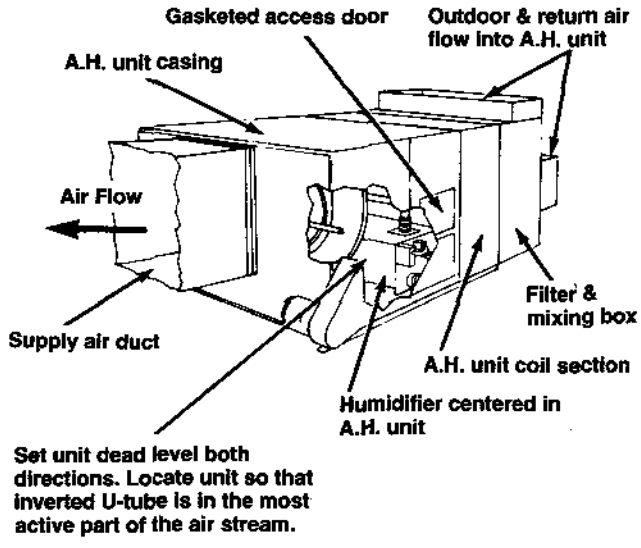
SINGLE INVERTED U-TUBE MODEL



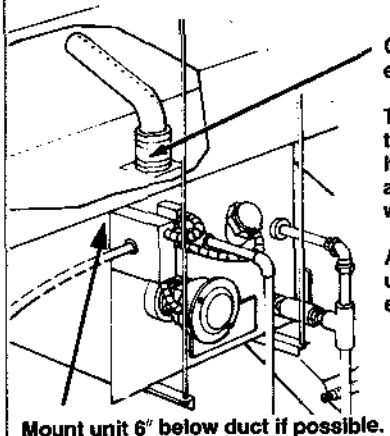
MOUNTING UNITS AWAY FROM DUCT(S) BY USE OF STEAM HOSE



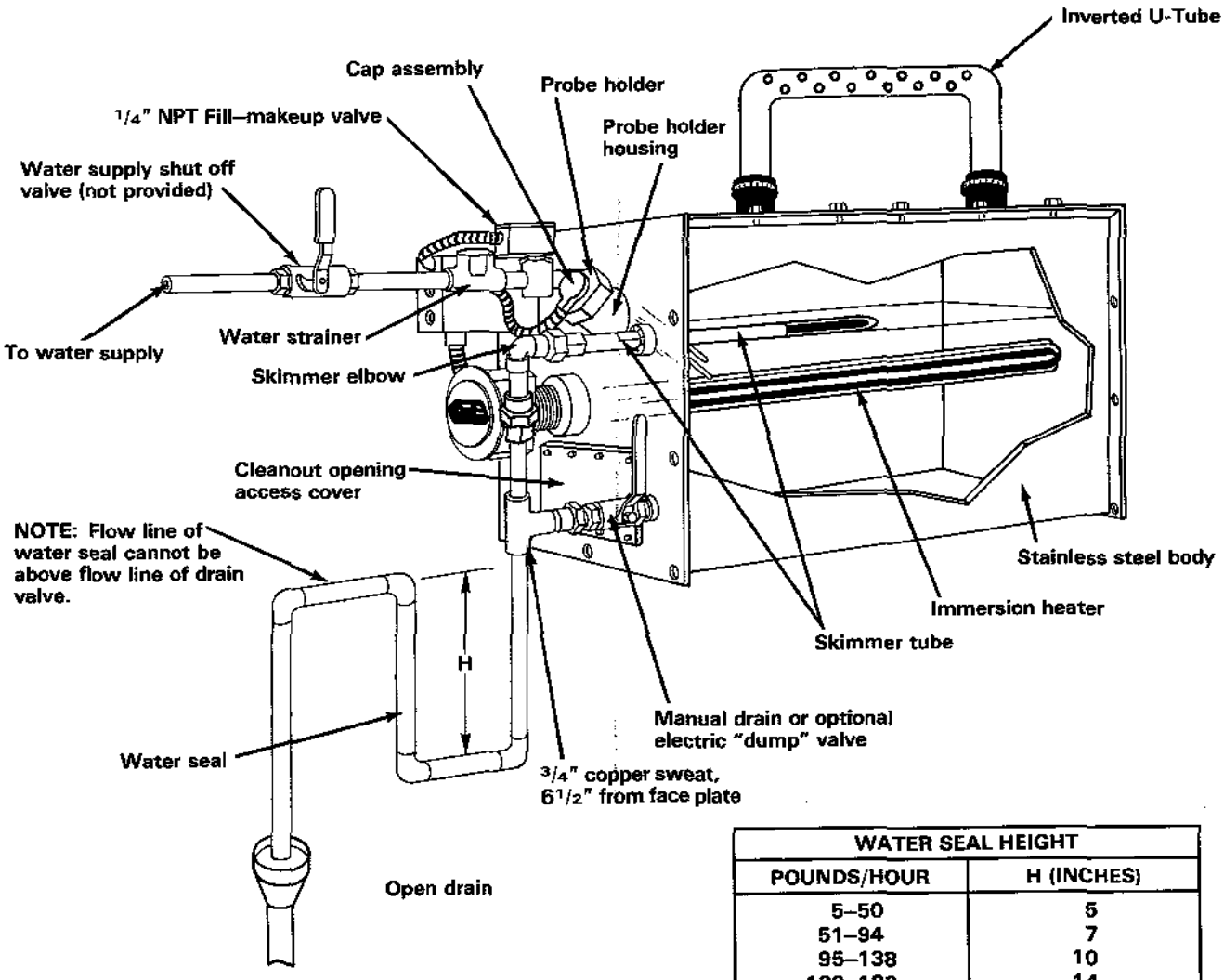
MOUNTING IN AIR HANDLING UNIT



MOUNTING L-TUBE UNDER DUCT



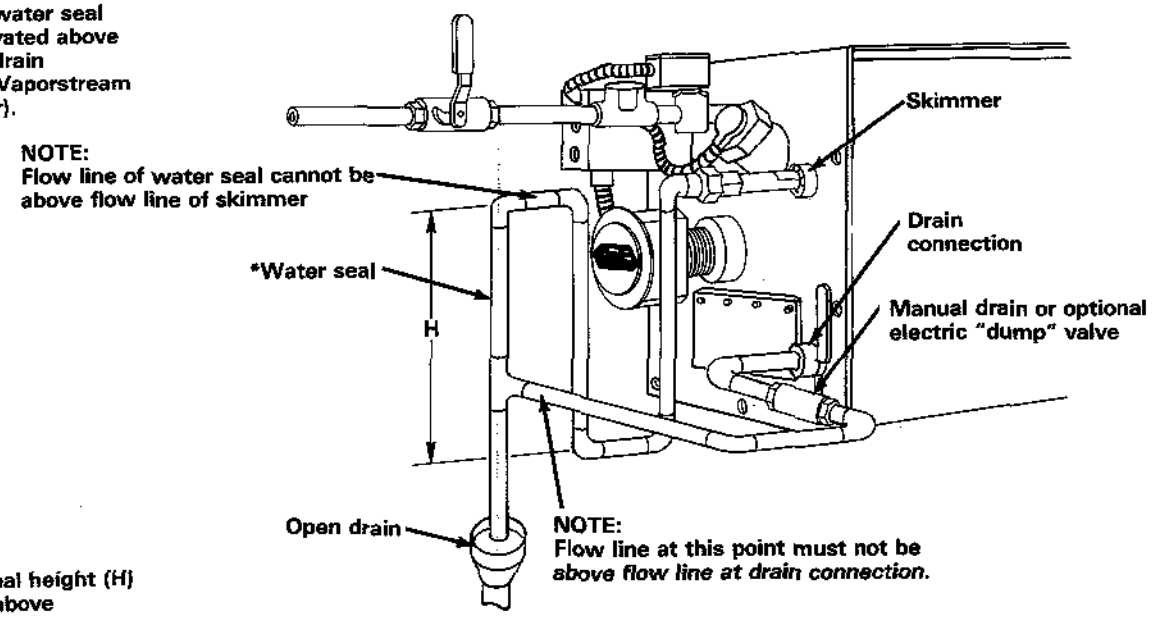
COMPONENTS AND PIPING METHODS



WATER SEAL HEIGHT	
POUNDS/HOUR	H (INCHES)
5–50	5
51–94	7
95–138	10
139–183	14
184–227	18

ALTERNATE WATER SEAL AND VALVE PIPING

Used when water seal must be elevated above flow line of drain connection (Vaporstream close to floor).

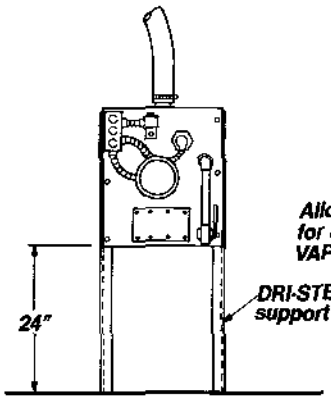


*For water seal height (H) follow chart above

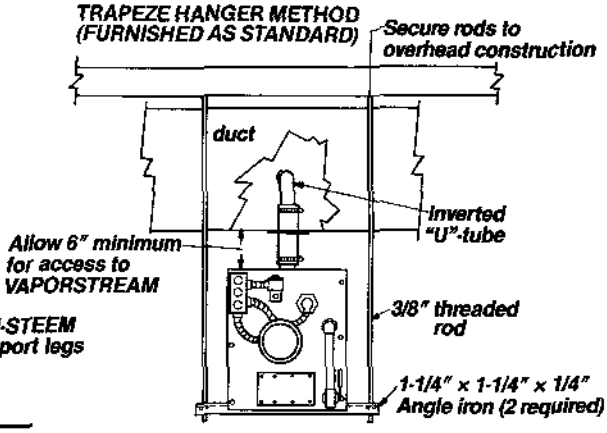
VAPORSTREAM®

Mounting:

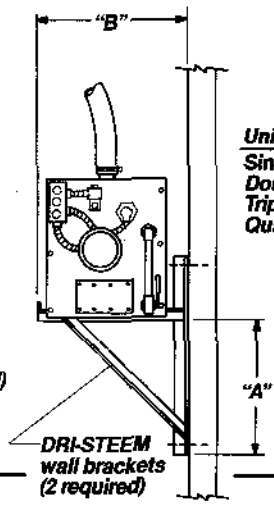
FLOOR STAND METHOD



TRAPEZE HANGER METHOD (FURNISHED AS STANDARD)



BRACKETED TO WALL METHOD



DIMENSIONS		
Unit	"A"	"B"
Single heater	15"	13"
Double heater	19"	15½"
Triple heater	21"	21"
Quad heater	40"	25"

Piping:

Drain piping:

A drain line should be extended from the skimmer connection to a sanitary waste or suitable drain. If non-metallic pipe or hose is used it must be capable of withstanding 212°F temperature.

To prevent steam from escaping from the drain line, a water seal must be provided in the drain line of sufficient height to contain the pressure developed within the humidifier. This pressure is the sum of the flow resistance in the dispersion tube and hose plus the static pressure of the duct system. Without this water seal, steam will escape from the drain line.

Makeup water piping:

Either cold or hot makeup water is acceptable. Usually unsoftened water is preferable to softened. The latter often produces "fluffier" residue.

When non-metallic water piping is used it must be rated to withstand 212°F or greater temperature. If not, the final 3 feet connected to the humidifier should be metallic and should *not* be insulated.

If the water pressure is above 60 psi and/or water hammer would be objectionable, a pressure reducing valve or shock arrester should be installed.

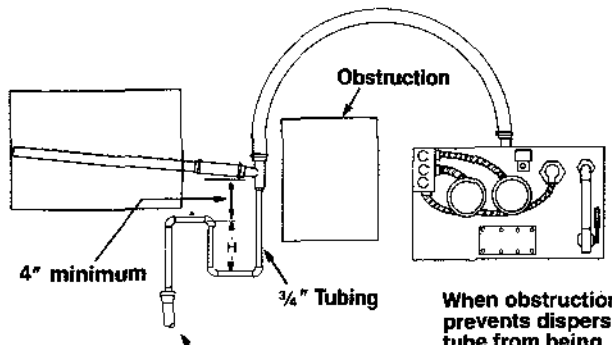
The Vaporstream has a one inch internal "air gap". However, local codes may require a vacuum breaker.

Steam hose piping:

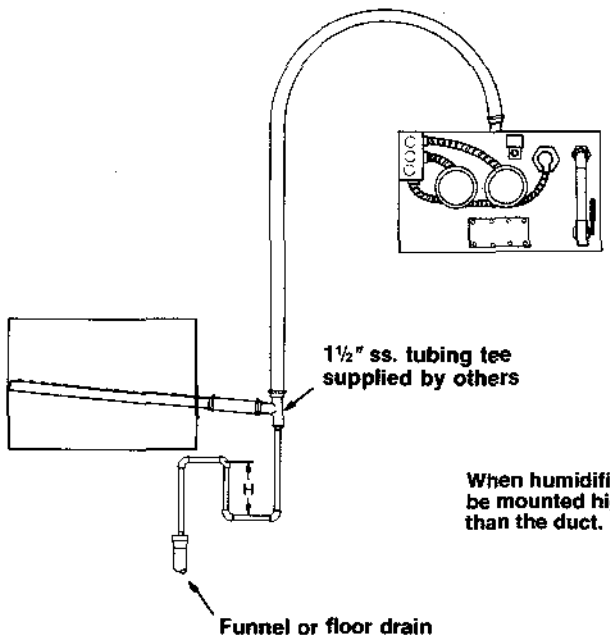
When the steam hose and stainless steel dispersion tube are used they should be pitched back to the humidifier. A gradual slope of 2" per foot of length (min.) with no "pockets" is recommended. When this is not possible due to duct elevation or an obstruction, alternate arrangements may be used as shown.

However, the condensate that forms in the steam hose must be removed. Preferably it should be returned to the Vaporstream as one method shows. When so done, it must connect below the water line and the drain connection can be used for this purpose.

When the condensate is wasted, as shown in the other method, a water seal of sufficient height to contain the duct static pressure, should be provided as shown.



When obstruction prevents dispersion tube from being continuously pitched back to humidifier.



When humidifier must be mounted higher than the duct.

INSTALLING THE VAPORSTREAM

Location

When selecting the location, first consideration should be given to rapid, thorough absorption of the steam. The warmest air will most readily absorb the steam. The most *active* part of the air stream will provide the best mixing of the steam and air. Avoid *dead* spots such as the inside curve of an elbow or an area immediately downstream of a baffle plate. Since the "fog" will travel some distance before "disappearing" and will saturate objects it touches while visible, avoid discharging the steam closer than 8–10 feet upstream of fans, filter, dampers, etc. unless the air temperature is warmer than 90°F. If so, 4–5 feet is permissible.

When the remote mounting method with the steam hose kit is used, condensate will drain into the duct unless the dispersion tube holes are pointed up and the tube and steam hose are pitched properly. Preferably the condensate should drain back to the humidifier in the steam hose. When obstructions prevent this, an alternate method is used (see page 15). Waterlogged low points in the hose will cause "gurgling" and in severe conditions periodic "slugs" of condensate will be discharged into the duct.

The location selected must also provide for electrical service, cold water for makeup and sanitary waste.

Mounting

For proper operation of the electrode probe water level control and the skimmer system the humidifier should be mounted dead level.

Access for periodic removal of the top cover is recommended. In most cases, scale that forms on the heating elements continuously flakes off as it forms and the loose scale that settles to the bottom can be raked or flushed out through the front face cleanout opening. However, removal through the top cover is easier.

If the Vaporstream is to be installed above expensive materials or devices, a drain pan of sufficient size and depth to retain rapid or sudden drainage of the contents of the humidifier should be provided. The drain pan should be drained to a sanitary waste.

Makeup water piping

Cold or hot makeup water. If the water pressure is above 60 PSI and/or water hammer would be objectionable, a pressure reducing valve or shock arrester should be installed. Even though the Vaporstream has an internal 1" "air gap", some local codes may require a vacuum breaker.

Drain piping

A drain line should be extended from the skimmer connection to a sanitary waste. A water seal should be provided in the drain line of sufficient height to contain the pressure developed within the humidifier. Without this, steam will be forced through the drain line which could be objectionable. The depth of the water seal must be sufficient to overcome the static pressure of the air handling system plus the pressure developed by the humidifier itself. See table on page 14.

Electrical

The current characteristics, and capacity requirements should be checked against the nameplates. The control cabinet should be mounted in a location convenient for service. All wiring must be in accordance with all governing codes and the Vaporstream wiring diagram. The diagram is inside the control cabinet. The wiring between the control cabinet and humidifier must be 105° rated wire.

The basic water level control and low water protection circuit found on page 20 is common to all VPC model Vaporstream humidifiers.

Please Note:
This humidifier is designed for use with either softened or unsoftened water. The probe type level control system requires water conductivity of 100 micromhos/cm (minimum) to function and therefore will not operate on water treated by the reverse osmosis or deionizing process.However, special design Vaporstream humidifiers are available for use with these water types.

Caution: Only qualified electrical personnel should perform Installation and Startup Procedures.

STARTUP AND CHECKOUT PROCEDURES

1. Mounting

Check mounting to see that unit is level and securely supported before filling with water.

2. Piping

Verify that all piping connections have been completed as recommended and that water pressure is available.

3. Electrical

Verify that all wiring connections have been made in accordance with the Vaporstream wiring diagram.

4. Control circuits

a) Adjust humidistat to "call" setting.
b) Open shut off valve on water supply line.
c) Set control module switch to "standby" position.
d) Set main disconnect switch to "on" position; control module "power" lamp should now light.
e) Set Control module switch in "normal op" position. The "fill" lamp should now light and the makeup valve should now open.
f) Filling should continue until the uppermost electrode has been in water contact for two seconds. At that point, the "fill" lamp should go out, the "ready water" lamp should light and the heating element contactor(s) should pull in.

g) Check low water cut off circuit:
   1. Close manual stop valve on water supply.
   2. Open ball valve and start draining unit. For units equipped with Automatic drain down, open "dump valve" to drain unit as follows: Set main disconnect switch to "off", jumper terminals "7" and "10" and set main disconnect back to "on". Dump valve should now open.
   3. As water level drops past center electrode "fill" lamp will light; when water level drops past lowest electrode "ready water" light will go out and the heating element contactor(s) will drop out.
   4. When step 3 has been satisfactorily completed, close drain valve or remove jumper and refill unit as in step "e".

h) Fill water seal in drain line by setting control module switch in "skimmer blowdown" position until water flows from drain pipe, reset to "Normal Op." and unit is ready to operate.

i) Check out function of field installed safety controls such as fan proving switch; contactor(s) should drop out when proving switch is "open".

j) Check heater draw by testing and recording voltage and amperage in each phase. Readings should match nameplate readings—nameplate is located on the humidifier housing.

k) Inspect installation for leaks by operating the Vaporstream. Any steam or air leaks should be sealed.

Adjustment and checkout of optional timer operated DRAIN/FLUSH control

Refer to page 5 of this manual for a description of this optional device.

Setting the drain interval timer

Your humidifier was shipped from the factory with the "Drain Interval" timer set for 20 hours. This means that at the end of *20 hours of actual humidifying time* the unit will go through its drain/flush cycle.

If you know the hardness of the water being supplied to your humidifier, you should reset the "hours" dial in accordance with the grains/gallon table found on page 5. If you can't get this information leave it set at 20 hours for now. Because of the many variables involved, trial and error may be the next most reliable means of arriving at the proper "hours" setting for your particular humidifier installation.

Trial and error means simply inspecting the humidifier at two week intervals. If the sides of the tank are building up with lime, lower the hours to 15. If after two more weeks it is continuing to build up, lower it to 10, etc. If, on the other hand, no build-up is evident, increase the hours to 25, etc.

The objective is to make sure the drain/flush cycle does the job, but does it without wasting water. It should drain/flush often enough to keep the unit free of *rapid* build-up, but no more often. The drain/flush cycle may not totally eliminate mineral build-up.

Note: After a week or two of operation, loose scale will begin to accumulate on the floor of the humidifier chamber. This is scale that forms on the heater element(s). When it gets thick enough (about 3/32") it flakes off. This is normal and need not be removed until the top of the accumulation approaches the underside of the heater element (usually once per season).

Setting the drain duration timer (minutes)

This setting is determined by the size (gallons capacity) of each Vaporstream model. Large units require more drain time and vice versa. This setting is made before the humidifier leaves the factory. It is always a good idea to check and make sure the setting of your unit agrees with the "Drain Duration" table found below.

Testing the drain/flush system

As a part of final checkout the installer should always verify the operation of the (optional) drain/flush system.

To test:

1. Set the Drain Interval timer dial to "0" hours.
2. Set the Drain Duration timer dial to "10" minutes.

In 30 to 45 minutes (varies) the drain valve should open, 5 minutes later the fill valve should open which creates the flushing action. After an additional five minutes the drain valve should close. The fill valve should remain open until the unit is refilled to the level of the top probe and then close.

If all of the above takes place as described, the drain/flush system is functioning correctly. The drain interval timer dial (hours) should be returned to 20 hours and the drain duration timer dial (minutes) should be set to agree with the table below. The unit will then be ready to resume humidifying.

Total KW	Drain Duration (minutes)
2-8	5
9-24	10
28-40	15
42-60	20
64-80	25

RECOMMENDED MAINTENANCE

Vaporstream is designed to deal with dissolved minerals in one of two ways depending on the degree of hardness. For light to moderate hardness (up to 10 grains per gallon), the surface skimmer action plus annual cleaning is usually adequate. For high mineral content water (above 10 grains per gallon), a time clock and solenoid "dump" valve is recommended in addition to the surface skimmer, along with annual cleaning. If the Vaporstream was originally purchased without a timer and dump valve they usually can be easily added in the field. Consult factory for details.

The frequency of cleaning will be dictated by water condition and evaporation load.

Note: *When performing maintenance on the* Vaporstream, always place control module switch in "standby" or place main disconnect in "off" position and close manual water shut-off valve.

Monthly or as required

1. *Cleaning probes—remove the cap assembly and* unscrew the probe holder from the Vaporstream unit. The scale will easily flake off from the TEFLON® coated sensing portion. The uncoated sensing portion (bottom 3/8") of the probe should be brushed clean with stainless steel wool. Reinstall the probe holder with *arrows up and "top" marking at the top.*

2. Cleaning skimmer tube—remove the elbow section of the skimmer and rotate tube so that loosened material will drop out. Loosen deposits with a long tool such as screwdriver or section of small diameter pipe and reassemble elbow. Skimmer drainage should be *verified by visual inspection once per week. Water* should drain from skimmer drain pipe after each fill cycle.

Summer maintenance

At the conclusion of the humidification season a *complete cleaning of the heaters, probe control,* skimmer, and water chamber is recommended. After cleaning the unit should be left unfilled until such time when humidification is required again.

Adjusting the surface skimmer

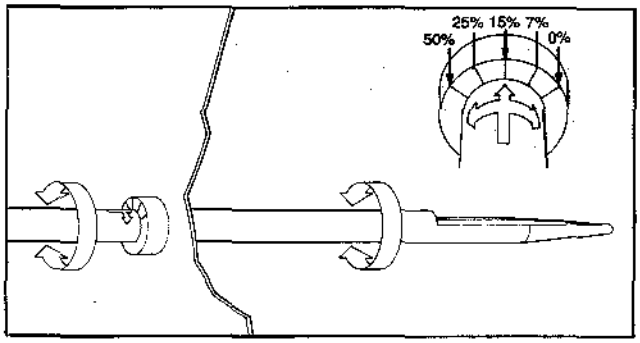
The elevation of the lip of the skimmer tube in respect to the water line, determines the quantity of "skimming" that takes place with each fill cycle. The height is field adjustable by rotation of the tube.

As evaporation takes place, a portion of the dissolved minerals precipitate (come out of solution) and remain *on the water surface.*

Each time the Vaporstream refills, it fills to an elevation above the lip of the skimmer tube. A portion of the refill water then flows to drain carrying the floating mineral with it. This action constantly reduces the mineral concentration thereby reducing the frequency of cleaning needed.

The heated water that flows to drain is a cost of operation. *Cleaning the humidifier is also a cost as* well as an inconvenience. It is, therefore, recommended that the user, at the time of initial startup, observe and adjust the skimming quantity. By doing so, a balance between minimized mineral build-up and conservation of waste water can be achieved.

The quantity of skimming water drained off per fill cycle is adjusted by rotation of the skimmer tube which alters the height of the overflow lip. It is factory set to skim about 15% of the total evaporating capacity of the unit. For example: A Model VPC 10-10 having an *output capacity of 56.8 pounds per hour would skim* about 8.5 pounds (one gallon) per hour.



Surface Skimmer

To adjust, loosen the union nut and rotate the tube to the desired percentage of skimming rate. Markings on the unit indicate the following:

50% 25% 15% 7% 0%

Allow the Vaporstream to operate five or ten days and then inspect it. If a mineral buildup is evident, increase the skim amount. If not, it should be reduced. Repeat the above process several times or until it is felt the proper adjustment has been attained.

Note: In those cases of extremely high mineral content where the surface skimmer will not control mineral build-up a timer and "dump" valve are recommended. *This feature is described on page 5.*

TROUBLESHOOTING GUIDE

	Control Module Lights				
Problem	**POWER**	**FILL**	**READY WATER**	**Possible Cause**	**Recommended Action**
Humidifier will not heat	Off	Off	Off	Control transformer	Verify control voltage across term 6 & 7
	On	Off	On	Humidistat is not calling	Set Humidistat to call. Inspect for faulty Humidistat
				Safety controls open (High limit, air proving, etc.)	Check safety controls
				Faulty Contactor(s)	Jumper term 8 & 9 contactor should pull in
				Faulty Control Module	Verify control voltage between term 6 & 8
				Probe Corrosion	Replace probes*
Humidifier will not fill	On	On	Off	No water pressure	Check manual water supply valve
				Faulty water fill valve	Verify action of fill solenoid valve by turning control module switch from standby to normal op. Audible click should be heard as solenoid operates.
				Plugged strainer	Check strainer
				Plugged valve	Check valve
				Faulty control module	Verify control voltage across term 5 & 6
Humidifier does not stop filling	On	On	Off	Lack of tank to probes continuity. Water conductivity 100 micromhos/cm (2 gr/gal) minimum	Jumper terminals 1 & 4. If water stops, verify tank ground to term 4; check water supply conductivity; then consult factory.
				Fill valve is stuck open holding valve open	Check valve for foreign matter
Low output	On	Off	On	Electric drain valve not seating	Clean diaphragm and seat of valve
	On	Off	On	Too much skimmer/drain	Reduce skimmer drain amount
				Fill valve is stuck open	Check valve for foreign matter
Unit short cycles				Probes may be incorrectly wired	Confirm that unit is wired per diagram

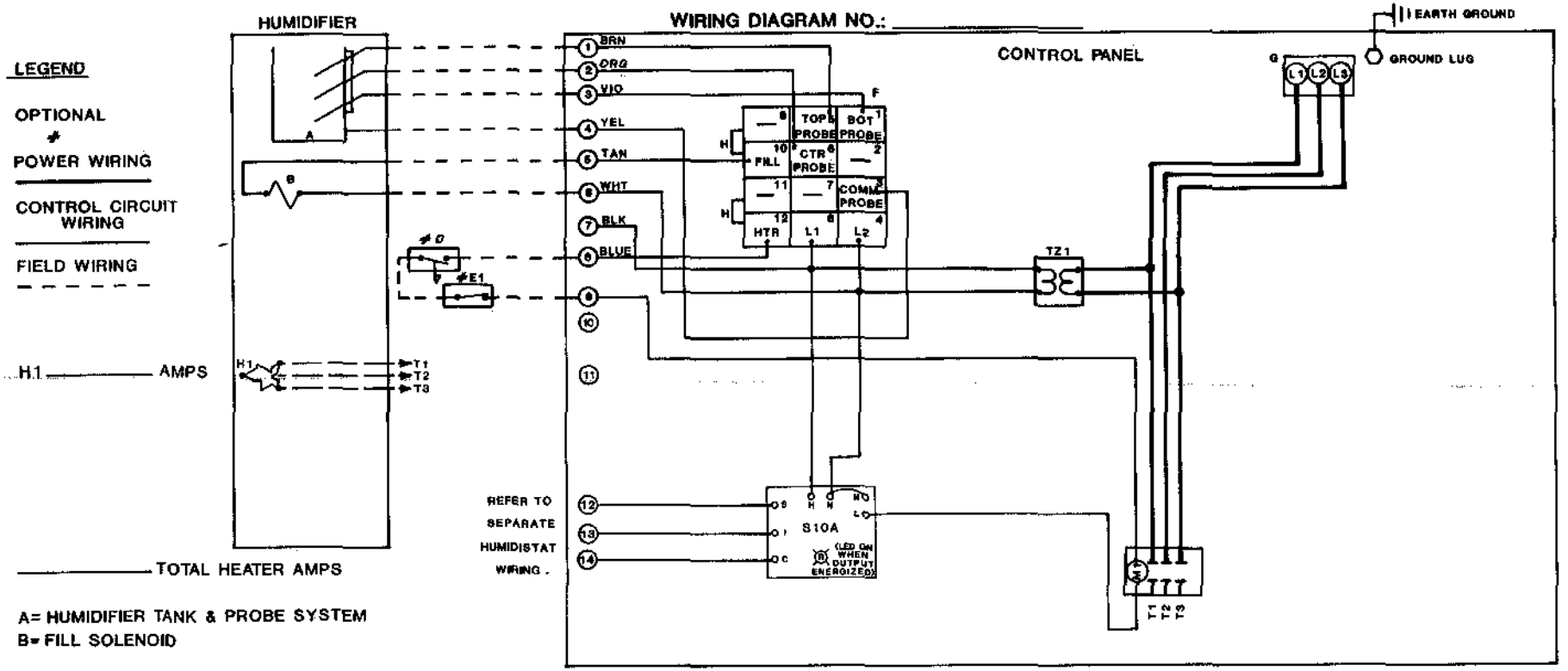
*Although the 3 stainless steel probes will eventually erode—due to corrosion—this generally doesn't occur until after about 5000 hours of operation.

VAPORSTREAM HUMIDIFIER WIRING DIAGRAM

VAPORSTREAM HUMIDIFIERS

NOTE: ALL WIRING TO BE PER LOCAL AND NATIONAL ELECTRICAL CODES.

WIRING DIAGRAM NO.: _____



A= HUMIDIFIER TANK & PROBE SYSTEM
B= FILL SOLENOID

D= AIR FLOW PROVING SWITCH
E1= HIGH LIMIT HUMIDISTAT
F= HARNESS RECEPTICAL
G= POWER BLOCK *MAX WIRE GAUGE*____
H= INDEX TABS
H1= HEATER

M1= CONTACTOR

TZ1= TRANSFORMER, CLASS 2, 75 VA.

WARNING

FOR SUPPLY CONNECTIONS USE COPPER CONDUCTORS ONLY AND GAUGE WIRE SIZE AT 75°C RATING. THEN USE SUITABLE CONDUCTORS FOR 105°C ENVIRONMENT

GROUND HUMIDIFIER SYSTEM TO AN APPROVED EARTH GROUND.

FIELD WIRING TORQUE REQUIREMENTS: (POUND/INCHES)

CONTROL BLOCK:_____ POWER BLOCK:_____

CONTACTORS:_____ GROUND LUG:_____

MODEL NO: _____

ORDER NO: _____

PRIMARY VOLTAGE :_____ PH:____ HZ:_____

CONTROL VOLTAGE: 24 HEATERS: 1

STAGE: MODULATING

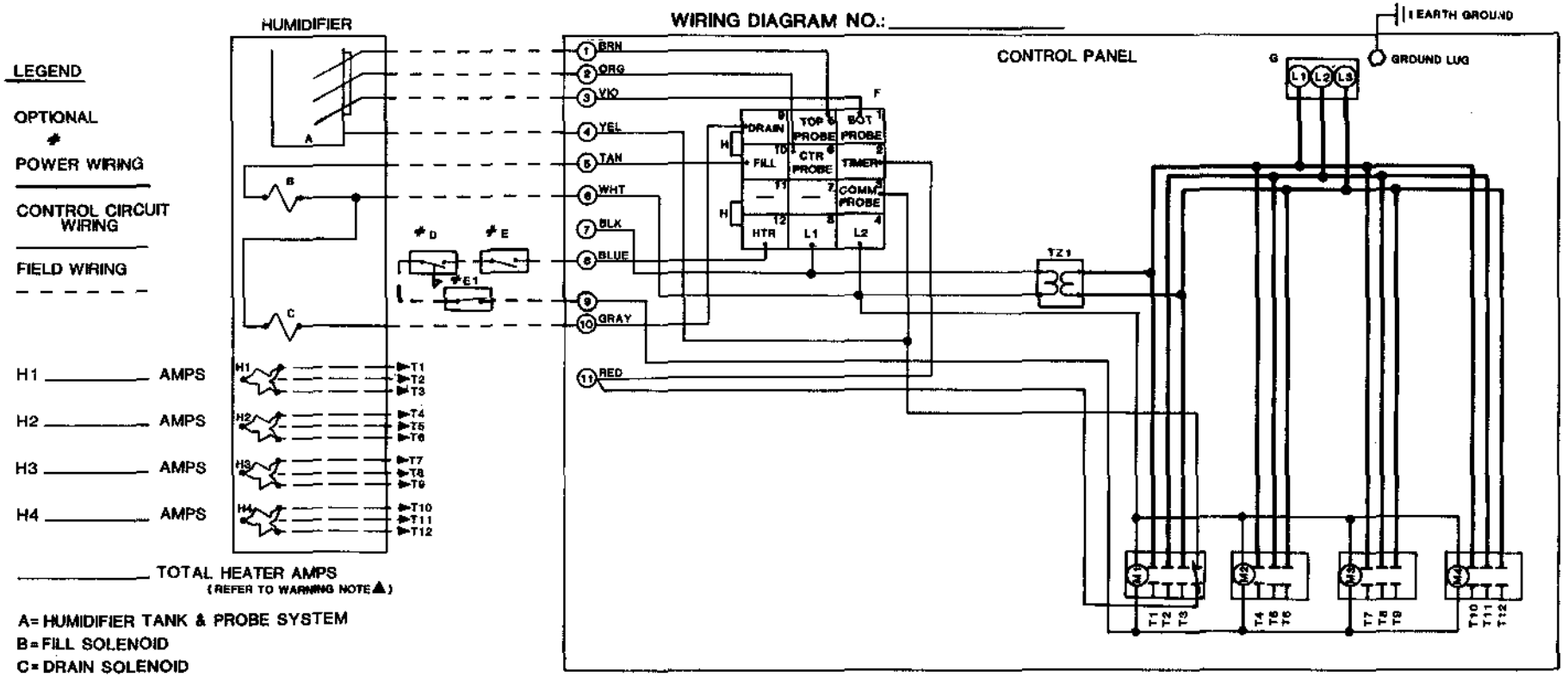
JOB: _____

VAPORSTREAM HUMIDIFIER
WIRING DIAGRAM

VAPORSTREAM HUMIDIFIERS

NOTE: ALL WIRING TO BE PER LOCAL AND NATIONAL ELECTRICAL CODES

WIRING DIAGRAM NO.: _____



A= HUMIDIFIER TANK & PROBE SYSTEM
B= FILL SOLENOID
C= DRAIN SOLENOID
D= AIR FLOW PROVING SWITCH
E= HUMIDISTAT, E1= HIGH-LIMIT HUMIDISTAT
F= HARNESS RECEPTICAL
G= POWER BLOCK MAX WIRE GAUGE_____
H= INDEX TABS

H1-H__ =HEATERS
M1-M__ =CONTACTORS

TZ1 = TRANSFORMER. ___VA.

WARNING

▲ WIRING DIAGRAM SHOWS MAXIMUM NUMBER OF HEATING ELEMENTS. YOUR PARTICULAR HUMIDIFIER MAY INCORPORATE LESS POWER CIRCUITRY DEPENDING ON THE NUMBER OF HEATERS.

FOR SUPPLY CONNECTIONS USE COPPER CONDUCTORS ONLY AND GAUGE WIRE SIZE AT 75°C RATING. THEN USE SUITABLE CONDUCTORS FOR 105°C ENVIRONMENT.

GROUND HUMIDIFIER SYSTEM TO AN APPROVED EARTH GROUND.

FIELD WIRING TORQUE REQUIREMENTS: (POUND/INCHES)

CONTROL BLOCK: _____ POWER BLOCK: _____

CONTACTORS: _____ GROUND LUG: _____

MODEL NO: _____

ORDER NO: _____

PRIMARY VOLTAGE: _____ PH: ____ HZ: _____

CONTROL VOLTAGE: _____ ▲HEATERS: ____

STAGE: _____ SINGLE _____

JOB: _____

MAINTENANCE SERVICE RECORD

Date Inspected	Personnel	Observation	Actions Performed

The Vaporstream Warranty

1. *Warranty.* Dri-Steem Humidifier Company (the "Company") guarantees its products to be free of defects in materials and workmanship under the service for which they are intended. The Company will repair or replace, without charge except for labor charges, products or parts which are found to be defective within one year from the date of shipment or, at the option of the Company, will refund the purchase price.

2. *Exclusions of other warranties.* The warranty described in the above paragraph shall be IN LIEU OF any other warranty, express or implied, including but not limited to any implied warranty of MERCHANTABILITY or fitness for a particular purpose.

3. *Limitation of Remedies.* By purchasing the Company's products, the purchaser agrees with the Company that the purchaser's sole and exclusive remedy shall be for the repair or replacement of defective parts or products, without charge except for labor charges, as described in paragraph 1, above. The purchaser agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available to him.

HUMIDIFIER COMPANY
BOX 128 • HOPKINS, MINNESOTA 55343

Form No. VSMO-R5-0588

Printed in U.S.A.