

DRISTEEM®
The humidification experts



Steam Injection

Humidification System
for use with a steam boiler

PRODUCT CATALOG



Humidify with existing boiler steam

Figure 2-1:
Steam Injection humidifiers



A DRI-STEEM® Steam Injection humidifier in its most elemental form — the Single-tube humidifier. Each Single-tube, Multiple-tube, Mini-bank® and Maxi-bank™ humidifier has the same basic components: a stainless steel separator, a steam valve, and one or more jacketed dispersion tubes. Steam Injection humidifiers with dispersion tubes disperse steam into ducts or through an air handling unit.



Area-type™ Steam Injection humidifiers disperse steam into ductless spaces using a fan.

Standard and Clean-steam™ models suitable for a wide range of applications

DRI-STEEM's Steam Injection humidifiers use steam from an external source, such as an in-house boiler or a district steam system. They are adaptable to virtually any size application, and a wide variety of models accommodate a broad range of steam absorption requirements. All humidifiers shown in this catalog, except Area-type humidifiers, are available as either standard or Clean-steam models. Area-type humidifiers are not available as Clean-steam models.

Clean-steam humidifiers for controlled environments

Some humidification applications require steam with no impurities. For these applications, boiler steam often is derived from deionized (DI) water and then dispersed into the air through one of our Clean-steam humidifiers.

Clean-steam humidifiers are typically used in environments with exacting temperature, air cleanliness, and humidity requirements such as hospitals, clean rooms, laboratories, and pharmaceutical plants.

Clean-steam humidifiers are available in a wide range of capacities, valve options, and configurations. See the opposite page for a description of Clean-steam features. See individual Steam Injection model descriptions for capacities.

Choose Area-type for ductless spaces

Area-type Steam Injection humidifiers are designed for open spaces such as warehouses and manufacturing spaces that may not have a duct system. The steam discharged from the humidifier is quietly dispersed by a fan without introducing water droplets into the air. For more information about Area-type humidifiers, see Pages 27-29.

Steam Injection features

Proven performance

- Stainless steel construction allows for instantaneous heat-up, which minimizes condensation and eliminates cold start-up spitting
- Stainless steel separator efficiently removes entrained condensate using proven centrifugal design
- Modulating steam control valves provide accurate control
- A wide selection of valve Cv/Kvs factors and ISA-certified rangeability ratings permit close matching of humidifier output capacity to actual job requirements, which eliminates valve hunting and results in precise control
- Steam control valves are independent of separators, allowing easy removal for servicing, and flexibility in valve choice
- Special tube adaptor fittings (with two internal O-ring seals) permit valve removal without disassembling the humidifier piping
- Lightweight construction simplifies installation; no special supports or hangers are required

Application flexibility

- Wide range of models and non-wetting distances meet virtually any humidification need
- Steam is dispersed through ductwork or directly into a space
- Adaptable to vertical as well as horizontal ducts
- Can be designed for use with deionized (DI) or reverse osmosis treated (RO) water to create chemical-free steam (see Clean-steam features below; Clean-steam not available on Area-type models)

Clean-steam features

- Series 304 stainless steel on all wetted parts reduces corrosion potential. When very pure DI steam is used, 316 stainless steel is an available option; humidifier passivation weldments is an option also
- Standard stainless steel valves are manufactured to precise tolerances and provide the highest turndown ratio in the industry. While a 40 to 1 turndown ratio is considered excellent, Clean-steam valves are capable of achieving better than 50 to 1 turndown ratio
- Steam valve options include electric, modulating, electric on-off, or pneumatic. The purchaser may also specify the valve manufacturer

Guaranteed absorption

- Steam-jacketed dispersion tubes are fitted with calibrated tubelets to ensure uniform steam dispersion across the duct
- Thermal-resin tubelets have exceptional ability to trap noise generated by the valve
- Cataloged and guaranteed steam non-wetting distances
- Published absorption tables for sizing and selecting the correct humidifier
- DRI-STEEM's Dri-calc® software is available for computer calculation of non-wetting distances and system selection

Steam Injection humidifiers

Choose standard or Clean-steam configurations

All Steam Injection models shown here can be purchased in either a standard or a Clean-steam configuration, except Area-type models, which are available only in standard configuration.

Figure 4-1:
Steam Injection humidifier models



Single-tube humidifier

- Suitable for small capacity systems
- Moderate to long non-wetting distance
- Pre-assembled header/tube assembly
- See pages 7-12 for more information



Mini-bank humidifier

- Suitable for medium capacity systems
- Sized for small ducts
- Short to moderate non-wetting distance
- Pre-engineered and pre-assembled header/tube assembly, ready for mounting and hookup
- See pages 13-17 for more information



Multiple-tube or Maxi-bank humidifier

- Suitable for large capacity systems
- Sizes to fit small ducts to large air handlers
- Short to moderate non-wetting distance
- Multiple-tube humidifier is field assembled (with interconnecting piping and header supplied by contractor)
- Maxi-bank humidifier is pre-assembled (except when either dimension is 98 inches or more) and includes interconnecting piping and header
- See pages 18-26 for more information

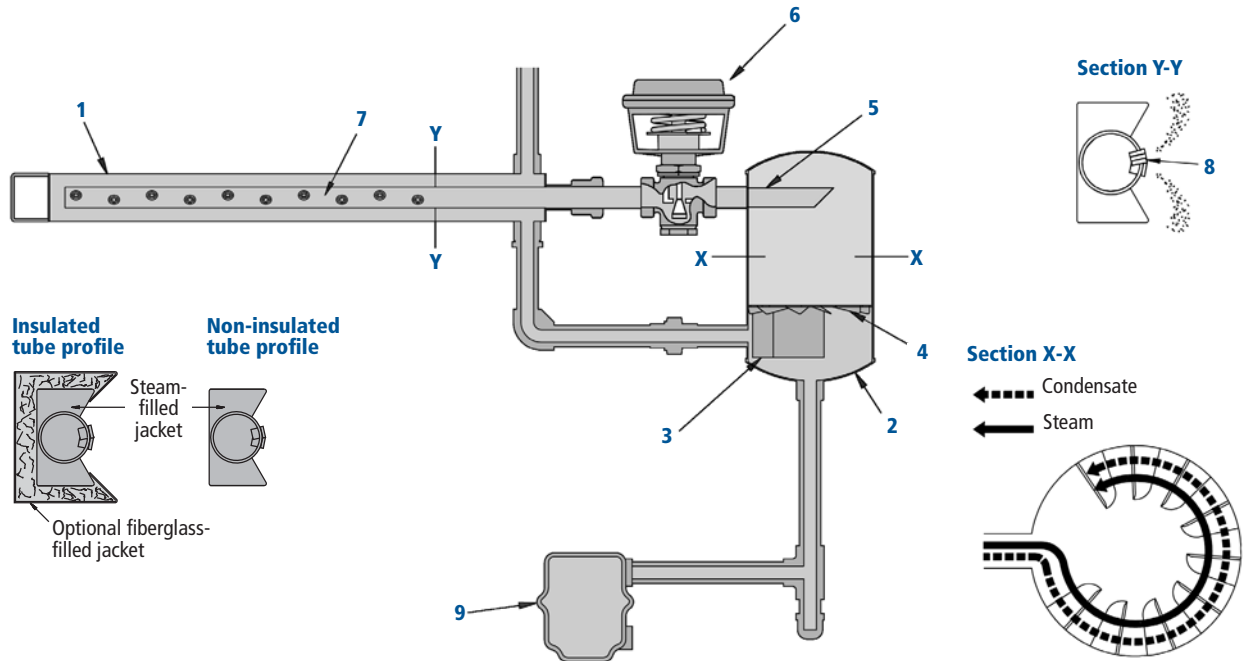


Area-type humidifier

- Suitable for medium capacity systems
- Used in ductless spaces
- Application-dependent non-wetting distances
- See pages 27-29 for more information

Steam Injection humidifier components

Figure 5-1:
Steam Injection humidifier components



1. Steam jacket

A chamber that jackets the inner dispersion tube with hot steam to eliminate condensation and dripping

2. Steam separator

Separates steam from condensate

3. Deflector plate

Inside the steam separator, deflects condensate into a circular pattern and toward the drain

4. Multi-baffle plate

Allows only steam to rise into the upper region of the separator

5. Internal drying tube

Excludes any remaining condensate, allowing only dry steam to leave the separator

6. Steam valve

Controls the amount of steam allowed into the dispersion tube

7. Dispersion tube

Provides uniform steam dispersion across the duct width

8. Thermal-resin tubelet

Unique tubelets extend into the dispersion tube center so only the hottest, driest steam is discharged into the air. These tubelets also have an exceptional ability to trap noise generated by the valve, making DRI-STEEM's Steam Injection humidifiers the quietest in the industry

9. Steam trap

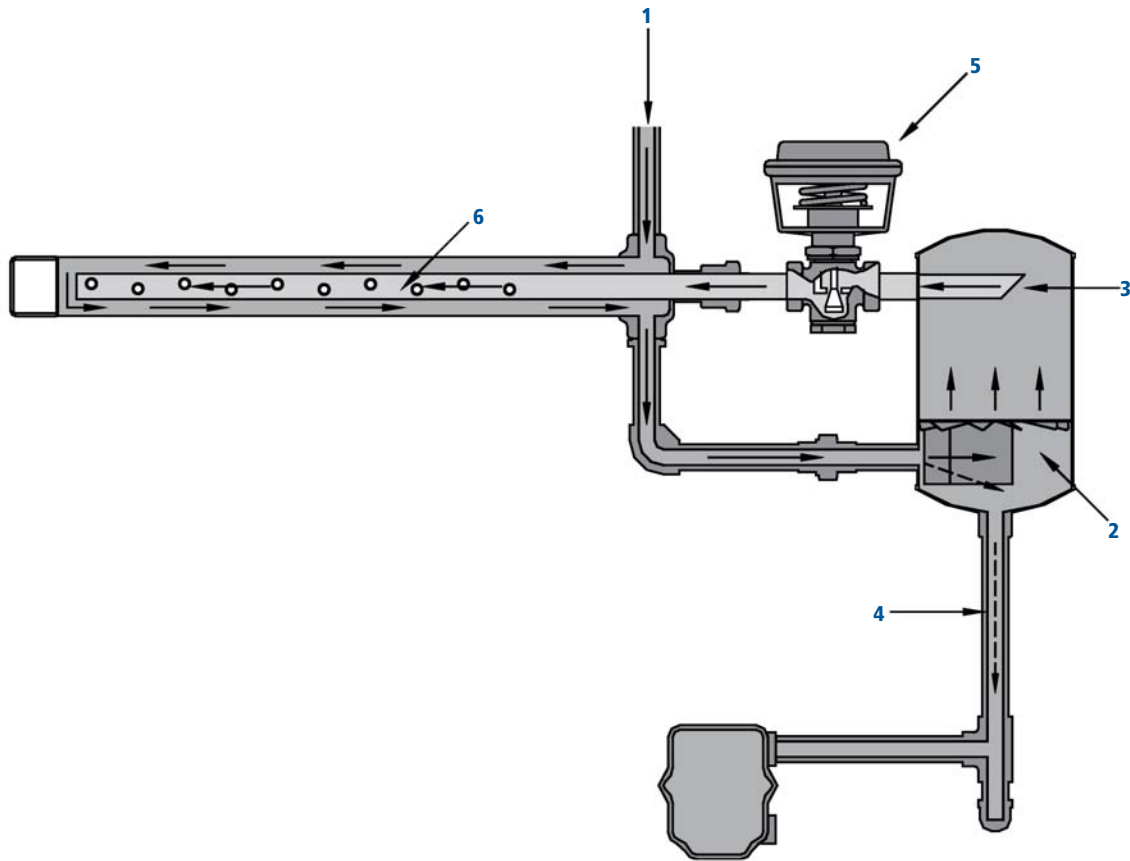
Allows only condensate to pass to the condensate return system

Please see the next page for a description of how these components operate together.

370-371M
OM-1171

Principle of operation

Figure 6-1:
Steam Injection humidifier principle of operation



1. Boiler steam enters the humidifier at line pressure and flows through a chamber (jacket) surrounding an inner dispersion tube. This steam jacketing preheats the dispersion tube so that when steam enters the dispersion tube (at Step 5 below) it does not condense as it would if the tube were cold, thereby eliminating condensation and dripping.
2. After flowing through the steam jacketing chamber, steam with entrained condensate slows from entering the larger space of the separator and from hitting the perimeter deflector plate, and begins to spin and separate.
3. Separated steam rises through slots in the multi-baffle plate to the separator upper region, and enters the internal drying tube that excludes any remaining condensate, allowing only dry steam to leave the separator.
4. Separated condensate drains from the separator to the steam trap.
5. The steam valve controls the amount of steam allowed into the preheated dispersion tube. The steam valve is typically controlled in one of three ways:
 - By a signal from a building automation system
 - By a humidity controller connected to the steam valve
 - By DRI-STEEM's Vapor-logic^{®3} microprocessor controller
6. Steam is discharged uniformly through the tubelets into the airstream.

OM-1170

Single-tube humidifier

Single-tube humidifier

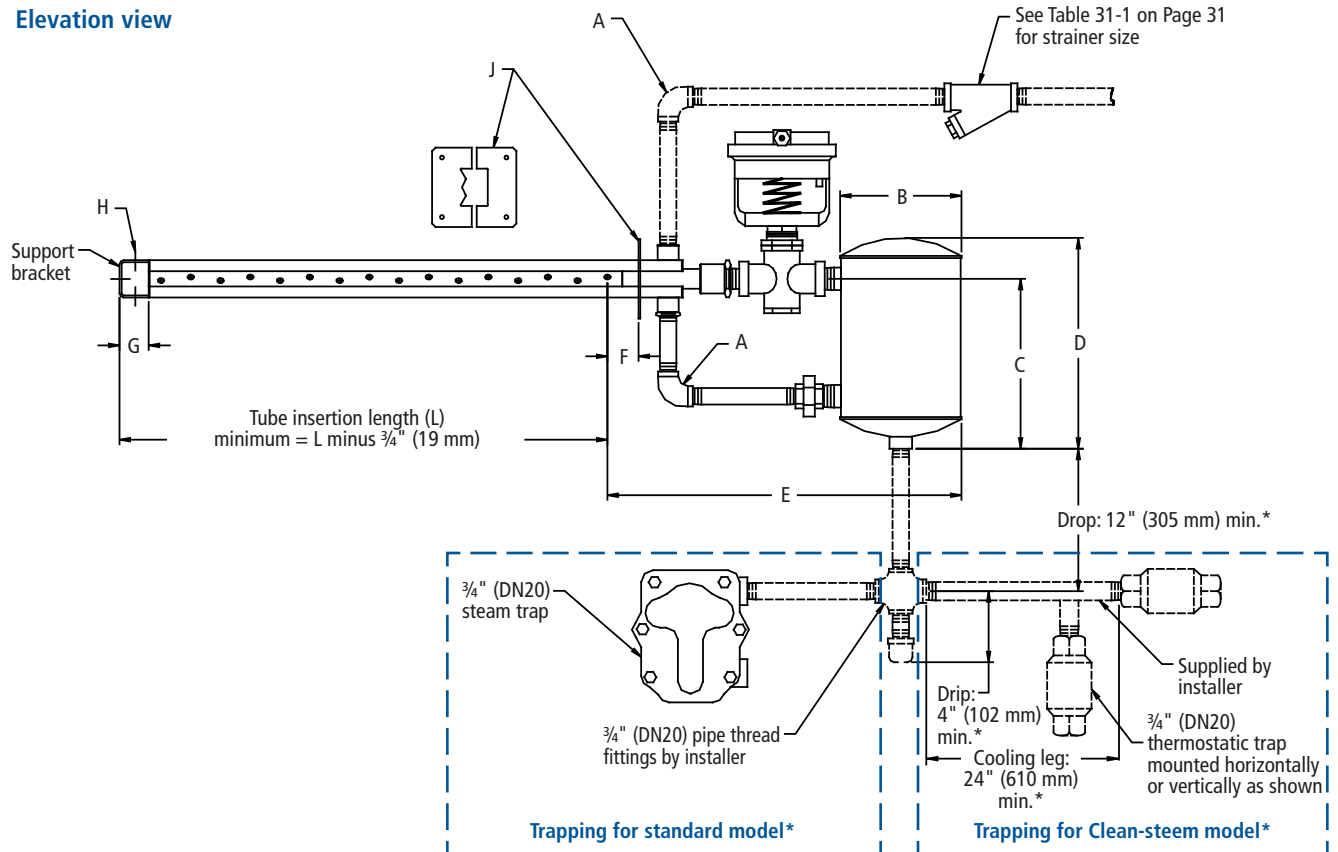
Single-tube humidifiers are preassembled and suitable for small capacity applications where available non-wetting distance is not critical.

Figure 7-1:
Single-tube humidifier



Figure 7-2:
Single-tube humidifier dimensions

Elevation view



See Tables 8-1 and 8-2 on Page 8 for dimensional data.

* See Page 30 and Note 5 on Page 11 for more information about traps and trap piping.

OM-565B

Single-tube humidifier dimensions and weights

Table 8-1:
Single-tube humidifier dimensions

Model	Valve size	A		B		C		D		E		F*		G		H		J	
	in.	in.	DN	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
5-60	½	½	15	5	127	8	203	10	254	15.75	400	2	51	1.5	40	0.42	10	4×4	100×100
6-70	½	¾	20	6	152	8.25	210	10.5	267	15.75	400	2	51	1.5	40	0.42	10	4×4	100×100
7-70	¾	¾	20	7	178	8.5	222	11	279	17	432	2	51	1.5	40	0.42	10	4×4	100×100
7-70	1	¾	20	7	178	8.5	222	11	279	17	432	2	51	1.5	40	0.42	10	4×4	100×100
8-80	1½	1½	40	8	203	10.5	273	13.5	349	22.5	572	2	51	1.5	40	0.42	10	6×6	152×152

Notes:

* Variable 0" to 2" (0 mm to 51 mm)

See Figure 7-2 on Page 7.

Table 8-2:
Single-tube humidifier standard dispersion tube insertion lengths (L)

Tube size	inches (mm)														
	6 (152)	12 (305)	18 (457)	24 (610)	30 (762)	36 (914)	48 (1219)	60 (1524)	72 (1829)	84 (2134)	96 (2438)	108 (2743)	120 (3048)	132 (3352)	144 (3658)
60	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
70*			X	X	X	X	X	X	X	X	X	X	X	X	X
80*				X	X	X	X	X	X	X	X	X	X	X	X

Notes:

End support brackets are available only on tube lengths of 12" (305 mm) or longer.

* Model 70 and 80 tubes are available in lengths up to 192" (4875 mm) in 12" (305 mm) increments.

Table 8-3
Single-tube humidifier shipping weights

Separator*			Tube		
Size	lbs	kg	No.	Wt/ft	
				lbs	kg
5	24	10.9	60	2.6	1.2
6	32	14.5	70	2.8	1.3
7	32.5	14.7	70	2.8	1.3
8	52.5	23.8	80	3	1.4
9	79.5	36	80	3	1.4

Note:

* Includes control valve, drain trap, and strainer

Single-tube humidifier capacities in lbs/hr

Table 9-1:
Single-tube (non-Clean-steem models) capacities in lbs/hr

Sep. size	Valve size	Valve Cv	Supply steam pressure (psi)																				
			2	3	4	5	6	7	8	9	10	11	12	13	14	15	20	25	30	35*	40*	45*	50*
5-60	½	0.1	1.8	2	2.3	2.5	2.8	3	3.2	3.4	3.6	3.8	4	4.2	4.3	4.5	5.2	5.8	6.3	6.8	7.2	7.7	8.2
5-60	½	0.22	3.9	4.5	5	5.6	6.1	6.6	7	7.5	7.9	8.4	8.8	9.2	9.5	9.9	11.5	12.8	13.9	14.9	15.9	16.9	18
5-60	½	0.4	6.5	8.0	9.2	10.3	11.3	12.2	13.0	13.8	14.5	15.3	15.9	16.6	17.2	17.8	20.6	23.0	25.2	27.2	29.1	30.8	32.5
5-60	½	0.75	12	15	17	19	21	23	24	26	27	28	30	31	32	33	38	43	47	51	54	58	61
5-60	½	1.3	21	26	29	33	36	39	41	44	46	48	50	53	55	56	65	73	81	87	93	99	105
5-60	½	2.2	34	41	47	53	58	63	67	71	75	79	83	86	90	93	107	121	133	145	156	165	175
6-70	½	3.25	50	62	70	80	87	95	101	108	114	120	125	131	136	141	164	184	202	220	238	254	270
6-70	½	4.4	66	81	93	104	115	125	135	143	151	158	166	173	179	187	216	245	272	296	321	345	368
7-70	¾	5.5	78	95	111	126	140	152	162	172	182	191	201	209	217	225	263	300	333	367	399	430	461
7-70	¾	7.5	96	121	142	161	178	189	204	217	229	239	251	262	274	285	337	386	434	480	526	571	617
7-70	1	10	117	149	168	188	216	226	241	258	270	285	300	313	326	342	409	470	530	592	650	711	771
7-70	1	12	126	155	180	202	224	245	264	279	297	311	326	340	359	373	450	520	586	655	724	796	867
8-80	1¼	20	291	349	405	436	471	514	552	586	621	657	689	723	757	785	917	1050	1183	1313	1439	1557	1672
8-80	1½	28	354	413	466	535	580	640	687	734	785	824	865	904	936	978	1196	1397	1586	1770	1957	2136	2312

Notes:

All valves are Siebe bronze valves.

* Valve manufacturer recommends not to exceed 35 psi drop across the valve.

Table 9-2:
Single-tube (Clean-steem models) capacities in lbs/hr

Sep. size	Valve size	Valve Cv	Supply steam pressure (psi)																				
			2	3	4	5	6	7	8	9	10	11	12	13	14	15	20	25	30	35 [†]	40 [†]	45 [†]	50 [†]
5-60	½	0.1	1.5	1.9	2.2	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.1	4.3	4.5	5.2	5.8	6.3	6.8	7.3	7.8	8.2
5-60	½	0.22	3.3	4.2	4.9	5.5	6.1	6.6	7.1	7.5	8.0	8.4	8.7	9.1	9.5	9.8	11.3	12.7	13.9	15.1	16.1	17.1	18.0
5-60	½	0.4	6.1	7.6	8.9	10.1	11.1	12.0	12.9	13.7	14.5	15.2	15.9	16.6	17.2	17.8	20.6	23.1	25.3	27.4	29.3	31.1	32.8
5-60	½	0.75	11	14	17	19	21	23	24	26	27	29	30	31	32	33	39	43	47	51	55	58	61
5-60	½	1.3	20	25	29	33	36	39	42	45	47	49	50	52	54	56	66	74	81	88	94	100	106
5-60	½	2.2	26	36	45	51	58	63	68	73	77	81	85	89	93	96	108	123	136	148	159	169	179
6-70	½	3.25	38	50	60	69	76	83	89	95	101	106	111	116	120	125	145	162	178	193	211	225	237
6-70	½	3.6	42	56	67	76	84	92	99	105	111	117	123	128	133	138	160	180	197	217	234	249	263
7-70	¾	5	58	77	92	105	117	127	137	146	155	163	170	178	183	190	221	251	278	304	328	350	371
7-70	¾	6.2	73	96	115	131	145	158	170	181	188	198	201	212	222	231	274	311	346	377	410	439	466
7-70	1*	9.5	111	147	160	172	184	210	233	254	265	275	294	312	328	344	409	435	460	521	576	626	630
8-80	1½*	17.5	255	305	354	378	405	439	471	496	524	551	577	601	628	647	744	840	928	1009	1083	1150	1212

Note:

All valves are Siebe stainless steel valves except those marked with *

* Indicates Baumann stainless steel valve

† Valve manufacturer recommends not to exceed 35 psi drop across the valve.

Single-tube humidifier capacities in kg/h

Table 10-1:
Single-tube (non-Clean-steem models) capacities in kg/h

Sep. size	Valve size (inches)	Valve Kvs	Supply steam pressure (kPa)																				
			14	21	28	34	41	48	55	62	69	76	83	90	97	103	138	172	207	241*	276*	310*	345*
5-60	½	0.09	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.5	1.6	1.7	1.8	1.9	2.0	2.0	2.4	2.6	2.9	3.1	3.3	3.5	3.7
5-60	½	0.19	1.8	2.0	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.3	4.5	5.2	5.8	6.3	6.8	7.2	7.7	8.2
5-60	½	0.35	3.0	3.6	4.2	4.7	5.1	5.5	5.9	6.3	6.6	6.9	7.2	7.5	7.8	8.1	9.3	10.4	11.4	12.3	13.2	14.0	14.7
5-60	½	0.65	5.5	6.8	7.8	8.7	9.6	10.4	11.1	11.7	12.3	12.9	13.4	14.0	14.5	15.1	17.4	19.4	21.3	23.0	24.6	26.1	27.5
5-60	½	1.12	9.6	11.7	13.2	14.9	16.2	17.6	18.7	19.9	20.9	22.0	22.9	23.9	24.7	25.6	29.7	33.3	36.6	39.5	42.3	45.0	47.4
5-60	½	1.90	15.4	18.5	21.5	23.9	26.3	28.4	30.4	32.3	34.1	36.0	37.6	39.0	40.7	42.0	48.5	54.7	60.5	65.7	70.6	75.0	79.3
6-70	½	2.81	22.8	28.1	31.9	36.3	39.4	43.0	45.8	48.9	51.6	54.3	56.8	59.4	61.6	64.0	74.3	83.4	91.7	99.6	107.8	115.2	122.3
6-70	½	3.81	30.0	36.5	42.1	47.1	52.2	56.7	61.1	64.8	68.5	71.9	75.3	78.4	81.2	84.6	98.2	111.3	123.2	134.3	145.5	156.6	167.1
7-70	¾	4.76	35.4	43.1	50.5	57.1	63.7	68.9	73.4	78.2	82.6	86.5	91.2	95.0	98.4	102.2	119.5	136.1	151.3	166.3	180.9	195.0	209.0
7-70	¾	6.49	43.4	54.8	64.6	73.0	80.6	85.8	92.5	98.3	103.7	108.4	113.8	119.0	124.1	129.1	152.9	175.3	196.7	217.8	238.8	258.9	280.1
7-70	1	8.65	53.1	67.5	76.0	85.3	97.9	102.5	109.5	117.0	122.3	129.4	135.9	142.2	147.7	155.3	185.6	213.0	240.4	268.4	295.0	322.4	349.6
7-70	1	10.38	57.1	70.4	81.6	91.8	101.8	111.3	119.7	126.7	134.5	141.2	147.8	154.3	163.0	169.3	204.3	236.0	266.0	297.0	328.5	361.2	393.3
8-80	1¼	17.30	132.0	158.2	183.7	197.9	213.6	233.0	250.6	265.8	281.8	298.0	312.7	327.9	343.6	356.3	415.9	476.2	536.4	595.4	652.5	706.0	758.6
8-80	1½	24.22	160.6	187.3	211.5	242.7	263.1	290.1	311.5	332.9	356.1	374.0	392.3	410.2	424.7	443.6	542.5	633.7	719.5	802.6	887.7	969.0	1048.6

Notes:

All valves are Siebe bronze valves.

* Valve manufacturer recommends not to exceed 241 kPa drop across the valve.

Table 10-2:
Single-tube (Clean-steem models) capacities in kg/h

Sep. size	Valve size (inches)	Valve Kvs	Supply steam pressure (kPa)																				
			14	21	28	34	41	48	55	62	69	76	83	90	97	103	138	172	207	241*	276*	310*	345*
5-60	½	0.09	0.7	0.9	1.0	1.1	1.3	1.4	1.5	1.5	1.6	1.7	1.8	1.9	2.0	2.0	2.4	2.6	2.9	3.1	3.3	3.5	3.7
5-60	½	0.19	1.5	1.9	2.2	2.5	2.8	3.0	3.2	3.4	3.6	3.8	3.9	4.1	4.3	4.4	5.1	5.8	6.3	6.8	7.3	7.8	8.2
5-60	½	0.35	2.8	3.4	4.0	4.6	5.0	5.4	5.9	6.2	6.6	6.9	7.2	7.5	7.8	8.1	9.3	10.5	11.5	12.4	13.3	14.1	14.9
5-60	½	0.65	5.0	6.4	7.7	8.6	9.5	10.4	10.9	11.8	12.2	13.2	13.6	14.1	14.5	15.0	17.7	19.5	21.3	23.1	24.9	26.3	27.7
5-60	½	1.12	9.1	11.3	13.2	15.0	16.3	17.7	19.1	20.4	21.3	22.2	22.7	23.6	24.5	25.4	29.9	33.6	36.7	39.9	42.6	45.4	48.1
5-60	½	1.90	11.8	16.3	20.4	23.1	26.3	28.6	30.8	33.1	34.9	36.7	38.6	40.4	42.2	43.5	49.0	55.8	61.7	67.1	72.1	76.7	81.2
6-70	½	2.81	17.2	22.7	27.2	31.3	34.5	37.6	40.4	43.1	45.8	48.1	50.3	52.6	54.4	56.7	65.8	73.5	80.7	87.5	95.7	102.1	107.5
6-70	½	3.11	19.1	25.4	30.4	34.5	38.1	41.7	44.9	47.6	50.3	53.1	55.8	58.1	60.3	62.6	72.6	81.6	89.4	98.4	106.1	112.9	119.3
7-70	¾	4.33	26.3	34.9	41.7	47.6	53.1	57.6	62.1	66.2	70.3	73.9	77.1	80.7	83.0	86.2	100.2	113.9	126.1	137.9	148.8	158.8	168.3
7-70	¾	5.36	33.1	43.5	52.2	59.4	65.8	71.7	77.1	82.1	85.3	89.8	91.2	96.2	100.7	104.8	124.3	141.1	156.9	171.0	186.0	199.1	211.4
7-70	1*	8.22	50	67	73	78	83	95	106	115	120	125	133	142	149	156	186	197	209	236	261	284	286
8-80	1½*	15.14	116	138	161	171	184	199	214	225	238	250	262	273	285	293	337	381	421	458	491	522	550

Note:

All valves are Siebe stainless steel valves except those marked with *

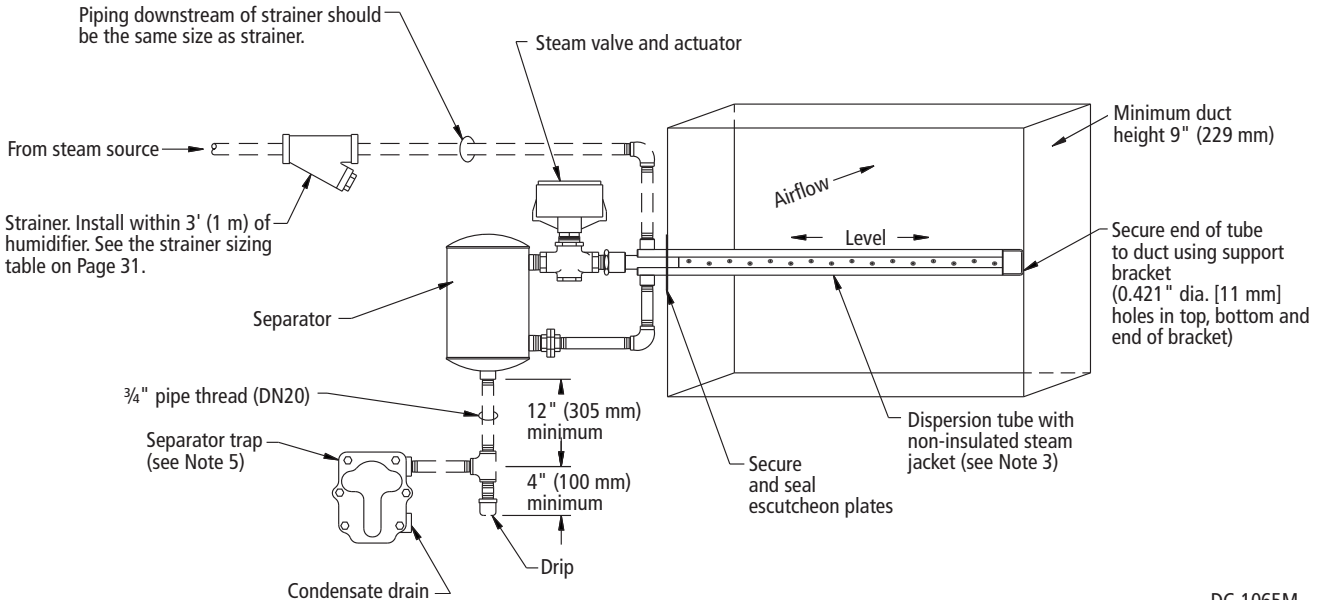
* Indicates Baumann stainless steel valve

* Valve manufacturer recommends not to exceed 241 kPa drop across the valve.

Single-tube humidifier field piping example

Figure 11-1:
Single horizontal dispersion tube humidifier installed in a duct with horizontal airflow

Elevation view (non-Clean-steam model shown)



DC-1065M

Notes:

1. To avoid metal fatigue, allow for dispersion tube thermal expansion.
2. Dashed lines indicate provided by installer.

3. Horizontal airflow (shown):

Slightly better mixing, with less visible vapor travel, occurs when discharged steam blows against the airflow rather than with the airflow. **Therefore, when using non-insulated steam jackets** in a horizontal airflow (as shown above), position dispersion tubelets (steam orifices) so that they face into the airflow.

However, if the dispersion tube has an insulated jacket, the discharged steam must blow with the airflow to avoid condensation that may occur when discharged steam contacts the cooler insulated jacket. Therefore, **when using insulated steam jackets** in a horizontal airflow, position dispersion tubelets so that they discharge steam with the airflow, and also add 24" (610 mm) to the non-wetting distance.

Vertical airflow:

Always position tubelets (steam orifices) pointing up when installing in a vertical airflow.

If steam jackets are insulated, install humidifier only in a vertical upflow application and add 24" (610 mm) to the non-wetting distance. **Do not install insulated jackets in a vertical downflow application.**

4. Center tube within duct height.

5. For non-Clean-steam models (shown):

If steam pressure is less than or equal to 15 psi (103.4 kPa), use a float and thermostatic (F&T) trap for the humidifier.

If steam pressure is greater than 15 psi (103.4 kPa), use an inverted bucket trap for the humidifier.

If lifting condensate, use an inverted bucket trap regardless of steam pressure.

Inverted bucket traps may require priming after seasonal shutdown.

For Clean-steam models:

Use only stainless steel thermostatic traps and stainless steel piping. Provide a 12" (305 mm) minimum drop to trap plus a 24" (610 mm) minimum cooling leg before the trap as shown in Figure 7-2 on Page 7.

For all models:

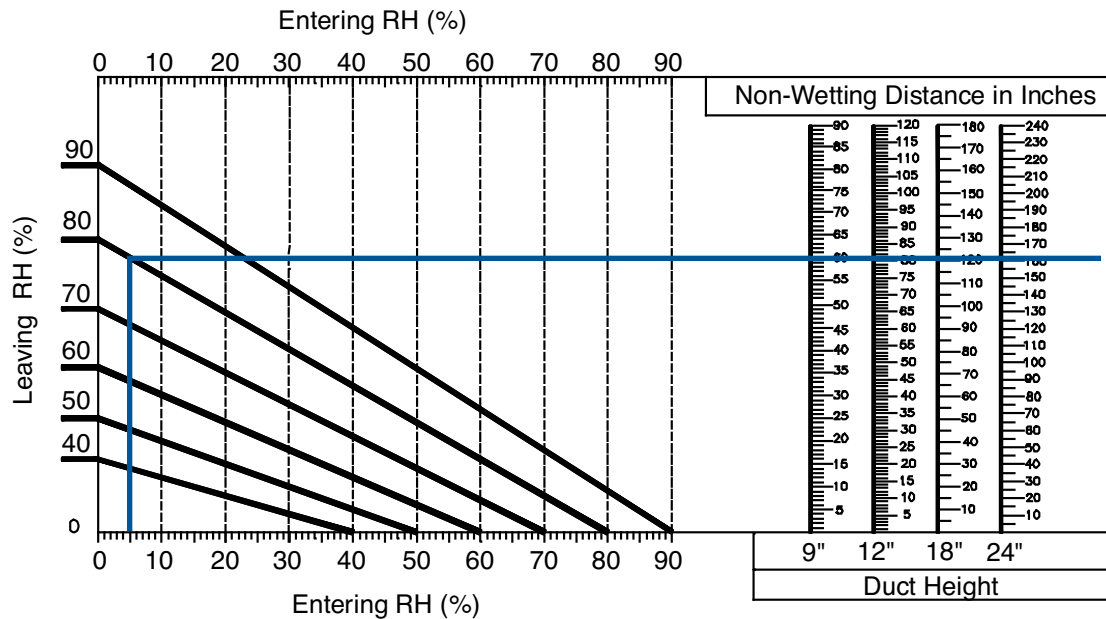
During consistent load, there may not be enough pressure in the separator trap to lift condensate from the separator.

6. See condensate drain piping and trapping information on Page 30.

7. See the Dri-calc Installation Guide library and/or the Steam Injection Installation, Operation, and Maintenance manual for more installation instructions. Dri-calc is DRI-STEEM's free sizing and selection software and can be ordered at www.drasteem.com. The manual can be viewed, printed, or ordered at www.drasteem.com

Single-tube humidifier non-wetting distances

Figure 12-1:
Single-tube humidifier non-wetting distances



Notes:

- The above data applies to all air velocities up to 1,500 fpm (7.6 m/s), and are based on air leaving the zone of humidification at conditions of 55 °F (13 °C) and the stated % RH. The blue lines in the graph refer to the sample exercise described below.
- Add 24" (610 mm) to the non-wetting distance when using insulated jackets.

Important notes

- See the DRI-STEEM Design Guide for humidification load calculation instructions. The Design Guide can be viewed, printed, or ordered at www.dristeem.com
- Use Dri-calc, DRI-STEEM's sizing and selection software for calculating load, determining non-wetting distance, and selecting equipment. Dri-calc can be ordered at www.dristeem.com
- Final equipment selection should account for condensate loss. See the DRI-STEEM Design Guide for steam loss tables.
- See "Important notes about non-wetting distances" on Page 17.

Sample exercise for determining non-wetting distance

Assume the air entering the humidifier is 5% RH, the air leaving the zone of humidification needs to be 80% RH, and the duct height is 18" (457 mm).

To determine the non-wetting distance of a Single-tube humidifier under these conditions, enter Figure 12-1 above at the entering RH of 5%. Proceed vertically as indicated by the blue lines to the 80% leaving RH sloped line and then read horizontally to the right where the line crosses the 18" (457 mm) duct height column to find that the non-wetting distance is approximately 120" (3048 mm).

Mini-bank humidifier

Mini-bank humidifier

The Mini-bank humidifier is designed for use in small ducts. It is a pre-engineered and pre-assembled header/tube assembly, ready for mounting and hookup.

Slimline dispersion tubes with laboratory-tested, optimum tube spacing promote rapid steam absorption without excessive static pressure loss and heat gain.

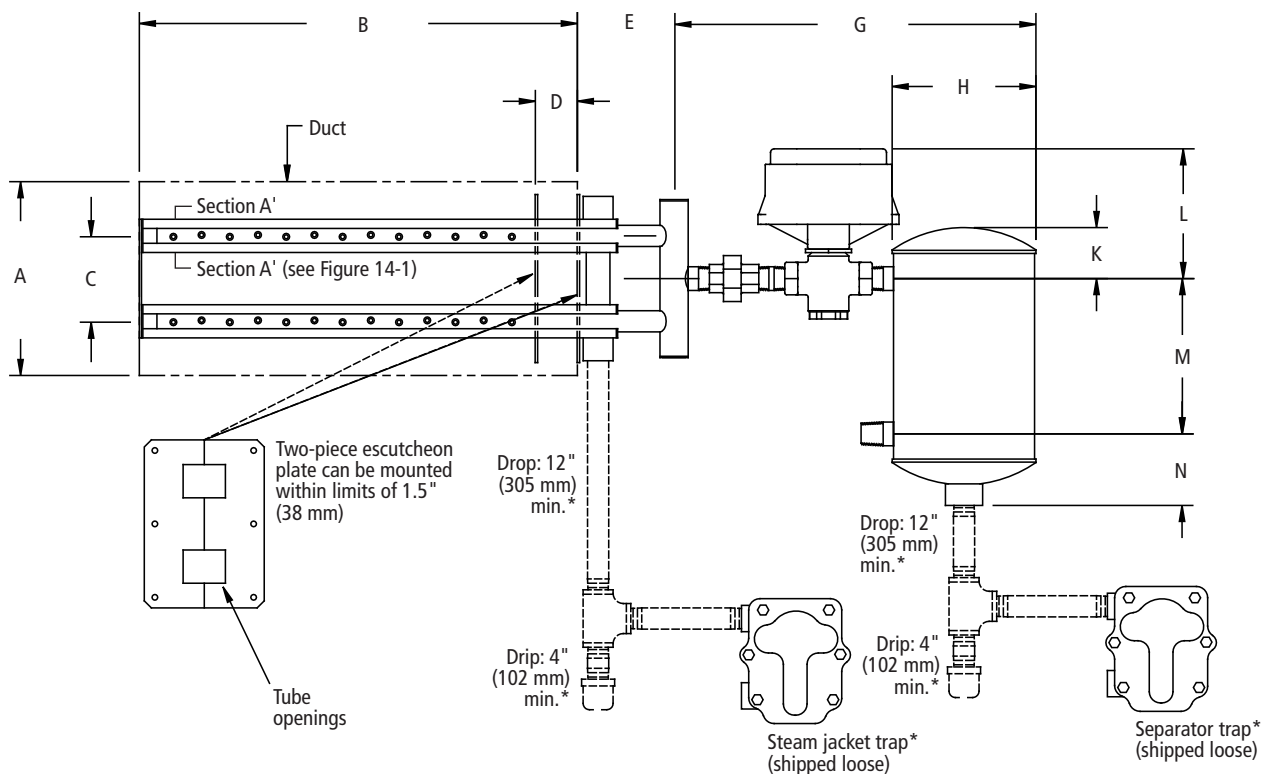
Precision orifices spaced 1" (25 mm) apart ensure proportional steam dispersion along the entire tube length.

Figure 13-1:
Mini-bank humidifier



Figure 13-2:
Mini-bank humidifier dimensions

Elevation view (non-Clean-steam model shown)



* See Page 30 and Note 6 on Page 16 for more information about traps and trap piping. See also Figure 14-1 and Tables 14-1 and 14-2.

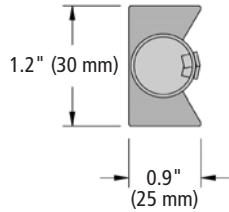
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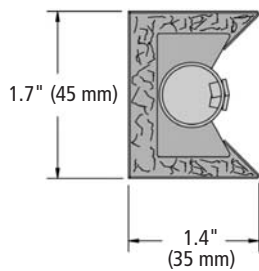
Mini-bank humidifier dimensions

**Figure 14-1:
View A' to A' from Figure 13-2**

Non-insulated



Insulated



mc_081208_0745

**Table 14-1:
Mini-bank humidifier specifications**

"A" duct height		Required number of tubes	"B" dispersion tube length	Shipping weights
inches	mm			
6-9	150-230	2	- From 6" to 36" in 2" increments (from 150 mm to 600 mm in 50 mm increments) - Additional lengths: 40" (1014 mm), 44" (1120 mm), 48" (1220 mm) - For ducts larger than 24" x 48" (610 mm x 1220 mm) use Multiple-tube unit	Tubes: 0.3 lbs per tube foot 0.4 kg per tube meter Remaining components (separator, valve, traps, etc.): 8.5 lbs (3.8 kg)
10-12	250-305	3		
13-15	330-380	4		
16-18	405-460	5		
19-21	480-535	6		
22-24	560-610	7		

Note:
See Figure 13-2 for A and B.

mc_081108_1455

**Table 14-2:
Mini-bank humidifier dimensions**

	C	D	E	G	H	K	L	M	N
inches	3.0	1.5	3.25	12.5	3.75	1.75	6.5	5.5	2.5
mm	76	38	83	318	92	45	165	140	64

Note:
See Figure 13-2
H = depth

mc_081208_0740

**Table 14-3:
Mini-bank humidifier air pressure loss**

Air velocity		Static pressure loss			
fpm	m/s	Inches wc		Pa	
		Insulated	Noninsulated	Insulated	Noninsulated
500	2.5	0.04	0.02	9.95	4.98
750	3.8	0.07	0.04	17.42	9.95
1000	5.1	0.13	0.075	32.35	18.66

Mini-bank humidifier capacities

Table 15-1:
Mini-bank humidifier maximum capacities (lbs/hr)

Valve Cv	Supply steam pressure (psi)***													
	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0.1	1.6	2.0	2.3	2.5	2.8	3.0	3.3	3.4	3.6	3.8	4.0	4.1	4.3	4.5
0.22	3.6	4.3	5.0	5.6	6.2	6.7	7.2	7.6	8.0	8.4	8.7	9.1	9.5	9.8
0.4	6.4	7.9	9.1	10.2	11.2	12.1	13.0	13.8	14.5	15.2	15.9	16.6	17.2	17.8
0.75	11.9	14.7	17.1	19.2	21.0	22.7	24.3	25.8	27.2	28.6	29.9	31.1	32.3	33.4
1.3	20.7	25.6	29.6	33.2	36.4	39.4	42.2	44.8	47.2	49.5	51.7	53.9	55.9	57.9
2.2	35.0	43.2	49.7	55.8	61.4	66.2	70.9	75.4	79.6	83.6	—	—	—	—
3.25	50.5	63.0	72.6	81.9	—	—	—	—	—	—	—	—	—	—
3.6**	55.9	68.7	80.5	—	—	—	—	—	—	—	—	—	—	—
4.4*	66.7	84.0	—	—	—	—	—	—	—	—	—	—	—	—

Notes:

All valves are Siebe valves available in bronze and stainless steel unless noted otherwise.

* This valve is available only in bronze.

** This valve is available only in stainless steel.

*** At connection to humidifier. A steam pressure of 5 to 10 psi at inlet connection to separator is recommended for the most accurate control and quietest operation.

Table 15-2:
Mini-bank humidifier maximum capacities (kg/h)

Valve Kvs	Supply steam pressure (kPa)***													
	14	21	28	34	41	48	55	62	69	76	83	90	97	103
0.09	0.7	0.9	1.0	1.1	1.3	1.4	1.5	1.5	1.6	1.7	1.8	1.9	2.0	2.0
0.19	1.6	2.0	2.3	2.5	2.8	3.0	3.3	3.4	3.6	3.8	3.9	4.1	4.3	4.4
0.35	3.0	3.6	4.1	4.6	5.1	5.5	5.9	6.3	6.6	6.9	7.2	7.5	7.8	8.1
0.65	5.4	6.7	7.8	8.7	9.5	10.3	11.0	11.7	12.3	13.0	13.6	14.1	14.7	15.2
1.12	9.4	11.6	13.4	15.1	16.5	17.9	19.1	20.3	21.4	22.5	23.5	24.4	25.4	26.3
1.9	15.9	19.6	22.5	25.3	27.9	30.0	32.2	34.2	36.1	38.0	—	—	—	—
2.81	23.0	28.6	32.9	37.1	—	—	—	—	—	—	—	—	—	—
3.1**	25.4	31.2	36.5	—	—	—	—	—	—	—	—	—	—	—
3.8*	30.3	38.1	—	—	—	—	—	—	—	—	—	—	—	—

Notes:

All valves are Siebe valves available in bronze and stainless steel unless noted otherwise.

* This valve is available only in bronze.

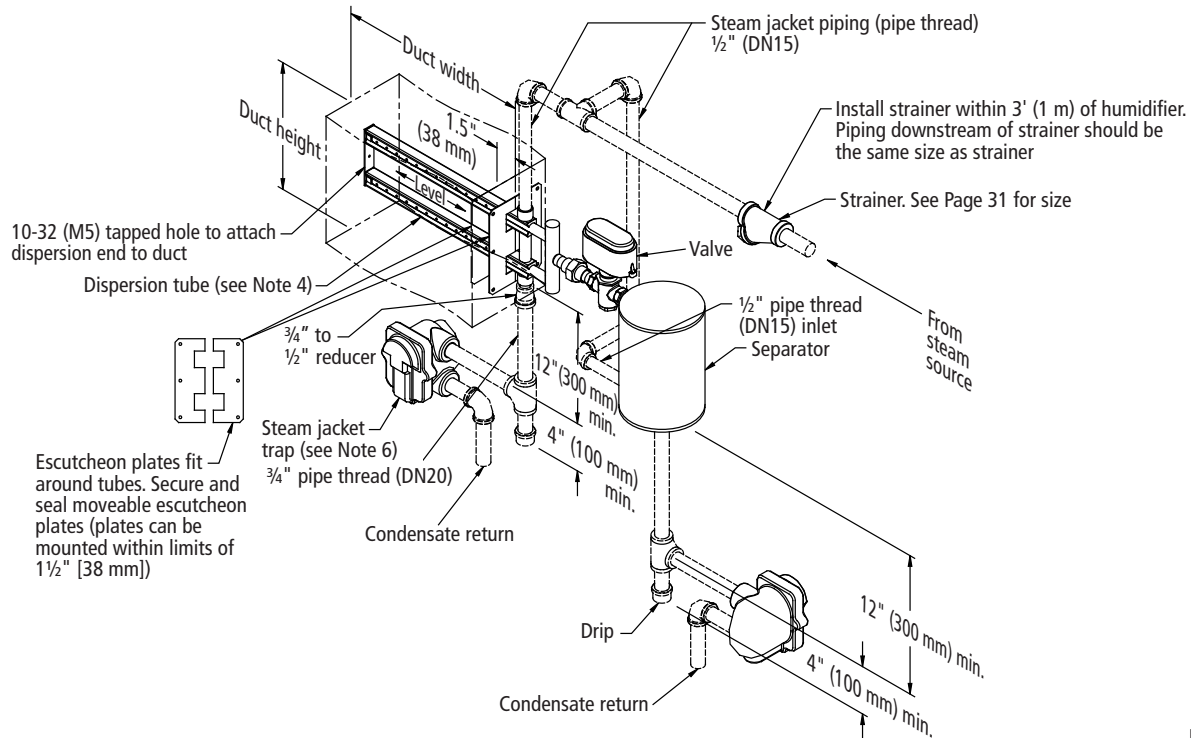
** This valve is available only in stainless steel.

*** At connection to humidifier. A steam pressure of 34 to 69 kPa at inlet connection to separator is recommended for the most accurate control and quietest operation.

Mini-bank humidifier field piping example

Figure 16-1:
Mini-bank humidifier installed in a duct with horizontal airflow

Elevation view (non-Clean-steam model shown)



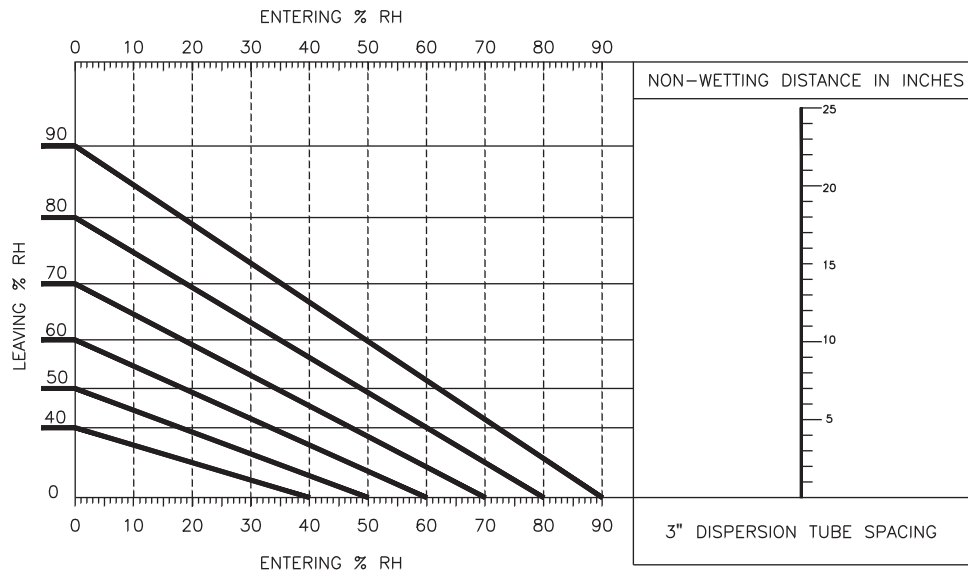
Notes:

1. To avoid metal fatigue, allow for dispersion tube thermal expansion.
2. Dashed lines indicate provided by installer.
3. Drawing represents a left-hand discharge.
4. **Horizontal airflow (shown):**
Slightly better mixing, with less visible vapor travel, occurs when discharged steam blows against the airflow rather than with the airflow. **Therefore, when using non-insulated steam jackets** in a horizontal airflow (as shown above), position dispersion tubelets (steam orifices) so that they face into the airflow. However, if the dispersion tube has an insulated jacket, the discharged steam must blow with the airflow to avoid condensation that may occur when discharged steam contacts the cooler insulated jacket. Therefore, **when using insulated steam jackets** in a horizontal airflow, position dispersion tubelets so that they discharge steam with the airflow, and also add 24" (610 mm) to the non-wetting distance.
Vertical airflow:
Always position tubelets (steam orifices) pointing up when installing in a vertical airflow.
If steam jackets are insulated, install humidifier only in a vertical upflow application and add 24" (610 mm) to the non-wetting distance.
Do not install insulated jackets in a vertical downflow application.
5. Center tube assembly within duct height.
6. **For non-Clean-steam models (shown):**
If steam pressure is less than or equal to 15 psi (103.4 kPa), use a float and thermostatic (F&T) trap for the humidifier.
If steam pressure is greater than 15 psi (103.4 kPa), use an inverted bucket trap for the humidifier.
If lifting condensate, use an inverted bucket trap regardless of steam pressure.
Inverted bucket traps may require priming after seasonal shutdown.
For Clean-steam models:
Use only stainless steel thermostatic traps and stainless steel piping. Provide a 12" (305 mm) minimum drop to trap plus a 24" (610 mm) minimum cooling leg before the trap as shown in Figure 7-2 on Page 7.
For all models:
During consistent load, there may not be enough pressure in the separator trap to lift condensate from the separator.
7. See condensate drain piping and trapping information on Page 30.
8. See the Dri-calc Installation Guide library and/or the Steam Injection Installation, Operation, and Maintenance manual for more installation instructions. Dri-calc is DRI-STEEM's free sizing and selection software and can be ordered at www.drirsteem.com. The manual can be viewed, printed, or ordered at www.drirsteem.com

DC-1490

Mini-bank humidifier non-wetting distances

Figure 17-1:
Mini-bank humidifier non-wetting distances



Notes:

- The above data applies to all air velocities up to 1,500 fpm (7.6 m/s), and are based on air leaving the zone of humidification at conditions of 55 °F (13 °C) and the stated % RH.
- Add 24" (610 mm) to the non-wetting distance when using insulated jackets.

Important notes about non-wetting distances

1. Non-wetting distance is the dimension downstream from the humidifier to the point where wetting will not occur, although steam wisps may be present. Solid objects at duct air temperature, such as coils, dampers, fans, etc., downstream of this dimension will remain dry.
2. **CAUTION!** Non-wetting distances described in this catalog do not apply when installing a Steam Injection humidifier upstream of filter media. If you need to install a Steam Injection humidifier upstream of filter media, consult your representative or DRI-STEEM directly for special recommendations.
3. Note that the rise (Δ) in RH (the difference between entering and leaving RH) has a direct bearing on the non-wetting distance. As the rise increases, more vapor needs to be dispersed into the air, and thus the non-wetting distance increases.
4. Uneven airflow over the dispersion assembly's cross-section can result in nonuniform mixing of steam with air which, in turn, will adversely affect the non-wetting distance.

Important notes

- See the sample exercise and notes on Page 12 for instructions about how to determine non-wetting distance.

Multiple-tube and Maxi-bank humidifiers

**Figure 18-1:
Multiple-tube humidifier**



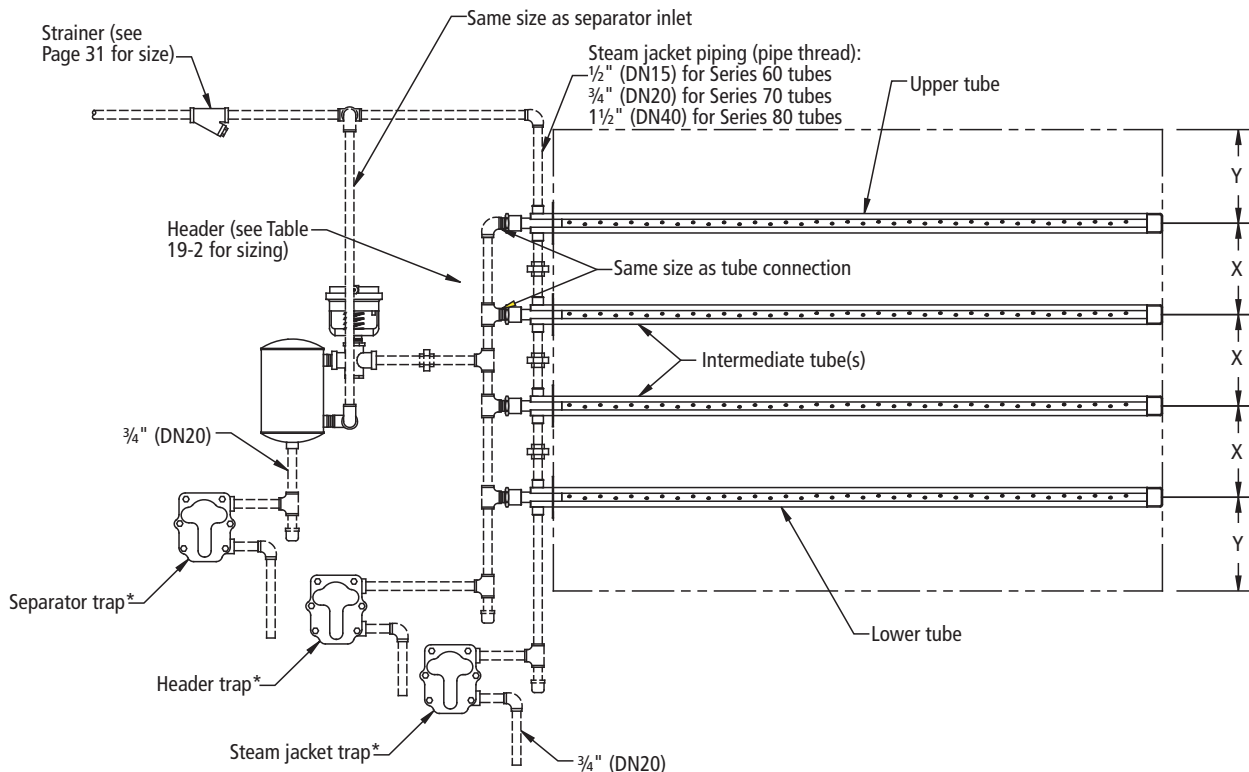
Multiple-tube and Maxi-bank humidifiers are best suited for large capacity applications with short to moderate non-wetting distance requirements. Both Multiple-tube and Maxi-bank humidifiers disperse steam evenly across an entire duct width and height.

Multiple-tube humidifier components are shipped loose for on-site assembly. All header and interconnecting piping is supplied by the contractor.

The Maxi-bank humidifier features a stainless steel header and black steel interconnecting piping. Maxi-bank humidifiers ship completely assembled (except when either dimension is 98 inches or more), ready for installation.

**Figure 18-2:
Multiple-tube/Maxi-bank humidifier dimensions**

Elevation view (non-Clean-steam model shown)



OM-13M

Notes:

- * See Page 30 and Note 7 on Page 25 for more information about traps and trap piping.
- X = distance between tubes, center to center. Y = 4 1/2" (114 mm) minimum. Center assembly in duct. See the minimum tube spacing table (Table 19-1) on Page 19.
- Tubes should span at least 90% of coil or airstream width.
- See Note 3 on Page 25 for dispersion tube positioning.

Multiple-tube/Maxi-bank humidifier dimensions

Table 19-1:
Multiple-tube/Maxi-bank humidifier minimum tube spacing distance, center to center (X)*

Dispersion tube model	Multiple dispersion tubes (standard)		Multiple dispersion tubes (Clean-steam)	
	X		X	
	inches	mm	inches	mm
Series 60	6	152	8	203
Series 70	7	178	9	229
Series 80	9	229	12	305

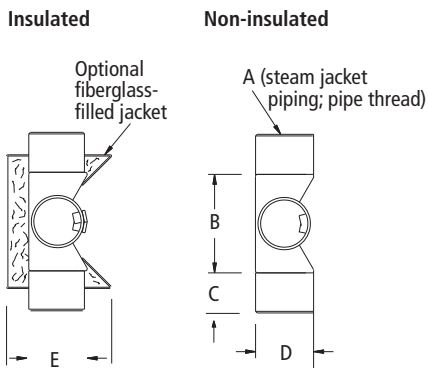
Note:
* See Figure 18-2 for X.

Table 19-2:
Multiple-tube/Maxi-bank humidifier header sizing

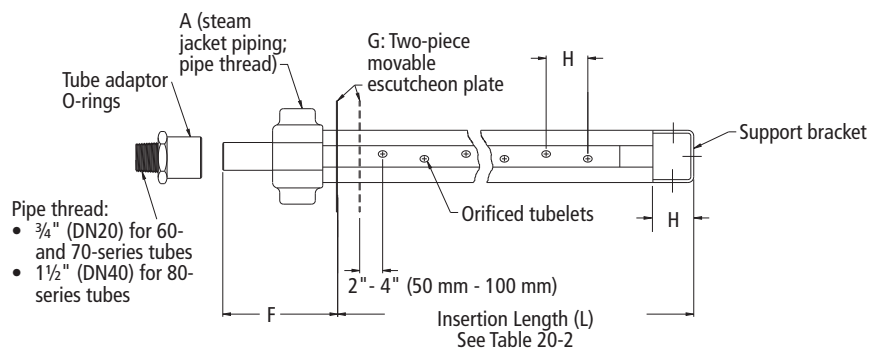
Total capacity		Header size	
lbs/hr	kg/h	inches	DN
up to 490	up to 222	2	50
491 to 980	223 to 444	3	80
981 to 1743	445 to 790	4	100
1744 to 2752	791 to 1248	5	125
2753 to 3989	1249 to 1809	6	150

Figure 19-1:
Multiple-tube/Maxi-bank humidifier dimensions

Dispersion tube dimensions



Dispersion tube detail



Notes:

- See Table 19-3 below for dimensions.

375lw and OM-388A

Table 19-3:
Multiple-tube/Maxi-bank humidifier dispersion tube dimensions

Tube no.	A		B		C		D		E		F		G		H	
	inches	DN	inches	mm	inches	mm	inches	mm	inches	mm	in	mm	in	mm	in	mm
60	1/2	15	1.88	48	0.81	21	1.13	29	2	51	4	102	4x4	102x102	1.5	38
70	3/4	20	2.63	67	0.81	21	1.88	48	3	76	4	102	4x4	102x102	1.5	38
80	1 1/2	40	3	76	1.06	27	2.5	64	3.5	89	5.5	140	6x6	152x152	1.5	38

Multiple-tube/Maxi-bank humidifier specifications

Figure 20-1:
Multiple-tube/Maxi-bank humidifier separator dimensions

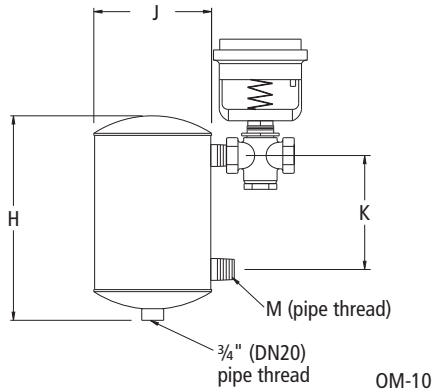


Table 20-1:
Multiple-tube/Maxi-bank humidifier separator dimensions and weights

Separator size	H		J		K		M		Shipping weight*	
	in.	mm	in.	mm	in.	mm	in.	DN		
5	10	254	5	127	5.5	140	½	15	9	8.6
6	10.5	267	6	152	5.38	137	¾	20	21	9.5
7	11	280	7	178	5.5	140	¾	20	24	10.9
8	13.5	343	8	203	6.88	175	1½	40	43	19.5
9	14.25	368	9	229	7	178	2	50	52	23.5

Note:

* Includes control valve, drain trap, and strainer

Table 20-2:
Multiple-tube/Maxi-bank humidifier dispersion tube insertion lengths (L) and tube weights

Tube size	Tube weight per 12" (305 mm)		inches (mm)														
			6	12	18	24	30	36	48	60	72	84	96	108	120	132	144
	lbs	kg	(152)	(305)	(457)	(610)	(762)	(914)	(1219)	(1524)	(1829)	(2134)	(2438)	(2743)	(3048)	(3352)	(3658)
60	0.75	0.34	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
70*	1	0.45			X	X	X	X	X	X	X	X	X	X	X	X	X
80*	1.5	0.68				X	X	X	X	X	X	X	X	X	X	X	X

Note:

See Figure 19-1 on Page 19.

For lengths not shown, consult factory.

* Model 70 and 80 tubes are available in lengths up to 192" (4875 mm) in 12" (305 mm) increments.

Table 20-3:
Multiple-tube/Maxi-bank humidifier dispersion tube capacities

Tube length		60- and 70-series tubes		80-series tubes	
inches	mm	lbs/hr	kg/h	lbs/hr	kg/h
24 to 35	610 to 890	180	81	350	159
36 to 48	915 to 1220	210	95	450	204
longer than 48	longer than 1220	250	113	525	238

Multiple-tube/Maxi-bank humidifier capacities in lbs/hr

Table 21-1:
Multiple-Tube/Maxi-bank humidifier maximum capacities (lbs/hr)

Separator size	Valve size	Valve Cv	Supply steam pressure (psi)										
			2	3	4	5	6	7	8	9	10	11	12
5	½	0.4	6.5	8.0	9.2	10.3	11.3	12.2	13.0	13.8	14.5	15.3	15.9
5	½	0.75	12	15	17	19	21	23	24	26	27	29	30
6	½	1.3	21	26	30	33	37	40	42	45	47	50	52
6	½	2.2	36	44	51	57	62	67	72	76	80	84	88
6	½	3.25	53	65	75	84	92	99	106	112	118	124	129
6**	½	3.6	59	72	83	93	101	110	117	124	131	137	143
6*	½	4.4	67	84	98	111	122	132	142	151	159	167	175
7**	¾	5.0	81	100	115	129	141	152	161	171	181	190	198
7*	¾	5.5	83	105	123	139	153	165	177	188	198	208	218
7**	¾	6.2	101	124	143	159	172	186	199	211	223	235	246
7*	¾	7.5	114	143	168	189	206	224	240	254	269	283	297
7**	1	9.5	144	181	208	234	257	279	301	320	340	357	375
7*	1	10	151	185	219	244	271	295	314	336	357	376	394
7*	1	12	182	222	257	293	319	349	377	403	428	451	473
8*	1¼	20	286	336	412	475	532	582	629	672	713	752	788
8**	1½	17.5	251	294	360	416	465	510	550	588	624	658	690
8*	1½	28	333	471	576	666	744	815	881	941	999	1053	1104
9**	2	30.5	363	513	628	725	811	888	959	1025	1088	1146	1202
9*	2	40	475	672	824	951	1063	1165	1258	1345	1426	1504	1577
Separator size	Valve size	Valve Cv	Supply steam pressure (psi)										
			13	14	15	20	25	30	35†	40†	45†	50†	—
5	½	0.4	16.6	17.2	17.8	20.6	23.0	25.2	27.2	29.1	30.9	32.5	—
5	½	0.75	31	32	33	39	43	47	51	55	58	61	—
6	½	1.3	54	56	58	67	75	82	88	95	100	106	—
6	½	2.2	91	95	98	113	127	139	150	161	171	180	—
6	½	3.25	135	140	145	168	188	206	224	239	255	269	—
6**	½	3.6	149	155	160	186	208	229	248	266	283	298	—
6*	½	4.4	182	189	196	227	255	280	303	327	347	366	—
7**	¾	5.0	207	215	223	259	291	320	347	371	394	416	—
7*	¾	5.5	227	236	245	284	320	352	381	408	434	458	—
7**	¾	6.2	256	266	276	321	361	397	430	460	489	516	—
7*	¾	7.5	310	321	334	389	437	480	520	557	591	624	—
7**	1	9.5	391	407	423	492	553	608	658	705	749	790	—
7*	1	10	412	429	445	518	582	640	693	742	788	832	—
7*	1	12	494	514	534	622	699	768	832	891	946	999	—
8*	1¼	20	824	857	890	1036	1165	1280	1386	1485	1577	1664	—
8**	1½	17.5	721	750	778	907	1019	1120	1213	1299	1380	1456	—
8*	1½	28	1153	1200	1245	1451	1631	1792	1941	2079	2208	2330	—
9**	2	30.5	1256	1307	1357	1580	1776	1952	2114	2264	2405	2538	—
9*	2	40	1647	1714	1779	2073	2329	2561	2772	2969	3154	3328	—

Notes:

All valves are Siebe valves available in bronze and stainless steel unless noted otherwise.

* This valve is available only in bronze.

** This valve is available only in stainless steel.

† Valve manufacturer recommends not to exceed 35 psi pressure drop across the valve.

Multiple-tube/Maxi-bank humidifier capacities in kg/h

Table 22-1:
Multiple-tube/Maxi-bank humidifier maximum capacities (kg/h)

Separator size inches	Valve size inches	Valve Kvs	Supply steam pressure (kPa)										
			14	21	28	34	41	48	55	62	69	76	83
5	½	0.3	2.9	3.6	4.2	4.7	5.1	5.5	5.9	6.3	6.6	6.9	7.2
5	½	0.65	5.4	6.8	7.7	8.6	9.5	10.4	10.9	11.8	12.2	13.2	13.6
6	½	1.1	9.5	11.8	13.6	15.0	16.8	18.1	19.1	20.4	21.3	22.7	23.6
6	½	1.9	16.3	20.0	23.1	25.9	28.1	30.4	32.7	34.5	36.3	38.1	39.9
6	½	2.81	24.0	29.5	34.0	38.1	41.7	44.9	48.1	50.8	53.5	56.2	58.5
6**	½	3.1	26.8	32.7	37.6	42.2	45.8	49.9	53.1	56.2	59.4	62.1	64.9
6*	½	3.8	30.4	38.1	44.5	50.3	55.3	59.9	64.4	68.5	72.1	75.8	79.4
7**	¾	4.3	36.7	45.4	52.2	58.5	64.0	68.9	73.0	77.6	82.1	86.2	89.8
7*	¾	4.8	37.6	47.6	55.8	63.0	69.4	74.8	80.3	85.3	89.8	94.3	98.9
7**	¾	5.4	45.8	56.2	64.9	72.1	78.0	84.4	90.3	95.7	101.2	106.6	111.6
7*	¾	6.5	51.7	64.9	76.2	85.7	93.4	101.6	108.9	115.2	122.0	128.4	134.7
7**	1	8.2	65.3	82.1	94.3	106.1	116.6	126.6	136.5	145.2	154.2	161.9	170.1
7*	1	8.7	68.5	83.9	99.3	110.7	122.9	133.8	142.4	152.4	161.9	170.6	178.7
7*	1	10.4	82.6	100.7	116.6	132.9	144.7	158.3	171.0	182.8	194.1	204.6	214.6
8*	1¼	17.3	129.7	152.4	186.9	215.5	241.3	264.0	285.3	304.8	323.4	341.1	357.4
8**	1½	15.1	113.9	133.4	163.3	188.7	210.9	231.3	249.5	266.7	283.0	298.5	313.0
8*	1½	24.2	151.0	213.6	261.3	302.1	337.5	369.7	399.6	426.8	453.1	477.6	500.8
9**	2	26.4	164.7	232.7	284.9	328.9	367.9	402.8	435.0	464.9	493.5	519.8	545.2
9*	2	34.6	215.5	304.8	373.8	431.4	482.2	528.4	570.6	610.1	646.8	682.2	715.3
Separator size inches	Valve size inches	Valve Kvs	Supply steam pressure (kPa)										
			90	97	103	138	172	207	241 [†]	276 [†]	310 [†]	345 [†]	—
5	½	0.3	7.5	7.8	8.1	9.3	10.4	11.4	12.3	13.2	14.0	14.7	—
5	½	0.65	14.1	14.5	15.0	17.7	19.5	21.3	23.1	24.9	26.3	27.7	—
6	½	1.1	24.5	25.4	26.3	30.4	34.0	37.2	39.9	43.1	45.4	48.1	—
6	½	1.9	41.3	43.1	44.5	51.3	57.6	63.0	68.0	73.0	77.6	81.6	—
6	½	2.81	61.2	63.5	65.8	76.2	85.3	93.4	101.6	108.4	115.7	122.0	—
6**	½	3.1	67.6	70.3	72.6	84.4	94.3	103.9	112.5	120.7	128.4	135.2	—
6*	½	3.8	82.6	85.7	88.9	103.0	115.7	127.0	137.4	148.3	157.4	166.0	—
7**	¾	4.3	93.9	97.5	101.2	117.5	132.0	145.2	157.4	168.3	178.7	188.7	—
7*	¾	4.8	103.0	107.0	111.1	128.8	145.2	159.7	172.8	185.1	196.9	207.7	—
7**	¾	5.4	116.1	120.7	125.2	145.6	163.7	180.1	195.0	208.7	221.8	264.1	—
7*	¾	6.5	140.6	145.6	151.5	176.4	198.2	217.7	235.9	252.7	268.1	283.0	—
7**	1	8.2	177.4	184.6	191.9	223.2	250.8	275.8	298.5	319.8	339.7	358.3	—
7*	1	8.7	186.9	194.6	201.9	235.0	264.0	290.3	314.3	336.6	357.4	377.4	—
7*	1	10.4	224.1	233.1	242.2	282.1	317.1	348.4	377.4	404.2	429.1	453.1	—
8*	1¼	17.3	373.8	388.7	403.7	469.9	528.4	580.6	628.7	673.6	715.3	754.8	—
8**	1½	15.1	327.0	340.2	352.9	411.4	462.2	508.0	550.2	589.2	626.0	660.4	—
8*	1½	24.2	523.0	544.3	564.7	658.2	739.8	812.8	880.4	943.0	1001.5	1056.9	—
9**	2	26.4	569.7	592.8	615.5	716.7	805.6	885.4	958.9	1026.9	1090.9	1151.2	—
9*	2	34.6	747.1	777.5	806.9	940.3	1056.4	1161.7	1257.4	1346.7	1430.6	1509.6	—

Notes:

All valves are Siebe valves available in bronze and stainless steel unless noted otherwise.

* This valve is available only in bronze.

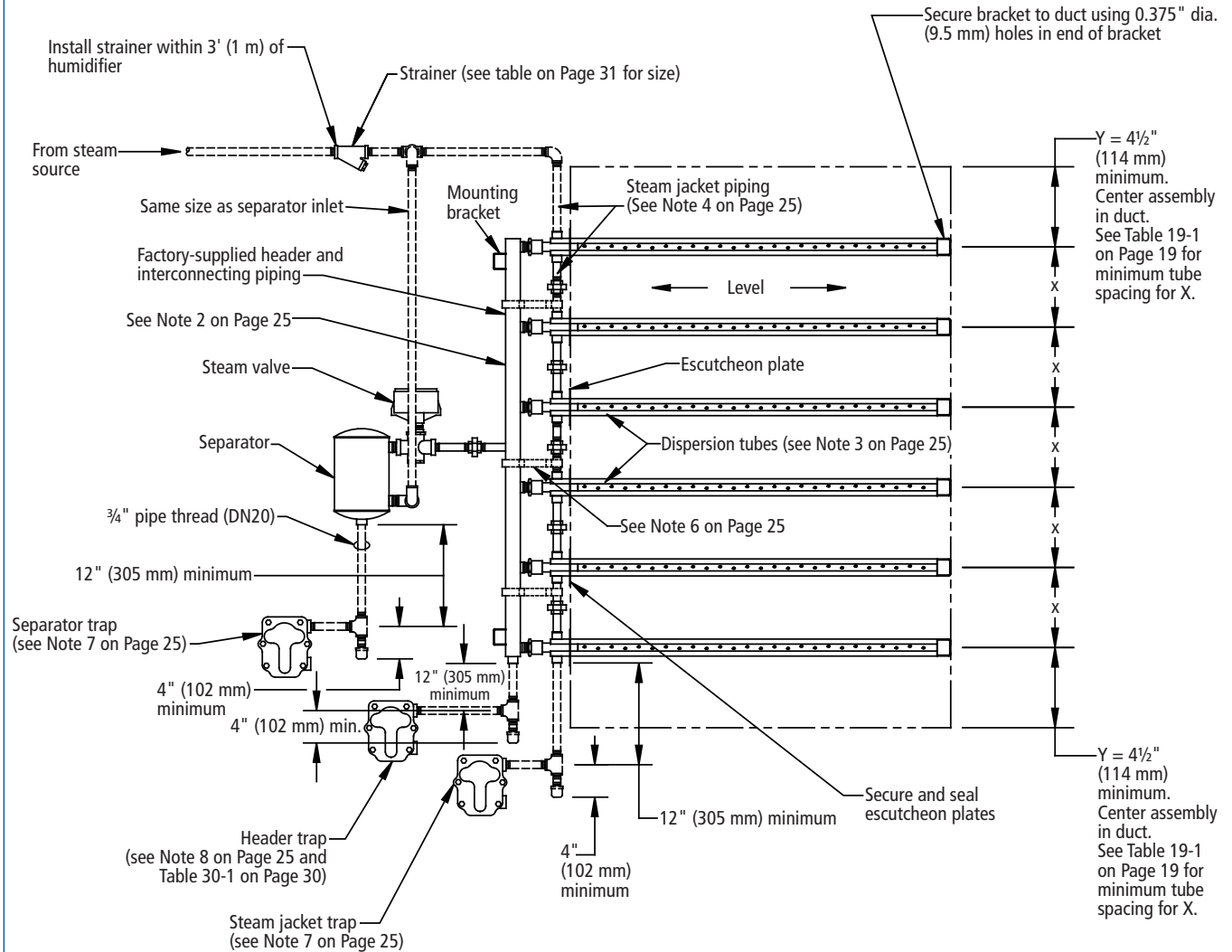
** This valve is available only in stainless steel.

† Valve manufacturer recommends not to exceed 241 kPa pressure drop across the valve.

Multiple-tube/Maxi-bank field piping example

Figure 23-1:
Maxi-bank humidifier with total tube length less than or equal to 45' (13.7 m) installed in a duct horizontal airflow

Elevation view (non-Clean-steam model shown)



Notes:

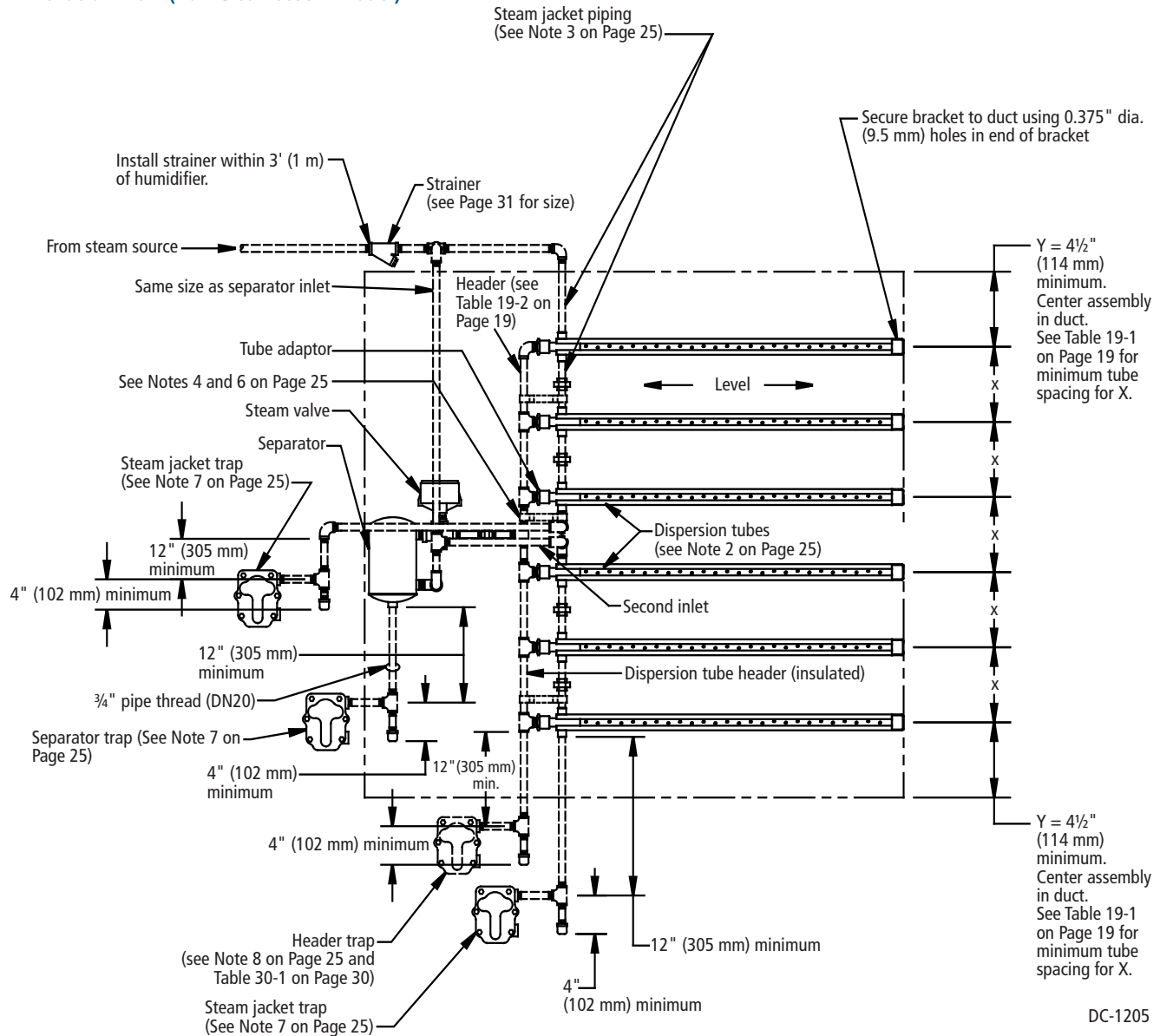
- To avoid metal fatigue, allow for thermal expansion of dispersion tubes.
- See Pages 25 and 30 for more installation information.

DC-1072

Multiple-tube/Maxi-bank field piping example

Figure 24-1:
Multiple tube humidifier with total tube length greater than 45' (13.7 m) in a duct with horizontal airflow

Elevation view (non-Clean-steam model)



DC-1205

Notes:

- To avoid metal fatigue, allow for thermal expansion of dispersion tubes.
- See Page 25 and 30 for more installation information.

Multiple-tube/Maxi-bank field piping example notes

Notes for Figures 18-2, 23-1 and 24-1

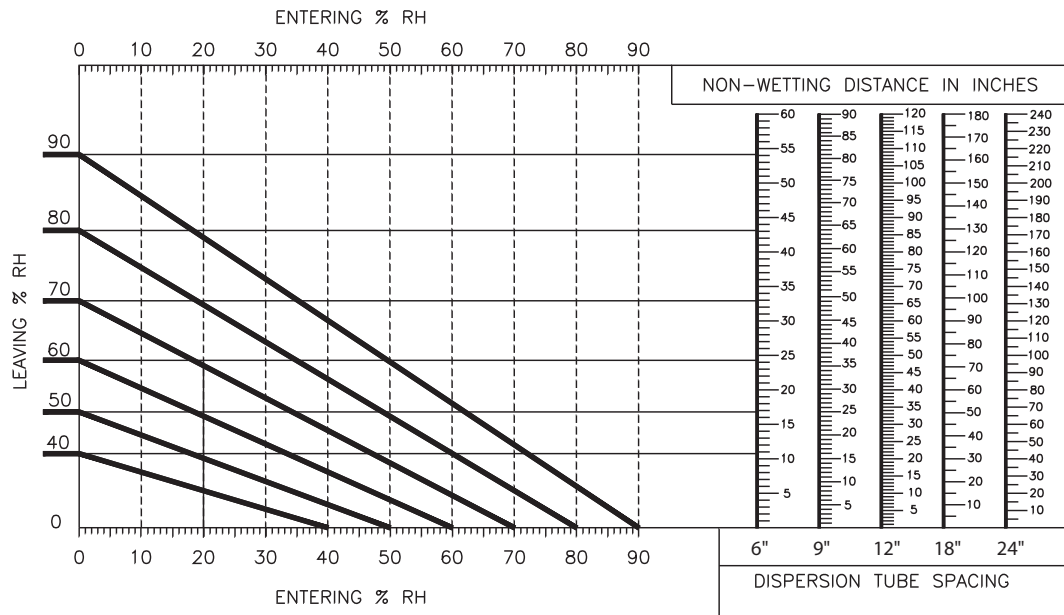
1. Dashed lines in drawings indicate provided by installer.
2. Drawings represents right-hand discharge.
3. Horizontal airflow (shown):
Slightly better mixing, with less visible vapor travel, occurs when discharged steam blows against the airflow rather than with the airflow. Therefore, **when using non-insulated steam jackets in a horizontal airflow** (as shown in the drawings), position dispersion tubelets (steam orifices) so that they face into the airflow. However, if the dispersion tube has an insulated jacket, the discharged steam must blow with the airflow to avoid condensation that may occur when discharged steam contacts the cooler insulated jacket. Therefore, **when using insulated steam jackets in a horizontal airflow**, position dispersion tubelets so that they discharge steam with the airflow, and also add 24" (610 mm) to the non-wetting distance.
Vertical airflow:
Always position tubelets (steam orifices) pointing up when installing in a vertical airflow. If steam jackets are insulated, install humidifier only in a vertical upflow application and add 24" (610 mm) to the non-wetting distance. **Do not install insulated jackets in a vertical downflow application.**
4. Jacket piping size: ½" pipe thread (DN15) for Series 60 tube(s)
¾" pipe thread (DN20) for Series 70 tube(s)
1½" pipe thread (DN40) for Series 80 tube(s)
5. See the strainer sizing table on Page 31 in this document.
6. After the unit is installed, secure steam jacket piping to the tube header.
7. For non-Clean-steam models (shown):
If steam pressure is less than or equal to 15 psi (103.4 kPa), use float and thermostatic (F&T) traps for the humidifier.
If steam pressure is greater than 15 psi (103.4 kPa), use inverted bucket traps for the humidifier. If lifting condensate, use an inverted bucket trap regardless of steam pressure. Inverted bucket traps may require priming after seasonal shutdown.
For Clean-steam models:
Use only stainless steel thermostatic traps and stainless steel piping. Provide a 12" (305 mm) minimum drop to trap plus a 24" (610 mm) minimum cooling leg before the trap as shown in Figure 7-2 on Page 7.
For all models:
During consistent load, there may not be enough pressure in the separator trap to lift condensate from the separator.
8. The header trap is required to collect condensate from the header assembly. Due to the pressure drop across the valve, the steam pressure at the header trap is minimal; therefore, you cannot lift condensate by steam pressure from this trap.
9. X = distance between tubes, center to center. Y = 4½" (114 mm) minimum. Center assembly in duct. See the minimum tube spacing table on Page 19.
10. See condensate drain piping and trapping information on Page 30.

For more installation information

See the Dri-calc Installation Guide library and/or the Steam Injection Installation, Operation, and Maintenance manual for more installation instructions. Dri-calc is DRI-STEEM's free sizing and selection software and can be ordered at www.dristeem.com. The manual can be viewed, printed, or ordered at www.dristeem.com

Multiple-tube/Maxi-bank humidifier non-wetting distances

Figure 26-1:
Multiple-tube/Maxi-bank humidifier non-wetting distances



Notes:

- The above data applies to all air velocities up to 1,500 fpm (7.6 m/s), and are based on air leaving the zone of humidification at conditions of 55 °F (13 °C) and the stated % RH.
- Add 24" (610 mm) to the non-wetting distance when using insulated jackets.

Determining non-wetting distance

- See Page 12 for instructions about how to determine non-wetting distance.
- See "Important notes" on Page 12.
- See "Important notes about non-wetting distances" on Page 17.

Area-type humidifier

Area-type humidifier

The Area-type humidifier is designed for open spaces, such as warehouses and manufacturing spaces, that do not have a duct system. The steam discharged from the humidifier is dispersed by the fan. The Area-type humidifier quietly distributes steam without introducing water into the air.

Application note

Steam discharged from the humidifier turns into a fog that is lighter than air. Should this fog contact any solid surface before it is absorbed, it may collect as water and drip. Observe the minimum non-wetting distances for rise, spread, and throw in Table 27-1

Figure 27-1:
Area-type humidifier



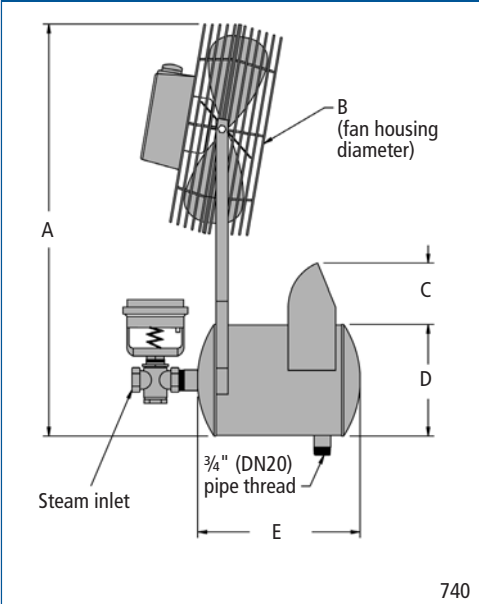
Table 27-1:
Area-type humidifier minimum distances for rise, spread, and throw

Maximum steam capacity		60 °F (16 °C)																	
		30% RH						40% RH						50% RH					
		Rise		Spread		Throw		Rise		Spread		Throw		Rise		Spread		Throw	
lbs/hr	kg/h	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m
50	20	1	0.3	2	0.6	6	1.8	1	0.3	2	0.6	6	1.8	1	0.3	2.5	0.8	6	1.8
75	34	3	0.9	3	0.9	8	2.4	3	0.9	3	0.9	8	2.4	3	0.9	4	1.2	8	2.4
100	45	4	1.2	4	1.2	10	3.1	4	1.2	4	1.2	10	3.1	4	1.2	5	1.5	10	3.1
150	68	6	1.8	5	1.5	12	3.7	6	1.8	5	1.5	12	3.7	6	1.8	5	1.5	12	3.7
200	90	7	2.1	7	2.1	13	4.0	8	2.4	7	2.1	14	4.3	8	2.4	7	2.1	14	4.3
225	102	7	2.1	7	2.1	13	4.0	8	2.4	7	2.1	14	4.3	8	2.4	7	2.1	14	4.3
250	110	8	2.4	8	2.4	15	4.6	9	2.7	9	2.7	16	4.9	9	2.7	9	2.7	16	4.9
285	130	9	2.7	9	2.7	17	5.2	10	3.1	10	3.1	18	5.5	10	3.1	10	3.1	18	5.5
300	136	9	2.7	9	2.7	17	5.2	10	3.1	10	3.1	18	5.5	10	3.1	10	3.1	18	5.5

Maximum steam capacity		70 °F (21 °C)																	
		30% RH						40% RH						50% RH					
		Rise		Spread		Throw		Rise		Spread		Throw		Rise		Spread		Throw	
lbs/hr	kg/h	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m	ft	m
50	20	1	0.3	1.5	0.5	4	1.2	1	0.3	2	0.6	4	1.2	1	0.3	2	0.6	4	1.2
75	34	2	0.6	2	0.6	6	1.8	2	0.6	2.5	0.8	6	1.8	2	0.6	2.5	0.8	6	1.8
100	45	3	0.9	3	0.9	8	2.4	3	0.9	3	0.9	8	2.4	3	0.9	3	0.9	8	2.4
150	68	4	1.2	4	1.2	10	3.1	4	1.2	4	1.2	11	3.4	4	1.2	4	1.2	11	3.4
200	90	5	1.5	5	1.5	11	3.4	5	1.5	5	1.5	12	3.7	5	1.5	5	1.5	12	3.7
225	102	5	1.5	5	1.5	11	3.4	5	1.5	5	1.5	12	3.7	5	1.5	5	1.5	12	3.7
250	110	6	1.8	6	1.8	12	3.7	6	1.8	6	1.8	13	4.0	6	1.8	6	1.8	14	4.3
285	130	7	2.1	7	2.1	14	4.3	7	2.1	7	2.1	15	4.6	7	2.1	7	2.1	16	4.9
300	136	7	2.1	7	2.1	14	4.3	7	2.1	7	2.1	15	4.6	7	2.1	7	2.1	16	4.9

Area-type humidifier dimensions and components

Figure 28-1:
Area-type humidifier dimensions

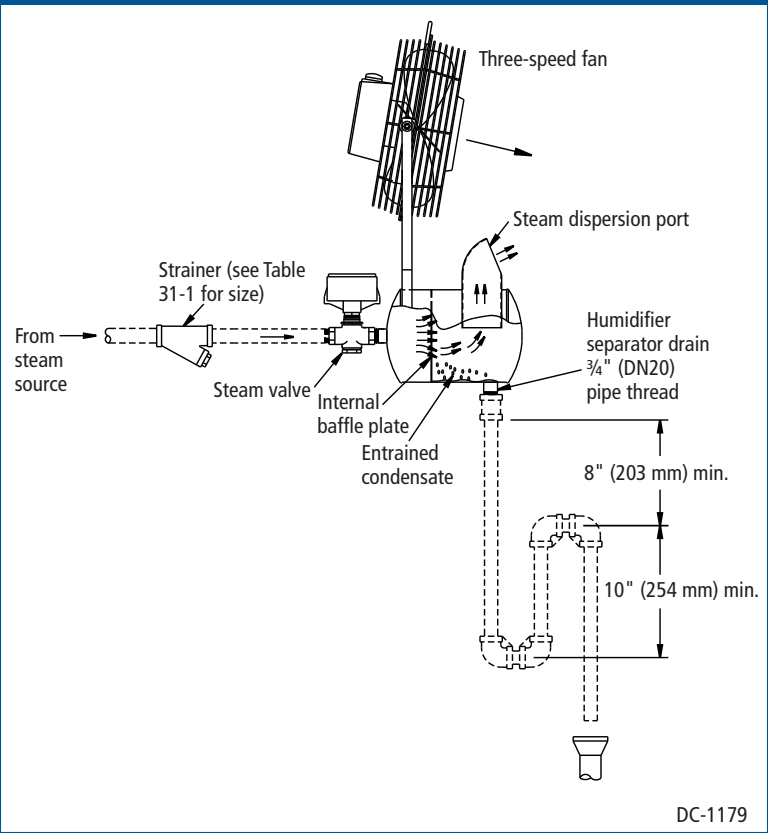


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Table 28-1:
Area-type humidifier dimensions

Fan type	A		B		C		D		E	
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm
Pneumatic	25.5	648	11	280	4.75	121	7.13	181	9.5	241
Electric	27	686	14	357	4.75	121	7.13	181	9.5	241

Figure 28-2:
Area-type humidifier components and installation overview



Area-type humidifier capacities

Table 29-1:
Area-type humidifier maximum capacities in lbs/hr

Valve size	Valve Cv	Steam pressure in psi													
inches		2	3	4	5	6	7	8	9	10	11	12	13	14	15
½	0.1	1.8	2	2.3	2.5	2.8	3	3.2	3.4	3.6	3.8	4	4.2	4.3	4.5
½	0.22	3.9	4.5	5	5.6	6.1	6.6	7	7.5	7.9	8.4	8.8	9.2	9.5	9.9
½	0.4	6.5	8.0	9.2	10.3	11.3	12.2	13.0	13.8	14.5	15.3	15.9	16.6	17.2	17.8
½	0.75	12	15	17	19	21	23	24	26	27	29	30	31	32	33
½	1.3	21	26	30	33	37	40	42	45	47	50	52	54	56	58
½	2.2	36	44	51	57	62	67	72	76	80	84	88	91	95	98
½	3.25	53	65	75	84	92	99	106	112	118	124	129	135	140	145
½	4.4	72	88	101	113	124	134	143	152	160	168	175	182	189	196
¾	5.5	89	110	127	141	155	167	179	190	200	210	219	228	237	245
¾	7.5	122	149	173	193	211	229	244	259	272	286	—	—	—	—
1	10	163	199	230	257	282	—	—	—	—	—	—	—	—	—
1	12	195	239	276	—	—	—	—	—	—	—	—	—	—	—

Note:
All valves are Siebe bronze valves.

Table 29-2:
Area-type humidifier maximum capacities in kg/h

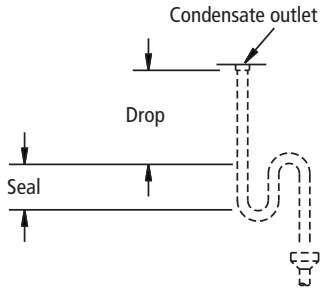
Valve size	Valve Kvs	Steam pressure in kPa													
inches		14	21	28	34	41	48	55	62	69	76	83	90	97	103
½	0.09	0.8	0.9	1.0	1.1	1.3	1.4	1.5	1.5	1.6	1.7	1.8	1.9	2.0	2.0
½	0.19	1.8	2.0	2.3	2.5	2.8	3.0	3.2	3.4	3.6	3.8	4.0	4.2	4.3	4.5
½	0.35	3.0	3.6	4.2	4.7	5.1	5.5	5.9	6.3	6.6	6.9	7.2	7.5	7.8	8.1
½	0.65	5.5	6.8	7.8	8.7	9.6	10.4	11.1	11.7	12.4	13.0	13.6	14.1	14.6	15.2
½	1.12	9.6	11.7	13.6	15.2	16.6	17.9	19.2	20.3	21.4	22.5	23.5	24.5	25.4	26.3
½	1.90	16.2	19.9	23.0	25.7	28.1	30.4	32.5	34.4	36.3	38.1	39.8	41.4	42.9	44.5
½	2.81	24.0	29.4	33.9	37.9	41.5	44.9	48.0	50.9	53.6	56.2	58.7	61.1	63.4	65.7
½	3.81	32.5	39.8	45.9	51.3	56.2	60.7	64.9	68.9	72.6	76.1	79.5	82.8	85.9	88.9
¾	4.76	40.6	49.7	57.4	64.2	70.3	75.9	81.2	86.1	90.7	95.2	99.3	103.4	107.5	111.1
¾	6.49	55.3	67.8	78.3	87.5	95.8	103.9	110.7	117.5	123.4	129.7	—	—	—	—
1	8.65	73.9	90.3	104.3	116.6	127.9	—	—	—	—	—	—	—	—	—
1	10.38	88.5	108.4	125.2	—	—	—	—	—	—	—	—	—	—	—

Note:
All valves are Siebe bronze valves.

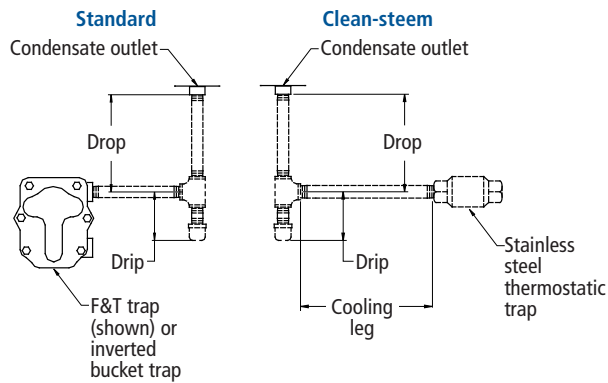
Condensate drain piping and trapping

Figure 30-1:
Condensate drain piping and traps for Steam Injection humidifiers

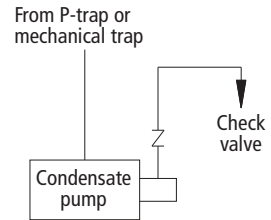
P-trap dimensions



Mechanical trap dimensions



Lifting condensate



Note:
Use condensate pump rated for 212 °F (100 °C) and suitable for lifting 250 gph (16 L/m) at required head (60 kPa). Stainless steel pump recommended for Clean-steam applications.

Table 30-1:
Condensate drain piping and traps for Steam Injection humidifiers

	Single-tube, Multiple-tube, Maxi-bank, Mini-bank humidifiers						Area-type humidifier
	Piping from separator***		Piping from steam jackets		Piping from header		Piping from separator
	Standard	Clean-steam	Standard	Clean-steam	Standard	Clean-steam	Standard
P-trap water seal	Don't use	Don't use	Don't use	Don't use	Don't use	Don't use	Use with minimum: Drop: 8" Seal: 10"
F&T trap	Use if steam pressure is ≤ 15 psi Drop: 12" Drip: 4"	Don't use	Use only if not lifting condensate and steam pressure is ≤ 15 psi Drop: 12" Drip: 4"	Don't use	Use with minimum: Drop: 12" Drip: 4"	Don't use	Don't use
Inverted bucket trap*	Use if steam pressure is > 15 psi Drop: 12" Drip: 4"	Don't use	Use only if lifting condensate or if steam pressure is > 15 psi Drop: 12" Drip: 4"	Don't use	Don't use	Don't use	Don't use
Stainless steel thermostatic trap	Don't use	Use with stainless steel piping with minimum: Drop: 12" Drip: 4" Cooling leg: 24"	Don't use	Use with stainless steel piping with minimum: Drop: 12" Drip: 4" Cooling leg: 24"	Don't use	Use with stainless steel piping with min.: Drop: 12" Drip: 4" Cooling leg: 24"	Don't use
Return condensate to boiler via nonpressurized return line?	Yes	Yes	Yes	Yes	Yes	Yes	No
Return condensate by condensate pump?	Yes	Yes**	Yes	Yes**	Yes	Yes**	Yes
Drain condensate to open drain?	Yes	Yes	Yes	Yes	Yes	Yes	Recommended

Notes:

* Trap may require priming after seasonal shutdown.

** DRI-STEEM recommends using a stainless steel condensate pump when pumping Clean-steam condensate.

*** During consistent load, there may not be enough steam pressure in the separator to lift condensate from the separator using steam.

Strainer sizes

Table 31-1:
Steam Injection humidifier strainer sizes

Entering steam pressure		NON-CLEAN-STEEM MODELS: Strainer size in inches (DN) based on steam output in lbs/hr and kg/h															
		½" (DN15)		¾" (DN20)		1" (DN25)		1½" (DN40)		2" (DN50)		2½" (DN65)		3" (DN80)		4" (DN100)	
psi	kPa	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h
2	14	30	14	65	29	85	39	200	91	300	136	500	227	640	290	950	431
5	34	50	23	100	45	145	66	330	150	500	227	810	367	1050	476	1600	726
10	69	65	29	120	54	190	86	450	204	760	345	1100	499	1635	742	2500	1134
15	103	75	34	140	64	230	104	540	245	900	408	1320	599	2060	934	3360	1524
20	138	85	39	160	73	260	118	625	284	1150	522	1550	703	2310	1048	4100	1860
25	172	95	43	180	82	300	136	720	327	1200	544	1750	794	2690	1220	4720	2141
30	207	110	50	200	91	340	154	790	358	1350	612	2000	907	3120	1415	5500	2495
35	241	120	54	220	100	360	163	860	390	1450	658	2200	998	3500	1588	6300	2858
40	276	130	59	245	111	400	181	960	435	1620	735	2350	1066	3700	1678	6550	2971
45	310	140	64	270	122	440	200	1035	469	1705	773	2430	1102	3850	1746	6840	3103
50	345	150	68	290	132	470	213	1100	499	1800	816	2500	1134	4000	1814	7100	3221
Entering steam pressure		CLEAN-STEEM MODELS: Strainer size in inches (DN) based on steam output in lbs/hr and kg/h															
		½" (DN15)		¾" (DN20)		1" (DN25)		1½" (DN40)		2" (DN50)		2½" (DN65)		3" (DN80)		4" (DN100)	
psi	kPa	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h	lbs/hr	kg/h
2	14	20	9	45	20	60	27	120	54	255	116	385	175	540	245	945	429
5	34	35	16	80	36	100	45	200	91	420	191	660	299	925	420	1620	735
10	69	50	23	120	54	160	73	315	143	650	295	1045	474	1465	665	2565	1163
15	103	65	29	155	70	210	95	420	191	870	395	1405	637	1970	894	3440	1560
20	138	80	36	190	86	260	118	515	234	1060	481	1750	794	2455	1114	4295	1948
25	172	95	43	210	95	310	141	620	281	1280	581	1990	903	2840	1288	5050	2291
30	207	110	50	230	104	360	163	730	331	1500	680	2225	1009	3205	1454	5700	2586
35	241	125	57	250	113	405	184	830	376	1625	737	2445	1109	3550	1610	6260	2840
40	276	135	61	270	122	450	204	935	424	1750	794	2665	1209	3850	1746	6820	3094
45	310	145	66	290	132	495	225	1020	463	1875	851	2850	1293	4100	1860	7300	3311
50	345	155	70	310	141	540	245	1110	503	2000	907	3075	1395	4450	2019	7900	3583

Notes:

- Capacity for non-Clean-steam model strainers is based on maximum 8,000 fpm (40.6 m/s) velocity through strainer.
- Capacity for Clean-steam model strainers is based on maximum 10,000 fpm (50.8 m/s) velocity through strainer.
- Strainer capacity limited to maximum pressure drop across strainer at 5% inlet steam pressure.
- Choose strainer size based on maximum flow through steam valve except for Multiple-tube/Maxi-bank humidifier with yoke assembly (multiple valves) where strainer size choice is based on combined maximum flow through all valves.

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For more than 40 years, DRI-STEEM has been leading the industry with creative and reliable humidification solutions. Our focus on quality is evident in the construction of our Steam Injection humidifiers, which feature cleanable stainless steel construction and a Two-year Limited Warranty.

For more information

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Drane-kooler™

The Drane-kooler mixes cold water with hot discharge water to reduce the water temperature before it enters the drain system. This complies with code requirements and prevents damage to PVC drain piping.



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