

## SCRUBBERS



- *wet scrubbers*
- *chrome (CMP) scrubbers*
- *mist eliminators (CMP)*
- *exhaust fans*
- *exhaust hoods*
- *canopy hoods*
- *ductwork*
- *installation*
- *maintenance programs*
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Mapco offers a complete line of quality built, corrosion-resistant horizontal and vertical fume scrubbers.

## MAPCO FUME SCRUBBERS

Mapco fume scrubber design is based on wetted, packed bed technology to achieve removal of water soluble contaminants, soluble gas and particulate matter through Mass Transfer (gas absorption) and Impingement (mechanical separation).

- **Gas Absorption** - Noxious or otherwise undesirable gasses are absorbed into the liquid phase.
- **Impingement** - Particulate matter is removed through impingement as it is first forced through a wetted packed bed and then through a chevron blade or mesh pad filter section.

Supplied in either counter-current flow (vertical) or cross-current flow (horizontal), these rugged units can be supplied with extended packed beds or in series.

### MW-100 Horizontal (cross flow)

When horizontal installation is required, the MW-100 is preferred. This compact unit is ideal for mezzanine or roof top mounting when a low profile is desired. Equipped with remote recirculation, the MW-100 is perfect for roof top mounting in cold climates.

### MW-200 Fan Scrubber (counter-current flow)

The MW-200 is an economical, space saving unit equipped with built-in fan. The fan can be rotated 90° in (4) directions and eliminates the need for transitions and ductwork between the fan and scrubber. This unit is shipped in two pieces and is bolted together on site.

### MW-300 Vertical (counter-current flow)

This design works well when floor space is at a premium and is especially effective when greater bed depths or multiple-stage systems are required for gas absorption. The MW-300 can be equipped with a stack fan and also works well with a pedestal base fan mounted on the roof or mezzanine.

## OPERATING PRINCIPLES

Contaminant removal is accomplished by first slowing the exhaust air to a velocity of less than 500 fpm. Scrubber liquor is recirculated from the self contained sump or remote tank and sprayed into a bed of corrosion-resistant, non-clogging, packing media. Depending on the application, the wetted pack surface provides a large area for

liquid/gas contact, allowing absorption of noxious gas and/or impingement of chemical mists.

Once through the packed bed and prior to exiting the scrubber, the mist laden exhaust air must pass through a two stage gravity mist eliminator section. The first stage consists of a drop out area whereby the larger droplets fall out of the air stream. Secondly, the smaller mist particles are removed by an integral, vertically or horizontally mounted PVC chevron type mist eliminator providing four 30° directional changes in air flow. Contaminants are then carried away in the wash water via the overflow.

Contaminants that are highly soluble in water usually require less packing. Removal of contaminants which are low in solubility can be enhanced with the addition of a chemical scrubbing agent (pH or ORP system) and in some cases by installing a pre-filter at the exhaust hood or prior to the scrubber.

## RECIRCULATION RATES/ WATER CONSUMPTION

Recirculation rates through Mapco fume scrubbers are expressed in terms of GPM per cross-sectional area (ft<sup>2</sup>) of the scrubbing media. Optimal recirculation rates through your fume scrubber will be determined by Mapco application engineers, and will usually depend upon the removal efficiency desired, in conjunction with the bed depth and type of packing media. Gases with low solubility typically require higher liquid-to-gas ratios for optimal scrubbing efficiency within the packed bed. Applications primarily involving mist require much lower liquid-to-gas ratios. As scrubber liquor and exhaust air collide within the vessel, some of the recirculated water will be evaporated and carried off as gaseous H<sub>2</sub>O, especially in warm arid climates. Fresh water must be added to the scrubber sump to maintain the proper balance and liquid level. A float valve can be installed in the sump to make up for evaporation losses only. Most scrubbers are operated on a constant-overflow basis. A constant volume of fresh water is metered into the sump, and a constant effluent is produced as the sump overflows through a fitting for this specific purpose. The constant overflow is necessary to keep chemical concentration as dilute as possible.

The addition of an optional float valve, timer and actuated ball valve in conjunction with a pH control system, allows for scheduled batch blow-down of the scrubber effluent, resulting in less water consumption and lower waste treatment costs. Alternatively, the wet scrubber can be configured to blow-down a continuous low volume effluent to waste treatment, under pump pressure.

## MAINTENANCE

Experience has taught us that the best engineered systems can fail if they are not easily maintainable. With this in mind we have made every effort to include as a standard, the features that too often are overlooked or supplied as options on

comparable equipment. As a result, Mapco scrubbers require the least amount of maintenance of any competitive product available.

## STANDARD FEATURES

- **Corrosion-Resistant 3/8" Thick PVC Shell Construction**
- **2" X 3/4" Thick Inlet and Outlet Flanges**
- **Heavy Duty Coated Steel Channel Base**
- **Flanged Spray Headers with Unions, Easily Removable for cleaning**
- **Packing Removal and Fill Doors**
- **Proprietary Chevron Mist Eliminator Section**
- **Liquid Regulation Valves for Precision Adjustment**
- **Overflow and Drain**
- **Vertical, Sealless CPVC Pumps with Run-Dry Capability**
- **In-Line Strainer to Prevent Nozzle Plugging**
- **Easily Removable Recirculation Pump**
- **External Sump Box (self-contained only) with Quick Access Door**
- **Flow Meter for Regulation of Fresh Water Make-up**
- **Helical or Open-Orifice Spray Nozzles... non-clogging**
- **Clear PVC Inspection Doors**
- **Polypropylene Mesh Pad Mist Eliminator**

## OPTIONAL FEATURES

- **pH / ORP Control System**
- **Automatic Batch Blowdown System**
- **Common Base for Scrubber and Fan**
- **Dual Mist Eliminators**
- **Magnehelic or Photohelic Gauge**
- **Inline Rotameters to indicate recirculated flow**
- **Solenoid Valve - Fresh Water Make-up**
- **Air or Liquid Flow Switch for Alarm**
- **Fume Arrestor™ Mist Pre-filter**
- **Polypropylene/FRP/SS Construction**
- **Liquid Level Controls**
- **Clear PVC Inlet Transition for Inspection**

# pH Control System

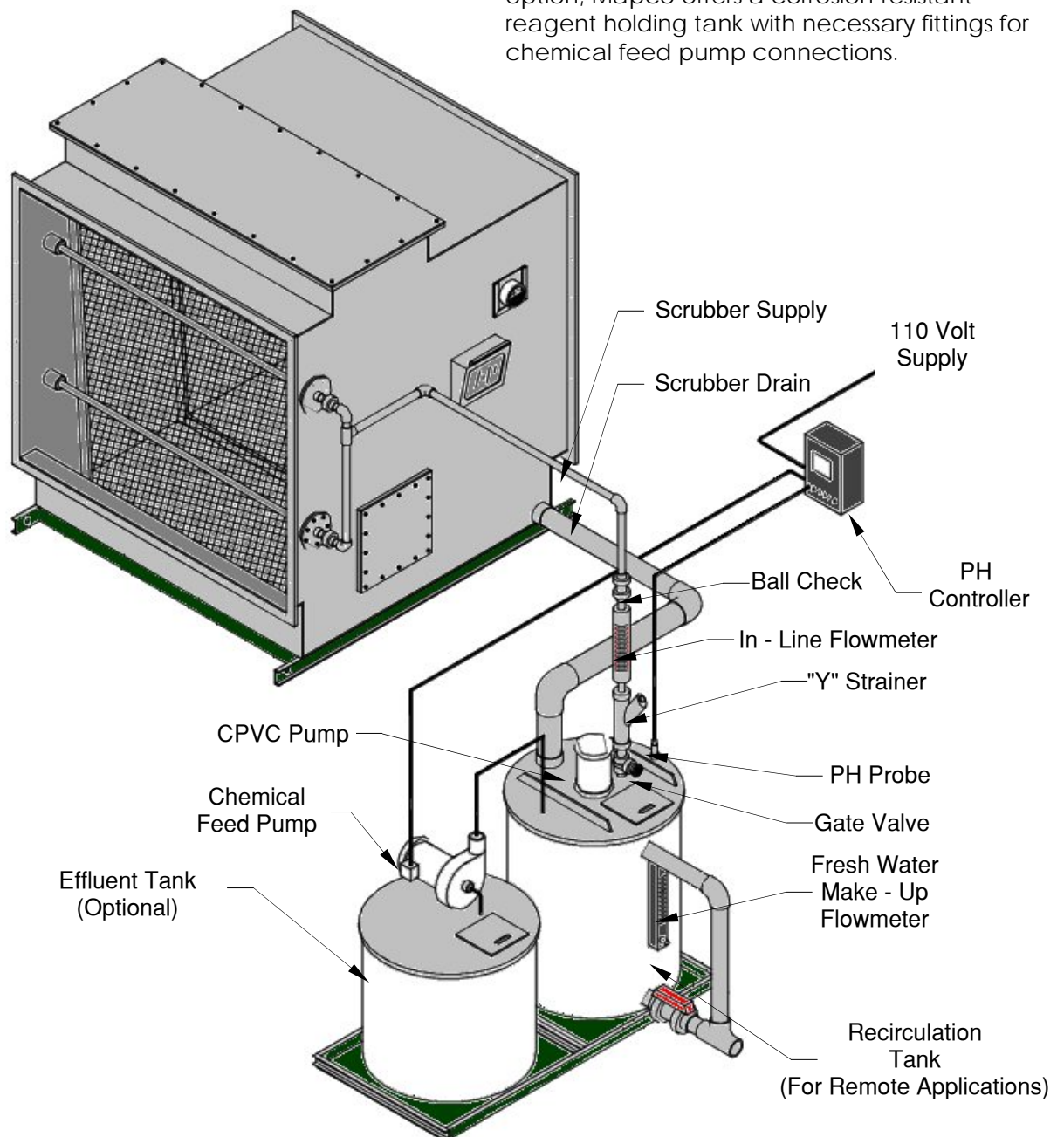
Mapco scrubbers utilize water as the main scrubbing agent. In certain cases contaminants which are low in solubility require the addition of chemical additives to:

1. Neutralize contaminants in the fume scrubber.
2. Provide precise control over effluent quality and quantity.

Mapco offers a pH control system to monitor and adjust the scrubbing liquor when necessary. This optional equipment can be incorporated into a new design as well as an existing installation.

The addition of an optional float valve, timer and actuated ball valve, in conjunction with a pH control system, allows scheduled batch blow-down of the scrubber effluent resulting in less water consumption and lower waste treatment costs. The Mapco pH control system consists of :

1. Weather-tight, corrosion-resistant enclosure containing a pH analyzer, terminal block and side wall mounted weather-proof electrical connections.
2. pH probe with cable
3. Chemical feed pump with check valve. As an option, Mapco offers a corrosion-resistant reagent holding tank with necessary fittings for chemical feed pump connections.

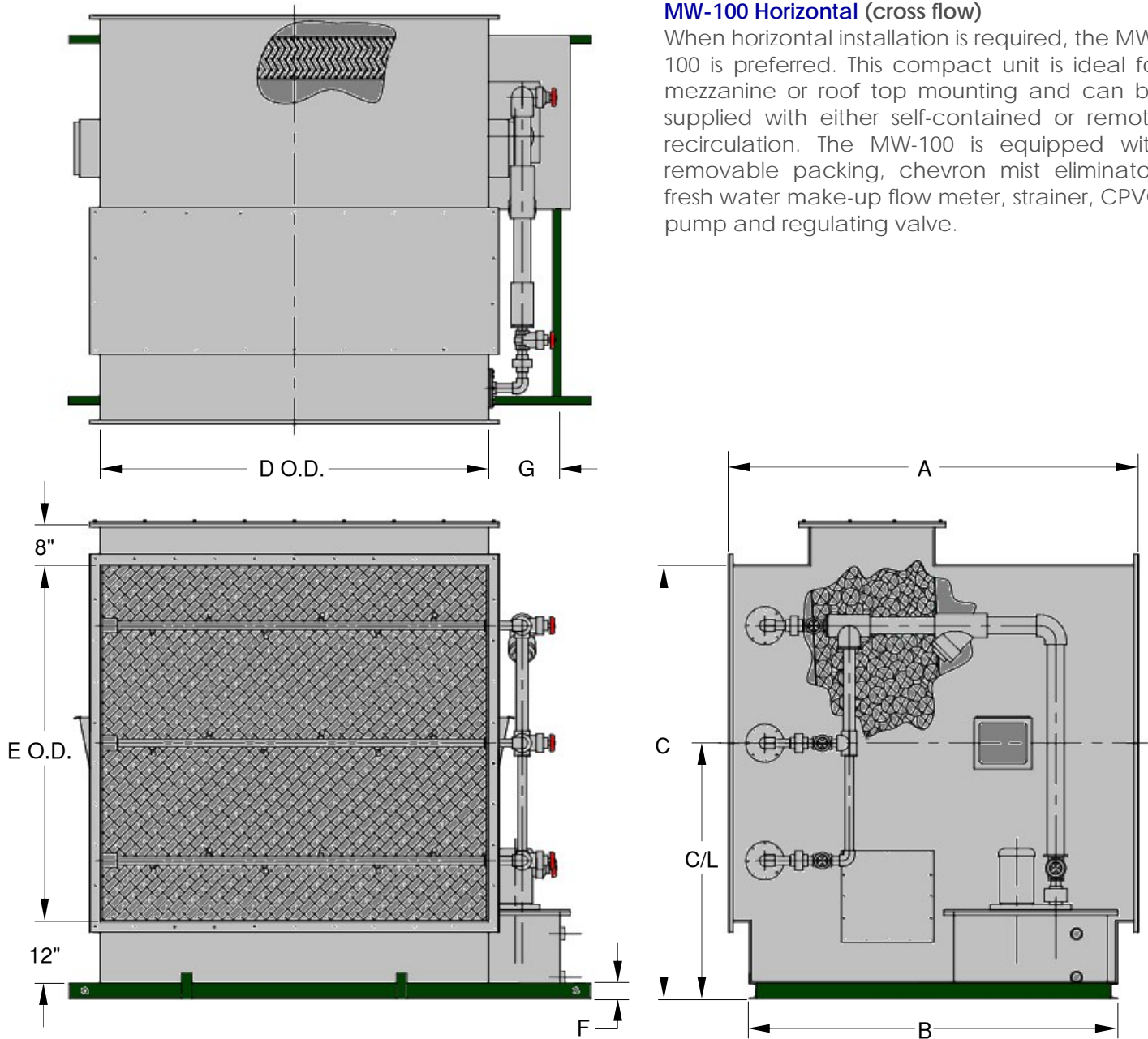




# MW-100

## MW-100 Horizontal (cross flow)

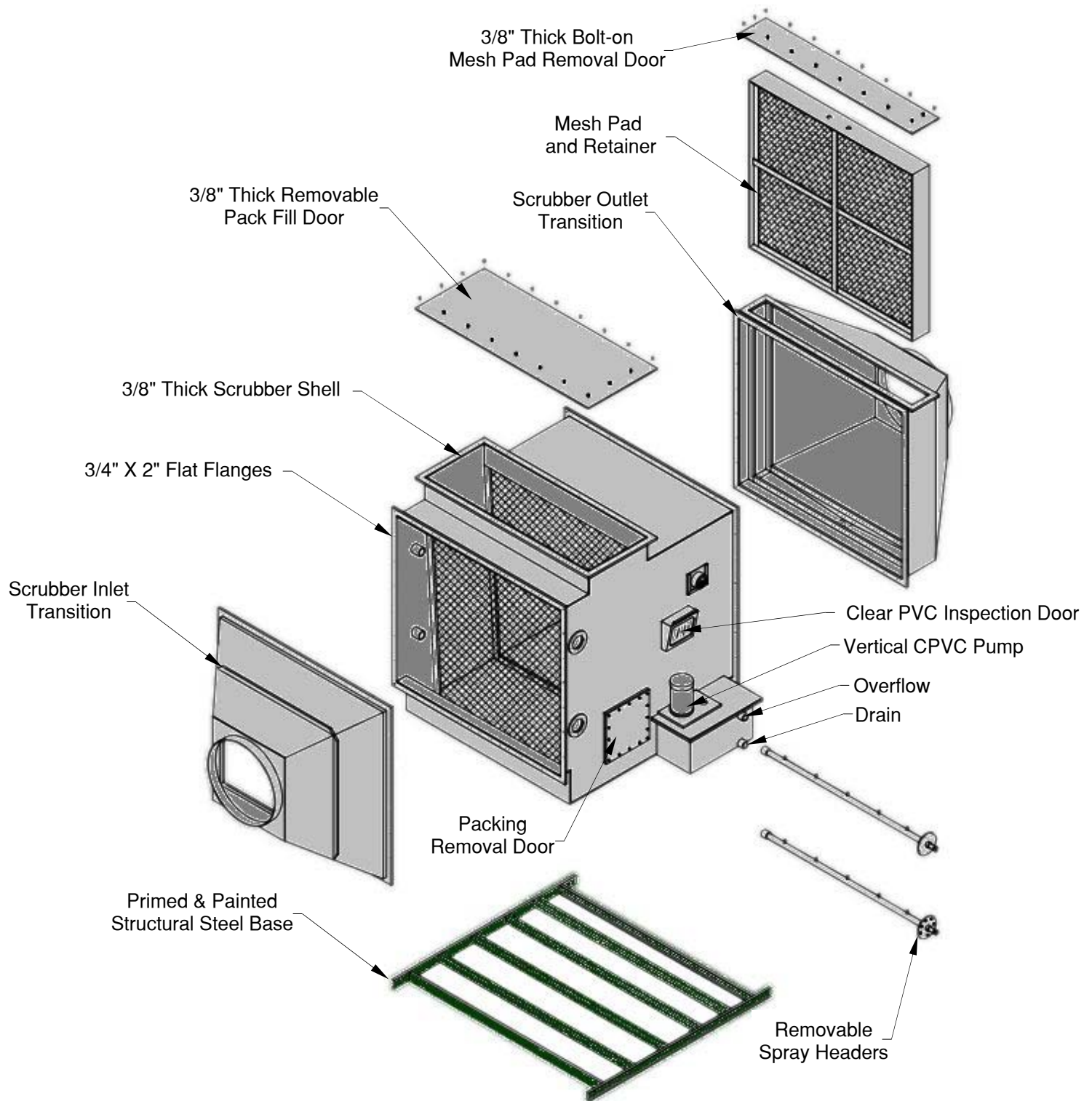
When horizontal installation is required, the MW-100 is preferred. This compact unit is ideal for mezzanine or roof top mounting and can be supplied with either self-contained or remote recirculation. The MW-100 is equipped with removable packing, chevron mist eliminator, fresh water make-up flow meter, strainer, CPVC pump and regulating valve.



**DIMENSIONS [inches]** Note: See page 10 for scrubber weights and transition lengths.

CFM	0.5	1	2	3	4	5	6	8	10	12	14	16	18	20	22	24	26	28	30	35	40	45	50	55	60
A	72												80												
B	64												72												
C	28	32	38	40	42	48	55	67	69	75	83	85	91						93						
D	16	24	28	38	48		50	52	62	68		76	80	88	96	106	114	124	132	154	176	198	220	242	264
E	14	18	24	26	28	34	40	52	54	60	68	70	75												
F	2						3						4						6						
G	14												16												
C.L.	21	23	26	27	28	31	35	41	42	45	49	50	53½						55½						
Pump Size	3/4				1	1.5			2				3				5				2-3	2-3	2-5		
Header Size	1/2	3/4			1			1-1/4		1-1/2	2				2-1/2				3				3-1/2		
Nozzle Qty	1	2	2	3	5	6	7	10	12	15	15	18	21	24	24	27	30	33	33	39	51	51	57	63	69
Pack Area	2	3	5	7	9	11	14	19	23	28	32	37	42	46	50	55	59	65	69	80	92	103	115	126	138
Remote Drain	2							3							4										

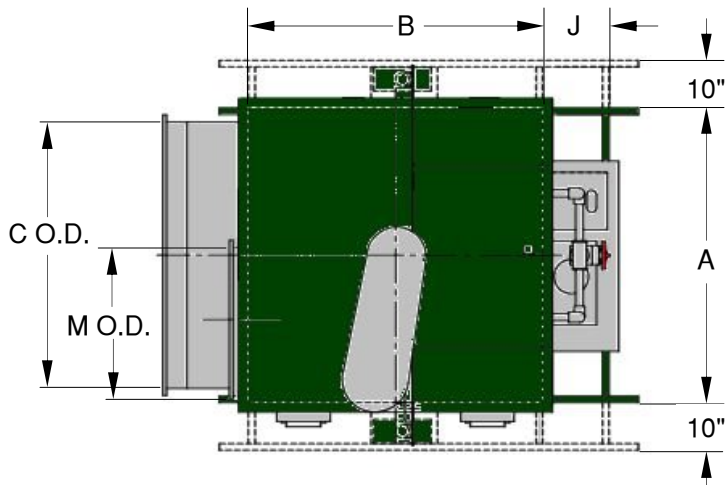
# MW-100 PARTS



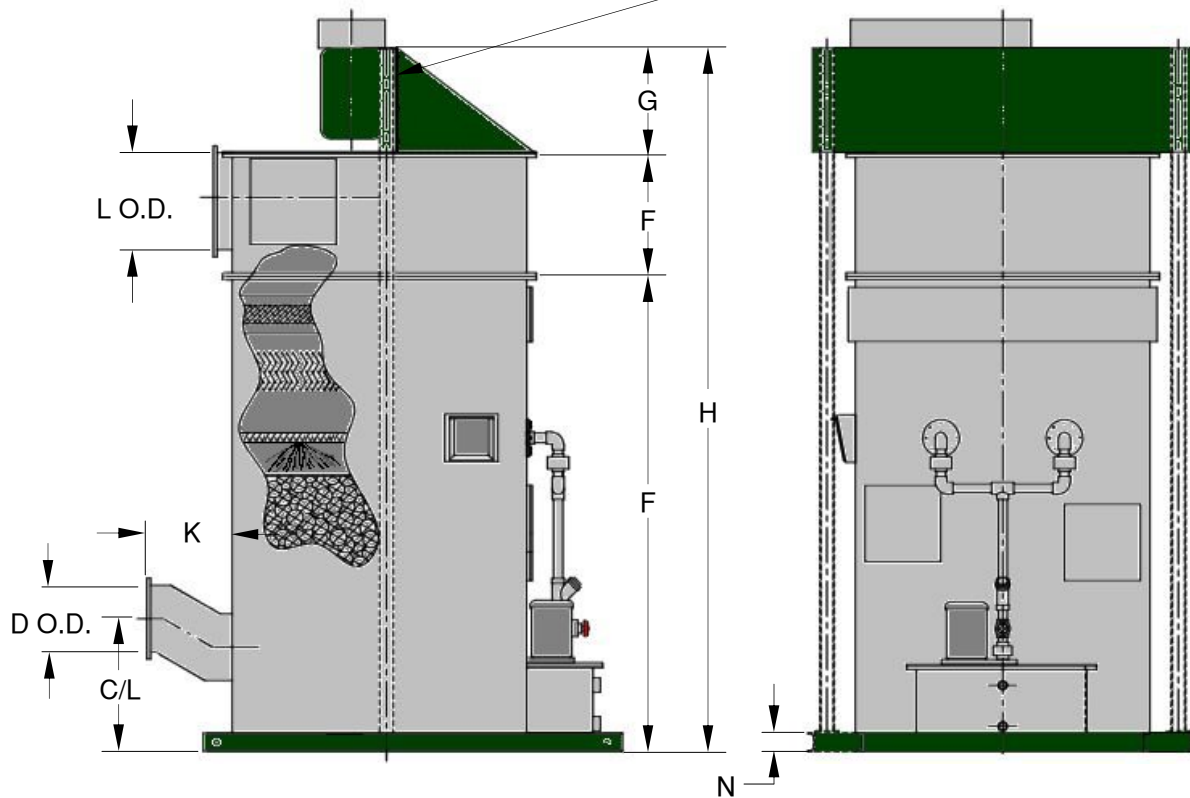
# MW-200

## MW-200 Vertical (counter-current flow) with Blower

The MW-200 is an economical, space saving unit equipped with built-in blower. The fan can be rotated 90° in four directions and eliminates the need for transitions and ductwork between the fan and scrubber. This unit is shipped in two pieces and is bolted together at the jobsite. The MW-200 is equipped with removable packing, mist eliminator, fresh water make-up flow meter, strainer, CPVC pump and regulating valve.



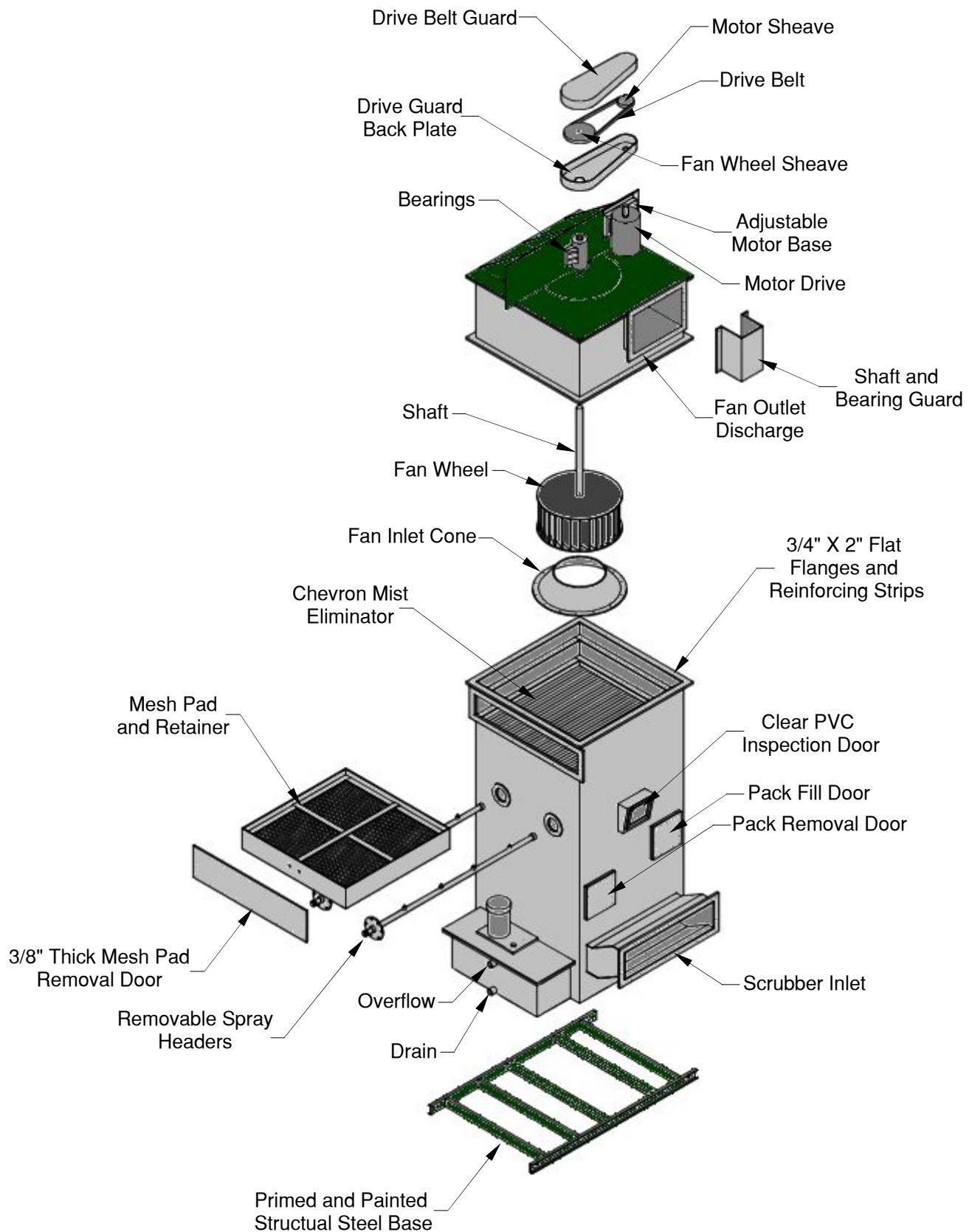
### Steel Fan Support Legs (10,000 & 12,000 CFM Units Only)



**DIMENSIONS [inches]** Note: See page 10 for scrubber weights and transition lengths.

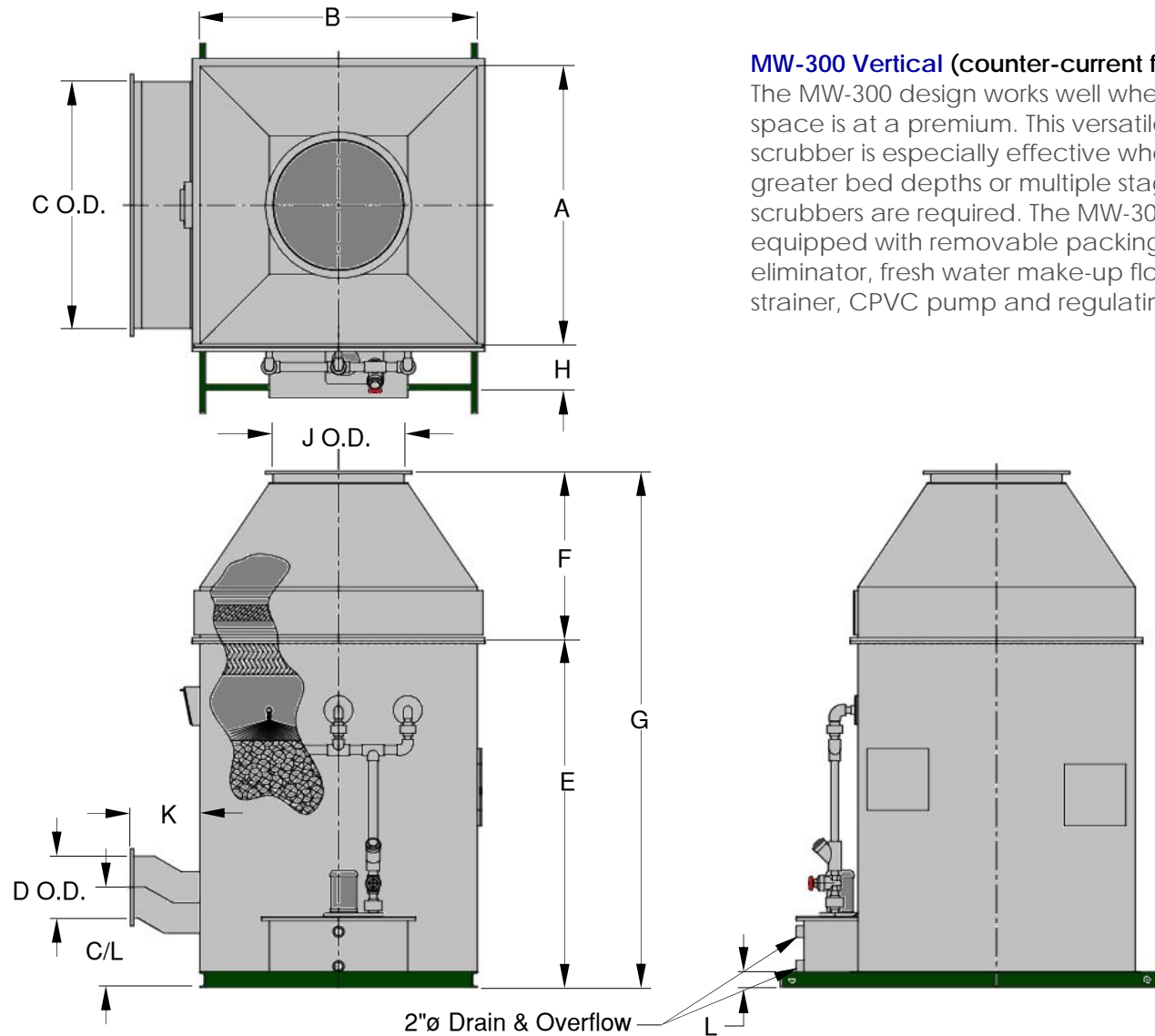
CFM	FAN SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	C.L.	Pump Size	Header Size	Nozzle Qty	Pack Area	Drain Remote
0.5	126	22	22	8	4	78	11-1/2	14	103½	14	13	6	5-3/8	2	14	3/4	3/4	1	3.3	2
1000	12	27	27	16	4	78	24	16	118	14	13	9-5/8	13-3/4	2	14	3/4	3/4	1	5	2
2000	12	29	29	16	8	82	24	16	122	14	14	9-5/8	13-3/4	2	16	1-1/2	3/4	2	5.8	2
3000	15	32	32	24	8	83	24	16	123	14	14	11-5/8	16-7/8	3	17	1-1/2	3/4	3	7.1	2
4000	18	38	38	26	10	85	24	16	125	14	16	14-1/8	20-1/2	3	18	1-1/2	1	4	10	2
5000	18	40	40	32	10	85	24	16	125	14	16	14-1/8	20-1/2	3	18	1-1/2	1	6	11	2
6000	18	44	44	38	10	85	24	16	125	14	16	14-1/8	20-1/2	3	18	1-1/2	1-1/4	8	13.4	2
7000	22	48	48	38	12	87	24	16	127	14	18	17-1/4	25	3	19	1-1/2	1-1/4	8	16	2
8000	22	50	50	44	12	87	24	16	127	14	18	17-1/4	25	3	19	1-1/2	1-1/4	8	17.3	2
10000	24	56	56	54	12	88	24	20	132	14	18	18-3/4	27-1/2	4	20	1-1/2	1-1/2	12	21.7	3
12000	27	62	62	56	14	92	26	22	140	14	18	20-5/8	30-3/8	4	21	1-1/2	2	12	26.6	3

# MW-200 PARTS





# MW-300



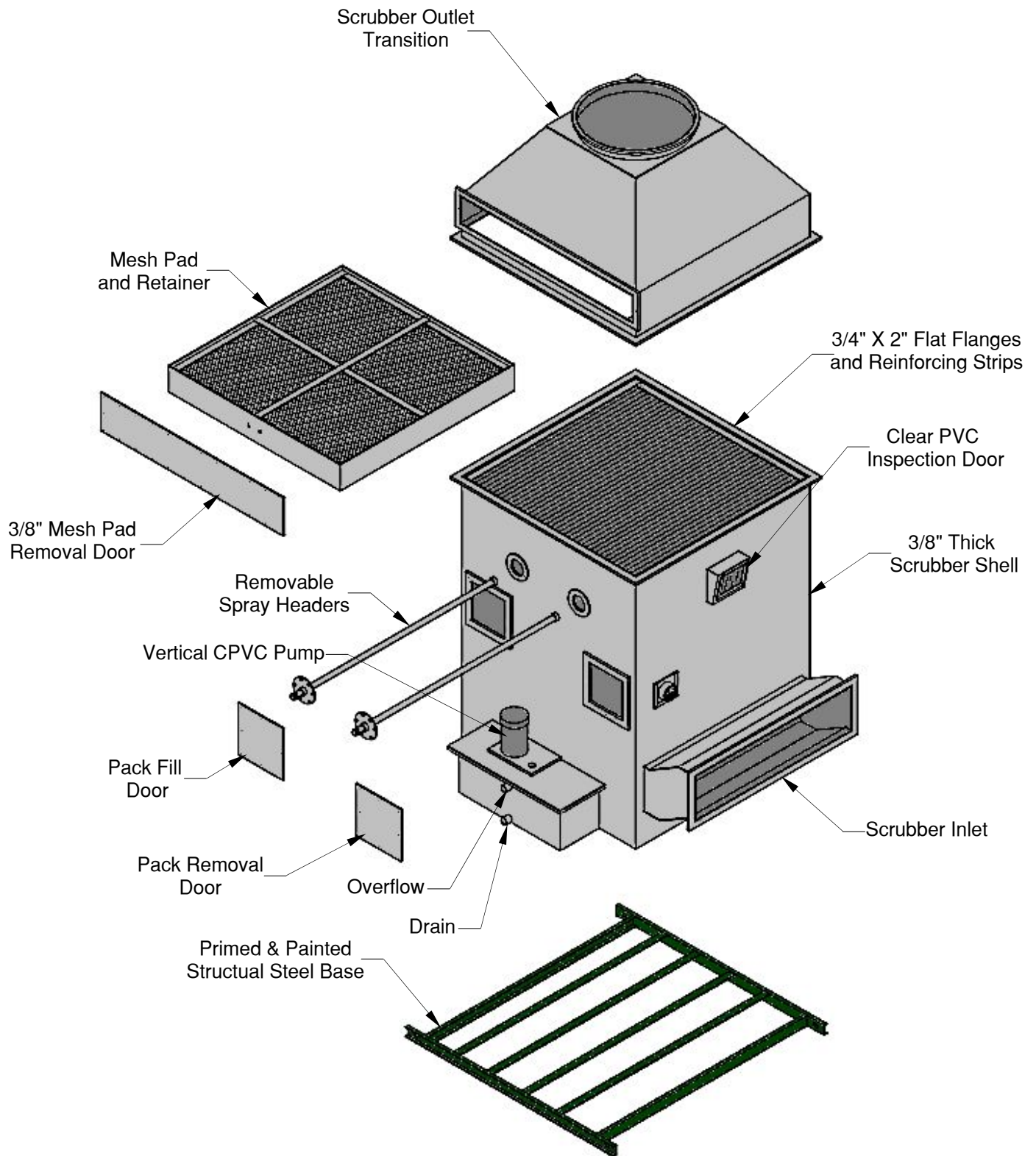
## MW-300 Vertical (counter-current flow)

The MW-300 design works well when floor space is at a premium. This versatile scrubber is especially effective when greater bed depths or multiple stage scrubbers are required. The MW-300 is equipped with removable packing, mist eliminator, fresh water make-up flow meter, strainer, CPVC pump and regulating valve

**DIMENSIONS [INCHES]** Note: See page 10 for scrubber weights and transition lengths.

CFM	0.5	1	2	3	4	5	6	8	10	12	14	16	18	20	22	24	26	28	30	35	40	45	50	55	60
A	14	18	25	32	36	40	44	50	56	62	66	72	76	80	84	88	90	94	96	114	132	144	144	150	164
B	14	18	25	32	36	40	44	50	56	62	66	72	76	80	84	88	90	94	96	96	96	96	108	114	114
C	8	16	16	24	26	32	38	44	54	56	64	64	72	72	78	86	84	90	90	102	116	130	136	140	160
D	4		8		10			12		14		16		18		20		22					24		
E	80		84	85				89		92		94		96			98		100	102					
F	12		18				24				30				36								40		
G	92		102	103			109	113		116	122	124		126	132		134		136	138			142		
H	14												16												
J	6	8	12	14	18	20	20	24	26	30	32	34	36	38	40	42	44	46	48	48	52	56	58	60	62
K	13		14		16			18																	
L	2			3						4										6					
C.L.	20		22	23				25		27		26		27			28		29	31			32		
Pump Size	3/4				1	1-1/2			2				3				5				2-3			2-5	
Header Size	1/2	3/4			1			1-1/4		1-1/2		2			2-1/2					3				3-1/2	
Nozzle Qty	1		2	3	4	6	8	8	12		15	18	20		24	26	28	30	32	38	44	48	55	60	65
Pack Area	1.3	2.3	4.3	7.1	9	11.1	13.4	17.4	21.7	26.7	30.2	36	40.1	44.4	49	53.7	56.2	61.3	64	76	88	96	108	118	129
Remote Drain	2									3										4				6	

# MW-300 PARTS



# SCRUBBER WEIGHTS

Scrubber weights shown below are for scrubbers with two foot packed beds. For extended packed bed scrubbers add 4.2 lbs. per ft<sup>3</sup> of packing. MW-200 and MW-300 scrubbers do not require additional weight for sump water. MW-100 scrubbers will require some calculation for additional weight due to extended sump. Calculate cubic feet of water based on a 10" liquid depth. Multiply ft<sup>3</sup> of water by 62½ lbs. to find additional weight.

MW-100 HORIZONTAL					MW-300 VERTICAL				MW-200 FAN SCRUBBER			
CFM	DRY WT.	SUMP CAPACITY		OPER. WT.	DRY WT.	SUMP CAPACITY		OPER. WT.	DRY WT.	SUMP CAPACITY		OPER. WT.
		GAL.	LBS.			GAL.	LBS.			GAL.	LBS.	
500	336	44	367	702	470	8.5	71	541	636	21	175	811
1000	421	66	550	971	521	14	117	638	884	31	258	1143
2000	476	77	641	1118	623	27	225	848	909	36	300	1209
3000	554	105	875	1429	706	44	367	1072	1000	44	367	1366
4000	635	133	1108	1743	756	56	466	1222	1233	62	516	1750
5000	707	133	1108	1815	840	69	575	1414	1295	69	575	1870
6000	849	138	1150	1998	947	84	700	1647	1363	84	700	2062
7000	N/A								1552	100	833	2385
8000	954	144	1200	2154	1064	108	900	1964	1589	108	900	2489
10000	1099	172	1433	2532	1201	136	1133	2334	1831	136	1133	2965
12000	1211	188	1566	2777	1333	166	1383	2716	2059	166	1383	3442
14000	1280	188	1566	2846	1447	189	1574	3022				
16000	1389	211	1758	3146	1590	225	1874	3464				
18000	1617	222	1849	3467	1773	250	2083	3855				
20000	1716	244	2033	3749	1882	277	2307	4190				
22000	1815	266	2216	4031	2021	306	2549	4570				
24000	1939	294	2449	4388	2127	336	2799	4926				
26000	2083	316	2632	4715	2239	351	2924	5163				
28000	2206	344	2866	5072	2352	383	3190	5542				
30000	2305	366	3049	5354	2423	400	3332	5755				
35000	2577	427	3557	6134	2758	475	3957	6715				
40000	2954	488	4065	7019	3186	550	4582	7768				
45000	3226	550	4582	7808	3401	600	4998	8399				
50000	3563	611	5090	8653	3662	675	5623	9285				
55000	3835	672	5598	9433	3925	742	6181	10105				
60000	4107	733	6106	10213	4207	811	6756	10963				

MW-100 - MW-200 - MW-300 INLET/OUTLET TRANSITION LENGTHS																												
CFM	.5	1	2	3	4	5	6	7	8	10	12	14	16	18	20	22	24	26	28	30	35	40	45	50	55	60		
MW-100	12		18		24			36										48										
MW-200	12						18					N/A																
MW-300	12						18					24				30				36			48					

# Mapco Average Scrubber Removal Efficiencies

CONTAMINANT	2 Ft. Packed Bed	With pH Control	5 Ft. Packed Bed	With pH Control
Acetic Acid	NR	80-85	NR	90-95
Alkaline Cleaners (Aqueous Mist) <sup>3</sup>	95-99	99.9	99.9	99.9
Ammonia <sup>3</sup>	NR	90-95	NR	98-99
Anodizing (Mists)	95-97	98-99		
Aqua Regia <sup>1,4</sup>	85-90	85-92	92-98	95-98
Boric Acid	95-98	95-98	98	98
Caustic Cleaners <sup>3</sup> (mist)	90-99.9	90-99.9	99.9	99.9
Caustic Soda <sup>3</sup>	90-99.9	90-99.9	99.9	99.9
Chlorine <sup>2</sup>	NR	85-90	NR	95-98
Chromic Acid <sup>3,7</sup>	98-99	98-99	99	99
Copper Chloride <sup>3</sup>	90-92	90-92	92	92
Cyanide Solutions <sup>3</sup>	99-99.9	99-99.9	99.9	99.9
Ferric Chloride <sup>3</sup> (mist)	92-95	92-95	95	95
Ferric Nitrate <sup>3</sup> (mist)	98-99	98-99	99	99
Ferrous Sulfate <sup>3</sup>	98-99	98-99	99	99
Fluosilicic Acid <sup>3</sup>	98-99	98-99	99	99
Hydrochloric Acid <sup>1</sup>	85-90	90-95	95-99	98-99
Hydrofluoric Acid <sup>1,2</sup>	90-95	95-98	95-99	98-99
Hydrofluosilicic Acid <sup>3</sup>	95-98	95-98	99	99
Hydrogen Cyanide <sup>1,5</sup>	NR	85-90	NR	95-98
Hydrogen Peroxide	85-90	90-95	95-99	95-99
Hydrogen Sulfide <sup>1,5</sup>	NR	60-72	NR	85-90
Nickel Chloride <sup>3</sup> (mist)	85-95	85-95	95	95
Nickel Sulfate <sup>3</sup> (mist)	95-99	98-99	99	99
Nitric Acid <sup>1,4</sup>	85-90	85-94	95-98	95-98
Nitric Oxide (NO) <sup>2</sup>	*	*	*	*
Nitrogen Dioxide (NO <sub>2</sub> ) <sup>2</sup>	*	*	*	*
Perchloric Acid <sup>4</sup>	80-85	80-85	85-90	95-98
Phosphoric Acid <sup>3</sup> (mist)	95-99	95-99	98-99	98-99
Potassium Dichromate <sup>3</sup> (mist)	95-99	95-99	99	99
Selenium Sulfide <sup>1</sup>	95-98	95-98	99	99
Sodium Chloride <sup>3</sup>	95-99	95-99	99	99
Sodium Fluoride <sup>3</sup>	95-99	95-99	99	99
Sodium Glutamate <sup>3</sup>	95-99	95-99	99	99
Sodium Hydroxide <sup>3</sup> (mist)	99-99.9	99-99.9	99.9	99.9
Sulfamate <sup>3</sup> (mist)	98-99	98-99	99	99
Sulfur Dioxide <sup>1</sup>	NR	80-85	NR	90-96
Sulfuric Acid	99-99.9	99-99.9	99.9	99.9
Tin Chloride <sup>3</sup> (mist)	85-95	90-95	95	95
Zinc Chloride <sup>3</sup> (mist)	85-95	90-95	90-95	90-95
Zinc Nitrate <sup>3</sup> (mist)	90-99	90-99	99	99
Zinc Sulfate <sup>3</sup> (mist)	95-99	95-99	99	99

These efficiencies are intended as a guide only. Depending on the process, specific combinations and concentrations of fumes may result in substantially different values than depicted above. Consult your scrubber manufacturer for specific efficiencies.

1. Application of pH control results in lower water usage.
2. This application may require chemical addition, extended pack bed, once through water and high efficiency mist eliminator.
3. Depending on the process, wet scrubbing may not be necessary. Consider Mapco MW-400 horizontal mist eliminator, Mist Master in-line vertical or horizontal mist eliminator, Terminator Exhaust hood or Enforcer III.
4. Depending on the process, inlet loading and temperature, a fine fog may be produced which is not included in the stated efficiencies. The addition of a special high efficiency mist eliminator will be required to minimize fog.
5. Efficiency is improved by chemical addition (other than pH control).
6. Stated efficiency is for the combined nitric and phosphoric acid fumes. The efficiency for the NO<sub>2</sub> portion of the fume is not listed.
7. Enforcer III on chromic acid in excess of 99.9% to 1.0 micron, Ultramact 99.9% to 99.9995 to 0.12 microns.

NR = Not Recommended



Highest Value  
Exhaust and Pollution  
Control Equipment

"old  
school  
quality,  
old  
school  
service"

Corrosion Resistant PVC Duct  
Corzan™ Duct



Turnkey  
Installations

Corzan™  
Duct



Terminator™  
Composite Mesh Pad  
Exhaust Hoods



Motorized Dampers

