DAS

DEEP BED • AIR • SCRUBBER

DRY SCRUBBERS

FOR HIGH CONCENTRATIONS OF ODORS & CORROSIVE CONTAMINANTS
FOR MUNICIPAL & INDUSTRIAL AIR PURIFICATION

CA CIRCUL-AIRE

CIRCUL-AIRE'S PROFILE

Circul-Aire has over 35 years of experience in the advanced technology gas phase filtration field. Circul-Aire is a manufacturing company specialized in air treatment products.

Circul-Aire designs and manufactures a complete line of air purification systems and offers a complete range of services, including the chemical media analysis TECH-CHEK™ Program. The Company's reputation has been built on years of research and development and on growing numbers of satisfied customers. Circul-Aire's laboratory offers product quality control and research on specific environmental problems.

ODOR & CORROSION CONTROL APPLICATIONS

- Pulp & paper
- Digesters
- Incineration plants
- Oil & gas refineries
- Exhaust pressurization
- Garbage depots
- Clarifiers
- Wet wells
- Process areas
- Waste transfer stations
- Emergency safe rooms

THE PROBLEMS

Odor and corrosion problems from various manufacturing processes are often the result of multiple airborne contaminants. Industries such as pulp and paper, oil and gas refineries and wastewater treatment generate contaminants such as hydrogen sulphide, an undesirable by-product which is malodorous, toxic and highly volatile.

In wastewater treatment facilities, specific characteristics such as basin detention times, loadings to biological processes and sludge generation potential can influence the odor levels.

Septage and sludge handling systems are also common sources of strong odors. Odor generation is often the result of organic overloading, inadequate supply of air, improper ventilation, or simply the failure to recognize that certain unit processes may require the implementation of special odor control technology.

Typical nuisance odors and corrosive contaminants are also produced in the manufacturing of chemicals, fertilizer, pharmaceuticals and food processing, as well as waste transfer stations, incineration plants and garbage depots.

The ability to control odorous emissions has become a growing concern as cities and populations are expanding closer to plant facilities. The objective of odor control is to prevent or minimize nuisance odor levels to the surrounding community. Safety and comfort of the employees working in plant facilities has also become a top priority. National and local regulations on air quality are more severe, responding to neighbour complaints and environmental groups.

The DAS systems can also be used for the abatement of intentional or non-intentional releases of toxic airborne contaminants, thus preventing them from infecting the space.

THE CONVENTIONAL SOLUTIONS

Traditional solutions used for odor and corrosion problems consist of two types of systems: wet scrubbers and dry scrubbers. Wet scrubbers are typically large towers utilizing chemical solutions to neutralize the odors. These types of systems are used in cases of very high concentrations (greater than 20 ppm) in order to reduce contaminant loads. Wet scrubbers require a major investment and substantial maintenance costs.

Circul-Aire's Deep Bed Air Systems (DAS) are smaller dry scrubbers filled with granular MULTI-MIX® media. Smaller concentrations (less than 20 ppm) require DAS dry scrubbers to efficiently remove contaminants to non-detectable levels.

Servicing DAS scrubbers is minimal only requiring annual bulk loading of the replacement media rather than complex and frequent maintenance procedures necessary for wet scrubbers.

VARIOUS MEDIA FOR CUSTOMIZED SOLUTIONS

Certain applications have several contaminants which are more complex to eliminate. Gas phase filtration often requires more than one type of media in order to efficiently remove contaminants. Circul-Aire's Deep Bed Air Scrubber is the ideal solution when multiple media sections are required.

ENGINEERED VERSATILITY

Circul-Aire's engineering and R & D departments have simplified the process of designing custom DAS systems allowing more versatility for the specifier and providing a superior quality/price ratio. Over 300 DAS models are available integrating various components into a complete package.

SINGLE SOURCE RESPONSIBILITY

Circul-Aire designs and manufactures the complete Deep Bed Air Scrubber system to maintain a high quality standard at every level. From the housing to the MULTI-MIX® media and custom controls, each component is engineered and fabricated for total system integration.

SIMPLIFIED MEDIA REPLACEMENT

The multiple media sections allow replacement of individual media beds. Maintenance no longer requires changing all the media but only the consumed portion, which can be determined through our lifetime TECH-CHEK™ program. Bulk loading and unloading allows for considerably reduced downtime.

EASIER ACCESS AND REDUCED HEIGHT

Circul-Aire's DAS system offers easy access to the filters due to its horizontal design and full-sized doors. Unlike vertical scrubbers, the Deep Bed Air Scrubbers are suitable for limited height applications.

MATERIAL CONSTRUCTION VERSATILITY

Circul-Aire's Deep Bed Air Scrubbers are manufactured from either corrosion protected mild steel, aluminum, or stainless steel. Our wide material selection enables us to meet specific needs of the client at minimum cost.

FEATURES

- Zinc coated steel protected by a three-coat corrosion resistant paint.
- 30% efficiency (MERV 6) 2" pre-filter.
- Up to three MULTI-MIX® media beds for odor and corrosion control.
- 30% efficiency (MERV 6) 2" after-filter.
- 90% efficiency (MERV 14) 12" final filter.
- Backward inclined plug blower or single inlet centrifugal blower.
- Perforated stainless steel 316 media section.
- Bulk media filling port.
- Bulk media discharge gate (optional vacuum port).
- Full size hinged access doors.
- High pressure stainless steel screw-on latches.
- Structural C-channel base.
- Insulated double-wall panel construction.

Fig A: *DAS Vertical Unit*
Consult factory for DAS vertical sizing

Fig B: *DAS - Painted Mild Steel*
Draw-Through Arrangement

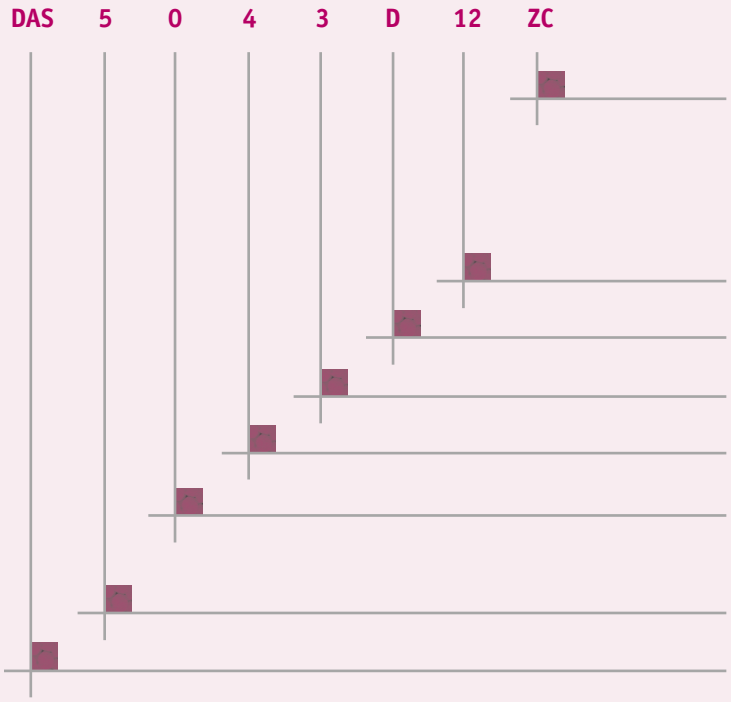
OPTIONS AVAILABLE

- Optional Differential Pressure Monitoring System (DPMS).
- Optional prewired control panel c/w disconnect.
- Optional Silencers.
- Optional temperature sensors.

Fig C: *DAS 316SS*
3-Stage System detail of loading access doors.

Fig D: *DAS*
Blow-Through Arrangement

EXAMPLE: DEEP BED MODEL: DAS-504-3D12ZC



Construction Material

- ZC = Zinc Coated Steel with a Corrosion Resistant Paint
  AL = Aluminum
  SS = Stainless Steel
- Chemical Media Bed Thickness
- Deep Bed System
- Quantity of Deep Beds
- Nominal Width (feet)
- 0 or Blank for Systems 10, 11 or 12 Feet Wide (e.g. DAS-510)
- Nominal Height (feet)
- Deep Bed Air System

The system is nominally 5 feet high by 4 feet wide with three 12" chemical media beds manufactured from zinc coated steel complete with a corrosion resistant paint.

GENERAL

1.1 Provide a Circul-Aire model DAS factory-fabricated gas phase air purification system or equal suitable in design for the removal of both organic and inorganic contaminants as indicated on the schedule and drawing.

1.2 The unit manufacturer shall have been engaged in the fabrication and design of air control systems for no less than the last ten years. Strict adherence to sizes and capacities shall be maintained. Any deviation from the specifications must be approved by the engineer's office no less than ten days prior to the project bid date. No consideration of alternates will be given after this time.

1.3 All components shall comply with the following standards:

- ASHRAE: Standard for filters.
- AMCA: Standard for fans.
- ASTM: Standard for testing methods.
- ASW: Standard for welding.
- ISA: Instrument Society of America
- IEEE: Standard for electrical.
- ANSI: Standard for sound.
- OSHA: Standard for safety.

1.4 The DAS as manufactured by Circul-Aire shall be capable of delivering the specified air volume with total reduced sulfur concentration less than three parts per billion (ppb) when challenged with _____ ppm of total reduced sulfur.

1.5 The DAS air purification system and chemical media shall be manufactured and provided by Circul-Aire. The manufacturer shall also have the in-house capability of analyzing the chemical media in the system to determine the degree of saturation. This shall be a service provided at no additional charge for the life of the system. Formal reports shall be issued directly to the client to aid in maintenance scheduling.

1.6 The air purification system shall be 99.5% efficient in the removal of gases ensuring no bypass of gaseous contaminants.

1.7 The purification system shall consist of, but not be limited to, a 30% (MERV 6) pre-filter section, (1, 2 or 3) 12" media bed section(s), 30% (MERV 6) after-filter and 90% (MERV 14) final filter.

UNIT HOUSING

2.1 The DAS system shall be constructed of zinc coated steel or (aluminum or stainless steel 316). The structure shall be designed to provide a fully self-supporting frame. The frame shall not rely on side panels and/or internal components for roof support or for structural integrity.

2.2 Exterior panels shall be minimum 16-gauge zinc coated steel (14-gauge aluminum or 16-gauge stainless steel 316). All interior panels of double wall construction shall be recessed, allowing the exterior panel to provide a knife-edge seal along the gasketed frame. Interior panels shall be minimum of 20-gauge zinc coated steel (0.108" aluminum or 20-gauge stainless steel 316).

2.3 All floor-to-wall and wall-to-wall interfaces shall be specially sealed to provide high static pressure leakage prevention. All bolts penetrating the external skin shall be (cadmium plated or stainless steel) and shall have individual rubber neoprene closed cell watertight gasket.

2.4 All access doors shall be constructed of a minimum 16-gauge zinc coated steel (0.125" aluminum or 16-gauge stainless steel 316). Doors shall be of double wall construction. All doors shall be flush to unit casing and gasketed to provide a positive air acoustic seal around sill, jamb and head. Inner panels shall be recessed, allowing the exterior panel to provide knife-edge seal.

2.5 Access doors shall include stainless steel piano hinges complete with a positive pressure, quick release stainless steel threaded knurled knob assembly with minimum 1.5" o.d.

2.6 Filter access shall be provided on both sides for units wider than 6 feet unless otherwise specified.

2.7 The DAS system floor shall be supported by a steel structural channel base or an aluminum or SS316 formed base. The unit base shall consist of a minimum steel framing of 3" high channel. The flooring shall be welded to the channel.

2.8 Lifting lugs shall be added to the frame so the unit can be lifted evenly without deflection.

2.9 Internal and external zinc coated steel surfaces shall be coated with a three-part corrosion resistant aliphatic polyurethane finish. Applications system shall consist of one prime coat (1 mil minimum) applied over a xylene cleaned surface followed by two finishing coats. Each finishing shall be 1 mil minimum. Final coating shall provide excellent resistance to moisture and traces of acid gases or alkali fumes, salt air or solvent, for temperatures up to 180°F. Standard system paint color shall be gray.

CONTAMINANT REMOVAL SECTION

The contaminant removal filter section shall be designed to provide a high degree of sealing integrity. All particulate filter banks shall be designed for side access servicing via fully opening hinged doors. From the air entering side, the unit shall include:

3.1 Pre-Filters

Roughing pre-filters shall be 2" deep in direction of air flow having a minimum efficiency reporting value of MERV 6 by ASHRAE Standard 52.2-1999 test method using atmospheric dust. Filters shall be UL Class 2 as per Standard 900. The pre-formed pleated design with reinforced fabric media, laminated to a supporting steel wire grip shall not have an initial resistance greater than 0.24" wg at 500 FPM.

3.2 Chemical Bed Sections

The media beds shall consist of 20-gauge stainless steel 316 perforated sheets reinforced to provide structural integrity. The perforated stainless steel sheets shall be on 5/32" staggered centers with 3/32" diameter perforations with a minimum of 33% free area. Filling ports shall extend no less than 6" vertically above the bed to ensure no air bypass upon media settling. These ports shall be hinged and incorporate positive pressure knurled knob assemblies as in the access doors (section 2.5). Latch type assemblies will not be acceptable.

3.3 Chemical Media

- The deep bed DAS system as manufactured by Circul-Aire shall have (1,2 or 3) separate chemical filtration chambers.
- The first bed shall be _____ inches (12, 24, 36) thick in direction of air flow complete with _____ ft^3 of MM-_____ (1000, 3000, 7000, 9000, 1355) chemical media as manufactured by Circul-Aire.
- The second bed shall be _____ inches (12, 24) thick in direction of air flow complete with _____ ft^3 of MM-_____ (1000, 3000, 7000, 9000, 1355) chemical media as manufactured by Circul-Aire.
- The third bed shall be 12" thick in direction of air flow complete with _____ ft^3 of MM-_____ (1000, 3000, 7000, 9000, 1355) chemical media as manufactured by Circul-Aire.
- The total volume of media shall be _____ ft^3 . The total weight of media shall be _____ pounds.
- The system residence time shall be a minimum of _____ seconds.
- Please refer to individual MULTI-MIX® media specification sheets for media details.
- The media unloading shall be accomplished via a bolted and gasketed discharge port at the base of each media bed.

Option: As an option, a 4" capped steel pipe shall be used as a vacuum connection extending from the discharge port.

MM-1000

The MULTI-MIX® MM-1000 shall be UL Class 1 nonflammable and is produced in 1/8" diameter spherical purple pellets and composed of activated alumina impregnated with potassium permanganate. The activated alumina collects odor molecules through adsorption. The odor molecules thereby come in contact with the potassium permanganate, which is evenly distributed throughout the pellets. The odor molecule is chemically oxidized to an odorless non-corrosive product.

MM-1355

A 50-50 mixture by volume of MM-1000 with MM-3000 for multiple gases.

MM-3000

The MULTI-MIX® MM-3000 shall be UL Class 1 nonflammable and consists of a coal based activated carbon of 1/8" diameter extruded cylinders. Physical adsorption removes the gas molecules, which is a form of condensation. Activated carbon is used for a wide range of contaminants with higher affinity to specific gases.

MM-7000

The MULTI-MIX® MM-7000 is manufactured in 1/8" diameter extruded cylinders and consists of activated carbon impregnated with phosphoric acid. Phosphoric acid is impregnated into the carbon to provide enhanced efficiency and capacity for alkaline contaminants. After adsorption, a chemical reaction follows to neutralize the contaminants.

MM-9000

The MULTI-MIX® MM-9000 is manufactured in 1/8" diameter extruded cylinders and consists of activated carbon (MM-3000) impregnated with potassium hydroxide. Potassium hydroxide is impregnated into the carbon to provide enhanced efficiency and capacity for acid type contaminants. After adsorption, a chemical reaction follows to neutralize the contaminants.

3.4 After-Filters

Roughing after-filters shall be 2" deep in direction of air flow having a minimum efficiency reporting value of MERV 6 based on ASHRAE Standard 52.2-1999 test method using atmospheric dust. Filters shall be UL Class 2 as per Standard 900. The preformed pleated design with reinforced fabric laminated to a supporting steel wire grip shall not have an initial resistance greater than 0.24" w.g. at 500 FPM.

3.5 Final Filters

Final filters shall be 12" deep in direction of air flow having a minimum efficiency reporting value of MERV 14 by ASHRAE Standard 52.2-1999 test method using atmospheric dust. Filters shall be UL Class 2 as per Standard 900. The filter frame shall consist of a minimum 3/4" particle board frame with 90% glass medium, corrugated aluminum separators and a rubber-based adhesive sealant which is self-extinguishing. The initial resistance shall be no greater than 0.55" w.g. at 500 FPM.

3.6 Pressure Gauges

Dwyer series 2000 magnehelic gauges shall be provided across each particulate filter section and one additional gauge across the entire media section. All gauges shall be mounted in a single panel flush to the system. Gauges shall be pretubed with color coded CPVC tubing. Gauges shall have both metric and imperial units.

FAN SECTION

The fan shall provide _____ CFM at _____ inches W.C. of external static pressure. Depending on CFM and static pressure one of the following fans can be used.

4.1.A Backward Inclined (Plug Blower) Arrangement

Fan wheel design shall be of a non-overloading type backward curved double surface airfoil section. The wheel shall be of welded construction and the wheel and shaft assembly shall be dynamically balanced to ANSI Standard S219-1989, Quality Grade G6.3. Wheel and cone shall be coated steel (aluminum, stainless steel).

OR

4.1.B Radial Blade Complete Blower Arrangements (Type LS)

Fan wheel shall be of a radial blade, open paddle wheel design with a fabricated steel hub and a straight-through bore. The complete fan wheel shall be welded construction and the wheel and shaft assembly shall be dynamically balanced to ANSI Standard S219-1989, Quality Grade G6.3. Fan shafts shall be designed to operate at no more than 80% of the first critical speed when the fan operates at the top of the fan class speed range. The fan housing shall be constructed of heavy gauge steel and shall be square sided with mounting holes for vertical or horizontal positions of the discharge. All seams and joints are to be continuously welded to eliminate leakage. All centrifugal fans shall be provided with an access door into the fan casing. Wheel and cone shall be coated steel (aluminum, stainless steel).

OR

4.1.C Centrifugal Airfoil Fans (Type SISW)

The fan wheel design shall be of a non-overloading type backward curved double surface airfoil section. The complete fan wheel shall be of welded construction and the wheel and shaft assembly shall be dynamically balanced to ANSI Standard S219-1989, Quality Grade G6.3. Fan shafts shall be designed so as to operate at no more than 80% of the first critical speed range. The fan housing shall be constructed of heavy gauge steel suitable for the CLASS duty. All seams and joints are to be continuously welded to eliminate leakage. All centrifugal fans are to be provided with an access door into the fan casing. Wheel and cone shall be coated steel (aluminum, stainless steel).

Note: A backward inclined (BI) wheel may be specified for light duty material handling applications.

4.2 Coatings

All fans shall have a prime finish coat and unless otherwise specified, this will then be followed by two coats of corrosion resistant aliphatic polyurethane finish.

4.3 Fan and Motor Vibration Isolation Base

The fan and motor shall be mounted on a structural steel base of sufficient strength to resist with minimum deflection all loads resulting from normal operation of the fan. Vibration spring mounts or rubber and shear isolators shall be selected with a maximum transmissibility of 25%.

4.4 Guards

V-belt drives are to be protected by guards that encompass all sides of the drive. Any expanded mesh or ventilation openings in the guard are to be «finger proof» to meet OSHA requirements. Guards shall be completely removable. Each guard shall be complete with two shaft holes opposite both the fan and motor shaft for the purpose of allowing tachometer readings.

4.5 V-Belt Drives

Each fan shall be complete with a matched set of V-belt sheaves rated at a safety factor of 1.5 times the driving motor nameplate horsepower. All drives transmitting power from motors of 60 BHP or greater must be dynamically balanced to ANSI Standard S219-1989, Quality Grade G6.3. Motor drive shall be variable pitch up to and including 7.5 HP (5.5 kw) and fixed pitch beyond this point.

4.6 Fan Bearings

Bearings shall be selected to have a minimum L10 life of 60,000 hours including belt pull. All grease lubricated bearings that are not directly accessible shall be fitted with extended grease leads terminating at some convenient accessible location in the fan housing or unit casing.

CONTROLS

5.1 Disconnect

The DAS system shall come complete with a pre-wired unit mounted NEMA-12 (4 or 4X) disconnect.

5.2 Motor Starter Panel

The motor starter panel shall come complete with a NEMA-12 (4 or 4X) enclosure. Panel shall be complete with non-fused disconnect switch, motor contactors, fuses, 24 volt control circuit c/w on/off lights and on/off selector switch.

5.3 Customized Controls

Customized controls are available on demand. Items may include air flow switches, pressure gradient control systems, PLC controllers, audible alarms, photohelic gauges, explosion proof and air flow stations.

OPTIONAL COMPONENTS AVAILABLE

- **A)** ARI certified cooling coils or heating coils
- **B)** CSA and ETL certified electric coils
- **C)** Air-to-air heat exchangers (plate type or heat pipe)
- **D)** Gas monitors
- **E)** Structural supports for gravity unloading
- **F)** Redundant fan arrangements
- **G)** Custom bed depths
- **H)** Silencers
- **I)** Temperature sensors
- **J)** Corrosion Monitoring Equipment, Surveyor®

Table 1 - FILTER REQUIREMENTS

Models	Air Flow		Volume of Media per Single 12" Bed Depth*		Particulate Filter Quantities					
					Pre-filter 30% (MERV 6)		After-filter 30% (MERV 6)		Final Filter 90% (MERV 14)	
	CFM	m3/hr.	CU. FT.	LITERS	24 x 24 x 2 (610 x 610 x 51)	24 x 12 x 2 (610 x 305 x 51)	24 x 24 x 2 (610 x 610 x 51)	24 x 12 x 2 (610 x 305 x 51)	24 x 24 x 12 (610 x 610 x 305)	24 x 12 x 12 (610 x 305 x 305)
202	300	510	5	142	1	0	1	0	1	0
302	450	765	7	198	1	1	1	1	1	1
204	600	1020	10	283	2	0	2	0	2	0
304	900	1529	14	396	2	2	2	2	2	2
404	1200	2039	18	509	4	0	4	0	4	0
504	1500	2549	22	623	4	2	4	2	4	2
604	1800	3059	26	736	6	0	6	0	6	0
306	1350	2294	21	595	3	3	3	3	3	3
406	1800	3059	27	765	6	0	6	0	6	0
506	2250	3823	33	935	6	3	6	3	6	3
606	2700	4588	39	1104	9	0	9	0	9	0
706	3150	5352	45	1274	9	3	9	3	9	3
806	3600	6117	51	1444	12	0	12	0	12	0
408	2400	4078	36	1019	8	0	8	0	8	0
508	3000	5098	44	1246	8	4	8	4	8	4
608	3600	6117	52	1473	12	0	12	0	12	0
708	4200	7137	60	1699	12	4	12	4	12	4
808	4800	8156	68	1926	16	0	16	0	16	0
908	5400	9176	76	2152	16	4	16	4	16	4
810	6000	10195	85	2407	20	0	20	0	20	0
910	6750	11470	95	2690	20	5	20	5	20	5
1010	7500	12744	105	2973	25	0	25	0	25	0
1011	8250	14018	116	3284	25	5	25	5	25	5
1012	9000	15293	126	3568	30	0	30	0	30	0
1212	10800	18351	150	4248	36	0	36	0	36	0

* Maximum 3 Beds
Media Weight = (Density of Media) x Volume x No. of Beds

DENSITIES:
MM-1000 = 55 lb./ft³ (880 kg/m³)
MM-1355 = 43 lb./ft³ (681 kg/m³)
MM-1955 = 47 lb./ft³ (745 kg/m³)
MM-3000 = 30 lb./ft³ (480 kg/m³)
MM-7000 = 41 lb./ft³ (656 kg/m³)
MM-8000 = 31 lb./ft³ (497 kg/m³)
MM-9000 = 38 lb./ft³ (609 kg/m³)

Note:
Media densities listed above are average densities and may vary between batches.

Table 2 - DESIGN PRESSURE DROP - 75 FPM (0.381 m/sec) FACE VELOCITY

No. of 12" Beds	Particulate 30% (MERV 6) Pre-filter		Circul-Aire MULTI-MIX® Chemical Media				Particulate 30% (MERV 6) After-filter		Particulate 90% (MERV 14) Final filter		External Static Pressure		Total Design Static Pressure			
			MM-1000		MM-3000 or MM-7000 or MM-9000								MM-1000		MM-3000 or MM-7000 or MM-9000	
	IWG	Pa	IWG	Pa	IWG	Pa	IWG	Pa	IWG	Pa	IWG	Pa	IWG	Pa	IWG	Pa
1	0.3	75	1.3	325	3.0	750	0.3	75	0.5	125	1.0	250	3.4	850	5.1	1275
2	0.3	75	2.6	650	6.0	750	0.3	75	0.5	125	1.0	250	4.7	1175	8.1	2025
3	0.3	75	3.9	975	9.0	750	0.3	75	0.5	125	1.0	250	6.0	1500	11.1	2775

60 HERTZ

Table 3a - MOTOR PERFORMANCE 60 HZ. (TEFC HIGH EFFICIENCY MOTORS)

HP (kw)	Full Load RPM	Voltage/3ø/60 Hz				NEMA Code		Full Load Efficiency
		460		575				
		FLA	LRA	FLA	LRA	DESIGN	CODE	%
1.0 (0.75)	1720	1.6	11.5	1.28	9.2	B	L	82.5
1.5 (1.1)	1710	2.2	17	1.75	13.6	B	L	84.0
2.0 (1.5)	1710	2.95	23	2.35	18	B	L	84.0
3.0 (2.2)	1740	4	32	3.2	25.6	B	K	87.5
5.0 (3.0)	1740	6.25	46	5	37	B	J	87.5
7.5 (5.5)	1740	9.3	62	7.5	50	B	H	89.5
10.0 (7.5)	1750	12.5	81	10	65	B	H	89.5
15.0 (11.0)	1750	17.6	112	14.1	90	B	G	91.0
20.0 (15.0)	1760	23	140	18.5	112	B	G	91.0

INSULATION: Class F
TEMPERATURE: 80°C at Rated H.P.
SERVICE FACTOR: 1.15
RATING: Continuous

50 HERTZ

Table 3b - MOTOR PERFORMANCE 50 HZ. (TEFC HIGH EFFICIENCY MOTORS)

HP (kw)	Full Load RPM	380 V/3ø/50 Hz		NEMA Code		Full Load Efficiency
		FLA	LRA	DESIGN	CODE	%
1.0 (0.75)	1430	1.9	13.5	B	L	82.5
1.5 (1.1)	1425	2.6	20	B	L	84.0
2.0 (1.5)	1425	3.6	28.1	B	L	84.0
3.0 (2.2)	1450	4.8	38	B	K	87.5
5.0 (3.0)	1450	7.6	56	B	J	87.5
7.5 (5.5)	1450	11.3	76	B	H	89.5
10.0 (7.5)	1460	15.1	98	B	H	89.5
15.0 (11.0)	1460	21.3	136	B	G	91.0
20.0 (15.0)	1465	27.8	170	B	G	91.0

INSULATION: Class F
TEMPERATURE: 80°C at Rated H.P.
SERVICE FACTOR: 1.0
RATING: Continuous

Table 4 - TYPICAL FAN PERFORMANCE (1-ONLY 12" BED OF MEDIA) 75 FPM (0.381 M/SEC) FACE VELOCITY

Models	Air Flow		SISW Fan Arrangement Based on							
			MM-1000 at a total ΔP of 3.4 iwg (850 Pa)*				MM-3000, 7000 or 9000 at a total ΔP of 5.1 iwg (1275 Pa)*			
	CFM	M^3/HR.	DIA. (IN.)	RPM	BHP	HP (KW)	DIA. (IN.)	RPM	BHP	HP (KW)
202	300	510	7.0	2075	0.33	1.0 (0.75)	7.0	2545	0.46	1.0 (0.75)
302	450	765	7.0	2092	0.46	1.0 (0.75)	7.0	2564	0.81	1.0 (0.75)
204	600	1020	7.0	2198	0.69	1.0 (0.75)	7.0	2694	1.04	1.5 (1.1)
304	900	1529	9.0	1695	1.04	1.5 (1.1)	9.0	2008	1.50	2.0 (1.5)
404	1200	2039	13.5	2309	0.92	1.5 (1.1)	13.5	2764	2.07	3.0 (2.2)
504	1500	2549	13.5	2495	1.15	1.5 (1.1)	13.5	2842	1.84	3.0 (2.2)
604	1800	3059	13.5	2466	1.50	2.0 (1.5)	13.5	2807	2.19	3.0 (2.2)
306	1350	2294	13.5	2313	1.04	1.5 (1.1)	13.5	2805	1.96	3.0 (2.2)
406	1800	3059	13.5	2287	1.50	2.0 (1.5)	13.5	2666	2.19	3.0 (2.2)
506	2250	3823	13.5	2482	2.07	3.0 (2.2)	13.5	2815	2.88	5.0 (3.0)
606	2700	4588	15.0	2205	2.42	3.0 (2.2)	15.0	2513	3.34	5.0 (3.0)
706	3150	5352	15.0	2381	3.11	5.0 (3.0)	15.0	2644	4.14	5.0 (3.0)
806	3600	6117	16.5	2100	3.34	5.0 (3.0)	16.5	2353	4.60	5.0 (3.0)
408	2400	4078	15.0	2108	2.07	3.0 (2.2)	15.0	2438	2.99	5.0 (3.0)
508	3000	5098	16.5	1938	2.53	3.0 (2.2)	16.5	2234	3.68	5.0 (3.0)
608	3600	6117	16.5	2100	3.34	5.0 (3.0)	16.5	2353	4.60	7.5 (5.5)
708	4200	7137	18.25	1830	3.80	5.0 (3.0)	18.25	2070	5.18	7.5 (5.5)
808	4800	8156	18.25	1959	4.72	7.5 (5.5)	18.25	2173	6.21	7.5 (5.5)
908	5400	9176	20.0	1926	4.95	7.5 (5.5)	20.0	2115	6.79	7.5 (5.5)
810	6000	10195	20.0	2057	5.98	7.5 (5.5)	20.0	2227	7.82	10.0 (7.5)
910	6750	11470	22.25	1741	6.33	7.5 (5.5)	22.25	1909	8.51	10.0 (7.5)
1010	7500	12744	22.25	1861	7.59	10.0 (7.5)	22.25	2013	9.89	15.0 (11.0)
1011	8250	14018	24.5	1604	7.48	10.0 (7.5)	24.5	1767	10.01	15.0 (11.0)
1012	9000	15293	27.0	1372	7.59	10.0 (7.5)	27.0	1534	10.58	15.0 (11.0)
1212	10800	18351	30.0	1237	9.41	15.0 (11.0)	30.0	1368	12.66	15.0 (11.0)

* Total Δp includes 1.0 IWG (250 Pa) external static (as per Table 2).

Table 5 - TYPICAL FAN PERFORMANCE (2-ONLY 12" BEDS OF MEDIA) 75 FPM (0.381 M/SEC) FACE VELOCITY

Models	Air Flow		SISW Fan Arrangement Based on							
			MM-1000 at a total ΔP of 4.7 iwg (1175 Pa)*				MM-3000, 7000 or 9000 at a total ΔP of 8.1 iwg (2025 Pa)*			
	CFM	M^3/HR.	DIA. (IN.)	RPM	BHP	HP (KW)	DIA. (IN.)	RPM	BHP	HP (KW)
202	300	510	7.0	2434	0.46	1.0 (0.75)	7.0	3232	0.805	1.5 (1.1)
302	450	765	7.0	2441	0.69	1.0 (0.75)	7.0	3211	1.15	1.5 (1.1)
204	600	1020	7.0	2504	0.92	1.5 (1.1)	7.0	3253	1.61	2.0 (1.5)
304	900	1529	9.0	1939	1.38	2.0 (1.5)	9.0	2521	2.42	3.0 (2.2)
404	1200	2039	13.5	2685	1.27	1.5 (1.1)	13.5	3576	2.19	3.0 (2.2)
504	1500	2549	13.5	2672	1.61	2.0 (1.5)	13.5	3470	2.88	5.0 (3.0)
604	1800	3059	13.5	2738	1.96	3.0 (2.2)	15.0	3161	3.34	5.0 (3.0)
306	1350	2294	13.5	2677	1.50	2.0 (1.5)	13.5	3512	2.53	3.0 (2.2)
406	1800	3059	13.5	2581	2.07	3.0 (2.2)	15.0	3037	3.45	5.0 (3.0)
506	2250	3823	13.5	2737	2.65	3.0 (2.2)	15.0	3094	4.37	5.0 (3.0)
606	2700	4588	15.0	2442	3.11	5.0 (3.0)	15.0	3057	5.29	7.5 (5.5)
706	3150	5352	15.0	2582	3.80	5.0 (3.0)	15.0	3099	6.21	7.5 (5.5)
806	3600	6117	16.5	2294	4.26	5.0 (3.0)	16.5	2780	7.02	7.5 (5.5)
408	2400	4078	15.0	2365	2.76	5.0 (3.0)	15.0	3050	4.60	7.5 (5.5)
508	3000	5098	16.5	2169	3.45	5.0 (3.0)	16.5	2793	5.87	7.5 (5.5)
608	3600	6117	16.5	2294	4.26	5.0 (3.0)	16.5	2780	7.02	7.5 (5.5)
708	4200	7137	18.25	2015	4.83	7.5 (5.5)	18.25	2504	7.94	10.0 (7.5)
808	4800	8156	18.25	2123	5.87	7.5 (5.5)	18.25	2530	9.09	10.0 (7.5)
908	5400	9176	20.0	2070	6.33	7.5 (5.5)	20.0	2435	10.12	15.0 (11.0)
810	6000	10195	20.0	2188	7.36	10.0 (7.5)	20.0	2527	11.50	15.0 (11.0)
910	6750	11470	22.25	1869	7.94	10.0 (7.5)	22.25	2195	12.65	15.0 (11.0)
1010	7500	12744	22.25	1979	9.32	15.0 (11.0)	22.25	2280	14.38	20.0 (15.0)
1011	8250	14018	24.5	1728	9.32	15.0 (11.0)	24.5	2032	14.95	20.0 (15.0)
1012	9000	15293	27.0	1497	9.89	15.0 (11.0)	27.0	1776	15.98	20.0 (15.0)
1212	10800	18351	30.0	1368	12.66	15.0 (11.0)	30.0	1587	19.33	25.0 (18.5)

*Total ΔP includes 1.0 IWG (250 Pa) external static (as per Table 2).

Table 6 - TYPICAL FAN PERFORMANCE (3-ONLY 12" BEDS OF MEDIA) 75 FPM (0.381 M/SEC) FACE VELOCITY

Models	Air Flow		SISW Fan Arrangement Based on							
			MM-1000 at a total ΔP of 6.0 iwg (1500 Pa)*				MM-3000, 7000 or 9000 at a total ΔP of 11.1 iwg (2775 Pa)*			
	CFM	M^3/HR.	DIA. (IN.)	RPM	BHP	HP (KW)	DIA. (IN.)	RPM	BHP	HP (KW)
202	300	510	7.0	2763	0.58	1.0 (0.75)	CF	CF	CF	CF
302	450	765	7.0	2753	0.92	1.5 (1.1)	9.0	2890	1.61	2.0 (1.5)
204	600	1020	7.0	2818	1.15	1.5 (1.1)	9.0	2982	2.19	3.0 (2.2)
304	900	1529	9.0	2157	1.84	3.0 (2.2)	9.0	2995	3.34	5.0 (3.0)
404	1200	2039	13.5	2990	1.73	3.0 (2.2)	9.0	3166	4.37	5.0 (3.0)
504	1500	2549	13.5	3008	2.07	3.0 (2.2)	11.0	2381	4.95	7.5 (5.5)
604	1800	3059	13.5	3072	2.53	3.0 (2.2)	16.5	3369	4.60	7.5 (5.5)
306	1350	2294	13.5	3027	1.84	3.0 (2.2)	11.0	2388	4.86	7.5 (5.5)
406	1800	3059	13.5	2931	2.65	3.0 (2.2)	13.0	2021	5.98	7.5 (5.5)
506	2250	3823	13.5	2986	3.34	5.0 (3.0)	15.0	1752	7.50	10.0 (7.5)
606	2700	4588	15.0	2667	3.91	5.0 (3.0)	16.5	3271	7.13	10.0 (7.5)
706	3150	5352	15.0	2784	4.72	7.5 (5.5)	16.5	3278	8.28	10.0 (7.5)
806	3600	6117	16.5	2487	5.29	7.5 (5.5)	15.0	1752	12.08	15.0 (11.0)
408	2400	4078	15.0	2654	3.45	5.0 (3.0)	13.0	2046	8.05	10.0 (7.5)
508	3000	5098	16.5	2378	4.37	5.0 (3.0)	15.0	1757	10.01	15.0 (11.0)
608	3600	6117	16.5	2487	5.29	7.5 (5.5)	15.0	1774	12.08	15.0 (11.0)
708	4200	7137	18.25	2189	5.98	7.5 (5.5)	17.0	1557	13.11	15.0 (11.0)
808	4800	8156	18.25	2283	7.02	7.5 (5.5)	17.0	1562	15.07	20.0 (15.0)
908	5400	9176	20.0	2216	7.71	10.0 (7.5)	20.0	2842	13.69	15.0 (11.0)
810	6000	10195	20.0	2318	8.86	10.0 (7.5)	20.0	2842	15.23	20.0 (15.0)
910	6750	11470	22.25	2000	9.66	15.0 (11.0)	22.25	2562	17.14	20.0 (15.0)
1010	7500	12744	22.25	2093	11.16	15.0 (11.0)	22.25	2522	19.09	25.0 (18.5)
1011	8250	14018	24.5	1852	11.50	15.0 (11.0)	24.5	2287	19.55	25.0 (18.5)
1012	9000	15293	27.0	1613	12.19	15.0 (11.0)	27.0	2076	22.77	30.0 (22.0)
1212	10800	18351	30.0	1447	14.88	20.0 (15.0)	30.0	1812	24.77	30.0 (22.0)

*Total ΔP includes 1.0 IWG (250 Pa) external static (as per Table 2).

CF = Consult Factory

Table 7 - PLUG BLOWER TYPE - DRAW-THROUGH & BLOW-THROUGH ARRANGEMENTS

Models	Air Flow		Overall Height (H)		Width (W)		Length* (for single 12" bed)					
							Draw-through		Blow-through		Weight**	
	CFM	M^3/HR.	INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM	LB.	KG.
202	300	510	34	864	26	660	CF	CF	CF	CF	CF	CF
302	450	765	46	1168	26	660	CF	CF	CF	CF	CF	CF
204	600	1020	34	864	50	1270	CF	CF	CF	CF	CF	CF
304	900	1529	46	1168	50	1270	104	2642	87	2210	1750	795
404	1200	2039	58	1473	50	1270	106	2692	88	2235	2070	940
504	1500	2549	70	1778	50	1270	110	2794	89	2261	2300	1044
604	1800	3059	82	2083	50	1270	113	2870	89	2261	2500	1135
306	1350	2294	46	1168	74	1880	111	2819	89	2261	2350	1067
406	1800	3059	58	1473	74	1880	113	2870	89	2261	2620	1190
506	2250	3823	70	1778	74	1880	116	2946	90	2286	2900	1317
606	2700	4588	84	2134	74	1880	119	3023	90	2286	3300	1498
706	3150	5352	96	2438	74	1880	133	3378	101	2565	3750	1703
806	3600	6117	108	2743	74	1880	136	3454	101	2565	4150	1884
408	2400	4078	60	1524	98	2489	120	3048	89	2261	3350	1521
508	3000	5098	72	1829	98	2489	126	3200	90	2286	3870	1760
608	3600	6117	84	2134	98	2489	136	3454	101	2565	4290	1948
708	4200	7137	96	2438	98	2489	137	3480	101	2565	4650	2111
808	4800	8156	108	2743	98	2489	137	3480	101	2565	4940	2243
908	5400	9176	122	3099	98	2489	139	3531	103	2616	5400	2452
810	6000	10195	110	2794	122	3099	140	3556	104	2642	5940	2697
910	6750	11470	122	3099	122	3099	140	3556	104	2642	6280	2851
1010	7500	12744	134	3404	122	3099	142	3607	106	2692	6820	3096
1011	8250	14018	134	3404	134	3404	142	3607	106	2692	7180	3260
1012	9000	15293	134	3404	146	3708	142	3607	106	2692	7580	3441
1212	10800	18351	158	4013	146	3708	149	3785	113	2870	8350	3791

* Add 12" (305 mm) in length per additional bed; maximum 3 beds total.
CF Consult Factory

** **MEDIA NOT INCLUDED** See bottom of Table 1 for media weights.
Weights based on zinc coated steel and stainless steel construction.
See below for aluminum construction weights.

ALUMINUM CONSTRUCTION WEIGHT:
Multiply zinc coated steel weight in table by 0.65.

Example: DAS-406, zinc coated steel weight from table is
2620 lb. - 2620 lb. x 0.65 = 1703 lb. aluminum construction.

All weights are approximate and may vary depending on final construction.
Actual weights can be provided upon request.

Table 8 - SISW - COMPLETE FAN ASSEMBLY - DRAW-THROUGH & BLOW-THROUGH ARRANGEMENTS

Models	Air Flow		Overall Height (H)		Width (W)		Length* (for single 12" bed)					
							Draw-through		Blow-through		Weight**	
	CFM	M^3/HR.	INCHES	MM	INCHES	MM	INCHES	MM	INCHES	MM	LB.	KG.
202	300	510	34	864	26	660	CF	CF	CF	CF	CF	CF
302	450	765	46	1168	26	660	CF	CF	CF	CF	CF	CF
204	600	1020	34	864	50	1270	CF	CF	CF	CF	CF	CF
304	900	1529	46	1168	50	1270	104	2642	100	2540	1750	795
404	1200	2039	58	1473	50	1270	106	2692	106	2692	2070	940
504	1500	2549	70	1778	50	1270	110	2794	112	2845	2300	1044
604	1800	3059	82	2083	50	1270	113	2870	114	2896	2500	1135
306	1350	2294	46	1168	74	1880	111	2819	112	2845	2350	1067
406	1800	3059	58	1473	74	1880	113	2870	114	2896	2620	1190
506	2250	3823	70	1778	74	1880	116	2946	116	2946	2900	1317
606	2700	4588	84	2134	74	1880	119	3023	121	3073	3300	1498
706	3150	5352	96	2438	74	1880	133	3378	124	3150	3750	1703
806	3600	6117	108	2743	74	1880	136	3454	130	3302	4150	1884
408	2400	4078	60	1524	98	2489	120	3048	125	3175	3350	1521
508	3000	5098	72	1829	98	2489	126	3200	130	3302	3870	1760
608	3600	6117	84	2134	98	2489	136	3454	130	3302	4290	1948
708	4200	7137	96	2438	98	2489	137	3480	130	3302	4650	2111
808	4800	8156	108	2743	98	2489	137	3480	132	3353	4940	2243
908	5400	9176	122	3099	98	2489	139	3531	134	3404	5400	2452
810	6000	10195	110	2794	122	3099	140	3556	134	3404	5940	2697
910	6750	11470	122	3099	122	3099	140	3556	142	3607	6280	2851
1010	7500	12744	134	3404	122	3099	142	3607	142	3607	6820	3096
1011	8250	14018	134	3404	134	3404	142	3607	146	3708	7180	3260
1012	9000	15293	134	3404	146	3708	142	3607	150	3810	7580	3441
1212	10800	18351	158	4013	146	3708	149	3785	154	3912	8350	3791

* Add 12" (305 mm) in length per additional bed; maximum 3 beds total.
CF Consult Factory

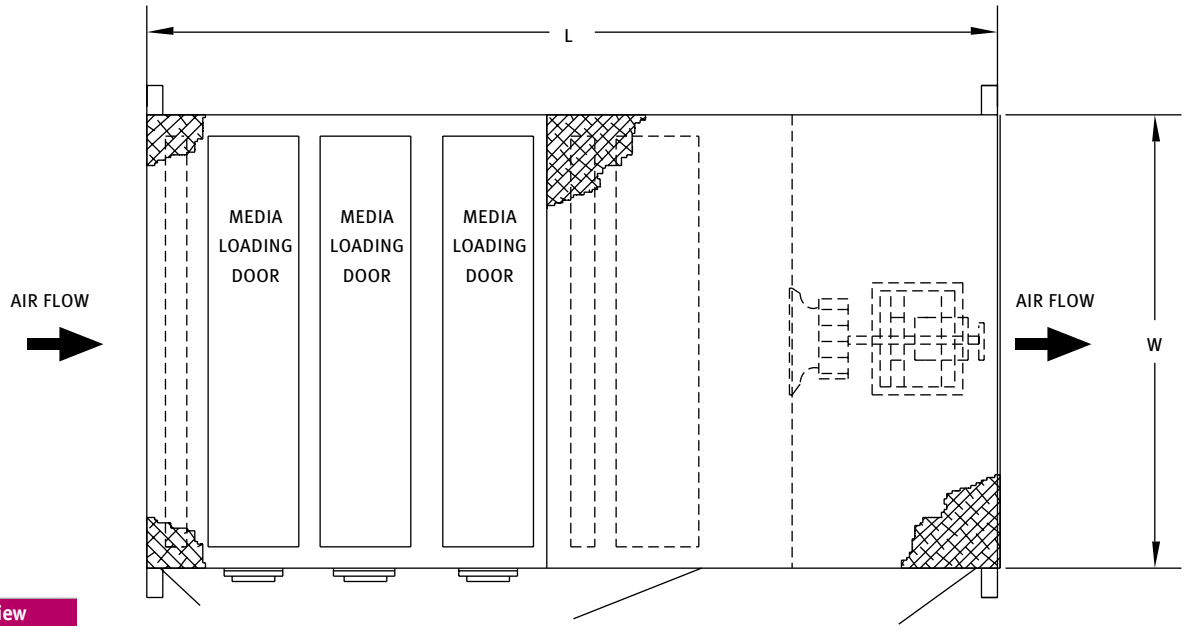
** **MEDIA NOT INCLUDED** See bottom of Table 1 for media weights.
Weights based on zinc coated steel and stainless steel construction.
See below for aluminum construction weights.

ALUMINUM CONSTRUCTION WEIGHT:
Multiply zinc coated steel weight in table by 0.65.

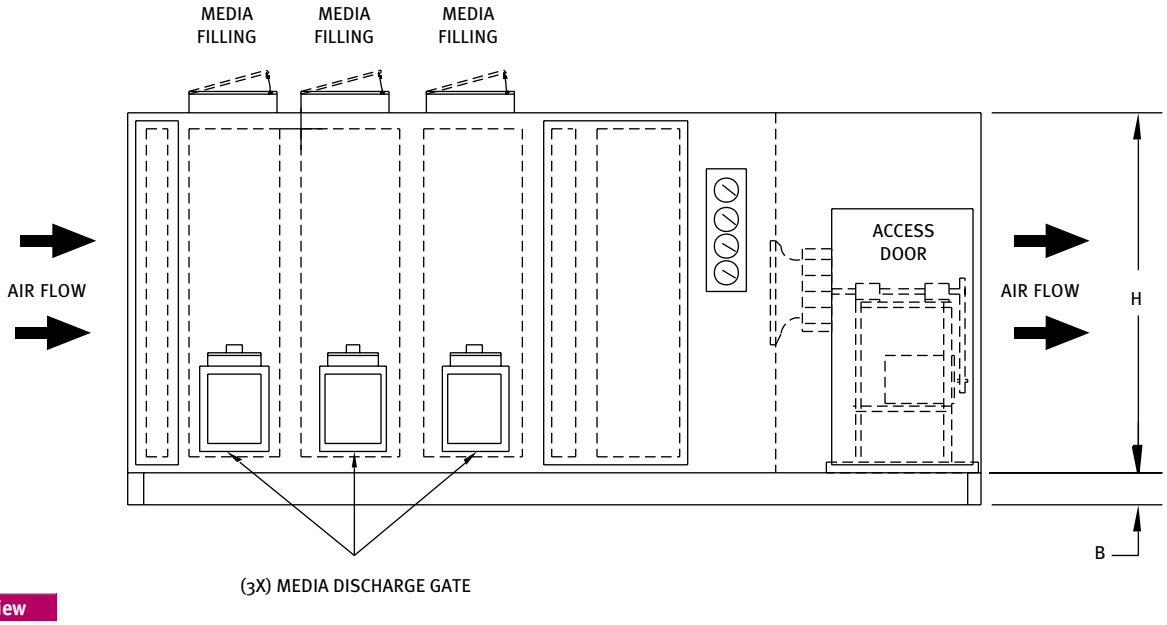
Example: DAS-406, zinc coated steel weight from table is
2620 lb. - 2620 lb. x 0.65 = 1703 lb. aluminum construction.

All weights are approximate and may vary depending on final construction.
Actual weights can be provided upon request.

CIRCUL-AIRE **Access provided on both sides for systems wider than 6 feet**



Plan View



Elevation View

Access provided on both sides for systems wider than 6 feet

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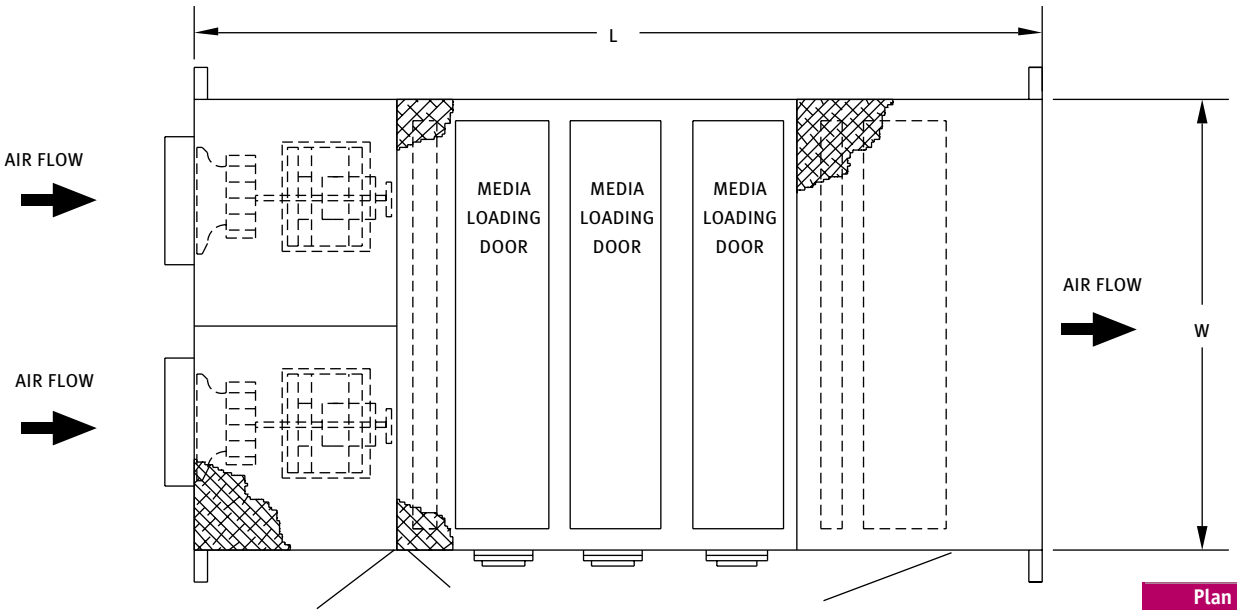
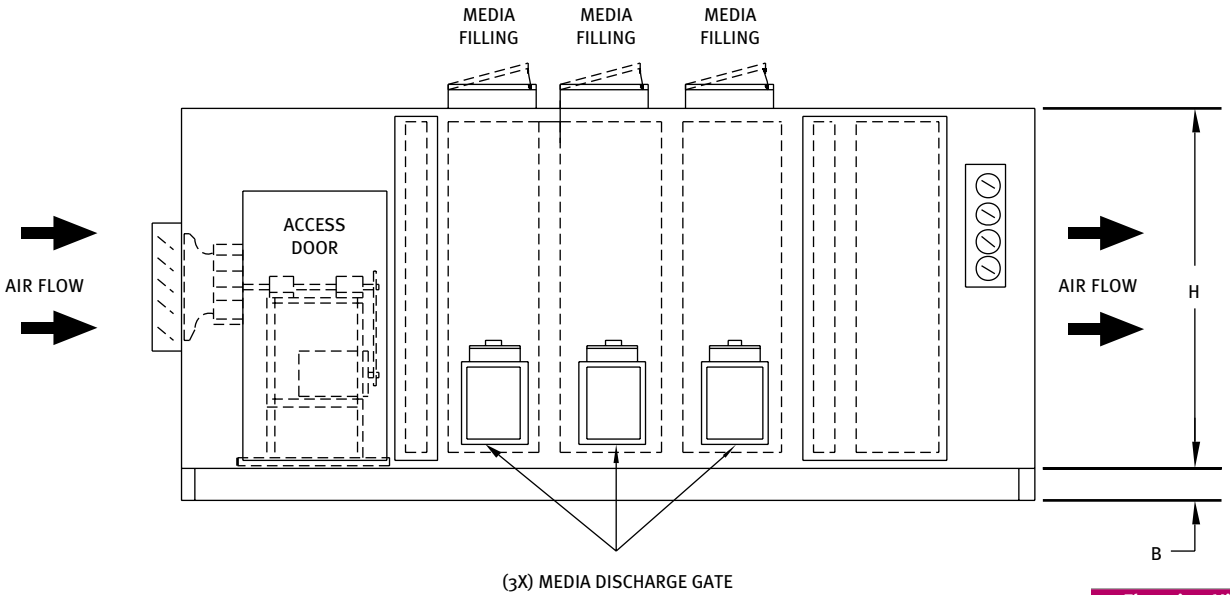


Plan View



Elevation View

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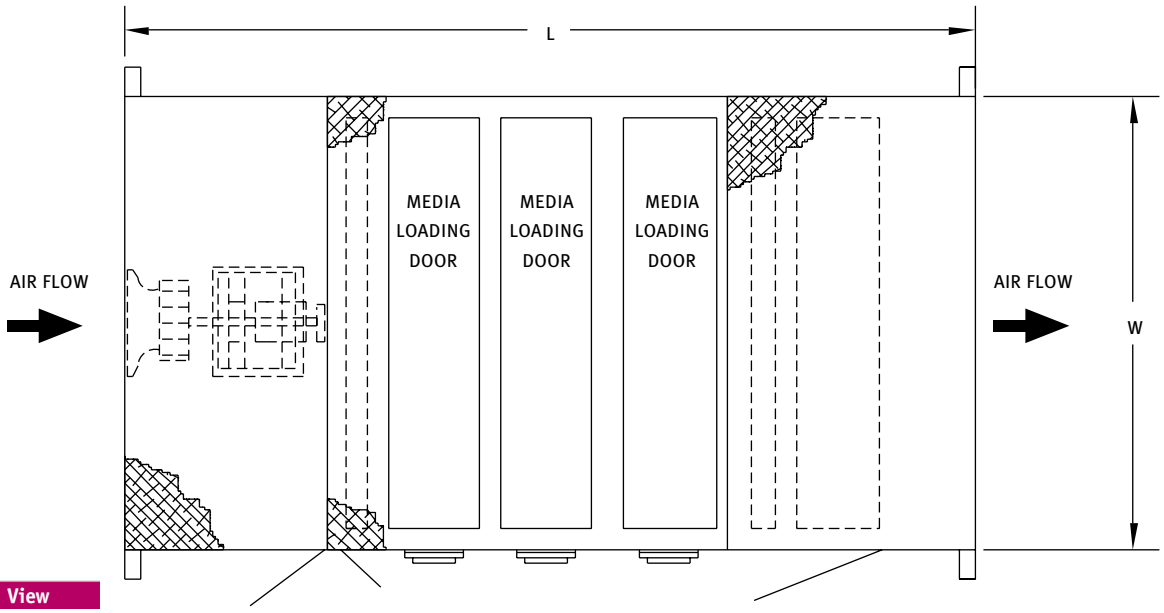
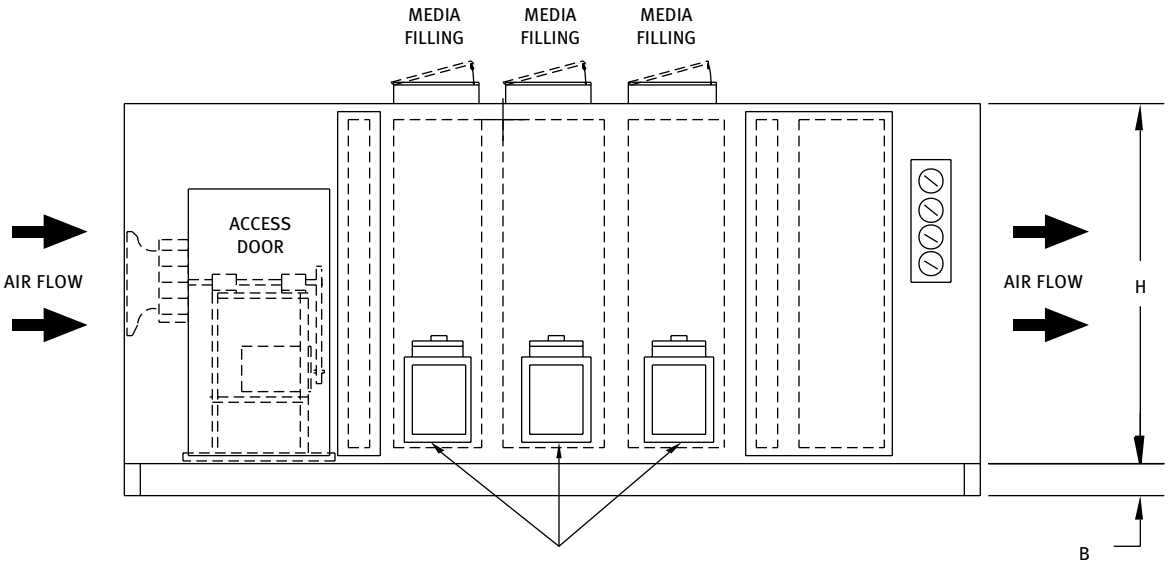


Plan View

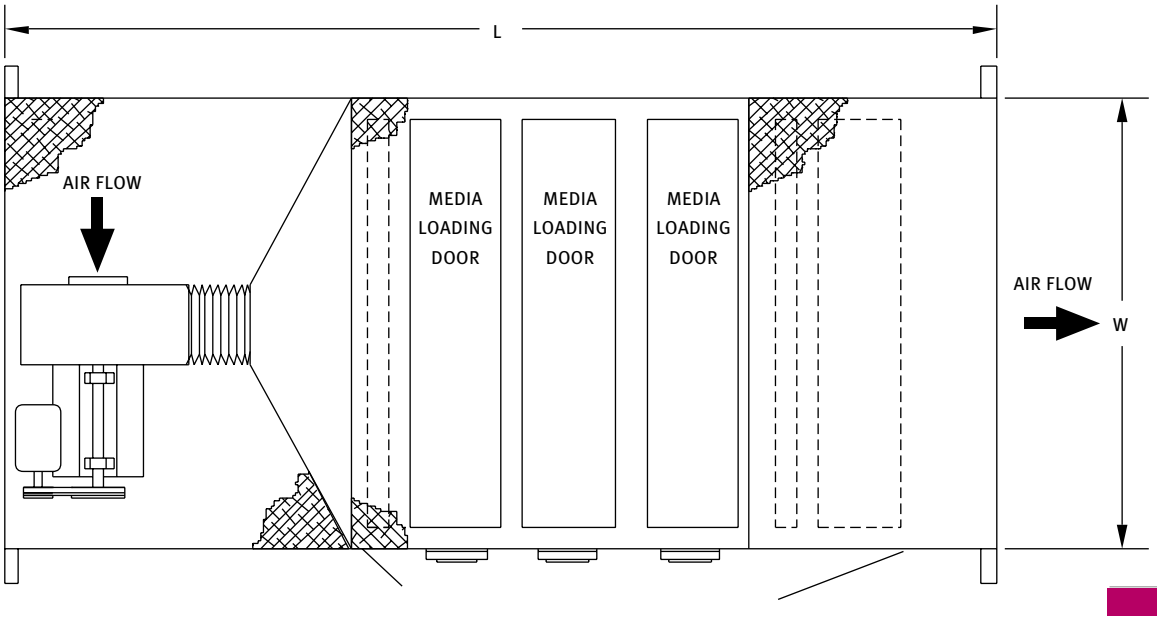


(3X) MEDIA DISCHARGE GATE

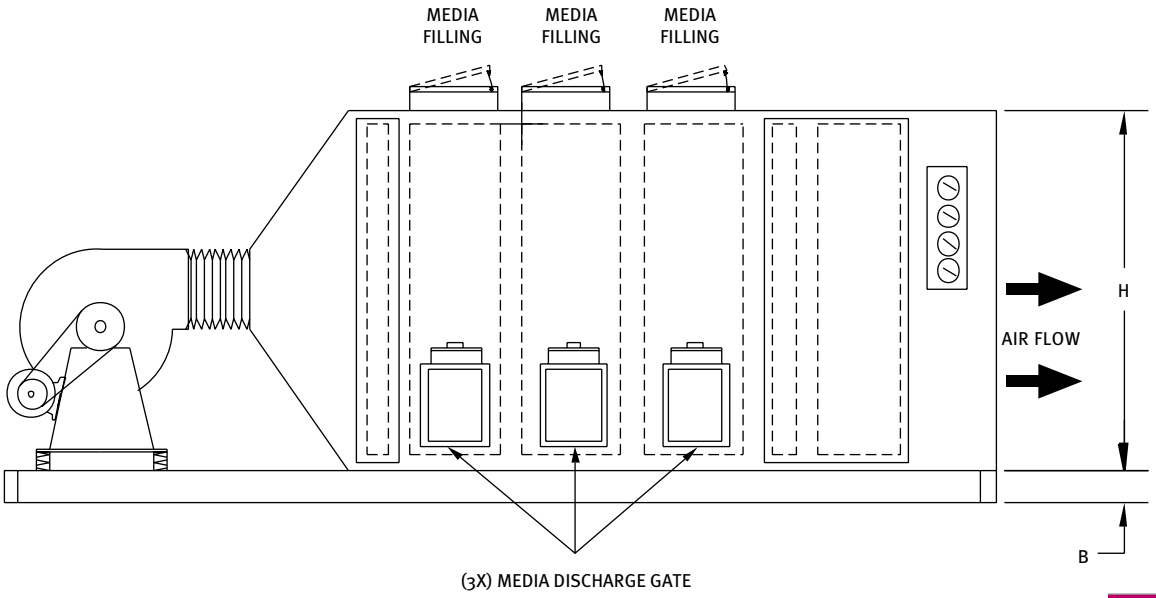
Elevation View

Access provided on both sides for systems wider than 6 feet

CIRCUL-AIRE



Plan View



Elevation View

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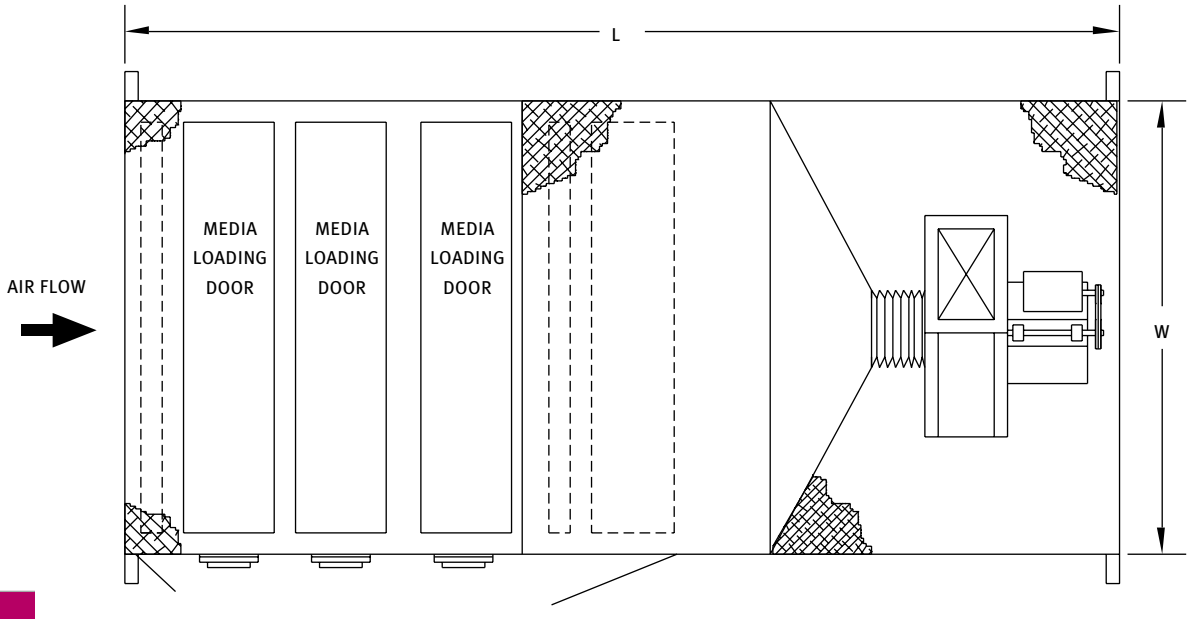
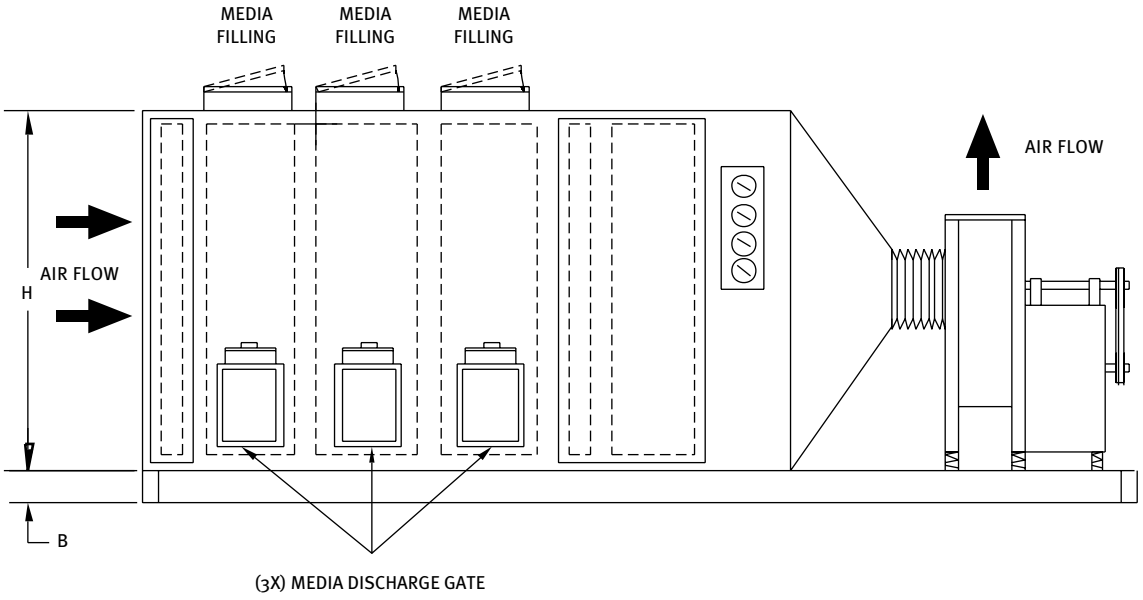


Plan View



Elevation View

MULTI-MIX® MEDIA & TECH-CHEK™ SERVICE

Circul-Aire's MULTI-MIX® is a proven filter media which provides continuous purification of corrosive, odorous and toxic contaminants in industrial and commercial environments. MULTI-MIX® media combines the adsorption properties of activated carbon with the oxidation properties of chemically enhanced alumina. For more information on MULTI-MIX® media, refer to our MULTI-MIX® brochures.

Media analysis through our lifetime TECH-CHEK™ Program ensures maximum efficiency of our products. A complete computerized report establishes media replacement schedule for each unit. Circul-Aire's laboratory can also provide additional performance tests for specific air contaminants.

REACTIVITY MONITORING SERVICE (REMO) & SURVEYOR®

Circul-Aire's Reactivity Monitoring Service (REMO) diagnoses according to the ISA the corrosion level from mild to severe (G1 to GX). Severity level is gauged by means of reactivity monitoring coupons which are installed in strategic areas for periods of 30 to 90 days.

These REMO coupons contain specially treated copper and silver strips that react with the environment. After exposure, coupons are analyzed to determine film thickness and chemistry: data are further used to determine MULTI-MIX® media selection and then normalized to a one-month value for ISA classification. The silver coupon can also be analyzed to evaluate the presence of chlorine and probable humidity level.

The SURVEYOR® on-line environmental monitoring provides the operator with real-time evaluation of the room's environment as per the Instrument Society of America (ISA) classification for applications where instantaneous readings are required.

SEALING INTEGRITY VERIFICATION (SIV)

The Sealing Integrity Verification (SIV) measures the protected area where process control equipment is located. Building enclosures can never be perfectly sealed. Often leakage allows contaminated air to infiltrate usually in significant quantities, even to the extent of preventing the required pressurization.

The Sealing Integrity Verification (SIV) measures room differential pressure and flow pressure of pressurization/depressurization. The values are used to calculate probable effective leakage area and geometry. Should verification analysis prove improper sealing, leakage identification and sealing procedures are implemented.

AIR PURIFICATION SYSTEMS

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