



FANWALL TECHNOLOGY® Customer Benefits

September 30, 2013



Innovation. Designed and delivered.



Name of Presenter

John Goodin, PE – Tom Barrow Company



FANWALL TECHNOLOGY®

Get the FANWALL® Advantage

- Fan arrays in air handlers are a preferred design
 - Originally reserved for critical applications
 - Now a mainstream selection for applications desiring redundancy, high efficiency, quiet operation, and low maintenance and service
 - Ideal for retrofit applications with access restrictions
- Imitation is flattery
 - Virtually every air handler manufacturer now offers a fan array
 - Only CES Group, Inc. companies offer the original and best fan array solution with a proven track record over more than six years:

FANWALL
TECHNOLOGY®
BY HUNTAIR®

FANWALL TECHNOLOGY®

The original and most widely used fan array solution

**FANWALL
TECHNOLOGY®**
BY HUNTAIR®



High Efficiency Fans

Designed specifically for a fan cube environment to achieve the industry's highest efficiency in their size range. AMCA certified performance.



System Optimization Controls

Automatically model and implement the most efficient system configuration to meet airflow requirements by varying the speed and number of enabled fans and motors at any given point in the operating range.

Patent No.

7,137,775

7,179,046

7,527,468

Additional patents pending



Matched Horsepower Motor Selections

Incremental motor nameplate HP to choose from to more closely match required BHP. Reduces connected load, wire sizing, transformer and switchgear costs for the building.



Near Zero Net System Effect Backdraft Damper

Prevents re-circulation through disabled fans and motors with near zero net system effect.

Patent Pending

FANWALL TECHNOLOGY®

The original and most widely used fan array solution

**FANWALL
TECHNOLOGY®**
BY HUNTAIR®



Coplanar Silencer®

Unique enclosure designed to absorb airborne motor and fan noise for unmatched quiet operation.

Patent No.

7,597,534

Additional patents pending



Optimized Inlet Cone Selections

Designed specifically to minimize inlet losses and optimize fan efficiency.



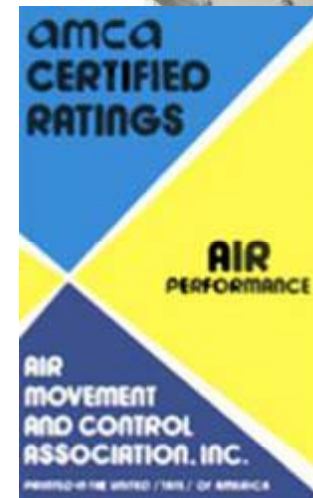
No Spring Isolation Required

Designed to meet the most stringent requirements and specifications.

This product is covered by one or more of the following U.S. patents (7,137,775; 7,179,046; 7,527,468; 7,597,534) and other pending U.S. or Canadian patent applications and/or foreign patents.

High Efficiency Fans

- Cornerstone of FANWALL[®] systems
- Designed and manufactured by HUNTAIR, Inc.
 - Sole source responsibility
- 72+% static efficiency
 - AMCA certified performance (six sizes from 10 to 22 inches)
 - **Better** than larger fans used for identical applications



High Efficiency Fans

- NOTE: An owner ultimately pays for the cfm and static pressure at the unit discharge of an air handling system
 - System must be designed within the specification and limits of the application/components selected
 - May force trade-offs that affect efficiency
 - Examples include space constraints, sound and vibration requirements, etc.
 - System effect will increase the amount of work required from fans and motors to produce the required cfm and static pressure
 - Ancillary components upstream and downstream from the fan produce a pressure drop that must be overcome
 - Examples include sound attenuators and blast or diffuser plates
- FANWALL TECHNOLOGY[®] eliminates or neutralizes limiting factors
 - Gives designers ultimate flexibility to select the highest efficiency “system” based on the specifications and design challenges of individual applications

New Backdraft Damper

Near Zero System Effect For FANWALL® Systems

FANWALL
TECHNOLOGY
BY HUNTAIR®

- A backdraft damper is critical for providing on/off control of fans
 - Prevents recirculation of system air in disabled fans
- New FBD backdraft damper designed for FANWALL systems provides this capability with industry leading results
 - Near zero net system effect
 - Extremely low leakage
 - Positive impact on acoustics



**Near Zero Net System Effect
Backdraft Damper
(Patent Pending)**

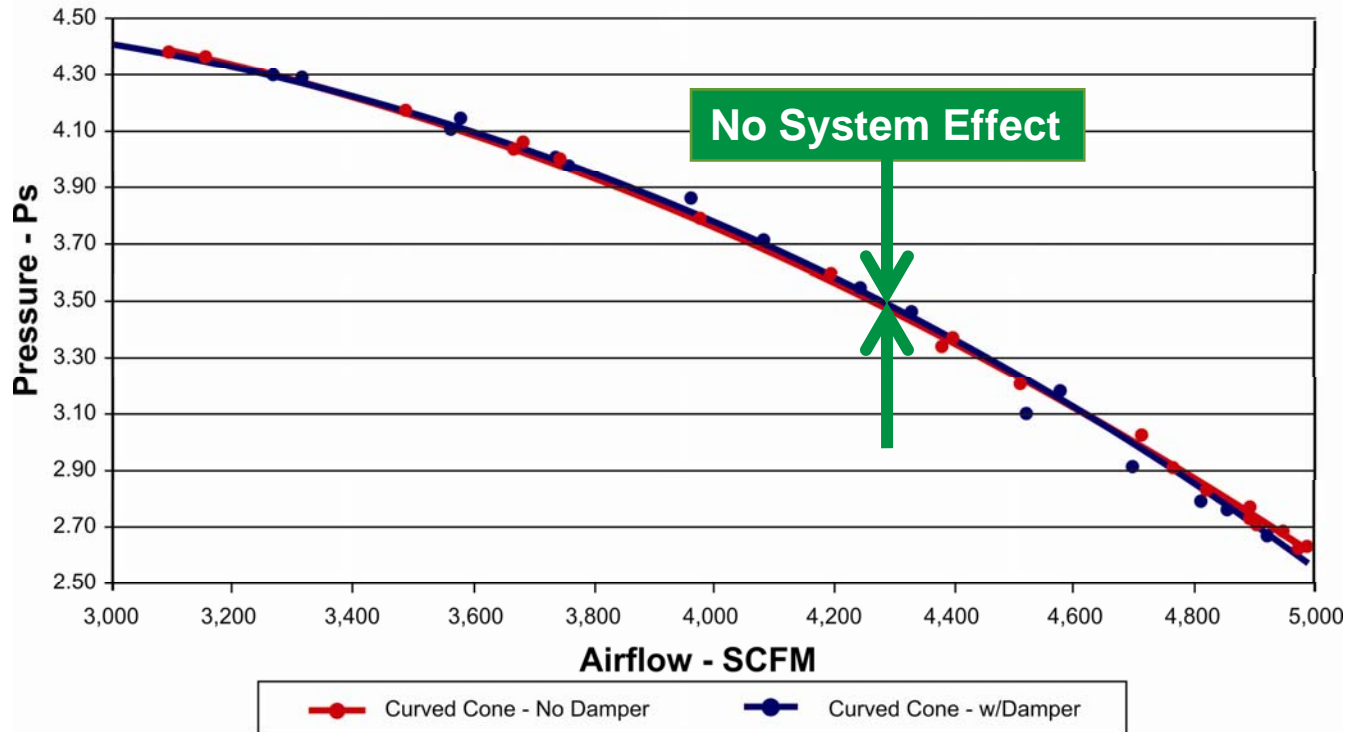
New Backdraft Damper

Near Zero System Effect For FANWALL® Systems



- FBD backdraft damper = near zero net system effect!

New FBD Backdraft Damper
18" OD FANWALL Fan @ 100% - 2100 RPM

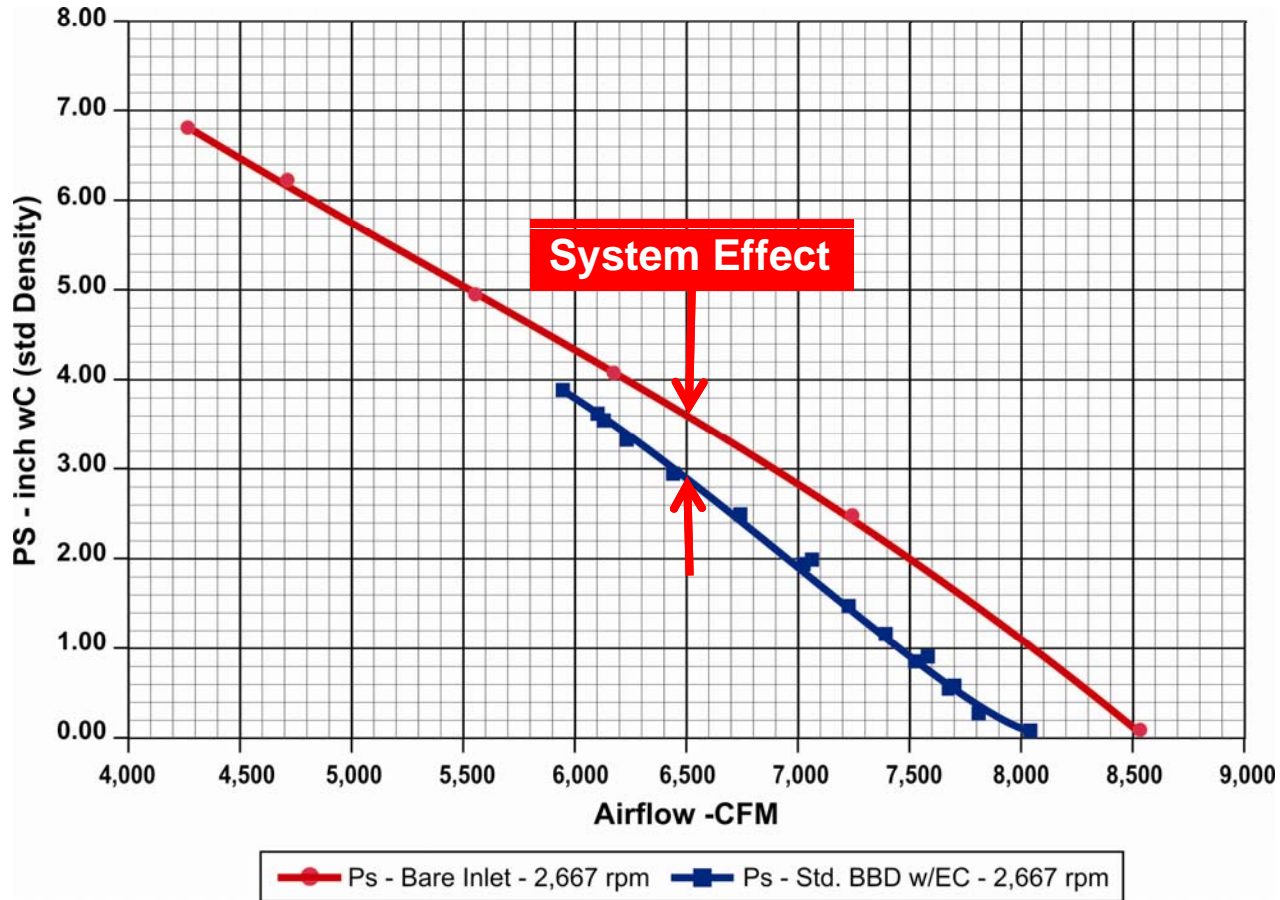


New Backdraft Damper

Near Zero System Effect For FANWALL® Systems



- Industry standard damper = significant system effect!

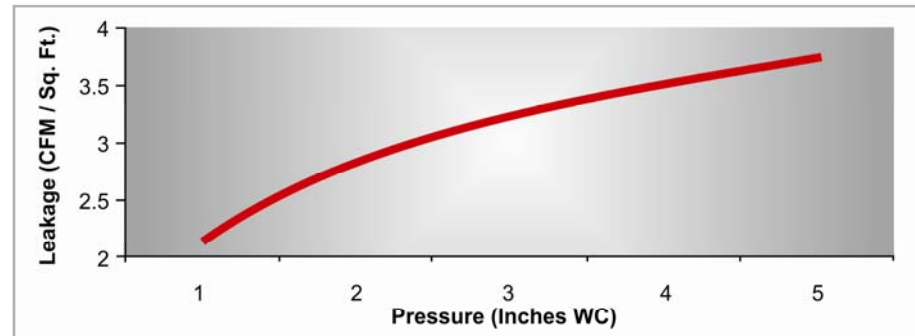


New Backdraft Damper

Near Zero System Effect For FANWALL® Systems



- Industry leading low leakage performance
 - FBD backdraft damper leak rate = 2 cfm/sq. ft. at 1" static pressure
 - Industry standard damper leak rate = 17.5 cfm/sq. ft. at 1" static pressure
- Significantly lower leak rate than is required for the highest industry standard rating for dampers in its class
 - AMCA Standard 511 requires a leak rate of 8 cfm/sq. ft. or less at 4" static pressure for its highest 1A Class rating
 - FBD backdraft damper leak rate = 3.5 cfm/sq. ft. at 4" static pressure



**New FBD Backdraft Damper
Leak Rate Vs. Pressure**

New Matched Horsepower Motors

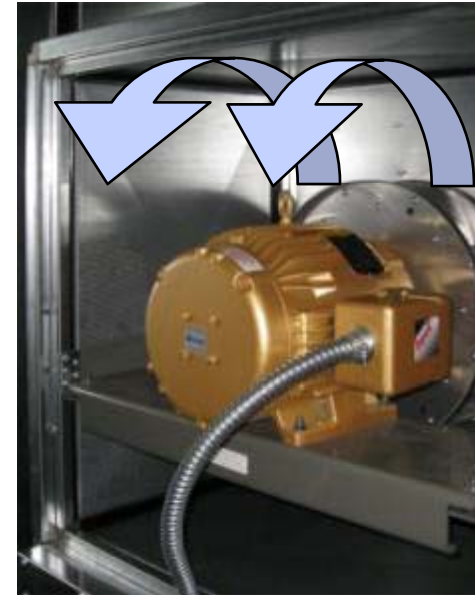
- 17 more motor horsepower selections allow designers to closely match required brake horsepower (BHP)
 - Reduce total connected horsepower
 - Reduce wire sizing and associated electrical costs



Typical Horsepower Selections	Expanded Horsepower Selections
1.0	1.0
3.0	1.5
	2.0
	2.5
	3.0
5.0	3.5
	4.0
	4.5
	5.0
7.5	5.5
	6.0
	6.5
	7.0
	7.5
10.0	8.0
	8.5
	9.0
	9.5
	10.0
15.0	10.5
	11.0
	11.5
	12.0
	15.0

New Matched Horsepower Motors

- Standard motors
 - Traditional NEMA T-frame sizes
 - Class H rated insulation
 - Nameplate HP provided for the required duty
 - Full factory warranty and 1.15 service factor are standard
- Application specific availability based on the coplanar motor mounting environment



BALDOR-RELIAN Super E™ Motor		BALDOR-RELIAN Super E™ Motor		BALDOR-RELIAN Super E™ Motor	
CAT. NO.	06H835W3560	CAT. NO.	06H835W5670	CAT. NO.	07R591X7900
HP	4 AIR OVER	HP	6 AIR OVER	HP	8.5 AIR OVER
VOLTS	230/460	VOLTS	230/460	VOLTS	230/460
AMPS	10.6/5.3	AMPS	15/7.5	AMPS	21/10.5
R.P.M.	1735	R.P.M.	1740	R.P.M.	1785
FRAME	1821 Hz 60 PH	FRAME	184T Hz 60 PH	FRAME	2131Z Hz 60
SER. F.	1.15 CODE H DES - CLASS	SER. F.	1.15 CODE J DES - CLASS	SER. F.	1.15 CODE H DES - CLASS
NEMA NOM. EFF.	86.5 % P.F. 82	NEMA NOM. EFF.	88.5 % P.F. 85	NEMA NOM. EFF.	91 % P.F. 83
RATING	40C AMB-CONT	RATING	40C AMB-CONT	RATING	40C AMB-CONT
CC	USABLE AT 208V 11.1	CC	USABLE AT 208V 15.8	CC	USABLE AT 208V 22.3
BEARINGS	DE 6206 DOD 6205	BEARINGS	DE 6206 DOD 6205	BEARINGS	DE 6307 DOD 6206
ENCL.	TEAO EN F0907131988	ENCL.	TEAO SH F0907170009	ENCL.	TENV SN F0907178623

New Matched Horsepower Motors



- Simple comparison
 - FANWALL TECHNOLOGY® fans with FBD backdraft damper and matched horsepower motor selections
 - Twin City Fan & Blower model MPQN fans with standard backdraft damper and standard horsepower motor selections
 - 34,000 cfm air handler at 4.2 in. static pressure

Model	Fans	Static Pressure (in.)	Wheel Size (in.)	Speed (rpm)	BHP Per Fan	Total BHP	Static Fan Efficiency (%)	Motor Nameplate HP (#)	Connected HP
FANWALL	9	4.32*	18.00	2232	3.55	31.95	72.3	4.0 (9)	36.0
MPQN	9	4.75**	18.25	2165	4.28	38.52	66.0	5.0 (9)	45.0
MPQN	4	4.75**	24.50	1688	9.26	37.04	68.1	10.0 (4)	40.0
MPQN	2	4.75**	36.50	1078	18.06	36.12	70.0	20.0 (2)	40.0

* Selection TSP is set at 4.32 in. to reflect the system effect introduced by the FANWALL cube (0.12" TSP) and provide an equal comparison to published MPQN fan data at identical operating conditions. This added TSP is included as part of the FANWALL® selection program.

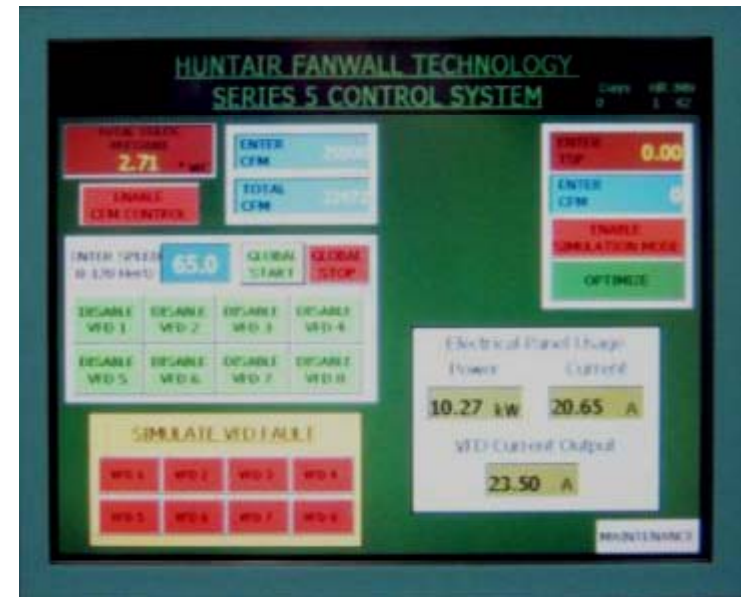
** Includes 0.55 added static pressure to account for the added system effect of a standard backdraft damper

System Optimization Controls

**FANWALL
TECHNOLOGY[®]**
BY HUNTAIR[®]

Improved Individual On/Off Control of Fans For FANWALL[®] Systems

- Automatic Control
 - Reconfigures the number of active fans and motors while controlling the speed of enabled fans
 - Optimizes efficiency over the range of system operation of an air handler



**System Optimization Controls
Unit-mounted Interface Screen
(BAS system interface also available)**

Patent Nos. 7,137,775 • 7,179,046 • 7,527,468 • Additional patents pending

System Optimization Controls

FANWALL
TECHNOLOGY[®]
BY HUNTAIR[®]

Improved Individual On/Off Control of Fans For FANWALL[®] Systems

- Improved control algorithms
 - Dynamic staging to optimize performance
 - Captures and communicates performance metrics
- Individual VFD control
 - Eliminates complete shutdown due to individual motor ground fault issues
 - Eliminates bypass VFD
 - Reduces control panel size
 - Reduces unit main wire sizing
- Near zero net system effect FBD backdraft damper is standard
- Standalone or BAS interface



Built-in Redundancy

■ FANWALL[®] systems

- Plurality of smaller fans and motors
 - System can still deliver up to 100% of airflow in the event of a fan or motor failure
 - Failed fan or motor can typically be treated as a high priority maintenance item
 - Smaller components more readily available and easier to remove and replace
- Can be selected to provide N+1 redundancy
 - No added space required
 - Lowest connected HP; optimized efficiency over operating range and life of the air handler

■ Conventional fan systems

- One or two larger fans and motors
 - Fan or motor failure is a critical path failure; complete shutdown or severely diminished airflow
 - Failed fan or motor requires immediate, costly repair to restore function
 - Larger components less readily available and require mechanical lifts, etc. to remove and replace
- N+1 redundancy achieved with severe cost/efficiency penalties
 - Cost/added space for a standby unit
 - Selection of the least efficient fan/motor combination over operating range and life of the air handler

Built-in Redundancy

- Where it is required
 - Mission critical applications that are sensitive to temperature and humidity changes, flow, pressure, etc.
 - Surgery suites, pharmaceutical manufacturing, food processing, laboratories, data centers, museums, hospitals, clean rooms, etc.
- Where is it desirable
 - Applications that would suffer a financial, property or schedule loss from a critical path failure of an air handler
 - Revenue-generating operations; office buildings, theaters, concert halls, hotel ballrooms, malls, airports, transportation centers
 - Institutional applications; K-12 schools, colleges, government facilities
 - Processes validated with flow/pressure criteria
 - Applications with access/egress restrictions
 - Retrofits of older air handlers and fan systems tucked into the bellows of existing buildings



N+1 Redundancy

- Benefits of using FANWALL[®] systems to provide N+1 redundancy
 - Smaller footprint
 - Fan, motor and array sizing flexibility allows designers to achieve smallest possible footprint
 - Can eliminate requirement for a standby unit
 - Can be provided within the existing footprint and cabinet for retrofit applications that would otherwise require major demolition and reconstruction
 - Reduced wire sizes and associated electrical costs
 - Can free up electrical infrastructure for other uses
 - Reduced energy consumption
 - Fan, motor and array sizing flexibility allows system to closely match the required BHP and avoid the energy penalty of oversized fans and motors
 - Motors operate in peak efficiency range throughout the operating range of the air handler

N+1 Redundancy

- Simple comparison
 - FANWALL TECHNOLOGY® with FBD backdraft damper, matched horsepower motor selections, able to achieve N+1
 - Twin City Fan & Blower model MPQN with standard backdraft damper, standard horsepower motor selections, able to achieve N+1
 - 34,000 cfm air handler at 4.2 in. static pressure

Model	Static Pressure (in.)	Wheel Size (in.)	All Fans /Motors Operating			One Fan/Motor Disabled			Motor Nameplate HP (#)	Total Connected HP
			Fans	Speed (rpm)	BHP Per Fan	Fans	Speed (rpm)	BHP Per Fan		
FANWALL	4.32*	18.00	9	2232	3.55	8	2299	4.00	(9) 4.0	36.0
MPQN	4.75**	18.25	9	2165	4.28	8	2253	4.86	(9) 5.0	45.0
MPQN	4.75**	24.50	4	1688	9.26	3	1932	13.27	(4) 15.0	60.0
MPQN	4.75**	36.50	2	1078	18.06	1	1588	47.98	(2) 50.0	100.0

* Selection TSP is set at 4.32 in. to reflect the system effect introduced by the FANWALL cube (0.12" TSP) and provide an equal comparison to published MPQN fan data at identical operating conditions. This added TSP is included as part of the FANWALL® selection program.

** Includes 0.55 added static pressure to account for the added system effect of a standard backdraft damper

Smaller Footprint Frees Up Space

- FANWALL[®] systems have a dramatically shorter footprint
 - Typical FANWALL section is 48 to 66 inches in length
 - Tremendous space savings versus conventional fan systems

One Specification, Four Air Handlers – Each With A Different Fan

Type	Width (in.)	Height (in.)	Length (in.)	Length (% Greater)
FANWALL System	133	86	189	0
Single DWDI Housed Fan	133	86	277	47%
Dual Direct Drive Plenum Fans	133	86	253	34%
Vaneaxial Fan	133	86	353	87%



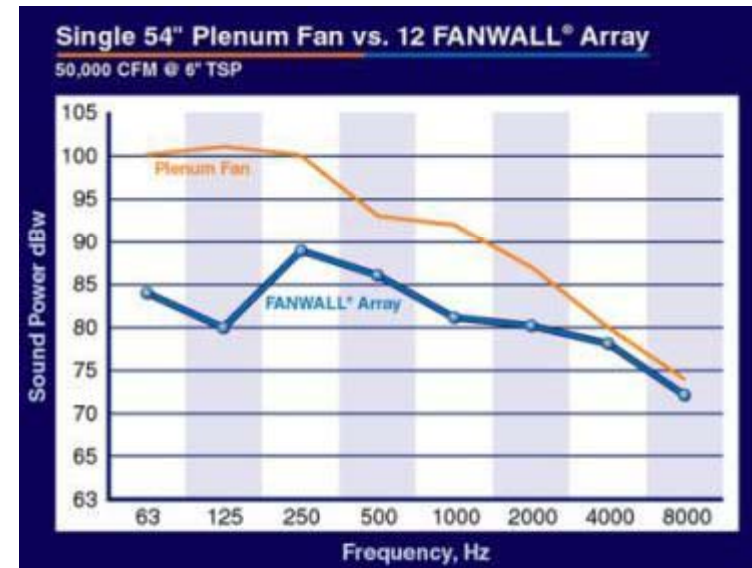
Smaller Footprint Frees Up Space

- Designers
 - Benefit from an easier fit for space limitations
- Architects
 - Can devote less space to mechanical equipment rooms
- Owners
 - Have more leasable space to generate revenue
- Contractors
 - Can handle and install smaller sections/components
 - Individual cubes can be navigated through standard 3-foot doors and easily assembled on site to accomplish retrofits within space constraints



Superior Acoustic Performance

- Often 16 to 18 dB less sound power in lower octave bands
- Designed for quiet operation
 - Smaller fans and motors generate less noise
 - Patented Coplanar Silencer[®] attenuates sound in the FANWALL[®] cube



Superior Acoustic Performance

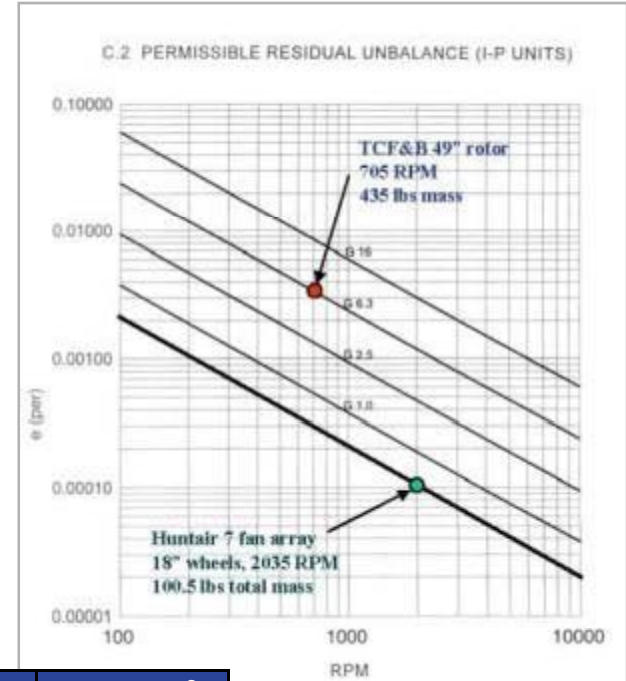
- Can eliminate the need for sound attenuators
 - Eliminates the cost, system effect and energy penalty of unit or duct installed devices
 - Can often be removed in retrofit applications, allowing the air handler to be reconfigured for more efficient operation
- Ideal for sound sensitive applications
 - Hospitals, theaters and concert halls, schools, offices, etc.



**Can Eliminate Need
For Sound Attenuators!**

Superior Vibration Performance

- All FANWALL[®] systems are balanced to achieve an equivalent AMCA 204-96 grade not to exceed .55 mm (.022 inch) per second peak, filter in
 - Significantly more stringent standard than manufacturers of conventional fans
 - Rotational vibration transmitted to the building is a fraction of that of a conventional fan system



	Conventional Fan	FANWALL [®]
Size	491 APF	18
Diameter (%)	100	100
Width (%)	100	100
Quantity	1	7
Rotor Weight (lbs)	435	100.8
Fan Speed (RPM)	705	2035
W	73.83	213.10
e _{per}	0.00335961	0.00010161
U _{per}	1.4614	0.0102

**Comparison:
49" conventional fan vs. FANWALL system with seven 18" fans in the array**

Easy Maintenance And Service

- Smaller components are easier to handle and service
 - Repair or maintenance can usually be accomplished by one or two maintenance personnel without requiring mechanical lifts
- Eliminates belts, sheaves, fan bearings
- Permanently sealed motor bearings are standard
- No performance degradation associated with belt, sheave, bearing and motor wear and tear



No routine belt, sheave, fan bearing or motor maintenance!

Ideal For Retrofits

- Modular design allows cubes to fit through a standard 3 ft. door
 - Can fit through tight spaces and be assembled in place
 - Helps avoid the cost of significant structural demolition and reconstruction
 - Avoids the cost of having a crane onsite
 - Simplifies project staging in tight spaces
 - Allows flexibility to preserve existing air handler cabinet and upgrade system



Ideal For Retrofits

- Upgrade system performance
 - Many older systems oversized; can update to match actual capacity and airflow requirements
 - Improved velocity profile across the coils more closely matches the ARI conditions used to rate coils, providing better performance
 - Low sound can allow attenuators to be removed, eliminating their static pressure penalty
 - Low vibration can resolve existing concerns and eliminate need for a costly concrete inertia pad
 - Can address system configuration (i.e. blow through or draw through), component access issues, coil and damper corrosion, etc.
 - Essentially results in a new air handler in the existing cabinet



Summary

Get the FANWALL® Advantage

FANWALL
TECHNOLOGY
BY HUNTAIR®

- FANWALL TECHNOLOGY is the preferred fan array solution
 - The original and most widely used fan array solution
 - High efficiency fans
 - New near zero system effect backdraft damper
 - New matched horsepower motor selections
 - Improved System Optimization Controls
 - N+1 redundancy
 - Saves valuable space
 - Superior acoustic performance
 - Superior vibration performance
 - Easy maintenance and service
 - Modular design is ideal for retrofits

FANWALL TECHNOLOGY®

Get the FANWALL® Advantage

- Questions?

FANWALL
TECHNOLOGY®
BY HUNTAIR®