

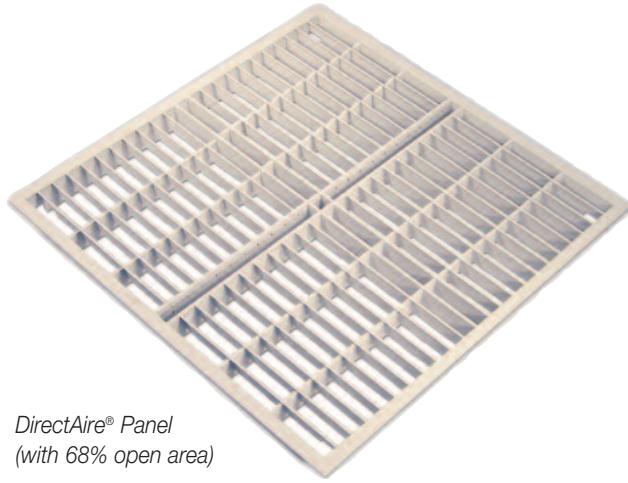
Data Center Airflow Solutions



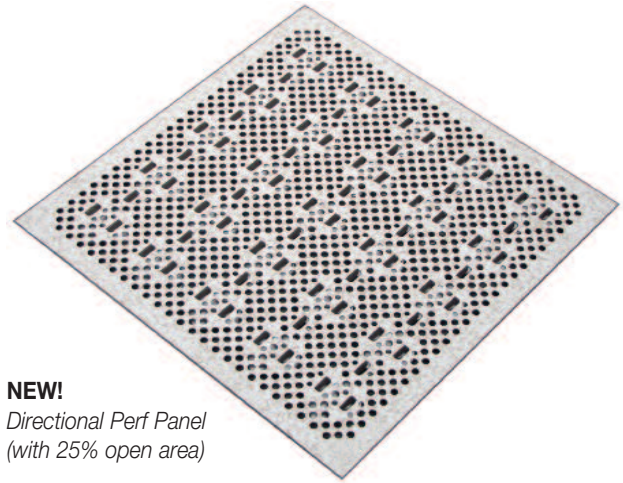
- Directional Airflow Panelspage 18
- Standard Airflow Panelspage 19
- Manual Controlspage 20
- Automatic Controls.....page 21
- Fan-Assisted Controlspage 22
- ContainAire™page 24
- KoldLok, HotLok, AisleLokpage 26
- Other Airflow Mgt Solutions.....page 27

Directional Airflow Panels

Higher Cooling Capacity and Improved Energy Efficiency



DirectAire® Panel
(with 68% open area)



NEW!
Directional Perf Panel
(with 25% open area)

DirectAire® Panels

Unlike other airflow panels the DirectAire® and DirectAire® X2 angle the airflow toward the server rack to significantly reduce bypass air and achieve a 93% Total Air Capture (TAC) rate. This means 93% of the air delivered through the panel is entering the face of a standard 42U rack. DirectAire is designed for a one-to-one pairing with a rack while DirectAire X2 divides the airflow to provide even distribution to racks on both sides of a cold aisle.

Panel Features

- 68% Open Area provides 2,600 CFM @ .1" H2O
- Supports 20kW per rack @ .1" H2O (X2, 10kW per rack)
- Available in 24" and 60cm panel sizes

Directional Perf Panels

Like the DirectAire panels the Directional Perf angles the airflow toward the server rack to significantly reduce bypass air and achieve a 93% Total Air Capture (TAC) rate. This means nearly twice the airflow through the panel is entering the face of the rack, improving cooling capacity and energy efficiency.

Panel Features

- 25% open area delivers 765CFM @ .1" H2O
- Directional air flow achieves a 93% total air capture
- Cools up to 8kW per rack
- Available in 3 concentrated load ratings 800, 1000 and 1250
- Available with or without a slide damper

Airflow Panel System Load Performance Chart* (Tested on Actual Understructure)

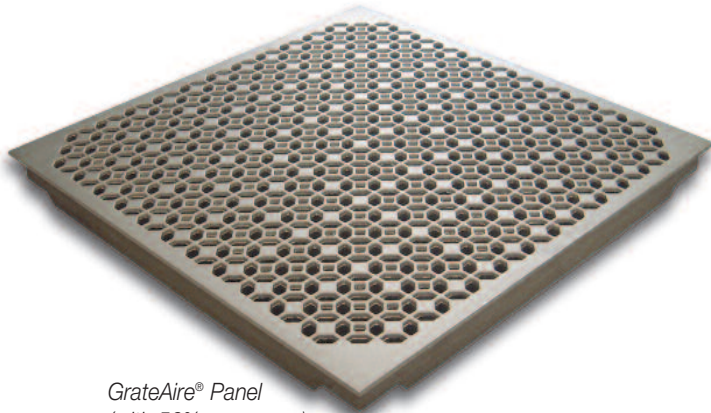
Panel	Understructure	System Weight (lbs/ft ²)	Static Loads		Rolling Loads		Impact Loads (lbs)	Total Air Capture
			Design Loads ¹ (lbs)	Safety Factors ² (min 2.0)	10 Passes (lbs)	10,000 Passes (lbs)		
DirectAire® & X2	Bolted Stringer	13.0 (63kg/m ²)	2500 (11.1kN)	Min. > 2.0	2000 (8.9kN)	2000 (8.9kN)	200 (91kg)	93%
DPerf 800	Bolted Stringer	9.5 (46kg/m ²)	800 (3.6kN)	Min. > 2.0	-	-	150 (68kg)	93%
DPerf 1000	Bolted Stringer	10.0 (49kg/m ²)	1000 (4.4kN)	Min. > 2.0	-	-	150 (68kg)	93%
DPerf 1250	Bolted Stringer	10.5 (51kg/m ²)	1250 (5.6kN)	Min. > 2.0	-	-	150 (68kg)	93%

*All tests are performed using CISCA's Recommended Test Procedures for Access Floors with the exception of Design Load

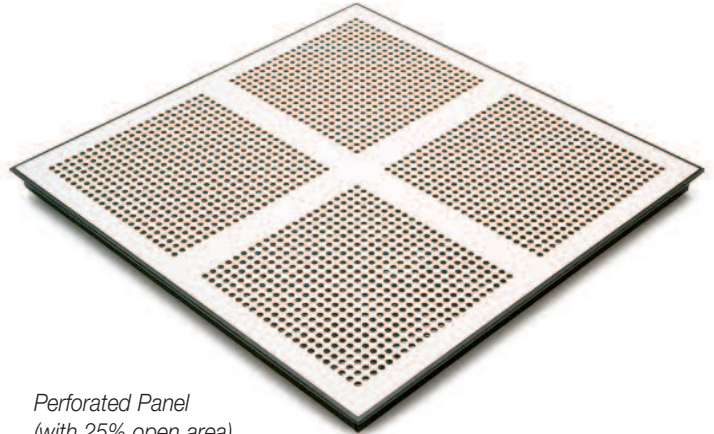
1. Design Load is tested using CISCA's Concentrated Load test method on actual understructure instead of steel blocks. Design Load is determined by taking the lesser value of ultimate load divided by two or the point at which permanent damage begins to occur.

2. Safety factor is the factor of Design load that can be divided into the Ultimate Load. International standards recommend a minimum of 2.

Standard Airflow Panels



GrateAire® Panel
(with 56% open area)



Perforated Panel
(with 25% open area)

GrateAire® Panels

Panel Features

- GrateAire® die-cast aluminum panels are compatible with any 24" or 60cm bolted stringer systems.
- 56% unobstructed open area
- Rolling load capacity equal to that of ConCore® 1250 panels (1000 lbs/800 lbs).
- Available with top surface adjustable damper.
- Available with an unpainted textured surface or epoxy powder coatings.
- Interchangeable with laminated ConCore, All Steel, Woodcore and Aluminum panels in a stringered system.

Perforated Panels

Panel Features

- Perforated steel panels are compatible with any 24" or 60cm bolted stringer systems.
- 25% open area
- Design loads with safety factors of 2, not recommended for rolling loads.
- All panels are available with top surface adjustable damper.
- Steel perforated panels are available with High Pressure Laminate, vinyl and rubber floor coverings.
- Interchangeable with laminated ConCore, All Steel and Woodcore panels in a stringered system.
- Perforated aluminum panels available for use with a bolted stringer aluminum system.

Airflow Panel System Load Performance Chart* (Tested on Actual Understructure)

Panel	Understructure	System Weight (lbs/ft²)	Static Loads		Rolling Loads		Impact Loads (lbs)	Total Air Capture
			Design Loads¹ (lbs)	Safety Factors² (min 2.0)	10 Passes (lbs)	10,000 Passes (lbs)		
GrateAire®	Bolted Stringer	8.0 (39kg/m²)	1000 (4.4kN)	Min. > 2.0	1000 (4.4kN)	800 (3.6kN)	150 (68kg)	50%
Perf 800	Bolted Stringer	9.5 (46kg/m²)	800 (3.6kN)	Min. > 2.0	-	-	150 (68kg)	50%
Perf 1000	Bolted Stringer	10.0 (49kg/m²)	1000 (4.4kN)	Min. > 2.0	-	-	150 (68kg)	50%
Perf 1250	Bolted Stringer	10.5 (51kg/m²)	1250 (5.6kN)	Min. > 2.0	-	-	150 (68kg)	50%

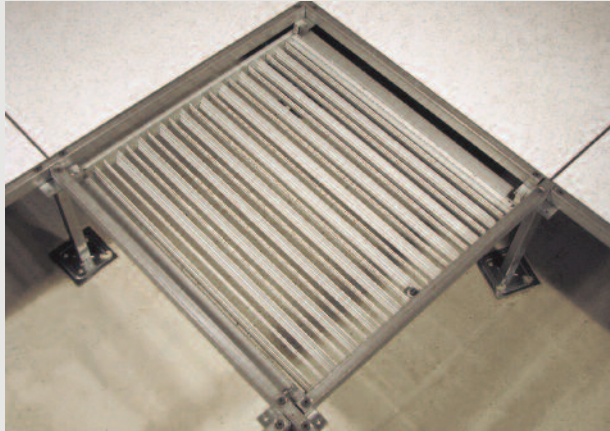
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2. Safety factor is the factor of Design load that can be divided into the Ultimate Load. International standards recommend a minimum of 2.

Manual Controls for Airflow Panels

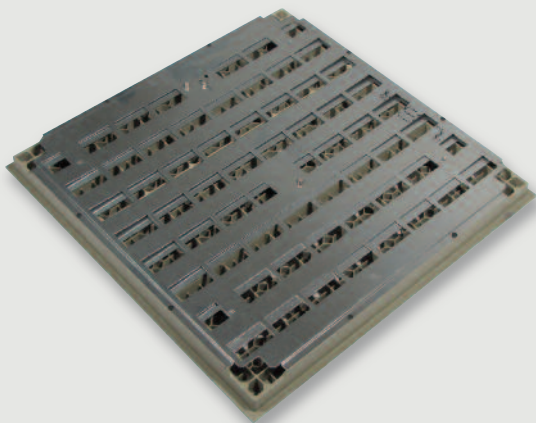
for ConCore and All Steel Systems



Opposed Blade Damper for use with DirectAire and GrateAire® Panels



Multi-zone Opposed Blade Damper for use with DirectAire Panels



Manual Damper for use with GrateAire® and Perf Panels

Opposed Blade Damper (OBD)

Tate's opposed blade damper allows the user infinite airflow adjustability with very little airflow resistance. Easy adjustable through the top surface of a GrateAire or DirectAire panel for balancing airflow to IT equipment with fixed requirements.

Key Performance Characteristics

- Provides more airflow at 100% open than slide dampers
- Easily adjustable from above without grate removal
- Drop in design allows for easy retrofits under Tate airflow panels

Multi-Zone Opposed Blade Damper

Tate's multi-zone opposed blade damper enables the airflow delivery to be balanced based on the specific load in a 14U section of the rack. The damper allows data center operators to individually adjust airflow to three zones within the rack (top, middle and bottom) without removing the DirectAire panel, ensuring fast and accurate balancing to the fixed IT load.

Key Performance Characteristics

- Reduces cooling energy usage.
- For use with full or partial loaded racks.
- Provides the most granular airflow control available
- Easily adjustable from above without panel removal

Slide Damper

Tate's slide damper is used to manually control airflow under a GrateAire or Perforated panel. The slide damper is mechanically attached to the panel to provide airflow control.

Key Performance Characteristics

- Easily adjustable from above without panel removal
- Mechanically attached to panel for easy underfloor access

Automatic Controls for DirectAir Panels

for ConCore and All Steel Systems

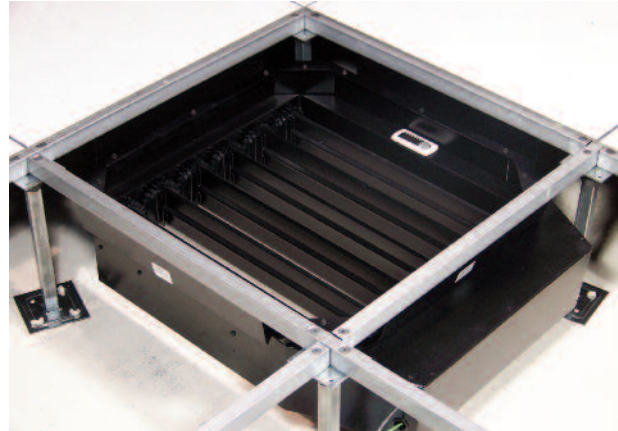
SmartAire® - Automatic VAV

The data center is in constant flux. Load diversity between racks and variable server loads are the norm. New demands to reduce energy consumption in the green data center require a fine balance to ensure proper air flow to each rack during peak, partial load and idle IT hardware operation.

Tate's SmartAire electronically controlled variable-air-volume damper adjusts cooling to allow for variable loads within a server rack. The damper opens and closes to adjust the amount of airflow and ensure the proper inlet temperature is maintained on a rack-by-rack basis.

Available Control Options

- **SmartAire C** - client sensor network
- **SmartAire S** - 1 rack mounted temperature sensor
- **SmartAire M** - 3 rack mounted temperature sensor
- **SmartAire P** - pressure differential sensor
- **SmartAire T** - technician activated temperature sensor



SmartAire Automatic Variable-Air-Volume Damper for use with DirectAir Panels



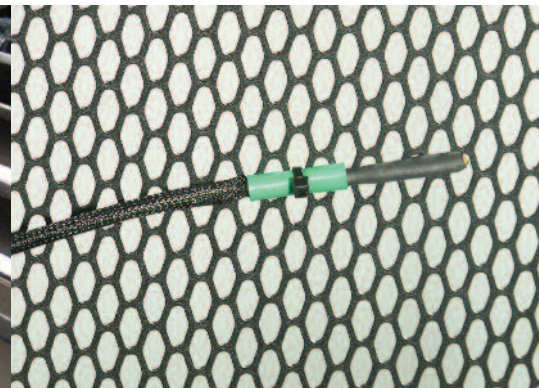
For more information about DirectAir, SmartAire and PowerAire, get Tate's In-floor Cooling Solutions for Data Centers brochure online at: www.tateinc.com



Temp Display and Setpoint Interface for SmartAire & PowerAire



0-100% Open VAV Actuating SmartAire Damper



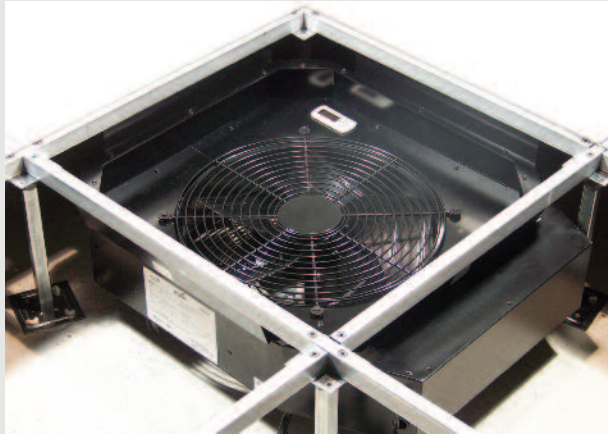
Sensor Mounted to the Face of the Rack for SmartAire & PowerAire

SmartAire Key Performance Characteristics

- 0-22kW supported IT load per DirectAir/SmartAire pair
- Power disruption fail safe to fully open position
- Zero maintenance
- Quick and easy installation
- Multiple control options available
- Optional BMS interface
- User programmable set point
- 6 vane damper for large open area
- Damper position is infinitely variable from 0-100%
- High Precision, Quick Response Temperature Measurement
- Viewable maximum temp for walkthrough check of each rack
- Available Automatic Transfer Switch offers N+1 reliability

Fan Assisted Controls for DirectAire Panels

for ConCore and All Steel Systems



PowerAire High Volume Fan Assist Module for use with DirectAire Panels



PowerAire Quad Fan Assist Module with redundant fan output for low finished floor heights

PowerAire®

Tate's PowerAire fan assist module is designed to provide a blast of cooling through an individual airflow panel. The fan automatically turn on when conditions require additional cooling. Options are available to utilize rack mounted temperature sensors or an existing client sensor network to control the fan. Equipped with a variable speed fan drive the fan can be throttled up or down based on the heat load requirements. This powerful solution is capable of cooling up to 25kW of IT load at .1" H2O for solving the toughest hot spots in a data center.

PowerAire Key Performance Characteristics

- Zero maintenance
- Installation can be carried out by IT staff
- Multiple control options available:
 - **PowerAire C** - client sensor network
 - **PowerAire S** - 1 rack mounted temperature sensor
 - **PowerAire M** - 3 rack mounted temperature sensors
- Available in 100-120V or 200-240V power input options
- High Precision, Quick Response Temperature Measurement
- User programmable set point
- Fan speed is infinitely variable from 0-100%
- Available in 100-120V or 200-240V power input options
- Viewable Peak Temp for walkthrough check of each rack
- Available Automatic Transfer Switch offers N+1 reliability

PowerAire® Quad

The PowerAire Quad fan assist module is equipped with 4 fans connected in parallel to provide built in redundancy. This unit is only 4" deep making it ideal for retrofit situations with finished floor heights as low as 7.5". This unit can cool up to 18kW of supported IT load per PowerAire Quad/DirectAire @ .1" H2O

PowerAire Quad Key Performance Characteristics

- Zero maintenance
- Installation can be carried out by IT staff
- Multiple control options available:
 - **PowerAire Quad C** - client sensor network
 - **PowerAire Quad S** - 1 rack mounted temperature sensor
 - **PowerAire Quad M** - 3 rack mounted temperature sensors
- Available in 100-120V or 200-240V power input options
- High Precision, Quick Response Temperature Measurement
- User programmable set point
- Fan speed is infinitely variable from 0-100%
- Available in 100-120V or 200-240V power input options
- Viewable Peak Temp for walkthrough check of each rack
- Available Automatic Transfer Switch offers N+1 reliability

Airflow Panel CFM and kW Capacity Chart

Airflow Panel	0.02" H ₂ O (5 Pa)		0.04" H ₂ O (10 Pa)		0.06" H ₂ O (15 Pa)		0.08" H ₂ O (20 Pa)		0.10" H ₂ O (25 Pa)	
	CFM (L/s)	(kW/Rack)	CFM (L/s)	(kW/Rack)	CFM (L/s)	(kW/Rack)	CFM (L/s)	(kW/Rack)	CFM (L/s)	(kW/Rack)
DirectAire										
w/o Damper	1151 (543)	8.5	1626 (767)	12.0	2007 (947)	14.8	2318 (1093)	17.1	2594 (1224)	19.1
w/ OBD	986 (465)	7.3	1427 (673)	10.5	1789 (844)	13.2	2056 (970)	15.2	2331 (1100)	17.2
w/ SmartAire	938 (443)	6.9	1310 (618)	9.7	1666 (786)	12.3	1912 (902)	14.1	2134 (1007)	15.8
w/ PowerAire	2717 (1282)	20.1	2780 (1312)	20.5	2877 (1358)	21.2	2974 (1404)	22.0	3014 (1422)	22.2
w/ PA Quad	2012 (950)	14.9	2061 (973)	15.2	2111 (996)	15.6	2158 (1018)	15.9	2199 (1038)	16.2
Directional Perf										
w/o Damper	357 (168)	2.6	496 (234)	3.7	602 (284)	4.4	689 (325)	5.1	765 (361)	5.6
w/ Slide damper	260 (123)	1.9	367 (173)	2.7	447 (211)	3.3	515 (243)	3.8	574 (271)	4.2
GrateAire										
w/o Damper	916 (432)	3.6	1320 (623)	5.2	1608 (759)	6.4	1860 (878)	7.4	2096 (989)	8.3
w/ OBD	907 (428)	3.6	1313 (620)	5.2	1587 (749)	6.3	1841 (869)	7.3	2062 (973)	8.2
w/ Slide damper	504 (238)	2.0	712 (336)	2.8	876 (413)	3.5	1008 (476)	4.0	1128 (532)	4.5
Standard Perf										
w/o Damper	332 (152)	1.3	476 (224)	1.9	584 (275)	2.3	666 (314)	2.6	746 (352)	3.0
w/ Slide damper	237 (112)	0.9	328 (155)	1.3	402 (190)	1.6	461 (218)	1.8	515 (243)	2.0

*Cooling capacity per rack are calculated based on the following formula (CFM x TAC) / 126 (CFM needed to cool 1kW @ 25°ΔT)

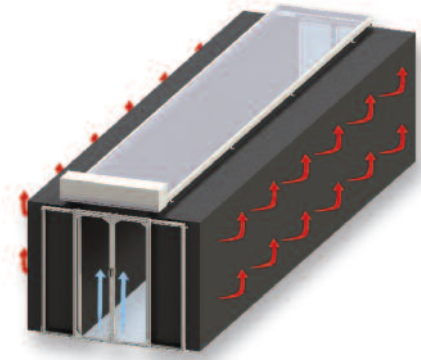


Data Center Syracuse University,
Syracuse, NY, 12,000 ft²

Aisle Containment

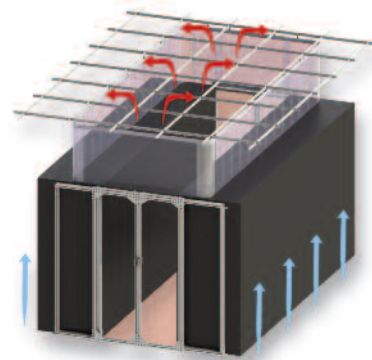
Cold Aisle Containment

A cold aisle containment system can be created using ContainAire partitions or a retracting roof. A retracting roof keeps the cool air closer to the equipment however, Partitions can be used when solid ceiling tiles are in place over the aisle.



Hot Aisle Containment

A hot aisle containment system will need to use the ContainAire partitions around the top of the racks since the hot air will need to exhaust through the ceiling return grilles. These systems can be used with any door option.



ContainAire™ Partitions

The ContainAire Vertical Partition System combines cost-effectiveness and ease of installation to create the finest ceiling mounted partition system for both hot and cold aisle containment. Tate formulated special ceiling attachments with a 360 degree swivel so as to easily attach to ceiling grid in any direction and at any point along the track.

High-grade aluminum tracks are connected with splicers and then hung with UL and FM rated fire suppression links designed so that curtains fall away during a fire, allowing sprinklers full operation range.



ContainAire Partition (close-up of fire suppression link)



ContainAire Retracting Roof

ContainAire™ Retracting Roof

The Tate ContainAire retracting roof system is a UL material solution for both cold and hot aisle containment. It combines cost-effectiveness, ease of installation, fire safety, and clean aesthetics.

High-grade aluminum track, UL rated drop in panels make for a below sprinkler containment solution. The ContainAire retracting roof kit includes all of the components and fasteners required to assemble and install the roof containment. Tate roofs can be installed on the top of the rack cabinets.

Features

- Modular design (all parts snap together)
- 2-6 foot wide models (60cm-180cm)
- Unlimited lengths
- UL/FM rated ceiling panels
- Flat roof to prevent overhead obstructions
- No tools required for installation