

Containment Solutions

ContainAire, SmartAire P, SmartAire T



*Energy Efficient Solutions for Diverse
and Variable Data Center Environments*

Tate[®]



“Aisle Containment Significantly Improved the Capacity and Energy Efficiency of My Data Center.”

Improve Cooling Efficiency

The Effectiveness of Aisle Containment in Data Centers

Typical raised floor data centers are designed using hot aisle/cold aisle layouts. This is done so that the hot exhaust air from one rack is not being ingested by the intake of another rack. This equipment layout strategy is intended to help keep the hot equipment exhaust air from mixing with the cold air being supplied from under the raised floor. While hot/cold aisle design is a necessary first step, it often doesn't go far enough.

Contain the Airflow in the Aisle

Containment systems have become a popular strategy for segregating hot and cold airflow. Containing an entire row of air has been shown to improve capacity and energy efficiency by reducing by-pass airflow. Many legacy airflow panel designs supply air in a vertical plume. Without a containment system this vertical plume can result in over 50% of the supplied airflow by-passing the equipment and mixing with the return air as shown in Figure 1. This wasted air not only reduces capacity it wastes energy.

Keys to Optimizing Cold & Hot Aisle Containment

Cold Aisle

Cold aisle containment systems increase cooling capacity by ensuring that all the supply air is funneled through the servers. However, a significant amount of leakage can occur through the servers themselves when pressure is allowed to build in the contained space (Figure 2). The key to successfully implementing cold aisle containment is to stop this leakage by modulating the airflow into the aisle in order to maintain a zero pressure differential inside and outside of the aisle as shown in Figure 3.

Hot Aisle

Most modern servers and storage devices are networked from the rear requiring occupancy within the hot aisle for servicing equipment. The increase in allowable inlet air temperature and temperature differentials (ΔT) across servers and other equipment results in temperatures over 110°F in some well designed contained hot aisles. Successful implementation of hot aisle containment requires the ability to provide cooling to the aisle during times when service is needed (Figure 4). This best practice technique allows technicians to work continuously in a contained hot aisle.

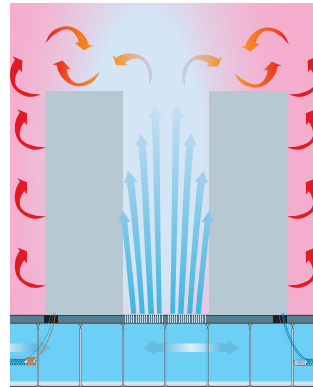


Figure 1:

Typical hot aisle/cold aisle layouts have a significant amount of mixing reducing capacity and efficiency.

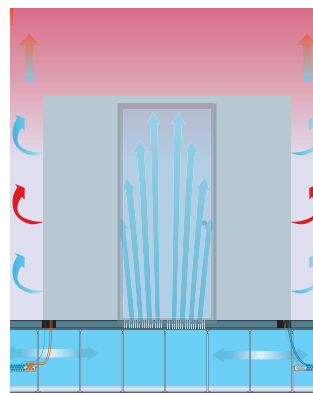


Figure 2:

Cold aisle containment systems help ensure maximum airflow to the racks but still create some bypass air when positive pressure builds.

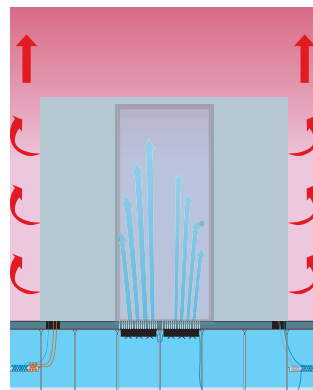


Figure 3:

Modulating the airflow into the cold aisle will help eliminate by-pass air through the servers by maintaining a neutral pressure differential.

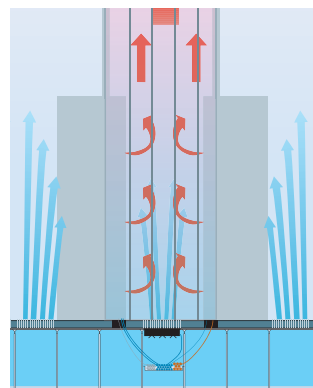


Figure 4:

Allowing cool airflow into the hot aisle when needed will help to create a comfortable working environment where technicians can service equipment without rest periods.

Improve Aisle Containment Designs

Cold Aisle Containment with SmartAire P

Solving the Leakage Issue

Cold Aisle containment systems are very common in perimeter CRAC/CRAH unit cooling designs. Some of the advantages include easy access to wires and cables, and a reduction in the amount of space you need to cool since the air is trapped only in that aisle. However, a significant amount of leakage can occur through the servers themselves. Tate conducted a study of 10 commonly used servers from 5 leading manufacturer's and found that in off and idle modes a significant amount of air can still be forced through them.

Cold Aisle Containment with Variable Load Servers

The airflow into the aisle is designed to handle the peak load. When servers are idle the aisle becomes positively pressurized forcing additional air through the idle servers resulting in by-pass airflow and leakage from the contained aisle through the servers. In many cases a full rack of idle servers can waste between 300-600 CFM. Tate's SmartAire P can eliminate this leakage by modulating the airflow in the cold aisle so that a zero static pressure differential inside and outside of the aisle is maintained.

Hot Aisle Containment with SmartAire T

Allowing for Continuous Work

Hot aisle containment is another common containment design. In hot aisle designs the entire room is still cooled using the perimeter CRAC units but, instead of trapping the cold supply air the exhaust air is isolated to keep it from mixing with the cool air in the rest of the room. OSHA requirements limit the length of time a person can work in elevated temperatures. This limitation would typically apply to all contained hot aisles.

Creating a More Comfortable Working Environment

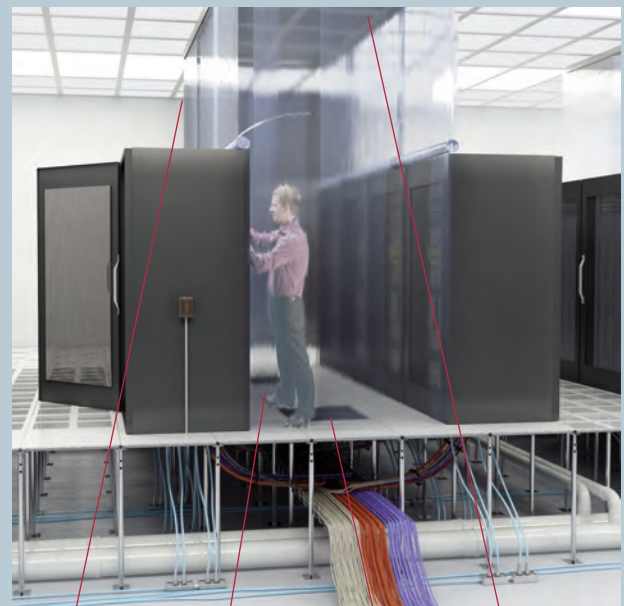
One of the advantages of hot aisle containment is that the overall space remains comfortable, however without the use of products such as Tate's SmartAire T the hot aisle temperature may be elevated above the OSHA limits for continuous work. SmartAire T provides on-demand airflow in the hot aisle to bring the temperature down so that continuous work can be performed.



For a white paper on by-pass air leakage through servers in a contained cold aisle visit: www.tateinc.com/resources/white_papers.aspx



ContainAire Retracting Roof ContainAire Hinged & Sliding Doors SmartAire P VAV Damper CRAC Hood



ContainAire Partitions ContainAire Strip Doors SmartAire T Occupancy Control Ceiling Return Grilles

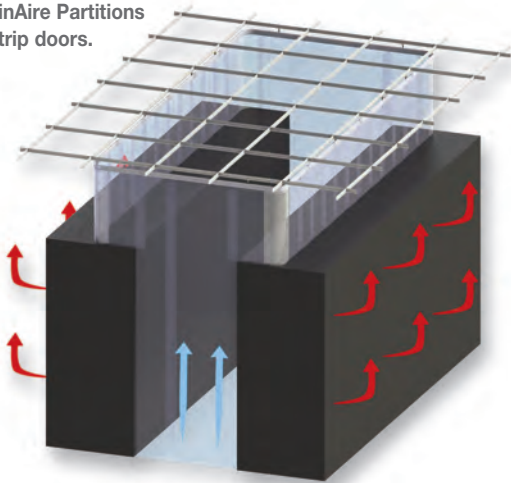
Containment Configurations

Typical Product Sets for Cold and Hot Aisle Containment Systems

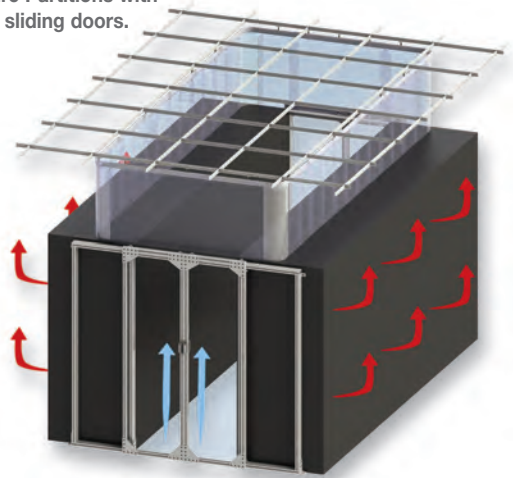
Cold Aisle Containment

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 and SmartAire P helps eliminate server airflow leakage. ContainAire partitions can be used around the top of the racks provided there are solid ceiling tiles in place over the aisle.

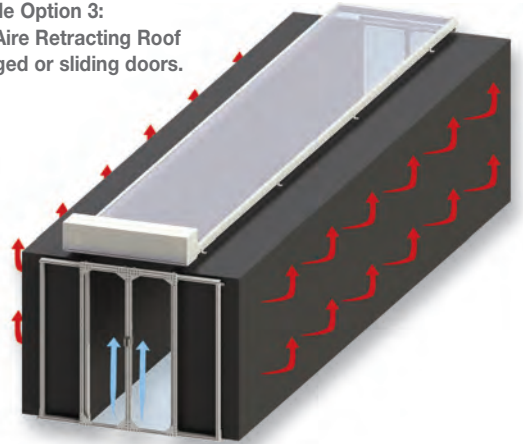
Cold Aisle Option 1:
ContainAire Partitions with strip doors.



Cold Aisle Option 2:
ContainAire Partitions with hinged or sliding doors.



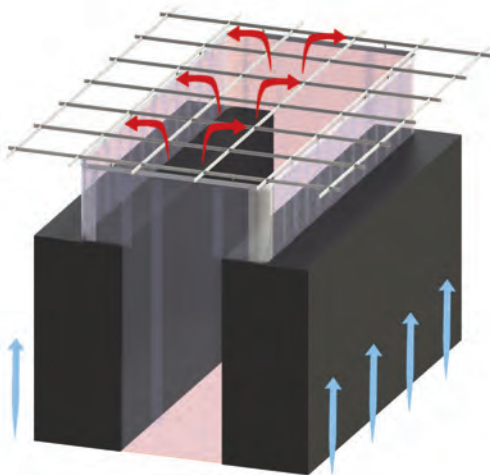
Cold Aisle Option 3:
ContainAire Retracting Roof with hinged or sliding doors.



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 needs to exhaust through the ceiling return grilles. These systems can be used with any door option. SmartAire T is needed to allow for continuous work in a contained hot aisle.

Hot Aisle Option 1:
ContainAire Partitions with strip doors and ceiling return grilles.



Hot Aisle Option 2: ContainAire Partitions with hinged or sliding doors and ceiling return grilles.

