

ProLine Modular Containment and Airflow Management Dynamics

CONNECT AND PROTECT

PROLINE EXPRESS CONTAINMENT OVERVIEW

Hot and cold aisle containment are proven methods to improve computer room cooling efficiency, increase rack densities, and improve overall utilization of the data center. In years past, the data center industry has depended on hard wall full roof containment to accomplish these goals. nVent HOFFMAN's solution, ProLine Express Containment, provides an exciting alternative to the status quo by offering a much simpler and cost-effective containment solution which is easier to implement and features a partially open roof, or 'open-sealed architecture'.

ProLine Express Containment offers the same core benefits of traditional containment solutions, but with the major advantage of saving time and effort upfront. The key benefit ProLine Express Containment offers is rapid deployment with little or no disruption to existing operations, and the ability to reconfigure the installation as the needs of the computer room change. This is made possible by a unique tool-less design that utilizes magnetic attachment for aisle end doors and top of rack baffles in both hot and cold aisles. ProLine Express Containment has been deployed in some of the most energy efficient data centers in the world.



WHY OPEN-SEALED CONTAINMENT WORKS IN COLD AISLES

ProLine Express Containment is designed with an open-sealed architecture for hot and cold aisle containment. In the cold aisle, the open architecture of ProLine partially contains the conditioned air, providing the required cooling to the IT equipment without over pressurizing the aisle. In this configuration, the Rack Top Angle Baffles extend 18" from the front edge of the rack, at a 30° angle from horizontal. This angle covers 66% of the open area of a typical 4' cold aisle.

The highly engineered design of the angle baffles creates a physical barrier that blocks exhaust air re-circulation over the tops of cabinets into the cold aisle, and helps retain cold air in the cold aisle, without over pressurizing. Another very important advantage of the open-sealed architecture is that in most cases no costly design or construction efforts are needed to modify the gaseous fire suppression or sprinkler head locations.



WHY VERTICAL Baffles WORK FOR HOT AISLES

As opposed to cold aisles where restricting the open area at the top of the aisle positively benefits IT intake air temperature conditions, the open area of hot aisle is often best left open and unrestricted. This provides as low a resistance path for the exhaust air back to the cooling units as possible. The goal with hot aisle containment is to channel or direct the hot air back to the air conditioning units while minimizing mixing with cold supply air. The vertical baffles in the hot aisle accomplish this by creating an 18" vertical barrier. For rooms with a ceiling plenum return the vertical baffles provide 18" of unrestricted "chimney" towards the ceiling openings. Without a barrier, the exhaust air easily flows over the tops of cabinets and mixes with the intake air in the cold aisles.

In addition to the height of the ceiling affecting the mixing of supply and return air, it also has an influence on the amount of hot air that wraps around the end cabinets of the rows through the end-aisle opening. The lower the ceiling, the more front to back wrap around recirculation occurs at the row end, creating hot spots in these cabinets. It is a best practice in any data center to use aisle end doors to prevent the hot air recirculation in row end cabinets.



FLUID DYNAMICS OF PROLINE EXPRESS CONTAINMENT

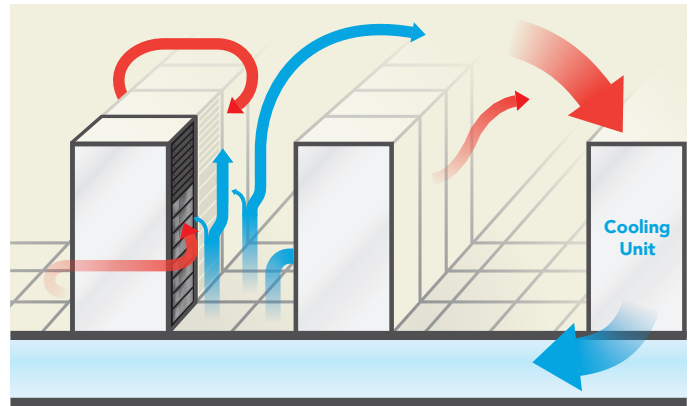
Installation of the ProLine Rack Top Angle Baffles in a typical 48" wide cold aisle will effectively reduce the open area between the tops of the two equipment rows to 16". This represents a 66% reduction of the width of the opening and 66% reduction in the open area at the top of the cold aisle. The reduced open area at the top of the aisle controls and restricts the flow of the excess conditioned from the cold aisle, and creates a slight positive pressurization of the cold aisle relative to surrounding spaces.

This results in conditioned air flowing out of the partially contained aisle in a more uniform manner while restricting hot exhaust air from flowing in. The slight positive pressurization is why the small gaps between adjacent baffles and above the Bi-Directional Doors is not a problem; in most cases excess conditioned air will flow out of these openings rather than hot air flowing in.

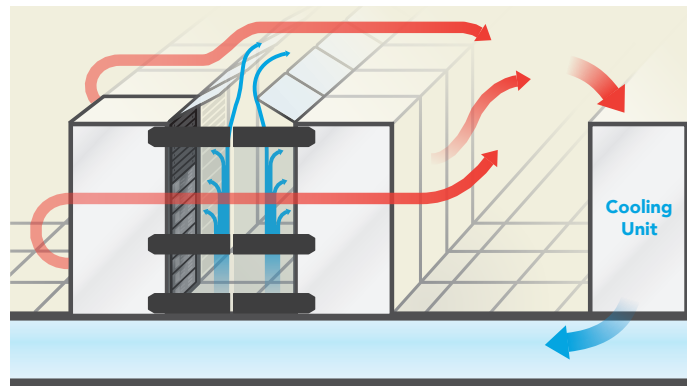
In the ideal case of 100% efficient airflow, the flow rate of conditioned air supplied to the cold aisle would equal the total required airflow of IT equipment within the aisle. In practice, this is not realistic. The flow rate of conditioned air supplied to cold aisles exceeds the total required airflow of the IT equipment for three reasons:

1. Overcome AFM inefficiencies/mixing of exhaust air with conditioned air,
2. Accommodate variations in airflow volume required by IT equipment, and
3. Requirements for redundant capacity.

The tool-less magnetic design of nVent HOFFMAN's ProLine Aisle Containment provides flexibility and ease of installation in just minutes, while mitigating the security risk of contract labor (see installation video).



Typical Airflow Patterns *without* Proline Modular Containment



Typical Airflow Patterns *with* Proline Modular Containment

North America

All locations

Tel +1.763.422.2661

Europe

Straubhardt, Germany

Tel +49.7082.794.0

Betschdorf, France

Tel +33.388.90.64.90

Warsaw, Poland

Tel +48.22.209.98.35

Assago, Italy

Tel +39.02.5776151.224

Middle East & India

Dubai, United Arab Emirates

Tel +971 4 823 8666

Bangalore, India

Tel +91.80.6715.8900

Istanbul, Turkey

Tel +90.216.250.7374

Asia

Shanghai, P.R. China

Tel +86.21.2412.6943

Qingdao, P.R. China

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