

Cold aisle air velocity standard for computer rooms



Overview

You can place one part of the sensor in the hot aisle and another in the cold aisle to assess proper airflow from cold to hot.

Key Takeaways

Recommended cold aisle air velocity in data centers typically ranges from 0.3 to 0.5 meters per second (60–100 feet per minute) at the server intake, according to ASHRAE guidelines.

Recommended Airflow and Velocity

Cold aisles are the spaces between the front faces of IT racks where servers draw in cooling air. Proper air velocity ensures that equipment receives sufficient cooling without creating turbulence or excessive energy use.

ASHRAE

ASHRAE 9 guidelines suggest that air velocity at the server intake should generally be maintained between 0.3 and 0.5

5 m/s (60–100 fpm) to provide effective cooling while minimizing hot air recirculation and pressure imbalances.



Factors Affecting Cold Aisle Velocity

Rack density and heat load: Higher-density racks may require slightly higher airflow to maintain target inlet temperatures. Raised floor or slab design: Cold air is typically supplied through perforated floor tiles in raised floor systems, or via overhead distribution in slab-mounted racks. Containment systems: Cold aisle containment improves airflow efficiency by isolating cold air from hot exhaust, allowing more uniform velocity and temperature across all racks.

Best Practices

Maintain uniform airflow: Avoid hotspots by ensuring that perforated tiles or vents are properly positioned and balanced. Monitor and adjust: Use airflow measurement devices or computational fluid dynamics (CFD) modeling to verify that cold aisle velocity meets design targets. Avoid excessive velocity: Too high airflow can increase energy consumption and create turbulence, reducing cooling efficiency.

Integrate with CRAC units: Coordinate cold aisle velocity with the capacity of computer room air conditioning (CRAC) units to maintain consistent temperatures and pressure.

Summary

For most computer rooms and data centers, maintaining cold aisle air velocity between 0.3 and 0.5 m/s at the server intake is considered best practice.

This range ensures effective cooling, reduces the risk of hotspots, and supports energy-efficient operation, especially when combined with cold aisle containment and proper airflow management.

Article Content

ASHRAE TC9.9 Data Center Power Equipment Thermal Guidelines

Strategies orient the IT racks in what is called a hot aisle/cold aisle layout. Cold aisles are formed by the space between the front faces of two rows of IT equipment racks.

FOCUSED COOLING USING COLD AISLE CONTAINMENT

Cold aisle containment can be used with or without conventional raised floor cooling. It is easily retrofitted into existing raised floor data centers and works in tandem with the raised floor as well as

Best Practices Guide for Energy-Efficient Data Center Design

All equipment is installed into the racks to achieve a front-to-back airflow pattern that draws conditioned air in from cold aisles, located in front of the equipment, and rejects heat out through the hot aisles.

Differential air pressure in your data centre

You can place one part of the sensor in the hot aisle and another in the cold aisle to assess proper airflow from cold to hot. A positive pressure differential in the hot aisle indicates

Data Center Cooling Systems for ASHRAE 90.4 | SimScale

This is due to the mixing of both the cold and hot aisles within the data center surrounding. The maximum velocity for this baseline design is at 0.44 m/s with a temperature range of 28.6 to 49.7

Data Center Design: Hot Aisle & Cold Aisle – Length and Width ...

Proper aisle planning isn't just about airflow—it's about optimizing safety, serviceability, and system efficiency. By adhering to these length and width standards, data center designers can enhance

General guidelines for data centers

Equipment layout and air delivery paths The hot-aisle, cold-aisle arrangement that is explained in the ASHRAE publication, "Thermal Guidelines for Data Processing Environments", dated 2011, should

Numerical and experimental investigations on thermal management

Thermal control is enhanced using overhead downward flow with cold aisle containment. Effects of supply air temperature and velocity on data center performance are studied. A good power

HVAC Cooling Systems for Data Centers

ASHRAE recommends laying out equipment racks according to the Hot Aisle-Cold Aisle layout, which means aligning IT equipment racks in rows, such that the cabinet fronts face the cool aisle, and

Technical Paper

Designed to prevent air temperature zones mixing together in a data centre, hot and cold aisle containment increases cooling efficiency, while reducing power consumption.

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Airflow and Cooling in a Data Center

This paper deals with the distribution of airflow and the resulting cooling in a data center. First, the cooling challenge is described and the concept of a raised-floor data center is introduced. In

Effects of airflow distribution changes on the thermal environment of ...

When side panels are installed, the influence of vertical air spirals in the cold-aisle air supply system can lead to the uneven distribution of horizontal and static pressure in the cold-aisle

Experimental and Numerical Investigation of Airflow Organization in ...

A cold/hot aisle is set up; the width of the cold aisle is 1.2 m, the width of the hot aisle is 1.2 m, and the data center is organized by the air supply airflow under the overhead floor, and the

Fundamentals of Data Center Airflow Management

The cold aisle containment system (CACS) envelopes the cold aisle by deploying a physical barrier to isolate it from the rest of the room. As such the entire room becomes the hot aisle,

ASHRAE TC9.9 Data Center Power Equipment Thermal Guidelines

vironmental areas: ballroom spaces, hot aisles, cold aisles, and grey areas. Many data center designs have computer rooms where cold air is distributed through a raised floor system tha

ASHRAE Data Center Temperature & Humidity Guidelines

They house computer systems and associated components such as telecommunications and storage systems. Therefore, understanding ASHRAE data center temperature and humidity

HVAC Cooling Systems for Data Centers

The cooling equipment used for data centers is commonly known as "Precision air conditioning units" or "Computer room air conditioners (CRAC"s)". By design these virtually deliver 100% sensible cooling

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This document is for preliminary research. Verify specifications against current standards, product documentation and project requirements.

