Dimensions of thermal aisles for intelligent buildings

Overview

Intelligent building control systems for thermal comfort and energy. Through this review, we systematically investigated how Artificial Intelligence (AI).

Key Takeaways

Hot and cold aisle widths typically start at 1. 2 meters, with maximum aisle lengths of 16 meters for continuous rows, ensuring optimal airflow, safety, and serviceability.

Aisle Widths

For effective thermal management in data centers and intelligent buildings, cold and hot aisle widths should generally be at least 1. 2 meters. This width allows for two full raised floor tiles between cabinet fronts, ensuring proper airflow and accessibility for maintenance personnel.

In facilities with ceiling heights exceeding 3. 7 meters, additional aisle width may be required to accommodate lifts or overhead systems such as lighting, fire detection, and suppression equipment.

Aisle Lengths

Maximum continuous aisle length: 16 meters when equipment cabinets form a continuous row, allowing for efficient airflow and thermal performance. Restricted aisle length: 6 meters if one end of the aisle is closed or lacks a personnel exit, to maintain safe access and evacuation routes.

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Containment Considerations

Hot Aisle Containment (HAC) and Cold Aisle Containment (CAC): Both systems separate hot exhaust air from cold supply air, improving cooling efficiency and reducing energy consumption. Service clearances: Ensure adequate space for rack mounts and airflow under both normal and abnormal operating conditions. Frames or containment structures should not obstruct airflow or maintenance access.

Material and modularity: Panels and partitions should be airtight and durable, often using materials like Lexan or aluminum profiles, to prevent air mixing and support long-term performance.

High-

Density and AI Data CentersFor intelligent buildings supporting high-density computing or AI workloads, thermal aisle design must integrate with advanced cooling architectures, including liquid-cooled IT loads, fan coil walls, and high-efficiency chillers. Reference design guides for gigawatt-scale AI data centers emphasize thermal flexibility, high-temperature loop readiness, and optimized airflow to maintain energy efficiency and operational reliability.

Summary

Width: Minimum 1. 2 meters, wider if ceiling height or overhead access requires. Length: Up to 16 meters for continuous rows; 6 meters for restricted aisles.

Containment: Use HAC or CAC systems with airtight panels to separate hot and cold air. High-density considerations: Integrate with advanced cooling systems and maintain service clearances for safety and efficiency. By adhering to these guidelines, intelligent buildings can achieve optimal thermal performance, energy efficiency, and safe operational access across all critical infrastructure.

Article Content

Intelligent building control systems for thermal comfort and energy ...

Through this review, we systematically investigated how Artificial Intelligence (AI) can be used to improve thermal comfort and energy efficiency requirements in buildings.

AISLE CONTAINMENT

Hot aisle containment is made from light duty aluminum profile and thermal insulation PC board, has better heat dissipation performance than cold aisle containment in high density data centers, to

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Enhance airflow control and energy efficiency in data centers, laboratories, and cleanroom environments with Armstrong Aisle Containment Ceilings & Walls. Our modular systems

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

To maintain thermal performance, equipment accessibility, and safety, it''s essential to follow key spatial guidelines. Maximum Aisle Length: When equipment cabinets form a continuous row, the aisle length

(PDF) Intelligent building control systems for thermal comfort and ...

Summary of the works focusing on intelligent management of thermal comfort and energy in buildings using Reinforcement Learning (RL) & Deep Reinforcement Learning (DRL).

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

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Specify complete aisle containment systems for data centers, edge facilities and high-density compute rooms. Compare configurations, build a shortlist and send one project-ready enquiry. Select products

Intelligent Thermal Comfort Controlling System for Buildings ...

This article proposes a building intelligent thermal comfort control system based on the Internet of Things and intelligent artificial intelligence. Through the literature review, various

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Intelligent Building Control Systems for Thermal Comfort and Energy-Efficiency: A Systematic Review of Artificial Intelligence-Assisted Techniques Ghezlane Halhoul Merabet a, i,*, Mohamed Essaaidi a,

Hot-Aisle vs. Cold-Aisle Containment for Data Centers Revision 1

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Hot-aisle containment can save 40% in annual cooling costs and reduce PUE by 13%. Containment strategies enhance energy efficiency by minimizing hot and cold air mixing. Economizer hours

Numerical investigation and parametric study for thermal and energy ...

Sharma studied the effects of cold aisle and hot aisle widths and ceiling space on data centers'' thermal performance. The study showed that data centers can be optimized not only based

Experimental investigations of thermal managements solutions in data ...

Abstract Cold aisles containments are used in data centers buildings to improve the thermal managements of the IT servers. In the present study, an experimental investigation of air flow and

Influence of floor air supply methods and geometric parameters on ...

This paper compares four commonly used air supply methods, namely hot and cold aisle open air supply systems, hot aisle sealed air supply systems, under-rack cold aisle air supply

Experimental study on improving thermal management of fan-wall data ...

This study explores the applicability of baffles in fan-wall data centers, analyzing and obtaining the optimal baffle angle, spacing, distance, and their corresponding thermal environment.

An IoT-Based Thermal Model Learning Framework for Smart Buildings

With the development of the Internet of Things (IoT) technologies, implementing intelligent controls in buildings to reduce energy consumption is becoming increasingly popular. Building

Impact of Tile Design on Thermal Performance of Open and Enclosed Aisles

A common belief is that the type of tile is not an important factor in a CAC system. In this study, the impacts of tile design on the thermal performance of open and enclosed aisle configurations is

A Comparative CFD Study of Two Air Distribution Systems with Hot Aisle ...

It can also resolve hot spots in traditional uncontained data centers to some degree. This study analyzes the IT environment of the hot aisle containment (HAC) system, which has been

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