June 2023

Modular Data Center with Rack Elements that Provide Structural Support

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ABSTRACT

This disclosure describes techniques for time-efficient and cost-effective construction of data center buildings. Per techniques of this disclosure, the server hall rack infrastructure that houses data center equipment is additionally utilized as structural support for the data center building itself. Columns of hot aisle containment (HAC) rows extend from the building foundation to the ceiling. The HAC rows house the data center equipment while columns of the HAC rows provide structural support to the data center building roof. Optionally, the lower rackstop can be extended and an upper rackstop provided for additional functionality. Air handling units (AHUs) can be attached to the rack. The described techniques enable the construction of modular-stick built data center housing (DCH). Utilization of the HAC to support the building envelope can lead to reduced costs and a lower carbon footprint.

KEYWORDS

- Modular data center
- Modular building
- Pre-fabricated structure
- Rack infrastructure
- Server hall
- Server rack
- Rack supported building
- Stick-built building
- Data center hosting (DCH)
- Hot aisle containment (HAC)

BACKGROUND

Data center buildings house computing devices such as servers and associated equipment, e.g., power infrastructure, thermal management infrastructure, networking infrastructure, etc. Such equipment is placed within data center racks that enable organization of the equipment and provide access, with racks being placed in aisles within a data center building. Thermal management (e.g., cooling) of data center equipment is vital for equipment efficiency as well as for comfort of data center employees.

Aisle containment techniques are commonly utilized to optimize data center cooling. For example, racks and cabinets are arranged such that the front portion of racks in one row face the front portion of racks from an adjacent row. This ensures that hot exhaust air from the back of the racks is less likely to be drawn into nearby equipment. A hot-aisle containment (HAC) system can be employed that includes racks arranged in rows that enclose the hot aisle to collect and remove hot exhaust from equipment.

Typically, a data center building is built out first, and subsequently fitted out with server hall infrastructure to get the building ready for operation. This can be time consuming since the data center building has to be completed first before the HAC system can be built out.

DESCRIPTION

This disclosure describes techniques for time-efficient and cost-effective construction of data center buildings. Per techniques of this disclosure, the server hall rack infrastructure that houses the data center equipment is additionally utilized as structural support for the data center building itself. The server hall infrastructure is thereby combined with the data center building and enables modular building construction. Prefabricated building modules that include server

hall infrastructure can be transported to the data center site and enable the overall building and server hall to be built and readied faster for deployment.

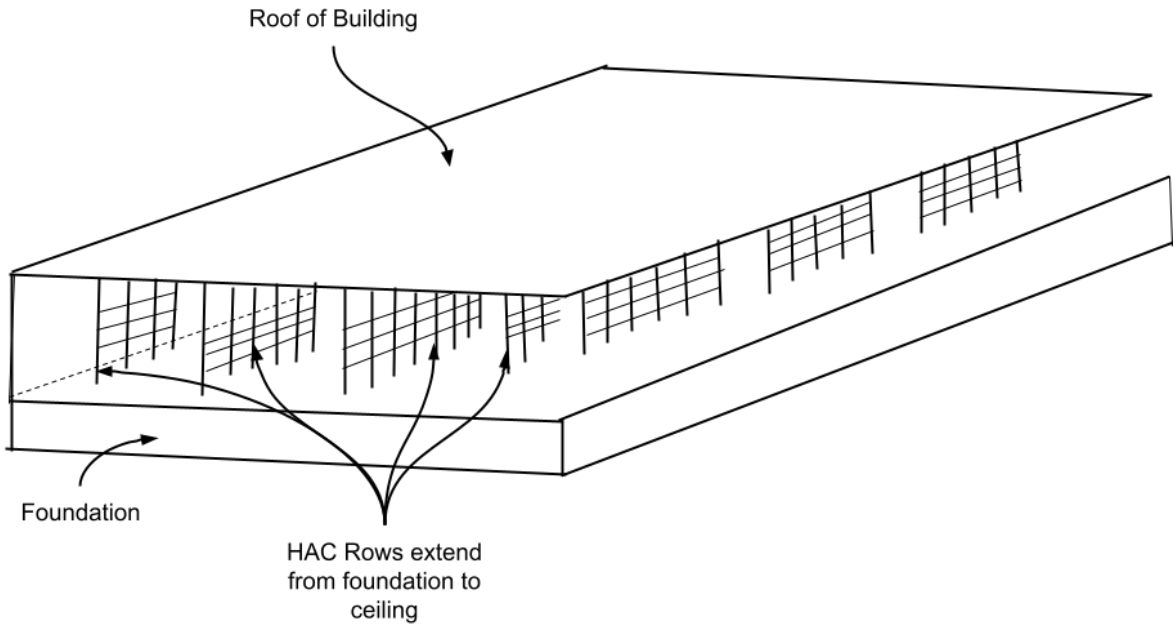

Fig. 1: Data center building with integrated server hall infrastructure

Fig. 1 depicts an example data center building that includes integrated server hall infrastructure. As depicted in Fig. 1, columns of the HAC rows extend from the building foundation to the ceiling. The HAC rows can house the data center equipment, while the columns of the HAC rows provide structural support to the data center building roof. Other structures of the building are designed to account for the support provided by the columns, leading to reduced material use and yielding cost savings.

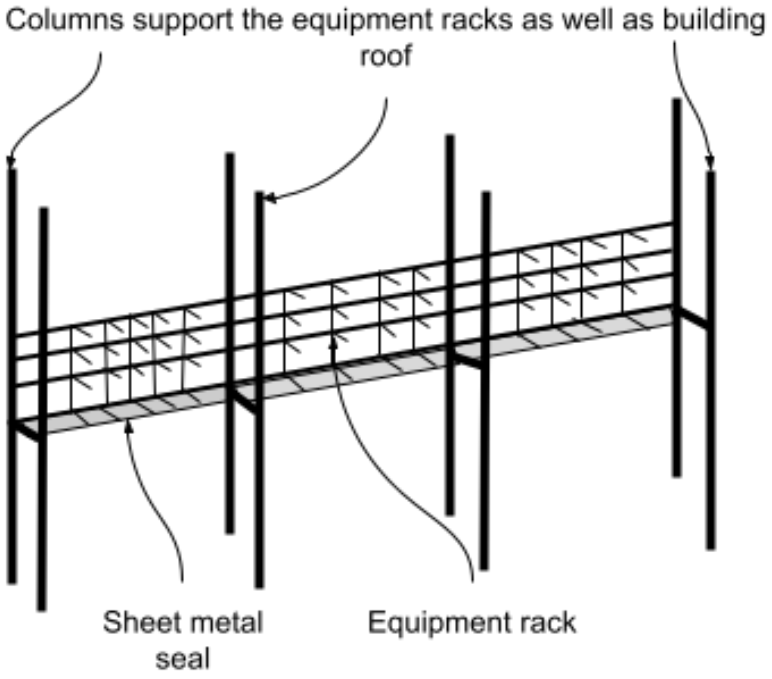

Fig. 2: Server hall rack

Fig. 2 depicts an example server hall rack, per techniques of this disclosure. The rack includes tall columns that span the distance from data center floor to ceiling and can serve as building columns. The rack additionally includes a framework to support data center equipment that can be attached to the provided uprights. Sheet metal can be utilized to create the heat aisle seal. Optionally, the lower rackstop can be extended and an upper rackstop provided for additional functionality. Air handling units (AHUs) can also be attached to the rack, e.g., hung above a cold aisle

The described techniques enable the construction of modular-stick built data center housing (DCH). Utilization of the HAC to support the building envelope can lead to reduced costs and a lower carbon footprint, e.g., due to reduced foundation requirements, reduced quantity of AHUs, etc. Further cost and carbon savings can be realized by the use of Insulated Metal Panels (IMPs) in the building envelope, in lieu of concrete wall panels.

CONCLUSION

This disclosure describes techniques for time-efficient and cost-effective construction of data center buildings. Per techniques of this disclosure, the server hall rack infrastructure that houses data center equipment is additionally utilized as structural support for the data center building itself. Columns of hot aisle containment (HAC) rows extend from the building foundation to the ceiling. The HAC rows house the data center equipment while columns of the HAC rows provide structural support to the data center building roof. Optionally, the lower rackstop can be extended and an upper rackstop provided for additional functionality. Air handling units (AHUs) can be attached to the rack. The described techniques enable the construction of modular-stick built data center housing (DCH). Utilization of the HAC to support the building envelope can lead to reduced costs and a lower carbon footprint.