# Standard 90.4-2022

## ANSI/ASHRAE Standard 90.4-2022, *Energy Standard for Data Centers*

### Purpose

Provides minimum energy efficiency requirements for the design and operation of data centers.

### Significance

Standard 90.4 offers a framework for the energy efficient design of data centers with special consideration to their unique load requirements compared to other buildings. This includes the maximum mechanical load component (MLC) and electrical loss component (ELC) values required for compliance which have been lowered in recognition of the industry's changing technologies and improved efficiencies. MLC is the sum of all power required for cooling, fans, pumps and heat rejection equipment, divided by the power for the data center. ELC is calculated using the worst-case parts of each segment of the power chain to demonstrate a minimum level of electrically efficient design.

This standard was developed under the guiding principle that data centers are mission critical facilities demanding careful attention to the potential impact of its requirements. Since 2019, ASHRAE Standard 90.1 (*Energy Standard for Buildings Except Low-Rise Residential Buildings*) has referenced Standard 90.4 as an alternative compliance path for large computer rooms, i.e., data centers.

### Scope

Standard 90.4 applies to data centers with a conditioned floor space that has a power density greater than 20 W/ft2 and IT equipment loads greater than 10 kW. It contains specific requirements for mechanical and electrical systems installed in new data centers or in data center additions/alterations that require new mechanical or electrical systems. It addresses a large number of facilities: there are millions of data centers in the U.S. alone, from small "Edge" rooms to large "Hyperscale" cloud facilities.

### Highlights

- ✓ The National Renewable Energy Laboratory (NREL) recommends that data centers follow the Standard 90.4 guidelines for data center temperature range, but consider operating at the maximum allowable range as specified in the standard .
- ✓ A code-intended companion to Standard 90.1 since 2016 and requires compliance with Standard 90.1 for building envelope, service water heating, lighting, and other equipment.
- ✓ Incentivizes energy efficient designs that harness the increasing availability of improved systems and techniques to enhance data center performance without compromising availability or reliability.
- ✓ Heat generation also warrants consideration; a typical large data center will generate between 20 and 50 megawatts of heat.
- ✓ The State of Oregon requires compliance with Standard 90.4-2019 for power distribution systems and equipment serving a data center.
- ✓ Washington's energy code includes sections 6 and 8 of Standard 90.4-2019; Heating, Ventilation, and Air-Conditioning; and Electrical, respectively.
- ✓ A section of the 2021 IECC (C403.1.2) requires systems to comply with Section 6 and 8 of Standard 90.4-2019, with modified values for design and annual MLC tables.

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## Changes and Improvements from Standard 90.4-2019

- ✓ Provides additional examples for mechanical load component (MLC) calculations.
- ✓ Both the MLC and ELC have been lowered for more stringent compliance.
- ✓ Compliance can be achieved without the use of an economizer and while following ASHRAE TC 9.9 Thermal Guidelines.
- ✓ Reduced the maximum electrical loss component (ELC) values for compliance.
- ✓ Provides new methodology to apply credit to MLC and ELC combined for on-site renewable energy deployment.
- ✓ Includes specific language to give credit for recovered heat (heat reclaim) shared with non- data center spaces.
- ✓ Eliminates the incoming service segment from ELC calculations due to minimal impact on data center efficiency.

[1]NREL. 2023. Reducing Commercial Building Process Loads and Refrigeration Unit Energy Consumption. https://betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/ReducingCommercialBuildingProcessLoads.pdf