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ANSI/ASHRAE Standard 90.4-2019
Energy Standard for Data Centers

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FOREWORD

ASHRAE Standard 90.4 was initiated to promote energy efficient design of data centers, a rapidly expanding and energy-intensive category among buildings in the United States and worldwide. Since 2013, Standard 90.4 has been in a continuous state of development as a code-intended companion to ASHRAE/IES Standard 90.1. It requires compliance with Standard 90.1 for the building envelope, service water heating, lighting, and other equipment. Designers seeking to comply with Standard 90.4 must satisfy the appropriate compliance path corresponding to their data center project, as determined in Section 4 of the standard. Compliance is based on mechanical load component (MLC) and electrical loss component (ELC) values in comparison to maximum values allowed per the design conditions. For optimal utility, maximum values for MLC vary by indicated climate zone.

Informative Appendix E contains a summary of addenda to the 2016 edition of Standard 90.4 that have been incorporated into the 2019 edition. Key changes include the following:

- a. In Section 6, the maximum MLC values required for compliance have been lowered. The revised MLC values are conservative and can be achieved with or without the use of an air-side economizer and in keeping with ASHRAE TC 9.9 recommended thermal guidelines. Also, the design MLC compliance path has been removed from Section 6 in favor of a more accurate maximum annualized MLC calculation.*
- b. In Section 8, the maximum ELC values for the UPS segment required for compliance have been lowered (also reducing the maximum allowable overall ELC). This step has been taken to recognize improvements in the efficiency of core electrical distribution equipment, particularly in the performance of the UPS module, that have occurred in the years following the initial publication of Standard 90.4.*

In addition, throughout the document, sections were renumbered and some text changes were made to maximize consistency with Standard 90.1.

Standard 90.4 follows ASHRAE's continuous maintenance process, which allows changes to the standard to be made on a continuous basis through addenda to the existing standard. This process allows for frequent modification to the standard to keep pace with rapidly changing technologies in the industry. In addition, the chairs of the committees responsible for both Standard 90.1 and Standard 90.4 meet with members of the ASHRAE Standards Committee to address any conflicts in scope between the two standards. It is the hope of the committee that knowledgeable people within the data center industry will continue to offer their talents in order to sustain and improve the quality and accuracy of the standard moving forward.

1. PURPOSE

The purpose of this standard is to establish the minimum *energy efficiency* requirements of *data centers* for

- a. design, construction, and a plan for operation and maintenance; and
- b. use of on-site or off-site renewable *energy* resources.

2. SCOPE

2.1 This standard applies to

- a. new *data centers*, or portions thereof, and their *systems*;
- b. new *additions* to *data centers*, or portions thereof, and their *systems*; and
- c. modifications to *systems* and *equipment* in existing *data centers* or portions thereof.

2.2 The provisions of this standard do not apply to

- a. *telephone exchanges*,
- b. *essential facilities*, and
- c. *information technology equipment (ITE)*.

2.3 Where specifically noted in this standard, certain other buildings or elements of buildings shall be exempt.

2.4 This standard shall not be used to circumvent any safety, health, or environmental requirements.

3. DEFINITIONS

3.1 General. Certain terms, abbreviations, and acronyms are defined in this section for the purposes of this standard. When the tense or plurality of the term differs from the defined term, the defined term still applies. These definitions are applicable to all sections of this standard except where specifically limited.

3.1.1 Coordination. Where terms are not defined in this standard but are defined in ANSI/ASHRAE/IES Standard 90.1, those terms shall have the meanings as assigned to them in ANSI/ASHRAE/IES Standard 90.1. Where terms are not defined in either document, they shall have their ordinary accepted meanings within the context in which they are used. Ordinarily accepted meanings shall be based on standard American English language usage as documented in an unabridged dictionary accepted by the *adopting authority*.

Informative Notes:

1. See Annex 1 for ANSI/ASHRAE/IES Standard 90.1 definitions.
2. Only terms that appear in Section 3 of this standard are italicized throughout the document.

3.2 Definitions

addition: see ANSI/ASHRAE/IES Standard 90.1.

adopting authority: see ANSI/ASHRAE/IES Standard 90.1.

air, ambient: the air surrounding a building or *space*; the source of *outdoor air* brought into a building.

air, exhaust: air removed from a *space* and discharged to outside the building by means of mechanical or natural *ventilation systems*.

air, recirculated: air removed from a *space* and reused as *supply air*.

air, return: air removed from a *space*, then to be recirculated or exhausted.

air, supply: air delivered by mechanical or natural *ventilation* to a *space*, composed of any combination of *outdoor air*, *recirculated air*, or transfer air.

alteration: see ANSI/ASHRAE/IES Standard 90.1.

annualized mechanical load component (annualized MLC): the sum of all cooling, fan, pump, and heat-rejection annual energy use divided by the *data center ITE energy*.

authority having jurisdiction (AHJ): see ANSI/ASHRAE/IES Standard 90.1.

automatic or automatically: see ANSI/ASHRAE/IES Standard 90.1.

branch circuit: see ANSI/ASHRAE/IES Standard 90.1.

building: see ANSI/ASHRAE/IES Standard 90.1.

building envelope: see ANSI/ASHRAE/IES Standard 90.1.

building official: see ANSI/ASHRAE/IES Standard 90.1.

cabinet: a container that encloses connection devices, terminations, apparatus, wiring, and equipment.

circuit breaker: see ANSI/ASHRAE/IES Standard 90.1.

computer room: a room or portions of a *building* serving an *ITE* load less than or equal to 10 kW or 20 W/ft² (215 W/m²) or less of *conditioned floor area*.

conditioned floor area: see *conditioned floor area, gross* in ANSI/ASHRAE/IES Standard 90.1.

construction: see ANSI/ASHRAE/IES Standard 90.1.

construction documents: see ANSI/ASHRAE/IES Standard 90.1.

control: see ANSI/ASHRAE/IES Standard 90.1.