STATE BUILDING CODE OPINION 20-Nov01

CODE: 2018 Washington State Energy Code, Commercial

SECTION: WSEC Section C403.1.3

Background: *2018 WSEC Section C403.1.3 states that data center systems, as defined in Chapter 2, shall comply with the provisions of ASHRAE Standard 90.4-2016 Sections 6 and Section 8. Section 6 applies to heating, ventilation and air conditioning system efficiency and Section 8 applies to the design electrical loss component of data center systems.*

Section C403.1.3 provision language applies changes to the required efficiency values published in Standard 90.4-2016 Table 6.2.1.1. Based on feedback from jurisdictions, data center engineers, and equipment suppliers, compliance with this section is anticipated to be problematic, and in some cases unenforceable, for the following reasons:

1. *Systems serving small data centers may not be able to comply with the Maximum Annualized MLC values. These values in the 2018 WSEC are reported to be too low for data center systems with ITE design power capacity equal to or less than 300 kW.*
2. *The ASHRAE standards committee issued Addendum g to 90.4-2016 in June 2019 that eliminated the Design MLC option and updated the Annualized MLC calculation, which provides a more accurate representation of data center system performance. In this update, Table 6.2.1.1 was deleted and replaced with Table 6.6. This new table defines separate Maximum Annualized MLC values for data centers with ITE design power capacity less than or equal to 300 kW, and capacity greater than 300 kW.*
3. *It is anticipated that the 2018 Seattle Energy Code will adopt ASHRAE Standard 90.4-2019 as the reference standard, which includes the updated information from Standard 90.4-2016 Addendum g.*

QUESTION 1: For 2018 WSEC Section C403.1.3 Data centers and Chapter 6 Reference Standards, do the requirements in ASHRAE Standard 90.4-2016 Addendum g apply?

ANSWER 1: **No. Updates to codes and standards do not become part of the state building code until reviewed and approved by the Council. However, jurisdictions may accept such updates and addenda as an alternate compliance path.**

QUESTION 2: If ASHRAE Standard 90.4-2016 Addendum g applies to the 2018 WSEC, do the updated Maximum Annualized MLC values in this addendum supersede the MLC values in Section C403.1.3?

ANSWER 2: While Addendum g is not included as part of the adoption of ASHRAE 90.4 in the WSEC, if a jurisdiction approves this as an alternate it would be appropriate to use the values from the addendum.

SUPERSEDES: None

REQUESTED BY: City of Bellevue

CODE LANGUAGE CITED:

C403.1.3 Data centers. *Data center systems* shall comply with Sections 6 and 8 of ASHRAE Standard 90.4 with the following changes:

1. Replace design MLC in ASHRAE Standard 90.4 Table 6.2.1.1 "Maximum Design Mechanical Load Component (Design MLC)" with the following per the applicable climate zone:

Zone 4C Design MLC = 0.22 Zone 5B Design MLC = 0.24

2. Replace annualized MLC values of Table 6.2.1.2 "Maximum Annualized Mechanical Load Component (Annualized MLC)" in ASHRAE Standard 90.4 with the following per applicable climate zone:

Zone 4C Annual MLC = 0.18 Zone 5B Annual MLC = 0.17

ANSI/ASHRAE Addendum g to ANSI/ASHRAE Standard 90.4-2016 Energy Standard for Data Centers

Approved by the ASHRAE Standards Committee on June 22, 2019; by the ASHRAE Technology Council on June 26, 2019; and by the American National Standards Institute on June 27, 2019.

FOREWORD

Addendum g lowers the Mechanical Load Component (MLC) values required for compliance in Section 6. The MLC values published in the 2016 edition of Standard 90.4 exceeded the required limits found in ASHRAE/IES Standard 90.1-2010 and in the energy codes for California, Oregon, and Washington, which are more conservative than intended for data centers guided by this standard.

The goal of this addendum is to provide an updated list of MLC values that can be achieved with the use of readily available packaged cooling products, including (a) packaged computer- room air conditioners with indirect evaporative cooling (IEC) and (b) packaged air-cooled chillers with integrated dry coolers serving packaged computer-room air handlers without air-side economizers. Both technologies are readily available from most of the leading computer-room air-conditioner manufacturers. An IEC unit uses an air-to-air heat exchanger to cool return air from the data center by spraying water on the outside of the heat exchanger and drawing outdoor air (scavenger air) across the outside of the heat exchanger. The outdoor air does not mix with the recirculated data center air. No outdoor air or humidity is introduced into the data center, which eliminates any air quality or humidity control issues associated with an air-side economizer. A DX coil handles any load that cannot be handled by the indirect evaporative air cooler.

The MLC values proposed herein are still conservative. Our analysis has shown that they can be achieved with or without the use of an air-side economizer and in keeping with ASHRAE TC 9.9 recommended thermal guidelines.

This addendum also removes the Design MLC compliance path from Section 6 in favor of a more accurate Maximum Annualized MLC calculation. Design MLC was intended only as an interim provision to be used as the necessary tools and techniques for calculating Annualized MLC were being developed. The Annualized MLC technique is detailed in this addendum.

Addendum d to Standard 90.4 renumbers Section 6.2.1.2 as Section 6.6. Addendum g further modifies Section 6.6 and its subsections as shown.

6.6 Maximum *Annualized Mechanical Load Component*. *Annualized MLC* shall be calculated using Equation ~~6.2.1.2~~6.6. The resulting value shall be less than or equal to the value in Table ~~6.2.1.2~~6.6, "Maximum *Annualized Mechanical Load Component*~~," when evaluated at 100% *ITE* load for the appropriate climate zone. The calculated MLC shall also be less than or equal to the corresponding Table 6.2.1.2 MLC value when evaluated at 50% of design *ITE* load.~~

~~6.2.1.2.1~~6.6.1 [. . .]

b. The systems' energy calculation may consider operation of economizer capacity in the design and available redundant equipment at the 100% ITE load condition and separately at the ~~50%~~ ITE part-load conditions if calculated using partially loaded equipment efficiencies.
[. . .]

~~6.2.1.2.1.1~~6.6.1.1 ***Data Center Energy***. The *data center energy* calculations shall be completed separately for 100% and for ~~50% of design~~ part-load *ITE* capacity in the calculations. The *system's UPS* and transformer cooling loads must also be included in this term, evaluated at their corresponding part-load efficiencies.

~~6.2.1.2.1.2~~6.6.1.2 **Calculated Quantity of Operating Units (*N*)**. As shown in Table ~~6.2.1.2~~6.6, the number of HVAC units required to meet the load can vary [. . .]

TABLE ~~6.2.1.2~~6.6 Maximum Annualized Mechanical Load Component (Annualized MLC)

Climate Zone	HVAC Maximum Annualized MLC ~~at 100% and at 50% ITE Load~~ for Data Center ITE Design Power > 300 kW	HVAC Maximum Annualized MLC for data Center ITE Design Power < 300 kW
4C	~~0.32~~ 0.14	0.23
5B	~~0.33~~ 0.14	0.23

(From WSEC: Zone 4C Annual MLC = 0.18 Zone 5B Annual MLC = 0.17