



**BSR/ASHRAE/IES Addendum by  
to ANSI/ASHRAE/IES Standard 90.1-2016**

**Public Review Draft**

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# **Proposed Addendum by to Standard 90.1-2016, Energy Standard for Buildings Except Low-Rise Residential Buildings**

**Second Public Review (February 2019)  
(Draft Shows Proposed Changes to Current Standard)**

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**(This foreword is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard. It has not been processed according to the ANSI requirements for a standard and may contain material that has not been subject to public review or a consensus process. Unresolved objectors on informative material are not offered the right to appeal at ASHRAE or ANSI.)**

## **FOREWORD**

*The purpose of this addendum is to allow designers the option to use ASHRAE Standard 90.4 requirements instead of ASHRAE 90.1 requirements in computer rooms that have an IT equipment load larger than 10 kW. A computer room that has such a load is the same as the defined term “data center” in 90.4.*

*For reviewers’ information, this is the current definition of computer room in 90.1:*

**computer room:** a room whose primary function is to house *equipment* for the processing and storage of electronic data and that has a design electronic data *equipment* power density exceeding 20 W/ft<sup>2</sup> (215 W/m<sup>2</sup>) of conditioned *floor* area.

*The option to follow these requirements has been added as an alternative path in Sections 6 and 8. There is no need to do so in other sections, as 90.4 either has no requirements for those sections or refers users back to 90.1.*

*Reviewers should note that Section 6 includes a requirement that the HVAC system serve only the computer room (data center). If the HVAC system also serves other parts of the building, the alternative path cannot be used. Similarly, in Section 8, the option is limited to power distribution systems and equipment that only serve computer equipment.*

*The PUE definitions and requirements that were in Section 6.6 have been removed, along with definitions related to PUE. Section 8.2, Compliance Paths, has been updated to allow the use of 8.6, Alternative Compliance Path.*

***This is a full second public review draft.***

***[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~striketrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]***

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## Addendum by to 90.1-2016

Modify the standard as follows (IP and SI Units)

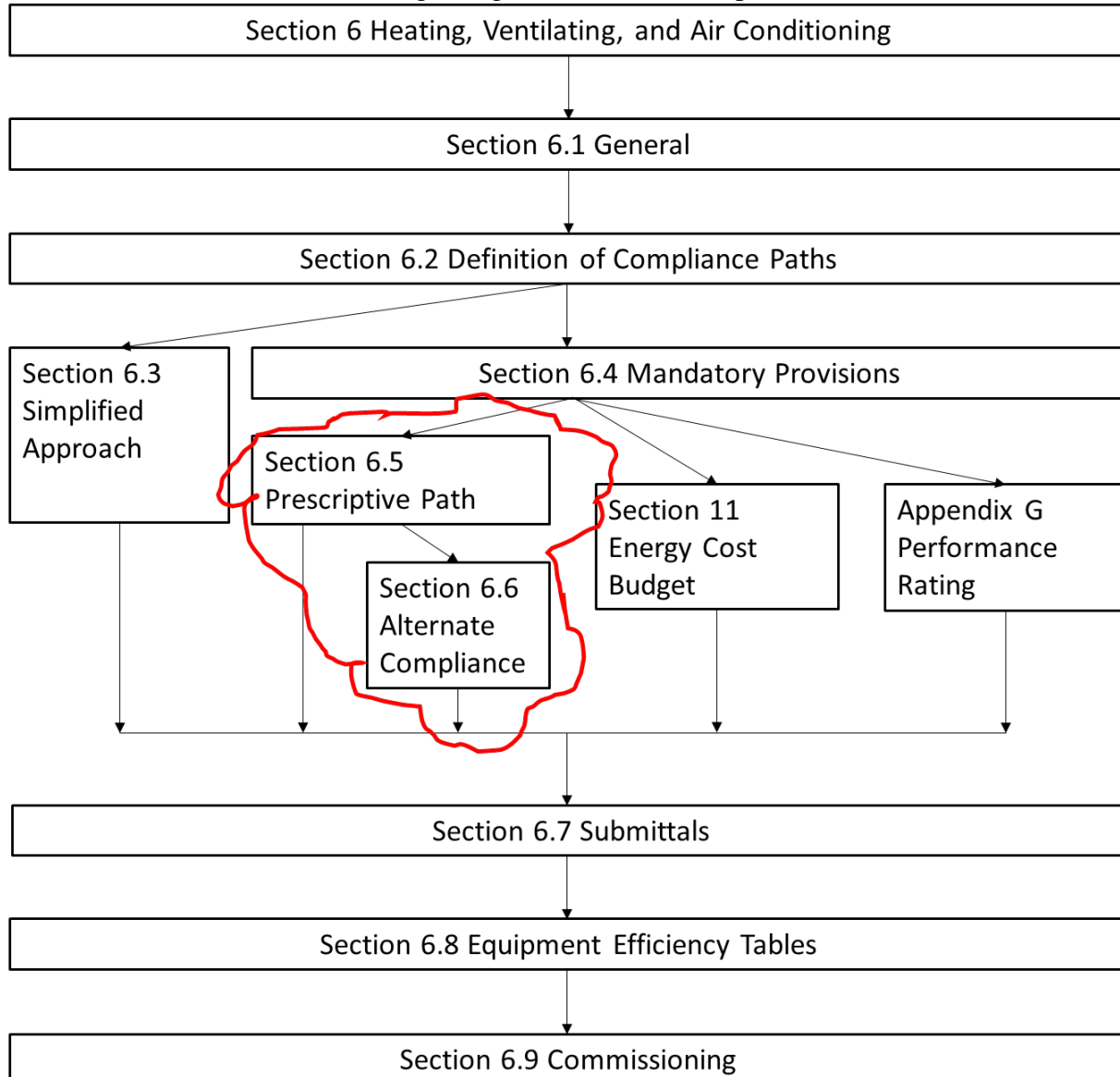
Delete the following definitions:

~~*power usage effectiveness (PUE): computer room energy divided by IT equipment energy calculated in accordance with industry accepted standards (see Informative Appendix E).*~~

~~*power usage effectiveness category 0 (PUE0): peak electric demand (kW) for the entire computer room, including IT equipment and supporting infrastructure, divided by peak electric demand (kW) of the IT equipment.*~~

~~*power usage effectiveness category 1 (PUE1): annual energy consumption (kWh) for the entire computer room, including IT equipment and supporting infrastructure, divided by annual energy consumption (kWh) of the IT equipment.*~~

\*Delete current flowchart at the beginning of Section 6 and replace as shown (revision is clouded)\*



Make the following changes to section 6.2

## 6.2 Compliance Paths

### 6.2.1 Compliance

Compliance with Section 6 shall be achieved by meeting all requirements for Sections 6.2, “General”; Section 6.7, “Submittals”; Section 6.8, “Minimum *Equipment Efficiency* Tables”; and one of the following:

- a. Section 6.3, “Simplified Approach Option for *HVAC Systems*”
- b. Sections 6.4, “Mandatory Provisions” and 6.5, “Prescriptive Path”

Exception to 6.2.1.b.: HVAC systems only serving the heating, cooling, or ventilating needs of a computer room with IT equipment load greater than 10 kW shall be permitted to comply with Sections 6.4, “Mandatory Provisions” and 6.6, “Alternative Compliance Path.

Make the following changes to section 6.6

### 6.6.1 Computer Room Systems

HVAC systems only serving the heating, cooling, or ventilating needs of a computer room with IT equipment load greater than 10 kW shall comply with Sections 6.1, 6.4, 6.6.1.1 or 6.6.1.2, 6.6.1.3, 6.7, and 6.8. ASHRAE Standard 90.4 Energy Standard for Data Centers.

#### 6.6.1.1

~~The computer room PUEI shall be less than or equal to the values listed in Table 6.6.1. Hourly simulation of the proposed design, for purposes of calculating PUEI, shall be based on the ASHRAE Standard 90.1 Appendix G simulation methodology.~~

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#### Exception to 6.6.1.1

~~This compliance path is not allowed for a computer room proposed design utilizing a combined heat and power system.~~

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Table 6.6.1 *Power Usage Effectiveness (PUE) Maximum*

Climate Zone	PUE <sup>a</sup>
0A	1.64
0B	1.62
1A	1.61
1B	1.53
2A	1.49
2B	1.45
3A	1.41
3B	1.42
3C	1.39
4A	1.36
4B	1.38
4C	1.38
5A	1.36
5B	1.33
5C	1.36
6A	1.34
6B	1.33
7	1.32

a. ~~PUE0 and PUE1 shall not include energy for battery charging.~~

~~6.6.1.2~~

~~The computer room PUE0 is less than or equal to the values listed in Table 6.6.1, shall be the highest value determined at outdoor cooling design temperatures, and shall be limited to systems only using electricity for an energy source. PUE0 shall be calculated for two conditions: 100% design IT equipment energy and 50% design IT equipment energy.~~

~~6.6.1.3~~

~~Documentation shall be provided, including a breakdown of energy consumption or demand by at least the following components: IT equipment, power distribution losses external to the IT equipment, HVAC systems, and lighting.~~

Make the following changes to section 8.2

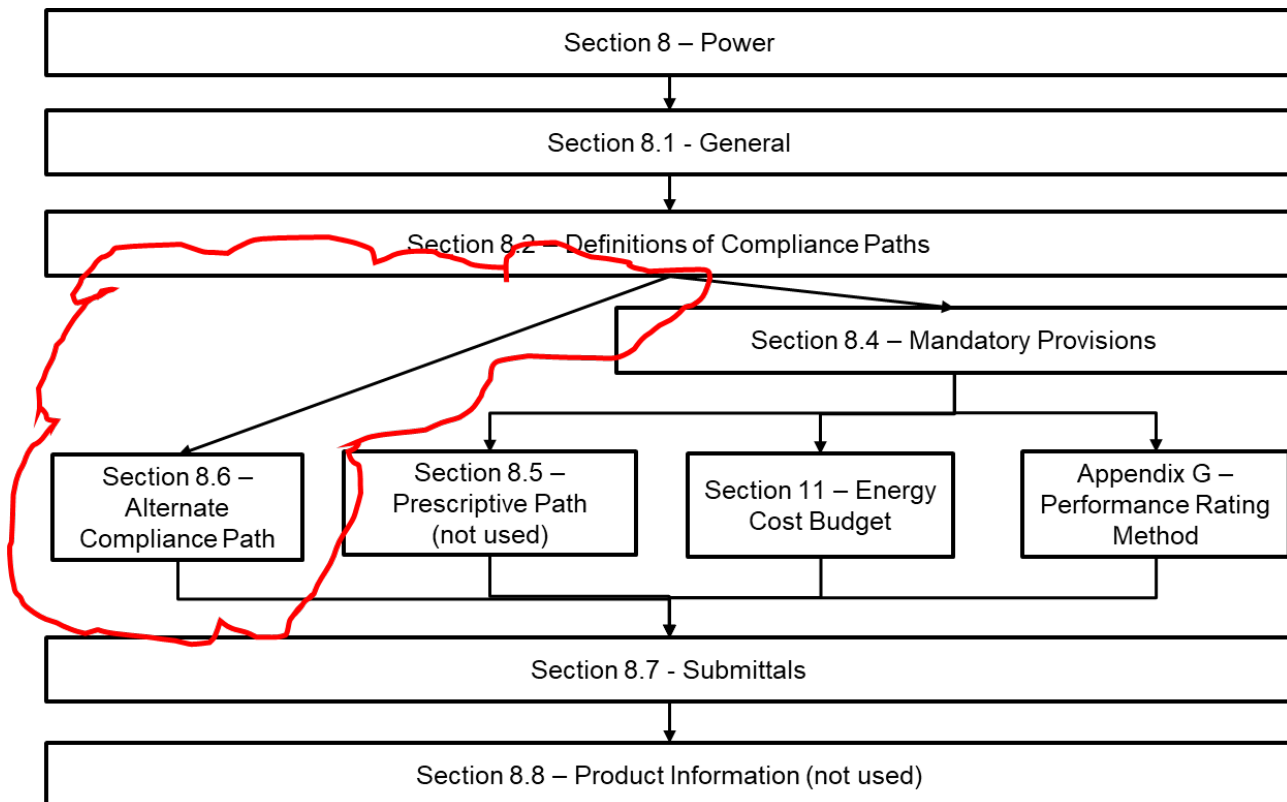
**8.2 Compliance Paths**

**8.2.1 Compliance**

Power distribution systems in all projects shall comply with the requirements of Section 8.1, “General”; Section 8.4, “Mandatory Provisions”; and Section 8.7, “Submittals.”

Exception to 8.2.1: Power distribution systems and equipment only serving a computer room with IT equipment load greater than 10 kW shall be permitted to comply with Section 8.1 “General”, Section 8.6 “Alternative Compliance Path”, and Section 8.7 “Submittals”.

Delete the flow chart at the beginning of Section 8 and replace as shown (revision is clouded)



Make the following changes to section 8.6

**8.6 Alternative Compliance Path (Not Used)**

**8.6.1 Computer Room Systems**

Power distribution systems and equipment only serving a computer room with IT equipment load greater than 10 kW shall comply with ASHRAE Standard 90.4 Energy Standard for Data Centers.

Add to section 12 References

<u>ASHRAE Standard 90.4-2016 with Addenda a and b</u>	<u>Energy Standard for Data Centers</u>
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*The following sections are also modified by addendum ad which is not yet published. If addendum ad and this addendum are published, the section will be appear as follows. Text that did not appear in addendum ad or in the previous sections of this draft, are shown below in strikethrough/underline:*

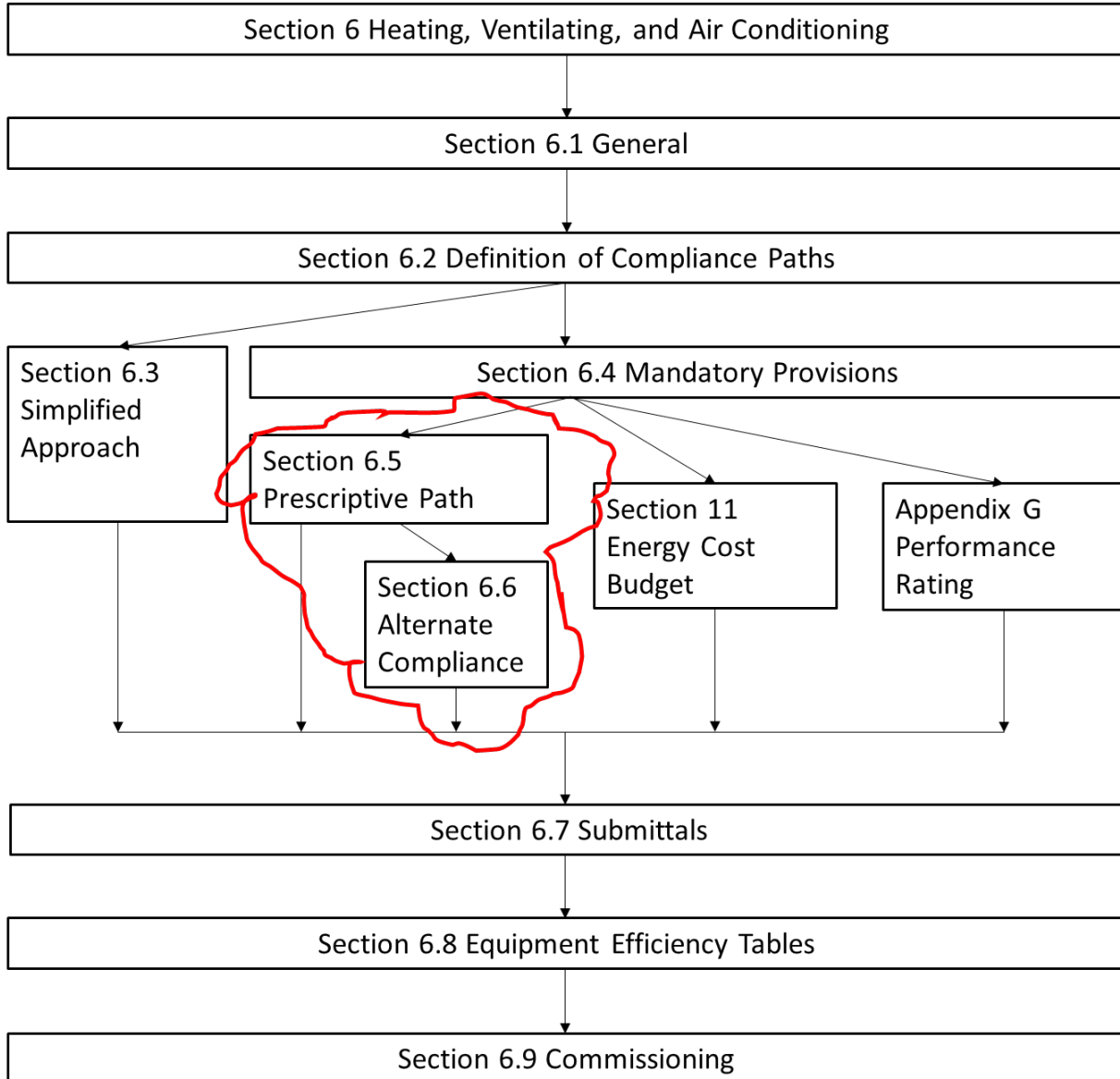
Delete the following definitions:

~~***power usage effectiveness (PUE):** computer room energy divided by IT equipment energy calculated in accordance with industry accepted standards (see Informative [Appendix E](#)).*~~

~~***power usage effectiveness—category 0 (PUE0):** peak electric demand (kW) for the entire computer room, including IT equipment and supporting infrastructure, divided by peak electric demand (kW) of the IT equipment.*~~

~~***power usage effectiveness—category 1 (PUE1):** annual energy consumption (kWh) for the entire computer room, including IT equipment and supporting infrastructure, divided by annual energy consumption (kWh) of the IT equipment.*~~

Revise the flow chart at the beginning of Section 6 (revision is clouded)



Make the following changes to section 6.2.2

#### 6.2.2 Additional Requirements to Comply with Section 6

Mechanical equipment and systems shall comply with one of the following:

- a. Section [6.3](#), “Simplified Approach Building Compliance Path for HVAC Systems”
- b. Section 6.5, “Prescriptive Compliance Path”

Exception to 6.2.2 b.: HVAC systems only serving the heating, cooling, or ventilating needs of a computer room with IT equipment load greater than 10 kW shall be permitted to comply with Section 6.6, “Alternative Compliance Path”.

Make the following changes to section 6.6

#### 6.6.1 Computer Room Systems

HVAC systems only serving the heating, cooling, or ventilating needs of a computer room with IT equipment load greater than 10 kW shall comply with Sections [6.1](#), [6.4](#), [6.6.1.1](#) or [6.6.1.2](#), [6.6.1.3](#), [6.7](#), and [6.8](#). ASHRAE Standard 90.4 Energy Standard for Data Centers.

**6.6.1.1**

The *computer room PUE1* shall be less than or equal to the values listed in Table 6.6.1. Hourly simulation of the *proposed design*, for purposes of calculating *PUE1*, shall be based on the ASHRAE Standard 90.1 [Appendix G](#) simulation methodology.

**Exception to 6.6.1.1**

This compliance path is not allowed for a *computer room proposed design* utilizing a combined heat and power system.

**Table 6.6.1 Power Usage Effectiveness (PUE) Maximum**

Climate Zone	PUE <sup>a</sup>
0A	1.64
0B	1.62
1A	1.61
1B	1.53
2A	1.49
2B	1.45
3A	1.41
3B	1.42
3C	1.39
4A	1.36
4B	1.38
4C	1.38
5A	1.36
5B	1.33
5C	1.36
6A	1.34
6B	1.33
7	1.32
8	1.30

a. *PUE0* and *PUE1* shall not include energy for battery charging.

**6.6.1.2**

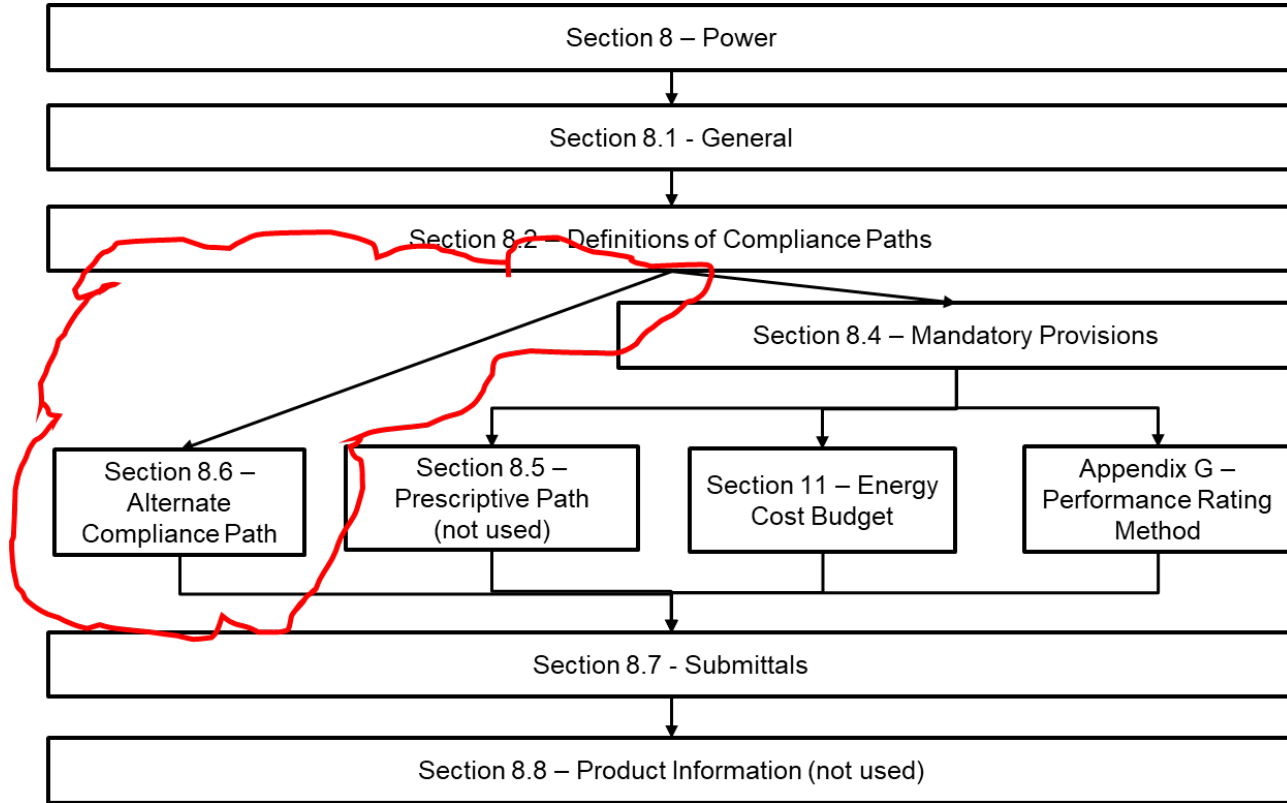
The *computer room PUE0* is less than or equal to the values listed in Table 6.6.1, shall be the highest value determined at outdoor *cooling design temperatures*, and shall be limited to systems only using electricity for an *energy source*. *PUE0* shall be calculated for two conditions: 100% design *IT equipment energy* and 50% design *IT equipment energy*.

**6.6.1.3**

Documentation shall be provided, including a breakdown of *energy consumption or demand* by at least the following components: *IT equipment*, power distribution losses external to the *IT equipment*, *HVAC systems*, and lighting.

Revise the flow chart at the beginning of Section 8 (revision is clouded)





Make the following changes to Section 8.2

## 8.2 Compliance Paths

Power distribution systems and equipment shall comply with Section 8.2.1 and Section 8.2.2.

### 8.2.1 Requirements for All Compliance Paths

Power *distribution systems* and equipment shall comply with Section 8.1, “General”; Section 8.4, “Mandatory Provisions”; and Section 8.7, “Submittals.”

Exception to 8.2.1: Power *distribution systems* and *equipment* only serving a *computer room* with *IT equipment* load greater than 10 kW shall be permitted to comply with Section Section 8.6, “Alternative Compliance Path”.

Make the following changes to Section 8.6

## 8.6 Alternative Compliance Path ~~(Not Used)~~

### 8.6.1 Computer Rooms Systems

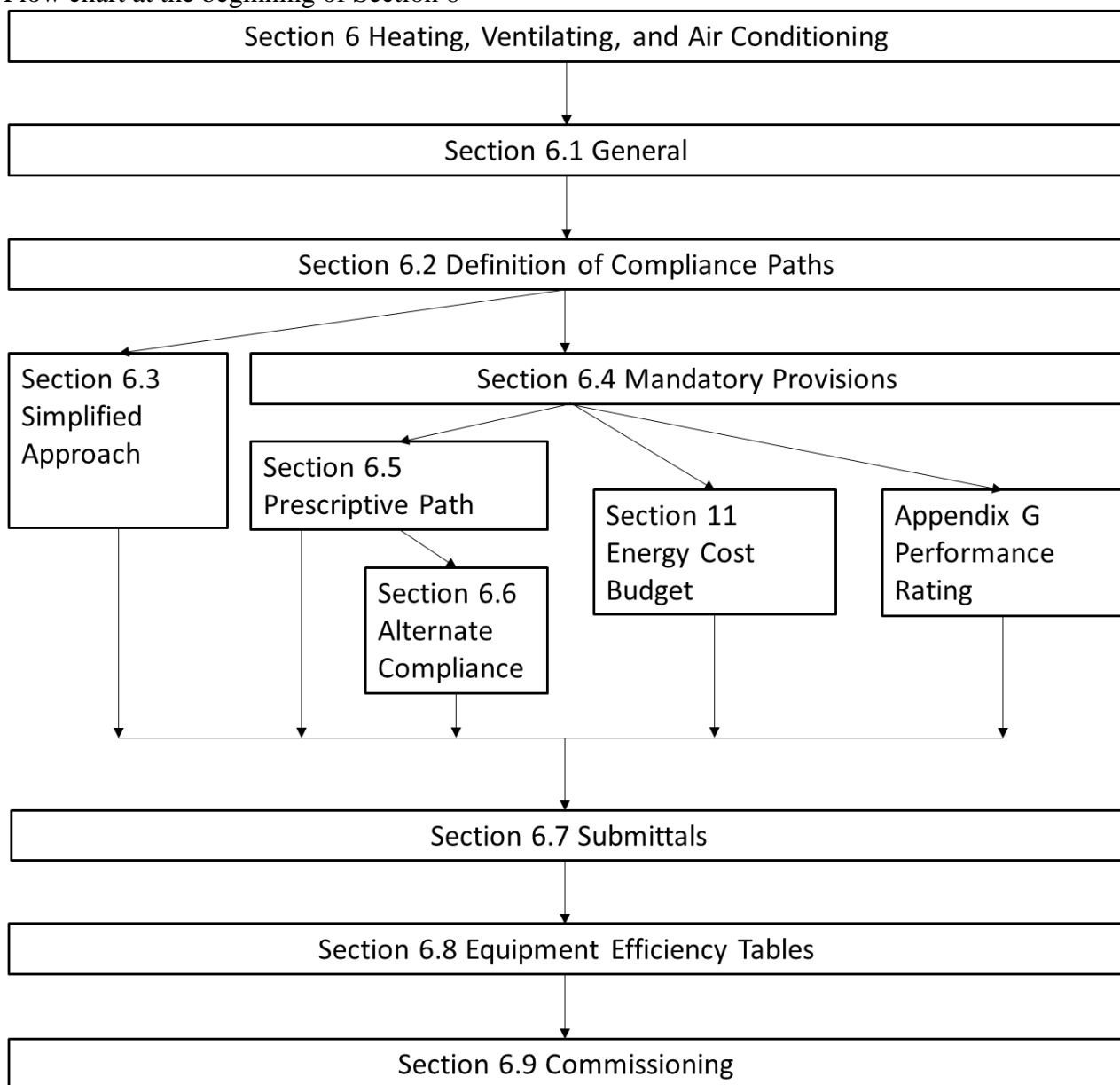
Power *distribution systems* and *equipment* only serving a *computer room* with *IT equipment* load greater than 10 kW shall comply with ASHRAE Standard 90.4 Energy Standard for Data Centers.

Section 12 References

<u>ASHRAE Standard 90.4-2016 with Addenda a and b</u>	<u>Energy Standard for Data Centers</u>
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The following is a “clean” version of the addendum as it would appear in the published standard without the strikeout and underlines. Addendum ad, which has been approved for publication, is included:

Flow chart at the beginning of Section 6



Section 6.2.2

### 6.2.2 Additional Requirements to Comply with Section 6

Mechanical equipment and systems shall comply with one of the following:

- a. Section 6.3, “Simplified Approach Building Compliance Path for *HVAC Systems*”
- b. Section 6.5, “Prescriptive Compliance Path”

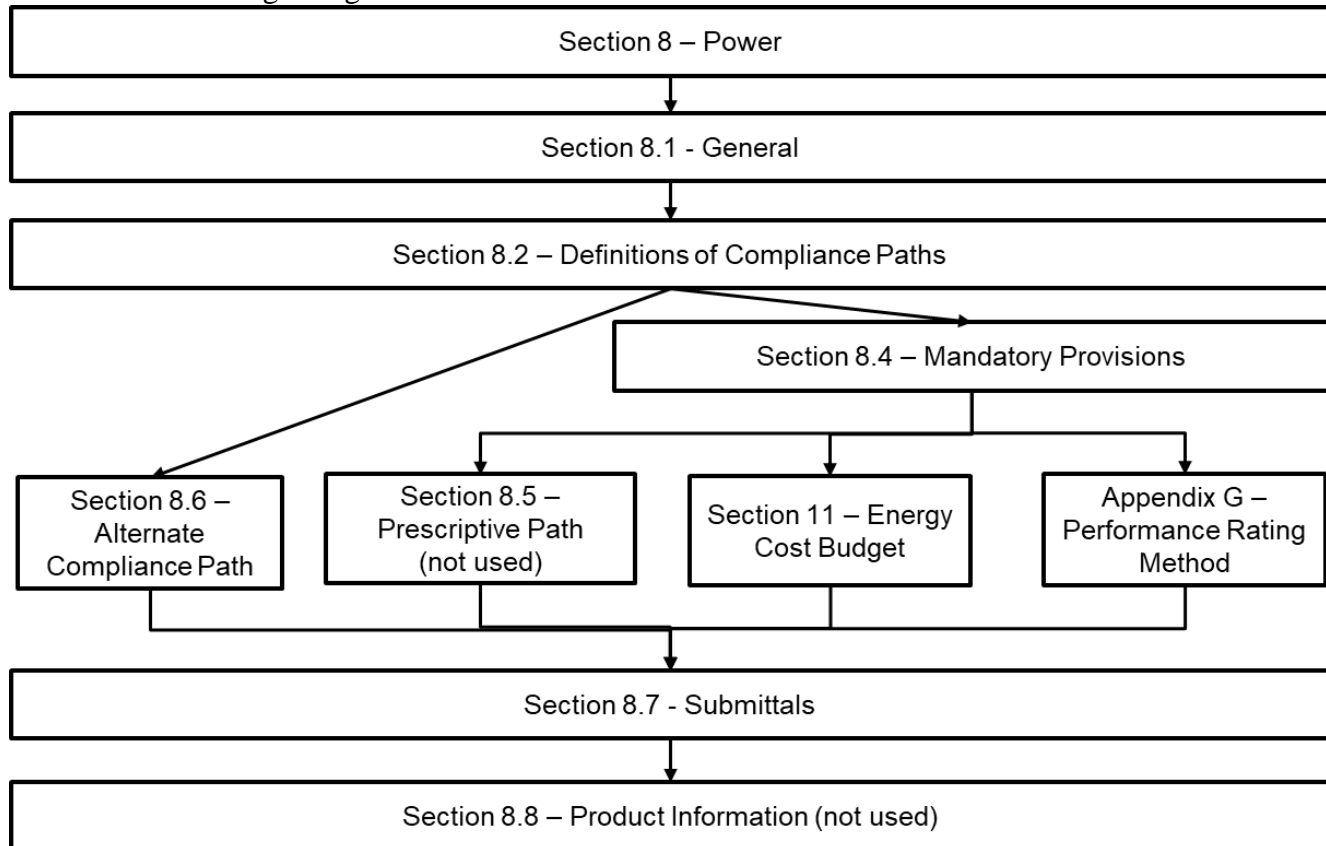
Exception to 6.2.2.b: *HVAC systems* only serving the heating, cooling, or ventilating needs of a computer room with IT equipment load greater than 10 kW shall be permitted to comply with Section 6.6, “Alternative Compliance Path”.

## Section 6.6

### 6.6.1 Computer Room Systems

*HVAC systems* only serving the heating, cooling, or ventilating needs of a *computer room* with IT equipment load greater than 10 kW shall comply with ASHRAE Standard 90.4 Energy Standard for Data Centers.

Flow chart at the beginning of Section 8



## Section 8.2.1

### 8.2.1 Requirements for All Compliance Paths

Power *distribution systems* and equipment shall comply with Section 8.1, “General”; Section 8.4, “Mandatory Provisions”; and Section 8.7, “Submittals.”

Exception to 8.2.1: Power *distribution systems* and *equipment* only serving a *computer room* with IT equipment load greater than 10 kW shall be permitted to comply with Section 8.6, “Alternative Compliance Path”.

## Section 8.6

## 8.6 Alternative Compliance Path

### 8.6.1 Computer Rooms Systems

Power *distribution systems* and *equipment* only serving a *computer room* with IT *equipment* load greater than 10 kW shall comply with ASHRAE Standard 90.4 Energy Standard for Data Centers.

## Section 12 References

ASHRAE Standard 90.4-2016 with Addenda a and b	Energy Standard for Data Centers
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