



**BSR/ASHRAE/IES Addendum ab  
to ANSI/ASHRAE/IES Standard 90.1-2019**

**Public Review Draft**

**Proposed Addendum ab to  
Standard 90.1-2019, Energy Standard  
for Buildings Except Low-Rise  
Residential Buildings**

**First Public Review (March 2021)  
(Draft Shows Proposed Changes to the Current Standard)**

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## FOREWORD

This addendum proposes a change to the wording of Section G3.1.1 to help clarify the process of selecting baseline HVAC systems when using Appendix G Performance Rating Method (PRM). The following clarifications are made.

1. All residential spaces, regardless of size in any building shall be modeled with a baseline system type 1 or 2 depending on climate zone.
2. Certain non-residential spaces such as corridors, storage rooms, restrooms, a small lounge or office that are designed to primarily serve the residents of a building and are located on a floor where the majority of the gross floor area of the floor is residential space types are to be modeled as system type 3 and 4. A new definition, residential associated HVAC zones, is proposed to clarify these unique spaces and to help streamline the selection of baseline HVAC systems.
3. The proposal clarifies how baseline HVAC systems shall be selected.
  - a. First, the combined floor area of conditioned and semi heated floor is determined for the building area types used to determine baseline HVAC systems
  - b. Second, the nonresidential building area type with the largest floor area calculated in step 1 is classified as the predominant nonresidential building area type. Any building area type with less than 20,000 ft<sup>2</sup> from step 1 is considered part of the predominant nonresidential building area type.
  - c. Assign baseline HVAC system types for the Residential building area type, the predominant building area type and any other nonresidential building area types with more than 20,000 ft<sup>2</sup> from step 1.
  - d. Once baseline HVAC systems are determined they shall be added or altered for individual HVAC zones based on certain criteria. Criteria related to HVAC zones specific baseline system changes were put in a new section G3.1.1.2.
  - e. Section G3.1.1.3 was added to clarify how to assign different baseline HVAC system types within the baseline building design.
4. The notes to Table G3.1.1-3 were all deleted and incorporated into G3.1.1.1 part a.
5. The requirements for Hospitals were moved from G3.1.1.2 and added to Table G3.1.1-3 as a building area type. This clarifies the current intent of G3.1.1.h
6. G3.1.1.g was renumbered to G3.1.1.2.e and the language was revised to clarify selecting baseline HVAC system types for computer rooms.
7. Table G3.1.1-3 was revised to clarify the current intent. None of the clarifications change the intent of the current requirements.
8. Several editorial changes were made to provide consistent application of the term HVAC zone as an alternative to space, zone or thermal zone that have been historically used throughout Appendix G.
9. This addendum impacts an optional performance path in the standard designed to provide increased flexibility and therefore was not subjected to cost effectiveness analysis.

*[Note to Reviewers: This public review draft makes proposed independent substantive changes to the previous public review draft. These changes are indicated in the text by underlining (for additions) and ~~strikethrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the previous draft 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 substantive changes.]*

## **Addendum ab to 90.1-2019**

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*Modify Section 3.2 as follows (I-P and SI Units)*

*residential associated HVAC zone*: Any HVAC zone that primarily includes nonresidential spaces designed to serve occupants of residential spaces, including but not limited to corridors, stairwells, elevator lobbies, and common restrooms, and is on a floor where over 75% of the gross conditioned floor area are residential spaces. This definition does not apply to HVAC zones within hospitals.

*Modify Section 3.3 as follows (I-P and SI Units)*

CV constant volume

...

ER energy recovery

...

HW heating hot water

...

PFP parallel fan -powered

...

PSZ-AC packaged single zone air conditioner

PSZ-HP packaged single zone heat pump

...

SZ single zone

*Modify Appendix G as follows (I-P and SI Units)*

## **G3 CALCULATION OF THE PROPOSED DESIGN AND BASELINE BUILDING PERFORMANCE**

### **G3.1 Building Performance Calculations**

The simulation model for calculating the proposed and *baseline building performance* shall be developed in accordance with the requirements in Table G3.1.

#### **G3.1.1 Baseline HVAC System Type and Description**

~~*HVAC systems in the baseline building design shall comply with the following:*~~

~~a. *HVAC systems in the baseline building design shall be determined in the following order of priority:*~~

- ~~1. *The building type with the largest conditioned floor area.*~~
- ~~2. *Number of floors (including floors above grade and below grade but not including floors solely devoted to parking).*~~
- ~~3. *Conditioned gross floor area.*~~
- ~~4. *Climate zone as specified in Table G3.1.1-3, which shall conform with the system descriptions in Table G3.1.1-4. For Systems 1, 2, 3, 4, 9, 10, 11, 12, and 13, each thermal block shall be modeled with its own HVAC system. For Systems 5, 6, 7, and 8, each floor shall be modeled with a separate HVAC system. Floors with identical thermal blocks can be grouped for modeling purposes.*~~

- b. ~~Use additional system types for nonpredominant conditions (i.e., residential/nonresidential or heating source) if those conditions apply to more than 20,000 ft<sup>2</sup> (1900 m<sup>2</sup>) of conditioned floor area.~~

HVAC systems in the baseline building design shall be selected based on the building area types and criteria described in Section G3.1.1.1 and shall be adjusted, when applicable, based on the requirements in Section G3.1.1.2 and modeled in the baseline building design per Section G3.1.1.3

**G3.1.1.1 Baseline HVAC System Types based on Building Area Types.** *HVAC system types in the baseline building design shall be determined as follows:*

- a. Determine the combined area of the gross conditioned floor area and semiheated floor area of each of the following building area types in the proposed design.
  1. **Residential:** *HVAC zones that include dwelling units, guest rooms, living quarters, private living spaces, and sleeping quarters, and residential associated HVAC zones shall be classified as Residential. Other space types, including patient rooms in hospitals, shall not be classified as Residential.*
  2. **Public Assembly:** *Houses of worship, auditoriums, movie theaters, performance theaters, concert halls, arenas, enclosed stadiums, ice rinks, gymnasiums, convention centers, exhibition centers, and natatorium buildings shall be classified as Public Assembly. HVAC zones that include these area types in other buildings shall also be classified as Public Assembly.*
  3. **Heated-only Storage:** *Non-refrigerated warehouse buildings and heated parking garages that are not mechanically cooled, shall be classified as Heated-only Storage.*
  4. **Retail:** *Grocery stores, retail stores and supermarket buildings with two floors or fewer shall be classified as Retail.*
  5. **Hospitals:** *Hospital building area type including patient rooms.*
  6. **Other Nonresidential:** *Buildings and areas within buildings that are not classified as Residential, Public Assembly, Heated-only Storage, Hospital or Retail shall be classified as Other Nonresidential.*
- b. Classify the nonresidential building area type with the largest combined area from G3.1.1.1(a) as the predominant nonresidential building area type. Add the combined area of any remaining nonresidential building area types with less than 20,000 ft<sup>2</sup> (1900 m<sup>2</sup>) to the combined area of the predominant nonresidential building area type.
- c. Select a baseline HVAC system type from Table G3.1.1-3 for each of the following building area types included in the proposed design:
  1. Residential based on G3.1.1.1(a),
  2. Predominant nonresidential based on G3.1.1(b),
  3. Each additional nonresidential building area type with more than 20,000 ft<sup>2</sup> (1900 m<sup>2</sup>) of combined area based on G3.1.1.1(a).

**G3.1.1.2 Additional and Adjusted Baseline HVAC System Types.** *Baseline HVAC systems shall be added or adjusted for individual HVAC zones based on the following criteria.*

- a. ~~e.~~ *If the baseline HVAC system type is 5, 6, 7, or 8, 9, 10, 11, 12, or 13 use separate single-zone systems conforming with the requirements of system 3 or system 4 for any HVAC zones that have occupancy, internal gains, or schedules that differ significantly from the rest of the HVAC zones served by the system. The total peak internal gains that differ by 10 Btu/h·ft<sup>2</sup> (31.2 W/m<sup>2</sup>) or more from the average of other HVAC zones served by the system, or schedules that differ by more than 40 equivalent full-load hours per week from other ~~spaces~~ HVAC zones served by the system, are considered to differ significantly. Examples where this exception may be applicable include but are not limited to natatoriums and continually occupied security areas. This exception does not apply to computer rooms.*
- b. ~~d.~~ *For Laboratory spaces In a building having a total laboratory exhaust rate greater than 15,000 cfm (7100L/s), use a single system of type 5 or 7 serving only those ~~spaces~~ HVAC zones that*

- include the laboratory spaces. The lab exhaust fan shall be modeled as constant horsepower (kilowatts) reflecting constant-volume stack discharge with *outdoor air* bypass.
- c. ~~e.~~ ~~Thermal zones~~ HVAC zones designed with heating-only systems in the *proposed design* serving storage rooms, stairwells, vestibules, electrical/mechanical rooms, and restrooms not exhausting or transferring air from mechanically cooled thermal zones in the *proposed design* shall use system type 9 or 10 in the *baseline building design*.
  - d. ~~f.~~ If the baseline HVAC system type is 9 or 10, use additional system types for all HVAC zones that are mechanically cooled in the *proposed design*. The baseline HVAC system types for such zones shall be determined based on the building area type determined in accordance with G3.1.1.1(a) and the requirements of G3.1.1.1(c).
  - e. ~~g.~~ The baseline HVAC system serving HVAC zones that include ~~computer rooms~~ shall be modeled in accordance with one of the following:
    1. Baseline System 11 shall be used for such HVAC zones in buildings with a total computer room peak cooling load ~~greater than 3,000,000 Btu/h (880 kW).~~
    2. Baseline System 11 shall be used for such HVAC zones in buildings ~~or a total computer room peak cooling load >600,000 Btu/h (175kW)~~ where the baseline HVAC system type is 7 or 8 and the total computer room peak cooling load is greater than 600,000 BTU/h (175 kW).
    3. Baseline System 3 or 4 shall be used for all ~~the~~ other HVAC zones that include computer rooms based on climate zone. ~~shall use System 3 or 4.~~
  - ~~h.~~ For hospitals, depending on building area type use system type 5 or 7 in all climate zones.
  - f. Residential associated HVAC zones shall use system type 3 or 4 based on climate zone.

**G3.1.1.3** For baseline HVAC systems 1, 2, 3, 4, 9, 10, 11, 12, and 13, each HVAC zone or thermal block shall be modeled with its own HVAC system. For Systems 5, 6, 7, and 8, each floor shall be modeled with a separate HVAC system. Floors with identical HVAC zones or thermal blocks can be grouped for modeling purposes.

**Exception:** Baseline system 5 or 7 serving laboratory spaces in accordance with G3.1.1.3(b).

Renumber current Sections G3.1.1.1 through G3.1.1.4

**Table G3.1.1-3 Baseline HVAC System Types**

<b>Building Area Types<sup>1</sup>, Number of Floors<sup>2</sup>, and Gross Conditioned Combined Floor Area<sup>3</sup></b>	<b>Climate Zones 3B, 3C, and 4 to 8,</b>	<b>Climate Zones 0 to 3A</b>
<i>Residential</i>	<i>System 1—PTAC</i>	<i>System 2—PTHP</i>
Public assembly area smaller than $<120,000 \text{ ft}^2$ (11,000 m <sup>2</sup> )	<i>System 3—PSZ-AC</i>	<i>System 4—PSZ-HP</i>
Public assembly area equal to or larger than $\geq 120,000 \text{ ft}^2$ (11,000 m <sup>2</sup> )	<i>System 12—SZ-CV-HW</i>	<i>System 13—SZ-CV-ER</i>
Heated-only storage	<i>System 9—Heating and ventilation</i>	<i>System 10—Heating and ventilation</i>
Retail in a building that is 1 or 2 floors or fewer	<i>System 3—PSZ-AC</i>	<i>System 4—PSZ-HP</i>
Hospital that is either: <ul style="list-style-type: none"> <li>• larger than <math>150,000 \text{ ft}^2</math> (14,000 m<sup>2</sup>), or</li> <li>• in a building greater than 5 floors</li> </ul>	<i>System 7—VAV with reheat</i>	<i>System 7—VAV with reheat</i>
Hospital - All other	<i>System 5—Packaged VAV with reheat</i>	<i>System 5—Packaged VAV with reheat</i>
Other Nonresidential area that is both: <ul style="list-style-type: none"> <li>• smaller than <math>25,000 \text{ ft}^2</math> (2300 m<sup>2</sup>), and</li> <li>• in a building 3 floors or fewer and 3 floors or fewer and <math>&lt;25,000 \text{ ft}^2</math> (2300 m<sup>2</sup>)</li> </ul>	<i>System 3—PSZ-AC</i>	<i>System 4—PSZ-HP</i>

Other Nonresidential area that is both: <ul style="list-style-type: none"> <li>• smaller than 25,000 ft<sup>2</sup> (2300 m<sup>2</sup>), and</li> <li>• in a <i>building</i> with 4 or 5 floors</li> </ul> and 4 or 5 floors and <25,000 ft <sup>2</sup> (2300 m <sup>2</sup> ) or 5 floors or fewer and 25,000 ft <sup>2</sup> (2300 m <sup>2</sup> ) to 150,000 ft <sup>2</sup> (14,000 m <sup>2</sup> )	System 5—Packaged VAV with reheat	System 6—Packaged VAV with PFP boxes
Other Nonresidential area that is both: <ul style="list-style-type: none"> <li>• 25,000 ft<sup>2</sup> (2300 m<sup>2</sup>) to 150,000 ft<sup>2</sup> (14,000 m<sup>2</sup>), and</li> <li>• in a <i>building</i> that is 5 floors or fewer</li> </ul>	System 5—Packaged VAV with reheat	System 6—Packaged VAV with PFP boxes
Other Nonresidential area that is both: <ul style="list-style-type: none"> <li>• larger than 150,000 ft<sup>2</sup>(14,000 m<sup>2</sup>), or</li> <li>• in a <i>building</i> greater than 5 floors</li> </ul> and more than 5 floors or >150,000 ft <sup>2</sup> (14,000 m <sup>2</sup> )	System 7—VAV with reheat	System 8—VAV with PFP boxes

Notes:

1. ~~Residential building types include dormitory, hotel, motel, and multifamily. Residential space types include, guest rooms, living quarters, private living spaces, and sleeping quarters. All other building and space types shall be considered non-residential~~
  2. ~~Where attributes make a building eligible for more than one baseline system type, use the predominant condition to determine the system type for the entire building except as noted in Section G3.1.1.~~
  3. ~~For laboratory spaces in a building having a total laboratory exhaust rate greater than 15,000 cfm(7100 L/s), use a single system of type 5 or 7 serving only those spaces.~~
  4. ~~For hospitals, depending on building type, use System 5 or 7 in all climate zones.~~
  5. ~~Public assembly building types include houses of worship, auditoriums, movie theaters, performance theaters, concert halls, arenas, enclosed stadiums, ice rinks, gymnasiums, convention centers, exhibition centers, and natatoriums.~~
1. Building area type determined in accordance with G3.1.1.1.
  2. The total number of floors in a building, including above-grade and below-grade floors but not including floors solely devoted to parking.
  3. Combined gross conditioned floor area and semiheated floor area, of the building area type, based on the requirements of G3.1.1.1.