



BSR/ASHRAE/IESNA Addendum dn
to ANSI/ASHRAE/IESNA Standard 90.1-2007

Public Review Draft

ASHRAE® Standard

Proposed Addendum dn to Standard 90.1-2007, *Energy Standard for Buildings Except Low-Rise Residential Buildings*

First Public Review (March 2010)
(Draft Shows Proposed Changes to
Current Standard)

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FOREWORD

This public review draft shows changes in Appendix G relative to addendum “cj” (computer rooms) to 90.1-2007.

Note: In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~striketrough~~ (for deletions) unless the instructions specifically mention some other means of indicating the changes. Only these changes 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 dn to 90.1-2007

Modify the Standard as follows (SI and IP Units)

Modify Appendix G as follows:

G3.1.1 Baseline HVAC System Type and Description. HVAC systems in the *baseline building design* shall be based on usage, number of floors, conditioned floor area, and heating source as specified in Table G3.1.1A and shall conform with the system descriptions in Table G3.1.1B. For systems 1, 2, 3, and 4, each thermal block shall be modeled with its own HVAC system. For systems 5, 6, 7, ~~and 8~~, 10 and 11 each floor shall be modeled with a separate HVAC system. Floors with identical thermal blocks can be grouped for modeling purposes.

Exceptions:

- a. Use additional system type(s) for nonpredominant conditions (i.e., residential/nonresidential or heating source) if those conditions apply to more than 20,000 ft² of conditioned floor area.
- b. If the baseline HVAC system type is 5, 6, 7, ~~or 8~~, 10 or 11 use separate single-zone systems conforming with the requirements of System 3 or System 4 (depending on building heating source) for any spaces that have occupancy or process loads or schedules that differ significantly from the rest of the building. Peak thermal loads that differ by 10 Btu/h·ft² or more from the average of other spaces served by the system or schedules that differ by more than 40 equivalent full-load hours per week from other spaces served by the system are considered to differ significantly. Examples where this exception may be applicable include, but are not limited to, computer server rooms, natatoriums, and continually occupied security areas.
- c. If the baseline HVAC system type is 5, 6, 7, ~~or 8~~, 10 or 11 use separate single-zone systems conforming with the requirements of System 3 or System 4 (depending on building heat source) for any zones having special pressurization relationships, cross-contamination requirements, or code-required minimum circulation rates.

- d. For laboratory spaces with a minimum of 5000 cfm of exhaust, use system type 5 or 7 that reduce the exhaust and makeup air volume to 50% of design values during unoccupied periods. For all-electric buildings, the heating shall be electric resistance.
- e. Thermal 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 10 or 11 in the baseline building design.
- f. If the baseline HVAC system type is 10 or 11, all spaces that are mechanically cooled in the proposed building design shall be assigned to a separate baseline system determined by using the area and heating source of the mechanically cooled spaces.

G3.1.2.6 Economizers. Outdoor air economizers shall not be included in *baseline* HVAC Systems 1, ~~and 2,~~ 10, and 11. Outdoor air economizers shall be included in *baseline* HVAC Systems 3 through 9 based on climate as specified in Table G3.1.2.6A.

G3.1.2.8 Design Airflow Rates.

G3.1.2.8.1 Baseline System Types 1 through 8. System design supply airflow rates for the *baseline building design* shall be based on a supply-air-to-room-air temperature difference of 20°F or the minimum outdoor air flow rate, or the air flow rate required to comply with applicable codes or accreditation standards ~~required ventilation air or makeup air~~, whichever is greater. If return or relief fans are specified in the *proposed design*, the *baseline building design* shall also be modeled with fans serving the same functions and sized for the *baseline* system supply fan air quantity less the minimum *outdoor air*, or 90% of the supply fan air quantity, whichever is larger.

G3.1.2.8.2 Baseline System Types 10 and 11. System design supply airflow rates for the *baseline building design* shall be based on the temperature difference between a supply air temperature setpoint of 105° F and the design space heating temperature setpoint, the minimum outdoor air flow rate, or the air flow rate required to comply with applicable codes or accreditation standards, whichever is greater.

If the Proposed Building Design includes a fan(s) sized and controlled to provide non-mechanical cooling, the baseline building design shall include a separate fan to provide non-mechanical cooling, sized and controlled the same as the proposed building design.

G3.1.2.9 System Fan Power. System fan electrical power for supply, return, exhaust, and relief (excluding power to fan-powered VAV boxes) shall be calculated using the following formulas:

For Systems 1 and 2,

$$P_{fan} = CFMS \cdot 0.3$$

For systems 3 through 8,

$$P_{fan} = bhp \times 746 / \text{Fan Motor Efficiency}$$

For Systems 10 and 11 (supply fan),

$$\underline{P_{fan}} = CFM_s \times 0.3$$

For Systems 10 and 11 (non-mechanical cooling fan if required by Section G3.1.2.8.2)

$$\underline{P_{fan}} = CFM_{nmc} \times 0.054$$

where

P_{fan} = electric power to fan motor (watts)

and

bhp = brake horsepower of *baseline* fan motor from Table G3.1.2.9

Fan Motor Efficiency = the efficiency from Table 10.8 for the next motor size greater than the bhp using the enclosed motor at 1800 rpm.

CFM_s = the baseline system maximum design supply fan airflow rate in cfm

(L/s)

CFM_{nmc} = the baseline non-mechanical cooling fan airflow in cfm

Modify table G3.1 as follows:

1. Design Model	
<p>a. The simulation model of the <i>proposed design</i> shall be consistent with the design documents, including proper accounting of fenestration and opaque envelope types and areas; interior lighting power and controls; HVAC system types, sizes, and controls; and service water heating systems and controls. All end-use load components within and associated with the building shall be modeled, including, but not limited to, exhaust fans, parking garage ventilation fans, snow-melt and freeze-protection equipment, facade lighting, swimming pool heaters and pumps, elevators and escalators, refrigeration, and cooking. Where the simulation program does not specifically model the functionality of the installed system, spreadsheets or other documentation of the assumptions shall be used to generate the power demand and operating schedule of the systems.</p> <p>b. All conditioned spaces in the <i>proposed design</i> shall be simulated as being both heated and cooled even if no heating or cooling system is to be installed, and temperature and humidity control setpoints and schedules shall be the same for <i>proposed</i> and <i>baseline building designs</i>.</p> <p><u>Exception:</u> Spaces using Baseline System types 10 and 11 shall not be simulated with mechanical cooling.</p> <p>c. When the <i>performance rating method</i> is applied to buildings in which energy-related features have not yet been designed (e.g., a lighting system), those yet-to-be-designed features shall be described in the <i>proposed design</i> exactly as they are defined in the <i>baseline building design</i>. Where the space classification for a space is not known, the space shall be categorized as an office space.</p>	<p>The <i>baseline building design</i> shall be modeled with the same number of floors and identical conditioned floor area as the <i>proposed design</i>.</p>
10. HVAC Systems	

<p>The HVAC system type and all related performance parameters in the <i>proposed design</i>, such as equipment capacities and efficiencies, shall be determined as follows:</p> <ol style="list-style-type: none"> Where a complete HVAC system exists, the model shall reflect the actual system type using actual component capacities and efficiencies. Where an HVAC system has been designed, the HVAC model shall be consistent with design documents. Mechanical equipment efficiencies shall be adjusted from actual design conditions to the standard rating conditions specified in Section 6.4.1 if required by the simulation model. Where no heating system exists or no heating system has been specified, the heating system classification shall be assumed to be electric, and the system characteristics shall be identical to the system modeled in the <i>baseline building design</i>. Where no cooling system exists or no cooling system has been specified, the cooling system shall be identical to the system modeled in the <i>baseline building design</i>. <p><u>Exception:</u> Spaces using baseline HVAC system types 10 and 11.</p>	<p>The HVAC system(s) in the <i>baseline building design</i> shall be of the type and description specified in Section G3.1.1, shall meet the general HVAC system requirements specified in Section G3.1.2, and shall meet any system-specific requirements in Section G3.1.3 that are applicable to the baseline HVAC system type(s).</p> <p>If the <i>proposed design</i> includes <i>computer room</i> humidification, then the <i>computer room</i> humidification system, schedules, and setpoints in the <i>baseline building design</i> shall be the same as the <i>proposed design</i>.</p> <p>For systems serving <i>computer rooms</i>, the baseline shall not have reheat for the purpose of dehumidification.</p>
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Modify Table G3.1.1A (IP Units) as Follows:

TABLE G3.1.1A Baseline HVAC System Types

Building Type	Fossil Fuel, Fossil/Electric Hybrid, & Purchased Heat	Electric and Other
Residential	System 1 – PTAC	System 2 - PTHP
Nonresidential & 3 Floors or Less & <25,000 ft ²	System 3 – PSZ-AC	System 4 – PSZ-HP
Nonresidential & 4 or 5 Floors & <25,000 ft ² or 5 Floors or Less & 25,000 ft ² to 150,000 ft ²	System 5 - Packaged VAV w/ Reheat	System 6 - Packaged VAV w/PFP Boxes
Nonresidential & More than 5 Floors or >150,000 ft ²	System 7 - VAV w/Reheat	System 8 - VAV w/PFP Boxes
<u>Heated Only Storage</u>	<u>System 11—Heating and Ventilation</u>	<u>System 10— Heating and Ventilation</u>

Notes:

Residential building types include dormitory, hotel, motel, and multifamily. Residential space types include guest rooms, living quarters, private living space, and sleeping quarters.

Other building and space types are considered nonresidential.

Where no heating system is to be provided or no heating energy source is specified, use the “Electric and Other” heating source classification.

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.

For laboratory spaces with a minimum of 5000 cfm of exhaust, use system type 5 or 7 and reduce the exhaust and makeup air volume to 50% of design values during unoccupied periods. For all-electric buildings, the heating shall be electric resistance.

Modify Table G3.1.1A (SI Units) as Follows:

TABLE G3.1.1A Baseline HVAC System Types

Building Type	Fossil Fuel, Fossil/Electric Hybrid, & Purchased Heat	Electric and Other
Residential	System 1 – PTAC	System 2 - PTHP
Nonresidential & 3 Floors or Less & <2300 m ²	System 3 – PSZ-AC	System 4 – PSZ-HP
Nonresidential & 4 or 5 Floors & <2300 m ² or 5 Floors or Less & 2300 m ² to 13,800 m ²	System 5 - Packaged VAV w/ Reheat	System 6 - Packaged VAV w/PFP Boxes
Nonresidential & More than 5 Floors or >13,800 m ²	System 7 - VAV w/Reheat	System 8 - VAV w/PFP Boxes
Heated Only Storage	System 11—Heating and Ventilation	System 10— Heating and Ventilation

Notes:

Residential building types include dormitory, hotel, motel, and multifamily. Residential space types include guest rooms, living quarters, private living space, and sleeping quarters.

Other building and space types are considered nonresidential.

Where no heating system is to be provided or no heating energy source is specified, use the “Electric and Other” heating source classification.

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.

For laboratory spaces with a minimum of 2400 L/s of exhaust, use system type 5 or 7 and reduce the exhaust and makeup air volume to 50% of design values during unoccupied periods.

For all-electric buildings, the heating shall be electric resistance.

Modify Table G3.1.1A (IP and SI Units) as Follows:

TABLE G3.1.1B Baseline System Descriptions

System No.	System Type	Fan Control	Cooling Type	Heating Type
1. PTAC	Packaged terminal air conditioner	Constant Volume	Direct Expansion	Hot Water Fossil Fuel Boiler
2. PTHP	Packaged terminal heat pump	Constant Volume	Direct Expansion	Electric Heat Pump
3. PSZ-AC	Packaged rooftop air conditioner	Constant Volume	Direct Expansion	Fossil Fuel Furnace
4. PSZ-HP	Packaged rooftop heat pump	Constant Volume	Direct Expansion	Electric Heat Pump
5. Packaged VAV w/ Reheat	Packaged rooftop variable air volume with reheat	VAV	Direct Expansion	Hot Water Fossil Fuel Boiler
6. Packaged VAV w/PFP Boxes	Packaged rooftop variable air volume with reheat	VAV	Direct Expansion	Electric Resistance
7. VAV w/Reheat	Variable air volume with reheat	VAV	Chilled Water	Hot Water Fossil Fuel Boiler
8. VAV w/PFP Boxes	Variable air volume with parallel fan powered boxes and reheat	VAV	Chilled Water	Electric Resistance
9. SZ – VAV	Single Zone VAV	VAV	Chilled Water	See Notes

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<u>10. Heating and Ventilation</u>	<u>Warm air furnace, electric</u>	<u>Constant volume</u>	<u>None</u>	<u>Electric resistance</u>
<u>11. Heating and Ventilation</u>	<u>Warm air furnace, gas fired</u>	<u>Constant volume</u>	<u>None</u>	<u>Fossil fuel furnace</u>

Notes:

Where the *proposed design* heating source is electric or other, the heating type shall be electric resistance.

Where the *proposed design* heating source is fossil fuel, fossil/electric hybrid, or purchased heat, the heating type shall be hot-water fossil fuel boiler.