ANSI/ASHRAE/IESNA Addenda aa, ab, ag, ah, aj, al, and am to ANSI/ASHRAE/IESNA Standard 90.1-2004

ASHRAE STANDARD

Energy Standard for Buildings Except Low-Rise Residential Buildings

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FOREWORD

This addendum adds definitions for lighting-related terms that are important to understanding and applying some of the lighting requirements in the standard.

The addendum also provides clarification by replacing undefined terms in the lighting section and Appendix G related to lighting transformers and dwelling unit spaces.

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Addendum aa to 90.1-2004 (I-P and SI Editions)

Add the following definitions to chapter 3:

astronomical time switch: a device that turns the lighting on at a time relative to sunset and off at a time relative to sunrise, accounting for geographic location and day of year.

efficacy (of a lamp): the ratio of the total luminous output of a lamp to the total power input to the lamp. Typically expressed in lumens per watt.

eye adaptation: the process by which the retina becomes accustomed to more or less light than it was exposed to during an immediately preceding period. It results in a change in the sensitivity to light.

high-frequency electronic ballast: ballasts that operate at a frequency greater than 20 kHz.

photosensor: a device that detects the presence of visible light, infrared transmission (IR), and/or ultraviolet (UV) energy.

task lighting: lighting directed to a specific surface or area that provides illumination for visual tasks.

Modify Section 9.1.3 as follows:

9.1.3 Installed Interior Lighting Power. The *installed interior lighting power* shall include all power used by the *luminaires*, including *lamps*, *ballasts*, *transformers* ~~current regulators~~, and *control devices* except as specifically exempted in 9.2.2.3.

Modify the exceptions to Section 9.1 (scope) as follows:

Exceptions to 9.1.1:

a. emergency lighting that is automatically off during normal *building* operation,
b. lighting within *dwelling units* ~~living units~~,
c. lighting that is specifically designated as required by a health or life safety statute, ordinance, or regulation,
d. decorative gas lighting systems.

Modify Appendix G Table G3.1 item 6, Lighting, and item 9, Thermal Blocks (column A), as follows:

6. LIGHTING

…….

d. lighting system power shall include all lighting system components shown or provided for on the plans (including lamps and ballasts and task and furniture-mounted fixtures).

Exception: For multifamily *dwelling units* ~~living units~~, hotel/motel guest rooms, and other spaces in which lighting systems are connected via receptacles and are not shown or provided for on building plans, assume identical lighting power for the *proposed* and *baseline building designs* in the simulations, but exclude these loads when calculating the *baseline building performance* and *proposed building performance*.

9. THERMAL BLOCKS—MULTIFAMILY RESIDENTIAL BUILDINGS

Residential spaces shall be modeled using at least one *thermal block* per *dwelling unit* ~~living unit~~, except that those units facing the same orientations may be combined into one *thermal block*. Corner units and units with roof or floor loads shall only be combined with units sharing these features.

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FOREWORD

This change to Section 11 and Appendix G clarifies which sections should be referenced.

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Addendum ab to 90.1-2004 (I-P and SI Editions)

Modify Table 11.3.1 as follows:

TABLE 11.3.1 Modeling Requirements for Calculating Design Energy Cost and Energy Cost Budget

No.	Proposed Building Performance	Baseline Building Performance
6.	**Lighting**	
	Lighting power in the *proposed design* shall be determined as follows: (a) Where a complete lighting system exists, the actual lighting power shall be used in the model. (b) Where a lighting system has been designed, lighting power shall be determined in accordance with ~~9.5 and 9.6~~ 9.1.3 and 9.1.4. (c) Where lighting neither exists nor is specified, lighting power shall be determined in accordance with the building area method for the appropriate building type. (d) Lighting system power shall include all lighting system components shown or provided for on the plans (including lamps and ballasts and task and furniture-mounted fixtures).	Lighting power in the *budget building design* shall be determined using the same categorization procedure (building area or space function) and categories as the *proposed design* with lighting power set equal to the maximum allowed for the corresponding method and category in either 9.5 or 9.6. Power for fixtures not included in the lighting power density calculation shall be modeled identically in the *proposed design* and *budget building design*. Lighting controls shall be the minimum required.

Modify Table G3.1 as follows:

TABLE G3.1 Modeling Requirements for Calculating Proposed and Baseline Building Performance

No.	Proposed Building Performance	Baseline Building Performance
6.	**Lighting**	
	Lighting power in the *proposed design* shall be determined as follows: (a) Where a complete lighting system exists, the actual lighting power shall be used in the model. … (g) For automatic lighting controls in addition to those required for minimum code compliance under ~~9.2~~ 9.4.1, credit may be taken for automatically controlled systems by reducing the connected lighting power by the applicable percentages listed in Table G3.2. Alternatively, credit may be taken for these devices by modifying the lighting schedules used for the *proposed design*, provided that credible technical documentation for the modifications are provided to the *rating authority.*	Lighting power in the *baseline building design* shall be determined using the same categorization procedure (building area or space function) and categories as the proposed design with lighting power set equal to the maximum allowed for the corresponding method and category in 9.2. No automatic lighting controls (e.g., programmable controls or automatic controls for daylight utilization) shall be modeled in the *baseline building design*, as the lighting schedules used are understood to reflect the mandatory control requirements in this standard.

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FOREWORD

The following change clarifies that only HVAC fans that provide outdoor air for ventilation need to be modeled as running continuously.

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Addendum ag to 90.1-2004 (I-P and SI Editions)

Modify Table G3.1 as follows:

TABLE G3.1 Modeling Requirements for Calculating Proposed and Baseline Building Performance

No.	Proposed Building Performance	Baseline Building Performance
4.	**Schedules**	
	Schedules capable of modeling hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat setpoints, and HVAC system operation shall be used. The schedules shall be typical of the proposed building type as determined by the designer and approved by the *rating authority.* **HVAC Fan Schedules**. Schedules for HVAC fans that provide outdoor air for ventilation shall run continuously whenever spaces are occupied and shall be cycled on and off to meet heating and cooling loads during unoccupied hours. **Exception:** Where no heating and/or cooling system is to be installed and a heating or cooling system is being simulated only to meet the requirements described in this table, heating and/or cooling system fans shall not be simulated as running continuously during occupied hours but shall be cycled on and off to meet heating and cooling loads during all hours.	Same as Proposed Design. **Exception:** Schedules may be allowed to differ between *proposed design* and *baseline building design* when necessary to model nonstandard *efficiency* measures, provided that the revised schedules have the approval of the rating authority. Measures that may warrant use of different schedules include, but are not limited to, lighting controls, natural ventilation, demand control ventilation, and measures that reduce service water heating loads.

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FOREWORD

It is unclear what to assume in the budget building model if condenser heat recovery is required by Section 6.5.2. This clarifies the requirement by stating that condenser heat recovery must be included in the budget building model if it is a prescriptive requirement for the building. This is consistent with the way the issue is dealt with in Appendix G and simply repeats the language in Appendix G. The exception recognizes that many simulation programs cannot model this prescriptive requirement. It allows the model to not include a simulation of the heat recovery system as long as the system itself is included in the proposed building design.

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Addendum ah to 90.1-2004 (I-P and SI Editions)

Modify Table 11.3.1 as follows:

TABLE 11.3.1 Modeling Requirements for Calculating Proposed and Baseline Building Performance

No.	Proposed Building Performance	Baseline Building Performance
11.	**Service Hot Water Systems** The service hot water system type and all related performance parameters, such as equipment capacities and efficiencies, in the *proposed design* shall be determined as follows: (a) Where a complete service hot water system exists, the *proposed design* shall reflect the actual system type using actual component capacities and efficiencies. (b) Where a service hot water system has been specified, the service hot water model shall be consistent with design documents. (c) Where no service hot water system exists or has been specified but the building will have service hot water loads, a service hot water system shall be modeled that matches the system in the *baseline building design* and serves the same hot water loads. (d) For buildings that will have no service hot water loads, no service hot water system shall be modeled.	The service hot water system type and related performance in the *budget building design* shall be identical to the *proposed design* Exceptions: (a)~~except w~~Where Section 7.5 applies~~. In this case~~ the boiler shall be split into a separate space heating boiler and hot water heater with *efficiency* requirements set to the least efficient allowed. (b) For 24-hour-per-day facilities that meet the prescriptive criteria for use of condenser heat recovery systems described in Section 6.5.6.2, a system meeting the requirements of that section shall be included in the *baseline building design* regardless of the exceptions to 6.5.6.2. If a condenser heat recovery system meeting the requirements described in Section 6.5.6.2 cannot be modeled, the requirement for including such a system in the actual building shall be met as a prescriptive requirement in accordance with 6.5.6.2, and no heat-recovery system shall be included in the *proposed* or *budget building designs*.

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FOREWORD

This addendum modifies the exception to Section 5.5.3.1 by adding the ASTM test method E 1980—Standard Practice for Calculating Solar Reflectance Index (SRI) of Horizontal and Low Sloped Opaque Surfaces. This test method employs the use of the solar reflectance and thermal emittance values of a roof product in the ASTM E1980 calculation to derive the SRI. The SRI minimum value of 82 was chosen as it represents the rounded value when applying the two current minimum values, solar reflectance of 0.70 and thermal emittance of 0.75, when applied to the calculation at medium wind speed condition.

The reasons for this are twofold. First, this is another test method that will allow additional roof products to meet the high albedo roof requirements of Standard 90.1 and allow more paths toward compliance. Second, Standard 90.2-2004 contains this test method; therefore, there is an attempt to bring both standards into near agreement on the subject of high albedo roof provisions.

Section 12, "Normative References," will be modified by introducing the ASTM E1980 standard in the listing of ASTM references.

The equation to calculate the cool roof credit with a table was also replaced. It was felt that a table would simplify the application of the credit.

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Addendum aj to 90.1-2004

Modify Section 5.5.3.1 as follows:

5.5.3.1 Roof Insulation. All *roofs* shall comply with the insulation values specified in Tables 5.5-1 through 5.5-8 or shall comply with the insulation values specified in Section 5.5.3.1.1 and Table 5.5.3.1. Skylight curbs shall be insulated to the level of roofs with insulation entirely above deck or R-5, whichever is less.

~~**Exception to 5.5.3.1:** for roofs where the exterior surface has a minimum total solar reflectance of 0.70 when tested in accordance with one of the solar reflectance test methods listed below and has a minimum thermal emittance of 0.75 when tested in accordance with one of the thermal emittance test methods listed below, other than roofs with ventilated attics or roofs with semi-heated spaces, the U-factor of the proposed roof shall be permitted to be adjusted using Equation 5-1 for demonstrating compliance. The values for solar reflectance and thermal emittance shall be determined by a laboratory accredited by a nationally recognized organization, such as the Cool Roof Rating Council CRRC-1 Product Rating Program, and shall be labeled and certified by the manufacturer.~~

~~$U_{roofadj} = U_{roofcriteria} - x\ Factor_{roofmultiplier}$~~ ~~*Multiplier*~~ ~~(5-1)~~

~~where~~

~~$U_{roofadj}$ = the adjusted roof U-factor for use in demonstrating compliance,~~

~~$U_{roofcriteria}$ = the U-factor from the appropriate table,~~

~~$Factor_{roofmultiplier}$ *Multiplier* = the roof U-factor multiplier from Table 5.5.3.1~~

~~Solar Reflectance Test Methods: ASTM E903, ASTM E1175, or ASTM E1918.~~

~~Thermal Emittance Test Methods: ASTM C835, ASTM C1371, or ASTM E408.~~

~~**TABLE 5.5.3.1 Roof U-Factor Multipliers for Exception to 5.5.1.1**~~

~~Climate Zone~~	~~Roof U-Factor Multipliers~~
~~1~~	~~0.77~~
~~2~~	~~0.83~~
~~3~~	~~0.85~~
~~4 through 8~~	~~1.00~~

5.5.3.1.1 High Albedo Roofs. For *roofs,* other than *roofs* over ventilated attics or *roofs* over *semi-heated spaces* or *roofs* over *conditioned spaces* that are not *cooled spaces,* where the exterior surface has:

a. a solar reflectance of 0.70 when tested in accordance with ASTM C1549, ASTM E903, or ASTM E1918, and in addition, a minimum thermal emittance of 0.75 when tested in accordance with ASTM C1371 or ASTM E408,

b. or a minimum Solar Reflective Index of 82 when determined in accordance with the Solar Reflectance Index method in ASTM E1980.

The insulation value for the roof shall comply with the values in Table 5.5.3.1. The values for solar reflectance and thermal emittance shall be determined by a laboratory accredited by a nationally recognized organization, such as the Cool Roof Rating Council CRRC-1 Product Rating Program, and shall be labeled and certified by the manufacturer.

Add the following reference to Section 12:

American Society for Testing and Materials,
100 Barr Harbor Dr., West Conshohocken, PA 19428-2959

ASTM E1980-(2001) Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low Sloped Opaque Surfaces

Revise Table G3.1, 5, Building Envelope, exception (c) as follows:

...

c. For exterior roofs, the roof surface may be modeled with a reflectance of 0.45 if the reflectance of the *proposed design* roof is greater than 0.70 and its emittance is greater than 0.75 or has a minimum SRI of 82. Reflectance values shall be based on testing in accordance with ASTM E903, ASTM E1175, or ASTM E1918, and the emittance values shall be based on testing in accordance with ASTM C835, ASTM C1371, or ASTM E408, and SRI shall be based on ASTM E1980 calculated at medium wind speed. All other roof surfaces shall be modeled with a reflectance of 0.30.

Add the following table to Section 5 (I-P and SI units):

TABLE 5.5.3.1 High Albedo Roof Insulation (I-P Units)

Climate Zone	Opaque Elements (Roofs)	Nonresidential		Residential	
		Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
1	Insulation entirely above deck	U-0.082	R-12.0 ci	U-0.081	R-12.0 ci
	Metal building	U-0.084	R-13	U-0.084	R-13.0
	Attic and other (a)	U-0.044	R-24.0	U-0.035	R-30.0
2	Insulation entirely above deck	U-0.076	R-13.0 ci	U-0.076	R-13.0 ci
	Metal building	U-0.078	R-13.0	U-0.078	R-13.0
	Attic and other (a)	U-0.041	R-25.0	U-0.032	R-30.0
3	Insulation entirely above deck	U-0.074	R-13.ci	U-0.074	R-13.0 ci
	Metal building	U-0.076	R-16	U-0.076	R-16.0
	Attic and other (a)	U-0.040	R-25.0	U-0.032	R-30.0
4,5,6,7,8	All roof opaque elements	NP	NP	NP	NP

NP = Not permitted.
(a) Excludes roofs over ventilated attics, or roofs over semi-heated spaces, or roofs over conditioned spaces that are not cooled spaces.

TABLE 5.5.3.1 High Albedo Roof Insulation (SI Units)

Climate Zone	Opaque Elements (Roofs)	Nonresidential		Residential	
		Assembly Maximum	Insulation Min. R-Value	Assembly Maximum	Insulation Min. R-Value
1	Insulation Entirely above Deck	U-0.466	R-2.1 ci	U-0.460	R-2.1 ci
	Metal Building	U-0.477	R-2.3	U-0.477	R-2.3
	Attic and other (a)	U-0.250	R-4.2	U-0.199	R-5.3
2	Insulation Entirely above Deck	U-0.432	R-2.3 ci	U-0.432	R-2.3 ci
	Metal Building	U-0.443	R-2.3	U-0.443	R-2.3
	Attic and other (a)	U-0.238	R-4.4	U-0.182	R-5.3
3	Insulation Entirely above Deck	U-0.420	R-2.3 ci	U-0.420	R-2.3 ci
	Metal Building	U-0.432	R-2.8	U-0.432	R-2.8
	Attic and other (a)	U-0.227	R-4.4	U-0.182	R-5.3
4,5,6,7,8	All Roof Opaque Elements	NP	NP	NP	NP

NP: Not permitted
(a) Excludes roofs over ventilated attics, or roofs over semi-heated spaces, or roofs over conditioned spaces that are not cooled spaces.

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FOREWORD

The purpose of this proposed addendum is to correct terminology contained in Appendix A, Section A2.3, "Metal Building Roofs," and to clarify the construction options presented in Table A2.3, Assembly U-Factors for Metal Building Roofs.

The terminology corrections change "spanning members" to "roof panels" and replaces "Screw Down Roofs" with "Thru-Fastened Roofs." Furthermore, "thermal spacer blocks" are substituted for "thermal blocks" in order to avoid any confusion from the definition in the standard of "thermal blocks," which refers to a collection of HVAC zones grouped for simulation purposes. In addition, a number of suspended blanket insulation systems are used in metal building roofs that are commonly installed below the roof purlins, and their use should be recognized and not limited by only referencing "boards."

The criteria presented in Table A2.3, Assembly U-factors for Metal Building Roofs, has been rearranged to group together the two constructions that require thermal spacer blocks (standing seam and filled cavity) from thru-fastened roofs. Furthermore, the overall u-factors for thru-fastened roofs that include continuous insulation have been deleted since they do not represent typical construction options.

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Addendum al to 90.1-2004

Modify Appendix A (I-P and SI units) as follows:

A2.3 Metal Building Roofs

A2.3.1 General: For the purpose of A1.2, the base assembly is a *roof* where the insulation is draped over the steel structure (purlins) and then compressed when the metal ~~spanning members~~ roof panels are attached to the steel structure (purlins). Additional assemblies include *continuous insulation*, uncompressed and uninterrupted by framing.

A2.3.2 Rated R-Value of Insulation

A2.3.2.1 The first *rated R-value of insulation* is for insulation draped over purlins and then compressed when the metal ~~spanning members~~ roof panels are attached, or for insulation hung between the purlins~~,~~ ~~provided there is a~~ A minimum 1 in. thermal ~~break~~ spacer block between the purlins and the metal ~~spanning members~~ roof panels is required when specified in Table A2.3.

A2.3.2.2 For double-layer installations, the second *rated R-value of insulation* is for insulation installed parallel to the purlins.

A2.3.2.3 For continuous insulation (e.g., insulation boards or blankets), it is assumed that the insulation ~~boards are~~ is installed below the purlins and ~~are~~ is uninterrupted by framing members. Insulation exposed to the *conditioned space* or *semiheated space* shall have a facing, and all insulation seams shall be continuously sealed to provide a continuous air barrier.

A2.3.3 U-factor. *U-factors* for *metal building roofs* shall be taken from Table A2.3 It is not acceptable to use these *U-factors* if additional insulated sheathing is not continuous.

Table A2.3 (IP units):

TABLE A2.3 Assembly U-Factors for Metal Building Roofs

Insulation System	Rated R-Value of Insulation	Total Rated R-Value of Insulation	Overall U-Factor for Entire Base Roof Assembly	Overall U-Factor for Assembly of Base Roof Plus Continuous Insulation (Uninterrupted by Framing) Rated R-Value of Continuous Insulation					
				R-5.6	R-11.2	R-16.8	R-22.4	R-28.0	R-33.6
Standing Seam Roofs with Thermal Spacer Blocks									
Single Layer	None	0	**1.280**	0.162	0.087	0.059	0.045	0.036	0.030
	R-6	6	**0.167**	0.086	0.058	0.044	0.035	0.029	0.025
	R-10	10	**0.097**	0.063	0.046	0.037	0.031	0.026	0.023
	R-11	11	**0.092**	0.061	0.045	0.036	0.030	0.026	0.022
	R-13	13	**0.083**	0.057	0.043	0.035	0.029	0.025	0.022
	R-16	16	**0.072**	0.051	0.040	0.033	0.028	0.024	0.021
	R-19	19	**0.065**	0.048	0.038	0.031	0.026	0.023	0.020
Double Layer	R-10 + R-10	20	**0.063**	0.047	0.037	0.031	0.026	0.023	0.020
	R-10 + R-11	21	**0.061**	0.045	0.036	0.030	0.026	0.023	0.020
	R-11 + R-11	22	**0.060**	0.045	0.036	0.030	0.026	0.022	0.020
	R-10 + R-13	23	**0.058**	0.044	0.035	0.029	0.025	0.022	0.020
	R-11 + R-13	24	**0.057**	0.043	0.035	0.029	0.025	0.022	0.020
	R-13 + R-13	26	**0.055**	0.042	0.034	0.029	0.025	0.022	0.019
	R-10 + R-19	29	**0.052**	0.040	0.033	0.028	0.024	0.021	0.019
	R-11 + R-19	30	**0.051**	0.040	0.032	0.027	0.024	0.021	0.019
	R-13 + R-19	32	**0.049**	0.038	0.032	0.027	0.023	0.021	0.019
	R-16 + R-19	35	**0.047**	0.037	0.031	0.026	0.023	0.020	0.018
	R-19 + R-19	38	**0.046**	0.037	0.030	0.026	0.023	0.020	0.018
~~(Multiple R-values are listed in order from inside to outside.)~~									
~~**Screw-Down Roofs**~~ **Thru-Fastened Roofs without Thermal Spacer Blocks**									
	R-10	10	**0.153**	~~0.082~~	~~0.056~~	~~0.043~~	~~0.035~~	~~0.029~~	~~0.025~~
	R-11	11	**0.139**	~~0.078~~	~~0.054~~	~~0.042~~	~~0.034~~	~~0.028~~	~~0.025~~
	R-13	13	**0.130**	~~0.075~~	~~0.053~~	~~0.041~~	~~0.033~~	~~0.028~~	~~0.024~~
	R-16	16	**0.106**						
	R-19	19	**0.098**						
Filled Cavity with Thermal Spacer Blocks									
	R19 + R-10	29	**0.041**	0.033	0.028	0.024	0.021	0.020	0.017
(Multiple R-values are listed in order from inside to outside)									

Table A2.3 (SI units):

TABLE A2.3 Assembly U-Factors for Metal Building Roofs

Insulation System	Rated R-Value of Insulation	Total Rated R-Value of Insulation	Overall U-Factor for Entire Base Roof Assembly	Overall U-Factor for Assembly of Base Roof Plus Continuous Insulation (Uninterrupted by Framing) Rated R-Value of Continuous Insulation					
				R-1.0	R-2.0	R-3.0	R-4.0	R-4.9	R-5.9
Standing Seam Roofs with Thermal Spacer Blocks									
Single Layer	None	0	**7.258**	0.919	0.493	0.335	0.255	0.204	1.070
	R-1.1	1.1	**0.947**	0.489	0.330	0.249	0.200	0.167	0.143
	R-1.8	1.8	**0.550**	0.356	0.264	0.209	0.173	0.148	0.129
	R-1.9	1.9	**0.522**	0.344	0.257	0.205	0.170	0.146	0.128
	R-2.3	2.3	**0.471**	0.321	0.244	0.197	0.165	0.142	0.124
	R-2.8	2.8	**0.408**	0.291	0.226	0.185	0.156	0.135	0.119
	R-3.3	3.3	**0.369**	0.270	0.213	0.176	0.150	0.131	0.116
Double Layer	R-1.8+ R-1.8	3.5	**0.357**	0.264	0.209	0.174	0.148	0.129	0.115
	R-1.8+ R-1.9	3.7	**0.346**	0.258	0.205	0.171	0.146	0.128	0.113
	R-1.9+ R-1.9	3.9	**0.340**	0.255	0.203	0.169	0.145	0.127	0.113
	R-1.8+ R-2.3	4.1	**0.329**	0.248	0.199	0.167	0.143	0.125	0.112
	R-1.9+ R-2.3	4.2	**0.323**	0.245	0.197	0.165	0.142	0.124	0.111
	R-2.3+ R-2.3	4.6	**0.312**	0.238	0.193	0.162	0.140	0.123	0.109
	R-1.8+ R-3.3	5.1	**0.295**	0.228	0.186	0.157	0.136	0.120	0.107
	R-1.9+ R-3.3	5.3	**0.289**	0.225	0.184	0.156	0.135	0.119	0.107
	R-2.3+ R-3.3	5.6	**0.278**	0.218	0.179	0.152	0.132	0.117	0.105
	R-2.8+ R-3.3	6.2	**0.266**	0.211	0.175	0.149	0.130	0.115	0.103
	R-3.4+ R-3.3	6.7	**0.261**	0.207	0.172	0.147	0.128	0.114	0.102
~~(Multiple R-values are listed in order from inside to outside.)~~									
~~**Screw-Down Roofs**~~ **Thru-Fastened Roofs without Thermal Spacer Blocks**									
	R-1.8	1.8	**0.868**	~~0.467~~	~~0.320~~	~~0.243~~	~~0.196~~	~~0.164~~	~~0.141~~
	R-1.9	1.9	**0.788**	~~0.443~~	~~0.308~~	~~0.236~~	~~0.192~~	~~0.161~~	~~0.139~~
	R-2.3	2.3	**0.737**	~~0.427~~	~~0.300~~	~~0.232~~	~~0.188~~	~~0.159~~	~~0.137~~
	R-2.8	2.8	**0.602**						
	R-3.3	3.3	**0.556**						
Filled Cavity with Thermal Spacer Blocks									
	R-3.3 + R-1.8	5.1	**0.232**	0.189	0.159	0.138	0.121	0.108	0.098
(Multiple R-values are listed in order from inside to outside)									

(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

This change is to Section 11 and Appendix G. Section 6.5.2.1 allows minimum VAV turndown to be limited by the minimum ventilation required for a zone. Without the following change, a design that has required ventilation in excess of 0.4 cfm/ft^2 (such as a laboratory or assembly space) is penalized when using Section 11 or Appendix G.

Note: *In this addendum, changes to the current standard are indicated in the text by underlining (for additions) and ~~strikethrough~~ (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 am to 90.1-2004

Make the following changes to the I-P edition:

TABLE 11.3.2.A Budget System Descriptions

Notes:

1. **VAV with parallel boxes:** Fans in parallel VAV fan-powered boxes shall be sized for 50% of the peak design flow rate and shall be modeled with 0.35 W/cfm fan power. Minimum volume setpoints for fan-powered boxes shall be equal to the minimum rate for the space required for ventilation consistent with 6.5.2.1
   Exception (a) 1. Supply air temperature setpoint shall be constant at the design condition (see 11.3.2 (h)).
2. **VAV with reheat:** Minimum volume setpoints for VAV reheat boxes shall be 0.4 cfm/ft^2 of floor area, or the minimum ventilation rate, whichever is larger, consistent with 6.5.2.1 Exception (a) 2. Supply air temperature shall be reset based on zone demand from the design temperature difference to a 10°F temperature difference under minimum load conditions. Design airflow rates shall be sized for the reset supply air temperature, i.e., a 10°F temperature difference.
3. **Direct Expansion:** The fuel type for the cooling system shall match that of the cooling system in the *proposed design*.

The rest of this table remains unchanged.

Modify Appendix G Section G3.1.3.13 as follows:

G3.1.3.13 VAV Minimum Flow Setpoints (Systems 5 and 7). Minimum volume setpoints for VAV reheat boxes shall be 0.4 cfm/ft^2 of floor area served or the minimum ventilation rate, whichever is larger.

Make the following changes to the SI edition:

TABLE 11.3.2A Budget System Descriptions

Notes:

1. **VAV with parallel boxes:** Fans in parallel VAV fan-powered boxes shall be sized for 50% of the peak design flow rate and shall be modeled with 0.74 W per L/s fan power. Minimum volume setpoints for fan-powered boxes shall be equal to the minimum rate for the space required for ventilation consistent with 6.5.2.1
   Exception (a) 1. Supply air temperature setpoint shall be constant at the design condition (see 11.3.2 (h)).
2. **VAV with reheat:** Minimum volume setpoints for VAV reheat boxes shall be 2.15 L/s·m^2 of floor area, or the minimum ventilation rate, whichever is larger, consistent with 6.5.2.1 Exception (a) 2. Supply air temperature shall be reset based on zone demand from the design temperature difference to a 5.6°C temperature difference under minimum load conditions. Design airflow rates shall be sized for the reset supply air temperature, i.e., a 5.6°C temperature difference.
3. **Direct Expansion:** The fuel type for the cooling system shall match that of the cooling system in the *proposed design*.

The rest of this table remains unchanged.

Modify Appendix G Section G3.1.3.13 as follows:

G3.1.3.13 VAV Minimum Flow Setpoints (Systems 5 and 7). Minimum volume setpoints for VAV reheat boxes shall be 2.15 L/s·m^2 of floor area served or the minimum ventilation rate, whichever is larger.

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the standards and guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive technical committee structure, continue to generate up-to-date standards and guidelines where appropriate and adopt, recommend, and promote those new and revised standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating standards and guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.