ANSI/ASHRAE/IESNA Addenda v, af, an, ao, and ap to
ANSI/ASHRAE/IESNA Standard 90.1-2007

ASHRAE STANDARD

Energy Standard for Buildings Except Low-Rise Residential Buildings

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FOREWORD

This is one of the last pieces of low-hanging fruit available to 90.1. It will reduce first costs and energy costs by encouraging designers to follow good practice. There is minimal, if any, incremental cost associated with this measure. Performing detailed pump-head calculations is good engineering practice. Unfortunately, some designers do not follow good practice and, instead, conservatively guess at the pump head. A pump that appears to be efficient at a conservatively estimated pump head will typically not be very efficient at the actual pump head. For example, a typical pump selection at 500 gpm and 100 ft of head might have a design point efficiency of 75%. If the actual head for this system is only, say, 55 ft, then actual pump efficiency may be closer to 62%. If the designer had used actual head he or she likely would have selected a less expensive pump with a smaller motor. Thus, correctly sizing pumps often reduces mechanical, electrical, structural, and energy costs in addition to conserving energy.

The mechanical subcommittee will provide a software tool for inclusion in the User's Manual that which allow designers to quickly and easily calculate pump head.

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.

Addendum v to 90.1-2007

Revise the Standard as follows (I-P and SI Units):

6.4.2 Calculations.

6.4.2.1 Load Calculations. Heating and cooling system design loads for the purpose of sizing systems and equipment shall be determined in accordance with ~~generally accepted engineering standards and handbooks acceptable to the adopting authority (for example, ASHRAE Handbook—Fundamentals)~~ *ANSI/ASHRAE/ACCA Standard 183-2007, Peak Cooling and Heating Load Calculations in Buildings Except Low-Rise Residential Buildings.*

6.4.2.2 Pump Head. Pump differential pressure (head) for the purpose of sizing pumps shall be determined in accordance with generally accepted engineering standards and handbooks acceptable to the adopting authority. The pressure drop through each device and pipe segment in the critical circuit at design conditions shall be calculated.

Add the following to Section 12, "Normative References":

Reference	Title
ANSI/ASHRAE/ACCA Standard183-2007	*Peak Cooling and Heating Load Calculations in Buildings Except Low-Rise Residential Buildings*

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FOREWORD

The fan power limitation in Standard 90.1 sets a minimum efficiency requirement for air systems. However, there is no equivalent minimum efficiency requirement for hydronic systems. This addendum attempts to correct this by providing guidance for designers, contractors, and owners to properly size system piping to balance ongoing energy costs and first costs.

The fan power limitation is a system performance approach. A similar performance approach on the hydronic side (i.e., a pump power limitation) is not practical for several reasons, including the following:

- *Air-side ΔT's are fairly consistent, but water-side are not.*
- *The range of sizes of pumping systems is much greater than that of fan systems. Fan systems do not serve entire campuses or run for miles.*

A component-based approach is a better way to prevent wasteful practices in pumping systems. Limits on pipe sizing are probably the biggest opportunity for cost-effective energy savings. The proposed limits were determined based on a detailed lifecycle cost analysis. Tables were developed for 1/2 to 26 in. diameter pipe, for systems with and without variable speed pumping, with and without two-way control valves, and for three ranges of annual operating hours. Review of the tabulated values showed that the velocities within each category were nearly uniform.

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.

Addendum af to 90.1-2007

Add definitions to Section 3.2 as follows (I-P and SI Units):

***critical circuit*:** the hydronic circuit that determines the minimum differential pressure that the pump must produce to satisfy the zone loads (e.g., the circuit with the most open valve). The critical circuit is the one with the highest pressure drop required to satisfy its load. At part load conditions, the critical circuit can change based on zone loads.

Modify Section 6.5 as follows: (I-P and SI Units)

6.5.4.5 Pipe Sizing. All chilled-water and condenser-water piping shall be designed such that the design flow rate in each pipe segment shall not exceed the values listed in Table 6.5.4.5 for the appropriate total annual hours of operation. Pipe size selections for systems that operate under variable flow conditions (e.g., modulating two-way control valves at coils) and that contain variable-speed pump motors are allowed to be made from the "Variable Flow/Variable Speed" columns. All others shall be made from the "Other" columns.

Exception:

1. Design flow rates exceeding the values in Table 6.5.4.5 are allowed in specific sections of pipe if the pipe in question is not in the *critical circuit* at design conditions and is not predicted to be in the critical circuit during more than 30% of operating hours.
2. Piping systems that have equivalent or lower total pressure drop than the same system constructed with standard weight steel pipe with piping and fittings are sized per Table 6.5.4.5.

TABLE 6.5.4.5 Piping System Design Maximum Flow Rate in GPM (I-P)

Operating Hours/Year	≤2000 Hours/Year		>2000 and ≤ 4400 Hours/Year		>4400 and ≤ 8760 Hours/Year	
Nominal Pipe Size, in.	Other	Variable Flow/ Variable Speed	Other	Variable Flow/ Variable Speed	Other	Variable Flow/ Variable Speed
2 1/2	120	180	85	130	68	110
3	180	270	140	210	110	170
4	350	530	260	400	210	320
5	410	620	310	470	250	370
6	740	1100	570	860	440	680
8	840	1300	650	970	510	770
10	1800	2700	1300	2000	1000	1600
12	2500	3800	1900	2900	1500	2300
Maximum Velocity for Pipes over 12 in. Size	8.5 fps	13.0 fps	6.5 fps	9.5 fps	5.0 fps	7.5 fps

TABLE 6.5.4.5 Piping System Design Maximum Flow Rate in Liters/Second (SI)

Operating Hours/Year	≤2000 Hours/Year		>2000 and ≤ 4400 Hours/Year		>4400 and ≤ 8760 Hours/Year	
DN Pipe Size, mm	Other	Variable Flow/ Variable Speed	Other	Variable Flow/ Variable Speed	Other	Variable Flow/ Variable Speed
75	8	11	5	8	4	7
90	11	17	9	13	7	11
110	22	33	16	25	13	20
140	26	39	20	30	16	23
160	47	69	36	54	28	43
225	53	82	41	61	32	49
280	114	170	82	126	63	101
315	158	240	120	183	95	145
Maximum Velocity for Pipes over 315 mm Size	2.6 m/s	4.0 m/s	2.0 m/s	2.9 m/s	1.5 m/s	2.3 m/s

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FOREWORD

The intent of this addendum is to expand the table of default U-factors for single-digit rafter roofs.

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.

Addendum an to 90.1-2007

Revise the Standard as follows for I-P units:

A2.4 Attic Roofs with Wood Joists

A2.4.1 General. For the purpose of Section A1.2, the base *attic roof* assembly is a *roof* with nominal 4 in.-deep wood as the lower chord of a roof truss or ceiling joist. The ceiling is attached directly to the lower chord of the truss, and the attic space above is ventilated. Insulation is located directly on top of the ceiling, first filling the cavities between the wood and then later covering both the wood and cavity areas. No credit is given for roofing materials. The *single-rafter roof* is similar to the base attic roof, with the key difference being that there is a single, deep rafter to which both the *roof* and the ceiling are attached. The heat flow path through the rafter is calculated to be the same depth as the insulation. Additional assemblies include *continuous insulation*, uncompressed and uninterrupted by framing. The *U-factors* include R-0.46 for semi-exterior air film, R-0.56 for 0.625 in. gypsum board, and R-0.61 for interior air film heat flow up. *U-factors* are provided for the following configurations:

a. *Attic roof, standard framing:* insulation is tapered around the perimeter with a resultant decrease in thermal resistance. Weighting factors are 85% full-depth insulation, 5% half-depth insulation, and 10% joists.
b. *Attic roof, advanced framing:* full and even depth of insulation extending to the outside edge of exterior walls. Weighting factors are 90% full-depth insulation and 10% joists.
c. *Single-rafter roof:* an *attic roof* where the roof sheathing and ceiling are attached to the same rafter. Weighting factors are 90% full-depth insulation and 10% joists.

Modify Table A2.4, Assembly U-Factors for Attic Roofs with Wood Joists (I-P), as follows:

TABLE A2.4 Assembly U-Factors for Attic Roofs with Wood Joists (I-P)

Rated R-Value of Insulation Alone	Overall U-Factor for Entire Assembly			
…	…			
Wood Joists, Single-Rafter Roof				
	Continuous Insulation R-Value			
Cavity Insulation R-Value	None	R-5	R-10	R-15
None	U-0.417	U-0.135	U-0.081	U-0.057
R-11	U-0.088	U-0.061	U-0.047	U-0.038
R-13	U-0.078	U-0.056	U-0.044	U-0.036
R-15	U-0.071	U-0.052	U-0.041	U-0.034
R-19	U-0.055	U-0.043	U-0.035	U-0.030
R-21	U-0.052	U-0.041	U-0.034	U-0.029
R-25	~~U-0.043~~ U-0.042	U-0.035	U-0.030	U-0.026
R-30	U-0.036	U-0.030	U-0.026	U-0.023
R-38	~~U-0.028~~ U-0.029	U-0.025	U-0.022	U-0.020

Revise the Standard as follows for SI units:

A2.4 Attic Roofs with Wood Joists

A2.4.1 General. For the purpose of Section A1.2, the base *attic roof* assembly is a *roof* with nominal 100 mm-deep wood as the lower chord of a roof truss or ceiling joist. The ceiling is attached directly to the lower chord of the truss, and the attic space above is ventilated. Insulation is located directly on top of the ceiling, first filling the cavities between the wood and then later covering both the wood and cavity areas. No credit is given for roofing materials. The *single-rafter roof* is similar to the base *attic roof*, with the key difference being that there is a single, deep rafter to which both the *roof* and the ceiling are attached. The heat flow path through the rafter is calculated to be the same depth as the insulation. Additional assemblies include *continuous insulation*, uncompressed and uninterrupted by framing. The *U-factors* include R-0.08 for semi-exterior air film, R-0.10 for 16 mm gypsum board, and R-0.11 for interior air film heat flow up. *U-factors* are provided for the following configurations:

a. *Attic roof, standard framing:* insulation is tapered around the perimeter with a resultant decrease in thermal resistance. Weighting factors are 85% full-depth insulation, 5% half-depth insulation, and 10% joists.
b. *Attic roof, advanced framing:* full and even depth of insulation extending to the outside edge of exterior walls. Weighting factors are 90% full-depth insulation and 10% joists.
c. *Single-rafter roof:* an *attic roof* where the roof sheathing and ceiling are attached to the same rafter. Weighting factors are 90% full-depth insulation and 10% joists.

Modify Table A2.4, Assembly U-Factors for Attic Roofs with Wood Joists (SI), as follows:

TABLE A2.4 Assembly U-Factors for Attic Roofs with Wood Joists (SI)

Rated R-Value of Insulation Alone	Overall U-Factor for Entire Assembly			
…	…			
Wood Joists, Single-Rafter Roof				
	Continuous Insulation R-Value			
Cavity Insulation R-Value	None	R-0.8	R-1.8	R-2.6
None	U-2.37	U-0.77	U-0.46	U-0.33
R-1.9	U-0.50	U-0.35	U-0.27	U-0.22
R-2.3	U-0.44	U-0.32	U-0.25	U-0.20
R-2.6	U-0.40	U-0.30	U-0.24	U-0.20
R-3.3	U-0.31	U-0.24	U-0.20	U-0.17
R-3.7	U-0.29	U-0.23	U-0.19	U-0.17
R-4.4	U-0.25	U-0.20	U-0.17	U-0.15
R-5.3	U-0.20	U-0.17	U-0.15	U-0.13
R-6.7	U-0.16	U-0.14	U-0.13	U-0.11

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FOREWORD

Table 6.8.1E was modified by Addendum k, but inconsistencies and changes from previous standard versions have made this table difficult to understand. This addendum repairs known errata and re-orders the notes to properly organize them. It corrects the error of identifying Ec, which should be listed as Et under "Warm Air Furnaces, Gas-Fired," and also eliminates incorrect and redundant footnotes.

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.

Addendum ao to 90.1-2007

Revise the Standard as follows:

Replace Table 6.8.1E, Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters, in its entirety with the new table as follows for I-P units.

~~TABLE 6.8.1E Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters~~

~~Equipment Type~~	~~Size Category (Input)~~	~~Subcategory or Rating Condition~~	~~Minimum Efficiency~~[a]	~~Test Procedure~~[b]
~~Warm-Air Furnace, Gas-Fired~~	~~<225,000 Btu/h~~	~~Maximum capacity~~[d]	~~78% AFUE or 80% *Et*~~[d]	~~DOE 10 CFR Part 430 or ANSI Z21.47~~
	~~≥225,000 Btu/h~~		~~80% *Ec*~~[c]	~~ANSI Z21.47~~
~~Warm-Air Furnace, Oil-Fired~~	~~<225,000 Btu/h~~	~~Maximum capacity~~[d]	~~78% AFUE or 80% *Et*~~[e]	~~DOE 10 CFR Part 430 or UL 727~~
	~~≥225,000 Btu/h~~		~~81% *Et*~~[f]	~~UL 727~~
~~Warm-Air Duct Furnaces, Gas-Fired~~	~~All capacities~~	~~Maximum capacity~~[e]	~~80% *Ec*~~[g]	~~ANSI Z83.8~~
~~Warm-Air Unit Heaters, Gas-Fired~~	~~All capacities~~	~~Maximum capacity~~[e]	~~80% *Ec*~~[g,h]	~~ANSI Z83.8~~
~~Warm-Air Unit Heaters, Oil-Fired~~	~~All capacities~~	~~Maximum capacity~~[e]	~~80% *Ec*~~[g,h]	~~UL 731~~

~~[a] Et = thermal efficiency. See test procedure for detailed discussion.~~
~~[b] Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.~~
~~[c] Ec = combustion efficiency. Units must also include an interrupted or intermittent ignition device (IID), have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.~~
~~[d] Minimum and maximum ratings as provided for and allowed by the unit's controls.~~
~~[e] Combination units not covered by NAECA (three-phase power or cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating.~~
~~[f] Et = thermal efficiency. Units must also include an interrupted or intermittent ignition device (IID), have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.~~
~~[g] Ec = combustion efficiency (100% less flue losses). See test procedure for detailed discussion.~~
~~[h] As of August 8, 2008, according to the Energy Policy Act of 2005, units must also include an interrupted or intermittent ignition device (IID) and have either power venting or an automatic flue damper. A vent damper is an acceptable alternative to a flue damper for those unit heaters where combustion air is drawn from the conditioned space.~~

TABLE 6.8.1E Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters (I-P)

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure[a]
Warm-Air Furnace, Gas-Fired	<225,000 Btu/h	Maximum capacity[c]	78% AFUE or 80% *Et* [b,d]	DOE 10 CFR Part 430 or Section 2.39, Thermal Efficiency, ANSI Z21.47
	≥225,000 Btu/h	Maximum capacity[c]	80% *Et* [d]	Section 2.39, Thermal Efficiency, ANSI Z21.47
Warm-Air Furnace, Oil-Fired	<225,000 Btu/h	Maximum capacity[c]	78% AFUE or 80% *Et* [b,d]	DOE 10 CFR Part 430 or Section 42, Combustion, UL 727
	≥225,000 Btu/h	Maximum capacity[c]	81% *Et* [d]	Section 42, Combustion, UL 727
Warm-Air Duct Furnaces, Gas-Fired	All Capacities	Maximum capacity[c]	80% *Ec* [e]	Section 2.10, Efficiency, ANSI Z83.8
Warm-Air Unit Heaters, Gas-Fired	All capacities	Maximum capacity[c]	80% *Ec* [e,f]	Section 2.10, Efficiency, ANSI Z83.8
Warm-Air Unit Heaters, Oil-Fired	All capacities	Maximum capacity[c]	80% *Ec* [e,f]	Section 40, Combustion, UL 731

[a] Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.
[b] Combination units not covered by NAECA (3-phase power or cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating.
[c] Compliance of multiple firing rate units shall be at the maximum firing rate.
[d] Et = thermal efficiency. Units must also include an interrupted or intermittent ignition device (IID), have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
[e] Ec = combustion efficiency (100% less flue losses). See test procedure for detailed discussion.
[f] As of August 8, 2008, according to the Energy Policy Act of 2005, units must also include an interrupted or intermittent ignition device (IID) and have either power venting or an automatic flue damper.

Replace Table 6.8.1E, Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters, in its entirety with the new table as follows for SI units.

~~TABLE 6.8.1 Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters~~

~~Equipment Type~~	~~Size Category (Input)~~	~~Subcategory or Rating Condition~~	~~Minimum Efficiency[a]~~	~~Test Procedure[b]~~
~~Warm-Air Furnace, Gas-Fired~~	~~<66kW~~	~~Maximum capacity[d]~~	~~78% AFUE or 80% *Et*[d]~~	~~DOE 10 CFR Part 430 or ANSI Z21.47~~
	~~≥66kW~~		~~80% *Ec*[c]~~	~~ANSI Z21.47~~
~~Warm-Air Furnace, Oil-Fired~~	~~<66kW~~	~~Maximum capacity[d]~~	~~78% AFUE or 80% *Et*[e]~~	~~DOE 10 CFR Part 430 or UL 727~~
	~~≥66kW~~		~~81% *Et*[f]~~	~~UL 727~~
~~Warm-Air Duct Furnaces, Gas-Fired~~	~~All capacities~~	~~Maximum capacity[e]~~	~~80% *Ec*[g]~~	~~ANSI Z83.8~~
~~Warm-Air Unit Heaters, Gas-Fired~~	~~All capacities~~	~~Maximum capacity[e]~~	~~80% *Ec*[g,h]~~	~~ANSI Z83.8~~
~~Warm-Air Unit Heaters, Oil-Fired~~	~~All capacities~~	~~Maximum capacity[e]~~	~~80% *Ec*[g,h]~~	~~UL 731~~

[a] ~~*Et* = thermal *efficiency*. See test procedure for detailed discussion.~~
[b] ~~Section 12 contains a complete specification of the referenced test procedure, including the referenced year version of the test procedure.~~
[c] ~~*Ec* = combustion *efficiency*. Units must also include an interrupted or intermittent ignition device (IID), have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.~~
[d] ~~Minimum and maximum ratings as provided for and allowed by the unit's controls.~~
[e] ~~Combination units not covered by NAECA (three-phase power or cooling capacity greater than or equal to 65,000 Btu/h) may comply with either rating.~~
[f] ~~*Et* = thermal *efficiency*. Units must also include an interrupted or intermittent ignition device (IID), have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.~~
[g] ~~*Ec* = combustion *efficiency* (100% less flue losses). See test procedure for detailed discussion.~~
[h] ~~As of August 8, 2008, according to the Energy Policy Act of 2005, units must also include an interrupted or intermittent ignition device (IID) and have either power venting or an automatic flue damper. A vent damper is an acceptable alternative to a flue damper for those unit heaters where combustion air is drawn from the conditioned space.~~

TABLE 6.8.1E Warm-Air Furnaces and Combination Warm-Air Furnaces/Air-Conditioning Units, Warm-Air Duct Furnaces, and Unit Heaters (SI)

Equipment Type	Size Category (Input)	Subcategory or Rating Condition	Minimum Efficiency	Test Procedure[a]
Warm-Air Furnace, Gas-Fired	<66 kW	Maximum capacity[c]	78% AFUE or 80% *Et*[b,d]	DOE 10 CFR Part 430 or Section 2.39, Thermal Efficiency, ANSI Z21.47
	≥66 kW	Maximum capacity[c]	80% *Et*[d]	Section 2.39, Thermal Efficiency, ANSI Z21.47
Warm-Air Furnace, Oil-Fired	<66 kW	Maximum capacity[c]	78% AFUE or 80% *Et*[b,d]	DOE 10 CFR Part 430 or Section 42, Combustion, UL 727
	≥66 kW	Maximum capacity[c]	81% *Et*[d]	Section 42, Combustion, UL 727
Warm-Air Duct Furnaces, Gas-Fired	All capacities	Maximum capacity[c]	80% *Ec*[e,]	Section 2.10, Efficiency, ANSI Z83.8
Warm-Air Unit Heaters, Gas-Fired	All capacities	Maximum capacity[c]	80% *Ec*[e,f]	Section 2.10, Efficiency, ANSI Z83.8
Warm-Air Unit Heaters, Oil-Fired	All capacities	Maximum capacity[c]	80% *Ec*[e,f]	Section 40, Combustion, UL 731

[a] Section 12 contains a complete specification of the referenced test procedure.
b Combination units not covered by NAECA (3-phase power or cooling capacity greater than or equal to 19 kW) may comply with either rating.
[c] Compliance of multiple firing rate units shall be at the maximum firing rate.
[d] Et = thermal efficiency. Units must also include an interrupted or intermittent ignition device (IID), have jacket losses not exceeding 0.75% of the input rating, and have either power venting or a flue damper. A vent damper is an acceptable alternative to a flue damper for those furnaces where combustion air is drawn from the conditioned space.
[e] Ec = combustion efficiency (100% less flue losses). See test procedure for detailed discussion.
[f] As of August 8, 2008, according to the Energy Policy Act of 2005, units must also include an interrupted or intermittent ignition device (IID) and have either power venting or an automatic flue damper.

(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

Demand control ventilation (DCV) is cost-effective for single-zone systems with high occupant densities and air-side economizers. It is required for such systems in the mandatory measures section (6.4.3.9). However, systems required to have DCV under the mandatory measures can avoid installing DCV by following the simplified approach. For example, a packaged unit serving an auditorium might have 50% outside air based on 100 people per 1000 ft^2*. This system would require DCV under the standard approach but could avoid installing DCV by using the simplified approach. This is a loophole in the standard that should be fixed. DCV should be included in the simplified approach.*

Note: In this addendum, changes to the current standard are indicated in the text by <u>underlining</u> (for additions) and ~~strikethrough~~ (for deletions), unless the instructions specifically mention some other means of indicating the changes.

Addendum ap to 90.1-2007

Revise the Standard as follows (I-P and SI units):

6.3.2 Criteria. The HVAC *system* must meet ALL of the following criteria:

a. The *system* serves a single *HVAC zone*.

…

o. *Systems* with a design supply air capacity greater than 10,000 cfm shall have *optimum start controls.*

<u>p. The system shall comply with the demand control ventilation requirements in section 6.4.3.9</u>

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.