

# ADDENDA

**Informative Addendum ch to  
ANSI/ASHRAE/IES Standard 90.1-2019**

# Energy Standard for Buildings Except Low-Rise Residential Buildings

This addendum makes editorial changes to the standard.

This addendum was approved by a Standing Standard Project Committee (SSPC) for which the Standards Committee has established a documented program for regular publication of addenda or revisions, including procedures for timely, documented, consensus action on requests for change to any part of the standard. Instructions for how to submit a change can be found on the ASHRAE® website (<https://www.ashrae.org/continuous-maintenance>).

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## FOREWORD

*Addendum ch adds informative appendix to support jurisdictions and beyond-code programs that choose to use Normative Appendix G compliance metrics other than energy cost. The appendix includes building performance factor (BPF) tables based on site energy, source energy, or carbon emissions to replace the cost-based BPF values currently used. The alternate BPF values are calculated using national average values consistent with the current national average energy costs used for electricity and natural gas.*

*The new appendix also includes a methodology for calculating custom BPFs for jurisdictions and beyond-code programs that choose to use local energy conversion factors for the selected metric in lieu of default values included in the appendix. The regulated electricity and natural gas, annual site energy of each Pacific Northwest National Laboratory (PNNL) prototype was converted to a series of coefficients for each building type and climate zone. The methodology used to calculate the coefficients follows the same methodology that was previously used to calculate the cost-based BPF values. Using Equation X-1, the energy conversion factors in Table X5-1, and the coefficients in Tables X5-2 through X5-4, the reported BPF values in Tables X3-1 through X3-3 can be recreated. Similarly, a jurisdiction may create their own set of BPF values using local energy costs or alternative metrics. Carbon emissions conversion factors in Table X5-1 reflect values in ANSI/ASHRAE/ICC/USGBC/IES Standard 189-2020.*

*Finally, the Appendix includes an example of how a jurisdiction would amend ASHRAE/IES Standard 90.1 language to adopt alternate compliance metrics. The example shows the proper changes using strikethrough and underline.*

*The information include in this Appendix improves the usability of Normative Appendix G by allowing jurisdictions greater flexibility to establish BPF values that align with local compliance goals.*

*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:** 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 ch to Standard 90.1-2019

**Modify Section 4.2.1.1 as shown (I-P and SI).**

### 4.2.1 Compliance Paths

**4.2.1.1 New Buildings.** New *buildings* shall comply with Sections 4.2.2 through 4.2.5 and either the provisions of

- a. Section 5, “*Building Envelope*”; Section 6, “*Heating, Ventilating, and Air Conditioning*”; Section 7, “*Service Water Heating*”; Section 8, “*Power*”; Section 9, “*Lighting*”; and Section 10, “*Other Equipment*,” or
- b. Section 11, “*Energy Cost Budget Method*,” or
- c. Normative Appendix G, “*Performance Rating Method*.”

When using Normative Appendix G, the Performance Cost Index (PCI) of new *buildings*, *additions* to existing *buildings*, and/or *alterations* to existing *buildings* shall be less than or equal to the Performance Cost Index Target (PCI<sub>t</sub>) when calculated in accordance with the following:

[ . . . ]

**Informative Note:** See Informative Appendix X for using other metrics, including *site energy*, *source energy*, and *carbon emissions*, in conjunction with the Normative Appendix G Performance Rating Method when approved by the rating authority.

**Modify Section G1.2.2 as shown (I-P and SI).**

**G1.2.2 Performance Rating Calculation.** The performance of the *proposed design* is calculated in accordance with provisions of this appendix using the following formula:

$$\text{Performance Cost Index} = \frac{\text{Proposed building performance}}{\text{Baseline building performance}}$$

Both the *proposed building performance* and the *baseline building performance* shall include all end-use load components within and associated with the *building* when calculating the Performance Cost Index.

[ . . . ]

**Informative Note:** See Informative Appendix X for using other metrics, including *site energy*, *source energy*, and carbon emissions, in conjunction with the Normative Appendix G Performance Rating Method when approved by the *rating authority*.

**Add a new Informative Appendix X to the standard (“X” is a placeholder). (Note: Areas highlighted in light gray indicate portions of the addenda where underline and strikethrough do not indicate a change but rather are intended to be illustrative.)**

**INFORMATIVE APPENDIX X  
USING OTHER METRICS IN CONJUNCTION WITH  
APPENDIX G PERFORMANCE RATING METHOD WHEN  
APPROVED BY THE RATING AUTHORITY**

**X1. GENERAL**

This informative appendix describes changes to Section 3, Section 4, and Appendix G for using metrics other than *energy cost*—including *site energy*, *source energy*, and carbon emissions—that may be adopted by the *rating authority* for the Normative Appendix G Performance Rating Method. It also provides methodology for determining *building performance factors* (BPFs) that should be used in conjunction with custom *energy conversion factors* other than the national average defaults in Table X5-1.

**X2. CHANGES TO SECTION 3**

Replace references to “annual *energy cost*” with the reference to the selected metric in the definitions of *baseline building performance* and *proposed building performance*.

**X3. CHANGES TO SECTION 4**

- a. Replace all references to “*energy cost*” in Section 4.2.1.1 with “*site energy*,” “*source energy*,” or “carbon emissions,” as appropriate, throughout.
- b. Replace all references to “Performance Cost Index” in Section 4.2.1.1 with “Performance Index (*Site Energy*),” “Performance Index (*Source Energy*),” or “Performance Index (*Carbon Emissions*),” as appropriate throughout.
- c. For *site energy*, replace Table 4.2.1.1 with Table X3-1.
- d. For carbon emissions, replace Table 4.2.1.1 with Table X3-2.
- e. For *source energy*, replace Table 4.2.1.1 with Table X3-3

**X4. CHANGES TO APPENDIX G**

- a. Replace references to “*energy cost*” with references to site “*energy*,” “*source energy*,” or “carbon emissions” as appropriate in Sections G1.2.2, G1.3.2, G2.1, G2.5 and G2.4.2 section heading.
- b. Remove the first sentence and informative note in Section G2.4.2, and replace it with the conversion factors from Table X4-1 for the selected metric.
- c. Add an exception to Section G2.4.2 to allow using alternative conversion factors as appropriate for *building location* and as approved by the *adopting authority*.

**X5. METHODOLOGY FOR BPF ADJUSTMENT  
TO ACCOUNT FOR LOCALIZED CONVERSION FACTORS**

The BPF values in Table 4.2.1.1, based on *energy cost*, and the values in Tables X3-1, X3-2, and X3-3 are based on the coefficients in Tables X5-2 through X5-4 and the electricity and fossil fuel conversion factors in Table X5-1. The values in Table X5-1 represent U.S. national average values.

The U.S. national conversion factors may not be appropriate for all locations, and some jurisdictions may want to adopt custom conversion factors other than those shown in Table X5-1. When energy conversion factors other than those specified in Table X5-1 are used, the BPFs should also be updated in accordance with Equation X-1.

**Table X3-1 Building Performance Factors (BPF), Site Energy**

<i>Building Area Type</i>	<i>Climate Zone</i>																		
	<i>0A</i>	<i>0B</i>	<i>1A</i>	<i>1B</i>	<i>2A</i>	<i>2B</i>	<i>3A</i>	<i>3B</i>	<i>3C</i>	<i>4A</i>	<i>4B</i>	<i>4C</i>	<i>5A</i>	<i>5B</i>	<i>5C</i>	<i>6A</i>	<i>6B</i>	<i>7</i>	<i>8</i>
Multifamily	0.72	0.71	0.75	0.73	0.76	0.76	0.77	0.75	0.70	0.61	0.71	0.64	0.56	0.63	0.63	0.54	0.57	0.54	0.56
Healthcare/hospital	0.67	0.66	0.68	0.65	0.65	0.61	0.62	0.64	0.63	0.62	0.63	0.61	0.65	0.63	0.68	0.64	0.68	0.69	0.71
Hotel/motel	0.69	0.69	0.72	0.68	0.69	0.68	0.69	0.70	0.71	0.65	0.69	0.68	0.63	0.66	0.67	0.60	0.64	0.59	0.58
Office	0.54	0.54	0.53	0.52	0.52	0.52	0.50	0.54	0.47	0.47	0.52	0.48	0.49	0.52	0.49	0.48	0.50	0.43	0.46
Restaurant	0.64	0.61	0.60	0.59	0.60	0.57	0.61	0.62	0.61	0.66	0.65	0.66	0.69	0.69	0.68	0.71	0.71	0.72	0.74
Retail	0.51	0.49	0.48	0.48	0.44	0.43	0.43	0.44	0.44	0.47	0.45	0.50	0.52	0.47	0.52	0.52	0.50	0.48	0.49
School	0.52	0.57	0.57	0.56	0.52	0.53	0.53	0.52	0.55	0.42	0.49	0.53	0.44	0.50	0.51	0.43	0.42	0.42	0.44
Warehouse	0.26	0.26	0.22	0.25	0.21	0.22	0.25	0.21	0.18	0.38	0.27	0.31	0.46	0.37	0.31	0.49	0.42	0.43	0.47
All others	0.63	0.62	0.65	0.61	0.56	0.53	0.55	0.55	0.59	0.55	0.55	0.58	0.57	0.57	0.61	0.57	0.57	0.56	0.58

**Table X3-2 Building Performance Factors (BPF), Carbon Emission**

<i>Building Area Type</i>	<i>Climate Zone</i>																		
	<i>0A</i>	<i>0B</i>	<i>1A</i>	<i>1B</i>	<i>2A</i>	<i>2B</i>	<i>3A</i>	<i>3B</i>	<i>3C</i>	<i>4A</i>	<i>4B</i>	<i>4C</i>	<i>5A</i>	<i>5B</i>	<i>5C</i>	<i>6A</i>	<i>6B</i>	<i>7</i>	<i>8</i>
Multifamily	0.71	0.69	0.73	0.71	0.74	0.74	0.74	0.75	0.67	0.64	0.73	0.67	0.60	0.67	0.66	0.59	0.61	0.58	0.60
Healthcare/hospital	0.68	0.67	0.69	0.67	0.66	0.63	0.64	0.65	0.63	0.63	0.65	0.62	0.66	0.64	0.67	0.65	0.67	0.69	0.70
Hotel/motel	0.67	0.67	0.70	0.66	0.67	0.66	0.66	0.68	0.68	0.64	0.67	0.65	0.63	0.65	0.65	0.61	0.63	0.59	0.58
Office	0.54	0.54	0.53	0.52	0.52	0.52	0.50	0.54	0.48	0.47	0.52	0.48	0.49	0.52	0.49	0.48	0.50	0.45	0.47
Restaurant	0.63	0.60	0.59	0.58	0.58	0.55	0.59	0.58	0.56	0.61	0.60	0.60	0.64	0.63	0.62	0.66	0.66	0.68	0.70
Retail	0.51	0.49	0.48	0.48	0.44	0.43	0.43	0.43	0.44	0.44	0.44	0.48	0.47	0.45	0.49	0.47	0.46	0.45	0.47
School	0.52	0.57	0.57	0.56	0.52	0.53	0.53	0.51	0.52	0.44	0.48	0.50	0.45	0.48	0.48	0.45	0.43	0.43	0.45
Warehouse	0.26	0.26	0.22	0.25	0.21	0.22	0.25	0.21	0.18	0.31	0.24	0.27	0.38	0.31	0.26	0.41	0.36	0.37	0.41
All others	0.63	0.61	0.63	0.60	0.55	0.52	0.54	0.54	0.57	0.54	0.53	0.56	0.55	0.55	0.58	0.56	0.56	0.55	0.56

**Table X3-3 Building Performance Factors (BPF), Source Energy**

<i>Building Area Type</i>	<i>Climate Zone</i>																		
	<i>0A</i>	<i>0B</i>	<i>1A</i>	<i>1B</i>	<i>2A</i>	<i>2B</i>	<i>3A</i>	<i>3B</i>	<i>3C</i>	<i>4A</i>	<i>4B</i>	<i>4C</i>	<i>5A</i>	<i>5B</i>	<i>5C</i>	<i>6A</i>	<i>6B</i>	<i>7</i>	<i>8</i>
Multifamily	0.70	0.69	0.72	0.71	0.73	0.73	0.73	0.75	0.65	0.66	0.74	0.69	0.63	0.69	0.68	0.61	0.63	0.60	0.63
Healthcare/hospital	0.69	0.68	0.70	0.67	0.66	0.64	0.64	0.66	0.64	0.64	0.65	0.63	0.66	0.64	0.66	0.66	0.67	0.68	0.70
Hotel/motel	0.66	0.67	0.70	0.66	0.66	0.65	0.65	0.67	0.66	0.63	0.66	0.64	0.62	0.64	0.64	0.61	0.62	0.59	0.58
Office	0.54	0.54	0.53	0.52	0.52	0.52	0.50	0.54	0.48	0.47	0.53	0.48	0.49	0.52	0.49	0.48	0.50	0.45	0.47
Restaurant	0.63	0.59	0.58	0.57	0.58	0.54	0.58	0.56	0.54	0.59	0.57	0.57	0.61	0.60	0.59	0.64	0.62	0.65	0.68
Retail	0.51	0.49	0.48	0.48	0.44	0.43	0.43	0.43	0.44	0.43	0.43	0.47	0.45	0.43	0.48	0.45	0.45	0.43	0.45
School	0.52	0.57	0.57	0.56	0.52	0.53	0.53	0.50	0.51	0.44	0.47	0.49	0.46	0.47	0.47	0.45	0.43	0.44	0.45
Warehouse	0.26	0.26	0.22	0.25	0.21	0.22	0.25	0.21	0.18	0.28	0.23	0.25	0.34	0.28	0.25	0.37	0.32	0.34	0.37
All others	0.62	0.61	0.63	0.60	0.55	0.52	0.54	0.53	0.56	0.54	0.53	0.56	0.54	0.54	0.57	0.55	0.55	0.55	0.56

**Table X4-1 Energy Conversion Factors (see Note 1)**

<b><u>Building Project Energy Source</u></b>	<b><u>Units</u></b>	<b><u>Carbon Emissions CO<sub>2e</sub> lb/unit (kg/unit)</u></b>	<b><u>Site Energy Btu/unit (kWh/unit) (see Note 2)</u></b>	<b><u>Source Energy Btu/unit (kWh/unit)</u></b>
Electricity	kWh	1.205 (0.547)	3,412 (1,000)	9,008 (2.64)
Natural gas	Therm (GJ)	19,960 (85.833)	100,000 (277.778)	109,000 (302.778)
Propane	Therm (GJ)	19,080 (76.367)	100,000 (277.778)	115,000 (319.445)
Distillate fuel oil	Gallon (L)	28,330 (13.077)	137,600 (10.651)	163,744 (12.674)

**Notes:**

1. These conversions are based on national averages for the United States and may not be representative for other locations. Jurisdictions that choose to use localized conversion factors for source energy or carbon emissions should update the corresponding BPF table for consistency using methodology in Section X5. Jurisdictions may add conversion factors for other energy sources.
2. Site energy only accounts for energy as measured at the building site. It does not account for the energy consumed in the extraction, processing, and transport of primary energy, nor energy consumed in conversion to electricity in power-generation plants.

**Table X5-1 National Average Energy Conversion Factors Used to Calculate BPF**

<b><u>Metric</u></b>	<b><u>Site Energy</u></b>	<b><u>Carbon Emissions CO<sub>2e</sub></u></b>	<b><u>Source Energy</u></b>	<b><u>Energy Cost</u></b>
<b><u>Units</u></b>	<b><u>site kBtu/site kBtu (site kWh/site kWh)</u></b>	<b><u>lb/site kBtu (kg/site kWh)</u></b>	<b><u>source kBtu/site kBtu (source kWh/site kWh)</u></b>	<b><u>\$/site kBtu (\$/site kWh)</u></b>
Electric conversion factors	1.0	0.353 (0.547)	2.64	0.03221 (0.1099)
Natural gas conversion factors	1.0	0.200 (0.309)	1.090	0.00802 (0.02737)

**Table X5-2 Coefficient A Values**

<b><u>Building Area Type</u></b>	<b><u>Climate Zone</u></b>																		
	<b><u>0A</u></b>	<b><u>0B</u></b>	<b><u>1A</u></b>	<b><u>1B</u></b>	<b><u>2A</u></b>	<b><u>2B</u></b>	<b><u>3A</u></b>	<b><u>3B</u></b>	<b><u>3C</u></b>	<b><u>4A</u></b>	<b><u>4B</u></b>	<b><u>4C</u></b>	<b><u>5A</u></b>	<b><u>5B</u></b>	<b><u>5C</u></b>	<b><u>6A</u></b>	<b><u>6B</u></b>	<b><u>7</u></b>	<b><u>8</u></b>
Multifamily	0.3006	0.3261	0.4321	0.4064	0.5158	0.5445	0.7128	0.6952	1.1709	1.1302	0.8644	1.2685	1.5138	1.1288	1.3067	1.7228	1.5398	1.8543	2.1737
Healthcare/hospital	0.1250	0.1412	0.1507	0.1544	0.1979	0.1602	0.2319	0.2098	0.2688	0.3262	0.2596	0.3865	0.4926	0.3624	0.5972	0.6143	0.6194	0.8438	1.0747
Hotel/motel	0.2711	0.2833	0.3267	0.3373	0.3922	0.4544	0.5143	0.6042	0.6922	0.8420	0.7668	0.9723	1.0639	0.9353	1.0888	1.2454	1.1995	1.4783	1.9709
Office	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0425	0.0105	0.2479	0.0868	0.2155	0.4409	0.2496	0.2634	0.6874	0.5018	0.6405	0.9613
Restaurant	0.2210	0.2418	0.3366	0.3120	0.3984	0.4813	0.5416	0.8752	1.0794	1.8987	1.3855	2.0956	2.9552	2.1791	2.6220	3.7419	3.1353	4.8743	7.2168
Retail	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0509	0.0056	0.4874	0.1141	0.3074	0.8526	0.3748	0.3778	1.1246	0.6886	1.1802	1.5119
School	0.0346	0.0368	0.0447	0.0461	0.0581	0.0703	0.0791	0.2052	0.2586	0.3806	0.3220	0.7076	0.6664	0.6527	0.7928	0.9529	0.7842	1.1857	2.0419
Warehouse	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1323	0.0158	2.6058	0.8393	1.2916	4.6583	2.2657	1.2302	6.2218	3.8034	5.9278	6.3860
All others	0.1552	0.1668	0.2257	0.2050	0.1784	0.1568	0.2015	0.3111	0.4107	0.7223	0.3880	0.7372	1.0594	0.7105	0.7100	1.2640	0.9793	1.2947	1.8802

**Table X5-3 Coefficient B Values**

<b><u>Building Area Type</u></b>	<b><u>Climate Zone</u></b>																		
	<b><u>0A</u></b>	<b><u>0B</u></b>	<b><u>1A</u></b>	<b><u>1B</u></b>	<b><u>2A</u></b>	<b><u>2B</u></b>	<b><u>3A</u></b>	<b><u>3B</u></b>	<b><u>3C</u></b>	<b><u>4A</u></b>	<b><u>4B</u></b>	<b><u>4C</u></b>	<b><u>5A</u></b>	<b><u>5B</u></b>	<b><u>5C</u></b>	<b><u>6A</u></b>	<b><u>6B</u></b>	<b><u>7</u></b>	<b><u>8</u></b>
Multifamily	1.472	1.504	1.440	1.472	1.434	1.433	1.455	1.318	1.701	1.314	1.263	1.305	1.283	1.259	1.288	1.248	1.278	1.251	1.153
Healthcare/hospital	1.423	1.437	1.400	1.449	1.475	1.506	1.510	1.492	1.546	1.520	1.505	1.548	1.483	1.519	1.572	1.483	1.513	1.488	1.447
Hotel/motel	1.547	1.545	1.480	1.580	1.574	1.623	1.626	1.582	1.627	1.637	1.610	1.665	1.627	1.628	1.677	1.640	1.660	1.688	1.719
Office	1.855	1.869	1.900	1.915	1.913	1.923	1.982	1.845	2.058	2.071	1.883	2.080	2.040	1.936	2.089	2.100	2.033	2.098	2.031
Restaurant	1.622	1.724	1.788	1.807	1.813	1.978	1.837	2.036	2.172	2.086	2.118	2.219	2.122	2.164	2.232	2.113	2.160	2.156	2.192
Retail	1.961	2.057	2.078	2.090	2.286	2.353	2.345	2.372	2.296	2.511	2.360	2.233	2.573	2.486	2.187	2.649	2.516	2.715	2.525
School	1.921	1.748	1.747	1.778	1.941	1.901	1.914	2.074	2.093	2.102	2.192	2.275	2.089	2.256	2.328	2.073	2.241	2.102	2.146
Warehouse	3.885	3.804	4.454	3.994	4.692	4.591	3.967	4.884	5.296	5.724	5.241	5.472	6.045	5.572	5.419	5.962	5.558	5.935	5.477
All others	1.621	1.667	1.632	1.712	1.852	1.973	1.902	1.950	1.863	1.899	1.985	1.870	1.970	1.966	1.866	1.906	1.902	1.881	1.933

**Table X5-4 Coefficient C Values**

Building Area Type	Climate Zone																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Multifamily	0.3268	0.3547	0.4698	0.4419	0.5608	0.5921	0.7751	0.9461	1.3802	2.1938	1.3725	2.2150	3.1673	2.1109	2.3514	3.7613	3.2073	4.0765	4.5499
Healthcare/hospital	0.2538	0.2952	0.2924	0.3186	0.3728	0.3966	0.4705	0.3979	0.4800	0.6318	0.4830	0.7239	0.8189	0.6407	0.7623	1.0245	0.8759	1.1802	1.4851
Hotel/motel	0.3054	0.3192	0.3674	0.3794	0.4401	0.5104	0.5758	0.7070	0.7578	1.1950	0.9496	1.2431	1.6502	1.2861	1.4319	2.0806	1.7910	2.4916	3.3918
Office	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0776	0.0890	0.6078	0.2077	0.4525	0.9224	0.4828	0.4656	1.4263	0.9818	1.6892	2.2766
Restaurant	0.2876	0.3147	0.4309	0.4001	0.5043	0.6085	0.6731	0.9800	1.2400	2.3208	1.5298	2.4918	3.6117	2.4166	3.1189	4.5816	3.6641	5.9587	8.8807
Retail	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0268	0.0031	0.6502	0.1292	0.4050	1.0239	0.4191	0.4873	1.4196	0.8469	1.8038	2.5674
School	0.0574	0.0605	0.0716	0.0734	0.0906	0.1091	0.1185	0.2332	0.2124	1.2081	0.5076	0.9354	1.6698	1.0708	1.1824	2.4336	1.9958	3.1587	4.7541
Warehouse	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4289	0.3731	3.7923	1.5264	1.8399	6.1674	3.2986	1.7394	8.7227	5.8554	10.164	10.401
All others	0.2029	0.2198	0.2640	0.2659	0.2354	0.2239	0.2697	0.4152	0.5288	1.2546	0.5421	1.1404	1.6641	1.0498	0.9435	2.0621	1.5669	2.2440	3.0603

$$BPF_{i,j} = (EC + A_{i,j} \times GC) / (B_{i,j} \times EC + C_{i,j} \times GC) \quad (X-1)$$

$A_{i,j}$ ,  $B_{i,j}$ ,  $C_{i,j}$  = coefficients from Tables X5-2, X5-3, and X5-4 for building area type *i* and climate zone *j*

EC = custom electricity conversion factor expressed using the units shown in Table X5-1 for the selected metric

GC = custom natural gas conversion factor expressed using the units shown in Table X5-1 for the selected metric

## **X6. SITE ENERGY USE LANGUAGE EXAMPLE**

The following example shows the recommended changes to Section 3, Section 4.2.1.1, and Table 4.2.1.1, and Sections G1.2.2, G1.3.2, G2.4.2, and G2.5, if the site *energy* alternative compliance metric is adopted. Example changes are illustrated in strikethrough and underline.

### **Modify Section 3 as follows:**

**baseline building performance:** the annual site energy cost for a building design intended for use as a baseline for rating above-standard design or when using the *Performance Rating Method* as an alternative path for minimum standard compliance in accordance with Section 4.2.1.1.

**proposed building performance:** the annual site energy cost calculated for a *proposed design*.

### **Modify Section 4.2.1.1 as follows:**

When using Normative Appendix G, the Performance ~~Cost~~ Index (Site Energy) of new buildings, additions to existing buildings, and/or alterations to existing buildings shall be less than or equal to the Performance ~~Cost~~ Index Target (PEI) when calculated in accordance with the following:

$$PEI = [BBUEC + (BPF_{site} \times BBREC) - PRE] / BBP$$

where

PEI = Performance Index (Site Energy) calculated in accordance with Section G1.2.

BBUEC = baseline building unregulated site energy cost, the portion of the annual site energy cost of a baseline building design that is due to unregulated energy use.

BBREC = baseline building regulated site energy cost, the portion of the annual site energy cost of a baseline building design that is due to regulated energy use.

BPF = building performance factor from Table 4.2.1.1. For building area types not listed in Table 4.2.1.1 use “All others.” Where a building has multiple building area types, the required BPF shall be equal to the area-weighted average of the building area types based on their gross floor area.

BBP = baseline building performance.

- PBP** = *proposed building performance*, including the reduced, annual ~~purchased-site energy cost~~ associated with all *on-site renewable energy* generation systems.
- PBP<sub>nre</sub>** = *proposed building performance* without any credit for reduced annual ~~energy costs~~ from *on-site renewable energy* generation systems.
- PBP<sub>pre</sub>** = *proposed building performance*, excluding any *renewable energy* system in the *proposed design* and including an *on-site renewable energy* system that meets but does not exceed the requirements of Section 10.5.1.1 modeled following the requirements for a budget building design in Table 11.5.1.
- PRE** =  $PBP_{nre} - PBP_{pre}$

When  $(PBP_{pre} - PBP)/BBP > 0.05$ , new buildings, additions to existing buildings, and/or alterations to existing buildings shall comply with the following:

$$PCI + [(PBP_{pre} - PBP)/BBP] - 0.05 < PCI_t$$

~~Regulated site energy cost shall be calculated by multiplying the total site energy cost by the ratio of regulated energy use to total energy use for each fuel type. Unregulated energy cost shall be calculated by subtracting regulated energy cost from total energy cost.~~

**Informative Notes:**

1.  $PBP_{nre}$  = proposed building performance, no renewable energy
2.  $PBP_{pre}$  = proposed building performance, prescriptive renewable energy
3. PRE = prescriptive renewable energy

**Replace values in Table 4.2.1.1 with the values from Table X3-1 (deleted values not shown):**

**Table 4.2.1.1 Building Performance Factors (BPF), Site Energy**

Building Area Type	Climate Zone																		
	0A	0B	1A	1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Multifamily	0.72	0.71	0.75	0.73	0.76	0.76	0.77	0.75	0.70	0.61	0.71	0.64	0.56	0.63	0.63	0.54	0.57	0.54	0.56
Healthcare/hospital	0.67	0.66	0.68	0.65	0.65	0.61	0.62	0.64	0.63	0.62	0.63	0.61	0.65	0.63	0.68	0.64	0.68	0.69	0.71
Hotel/motel	0.69	0.69	0.72	0.68	0.69	0.68	0.69	0.70	0.71	0.65	0.69	0.68	0.63	0.66	0.67	0.60	0.64	0.59	0.58
Office	0.54	0.54	0.53	0.52	0.52	0.52	0.50	0.54	0.47	0.47	0.52	0.48	0.49	0.52	0.49	0.48	0.50	0.43	0.46
Restaurant	0.64	0.61	0.60	0.59	0.60	0.57	0.61	0.62	0.61	0.66	0.65	0.66	0.69	0.69	0.68	0.71	0.71	0.72	0.74
Retail	0.51	0.49	0.48	0.48	0.44	0.43	0.43	0.44	0.44	0.47	0.45	0.50	0.52	0.47	0.52	0.52	0.50	0.48	0.49
School	0.52	0.57	0.57	0.56	0.52	0.53	0.53	0.52	0.55	0.42	0.49	0.53	0.44	0.50	0.51	0.43	0.42	0.42	0.44
Warehouse	0.26	0.26	0.22	0.25	0.21	0.22	0.25	0.21	0.18	0.38	0.27	0.31	0.46	0.37	0.31	0.49	0.42	0.43	0.47
All others	0.63	0.62	0.65	0.61	0.56	0.53	0.55	0.55	0.59	0.55	0.55	0.58	0.57	0.57	0.61	0.57	0.57	0.56	0.58

**Modify Section G1.2.2 as follows:**

The performance of the *proposed design* is calculated in accordance with provisions of this appendix using the following formula:

$$\text{Performance Cost-Index} = \frac{\text{Proposed building performance}}{\text{Baseline building performance}}$$

Both the *proposed building performance* and the *baseline building performance* shall include all end-use load components within and associated with the *building* when calculating the Performance Cost-Site Energy Index.

**Modify Section G1.3.2(a) and G1.3.2(p) as follows:**

[ ... ]

The following documentation shall be submitted to the *rating authority*:



- a. The *simulation program* used, the version of the *simulation program*, and the results of the *energy analysis* including the calculated values for the baseline *building unregulated site energy cost* (BBUEC), baseline *building regulated site energy cost* (BBRE€), *building performance factor* (BPF), *baseline building performance*, the *proposed building performance*, *Performance Cost Site Energy Index* (PCI), and *Performance Cost Site Energy Index Target* (PGIt).

[ . . . ]

- p. For any exceptional calculation methods employed, document the predicted *energy savings* by *energy type*, the *site energy cost* savings, a narrative explaining the exceptional calculation method performed, and theoretical or empirical information supporting the accuracy of the method.

**Modify Section G2.4.2 as follows:**

**G2.4.2 Annual Energy Costs Site Energy.** The *design energy cost* and *baseline energy cost* shall be determined using either actual rates for *purchased energy* or state average *energy prices* published by DOE's Energy Information Administration (EIA) for commercial *building* customers, but rates from different sources may not be mixed in the same project.

**G2.4.2.1** The *baseline building performance* and *proposed building performance* shall be determined using conversion factors in Table G2.1.

**Table G2.1 Units of Fuel to Site Energy Conversion Factors**

<i>Building Project Energy Source</i>	<i>Units</i>	<i>Site Energy</i> <i>Btu/unit (W·h/unit)</i>
Electricity	kWh	3,412
Natural Gas	therm (GJ)	100,000 (277,778)
Propane	therm (GJ)	100,000 (277,778)
Distillate fuel oil	gal (L)	137,600 (10,651)

**G2.4.2.2** Where *on-site renewable energy* or *site-recovered energy* is used, the *baseline building design* shall be based on the *energy source* used as the backup *energy source*, or the *baseline system energy source* in that category if no backup *energy source* has been specified, except where the *baseline energy source* is prescribed in Tables G3.1.1-2 and G3.1.1-3. Where the proposed design includes *on-site electricity generation systems* other than *on-site renewable energy systems*, the *baseline design* shall include the same generation systems excluding its *site-recovered energy*.

**Informative Note:** The above provision allows users to gain credit for features that yield load management benefits. Where such features are not present, users can simply use state average unit prices from EIA, which are updated annually and readily available on EIA's web site (<http://www.eia.gov>).

**Modify Section G2.5(e) as follows:**

[ . . . ]

- e. The *Performance Cost Index* calculated with and without the exceptional calculation method.

## **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.

**ASHRAE · 180 Technology Parkway NW · Peachtree Corners, GA 30092 · [www.ashrae.org](http://www.ashrae.org)**

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