







REQUIREMENTS

Analyze efficiency measures during the design process and account for the results in design decision making. Use energy simulation of efficiency opportunities, past energy simulation analyses for similar buildings, or published data (e.g., Advanced Energy Design Guides) from analyses for similar buildings.

Analyze efficiency measures, focusing on load reduction and HVAC-related strategies (passive measures are acceptable) appropriate for the facility. Project potential energy savings and holistic project cost implications related to all affected systems.

REQUIREMENTS +

Choose one of the options below.

Option 1. Energy Performance Compliance (1-18 points except Schools and Healthcare, 1-16 points Schools, 1-20 points Healthcare)

Demonstrate a Performance Cost Index (PCI)¹ below the Performance Cost Index Target (PCI_t) calculated in accordance with Section 4.2.1.1 of ANSI/ASHRAE/IESNA Standard 90.1-2016, Appendix G, Table 4.2.1.1. For mixed use buildings, the required PCI shall be calculated by using an area weighted average of the building types.

Calculate the PCI, PCI_t, and percentage improvement using metrics of cost and greenhouse gas (GHG) emissions. For each energy source serving the building, the GHG emission factors must be identical for the Baseline and Proposed building models.

LEED points are calculated based on the project percent improvement PCI below the PCI_t using metrics of cost and GHG emissions. Total points have been divided equally between the metrics of energy cost and greenhouse gas emissions. Points are awarded according to Table 1 and Table 2.

For project percent improvement for the cost metric, on-site renewable energy may be subtracted from proposed energy cost prior to calculating proposed building performance per ASHRAE Standard 90.1-2016 Section G 2.4.1.

Table 1. Points for percentage improvement in energy performance – % Cost PCI below PCI_t (1-9 points NC and CS, 1-8 points Schools, 1-10 points Healthcare)

Table 1. Points for percentage improvement in energy performance – % Cost PCI below PCI_t (1-9 points NC and CS, 1-8 points Schools, 1-10 points Healthcare)

New Construction	Healthcare, Major Renovation, CS	Points BD+C (except Schools, Healthcare) ^a	Points Healthcare	Points Schools
5%	2%	1	1	1
10%	5%	2	2	2
15%	10%	3	3	3
20%	15%	4	4	4
25%	20%	5	5	5
30%	25%	6	6	6
35%	30%	7	7	7
40%	35%	8	8	8
45%	40%	9	9	8
50%	45%		10	

^aBD+C projects except Data Centers with unregulated energy cost exceeding 50% of the total proposed building energy cost, and BD+C Data Centers projects with at least 60% gross colocation data center area may use the "Healthcare, Major Renovation, CS" column in lieu of the "New Construction" column.

On-site renewable energy may be subtracted from proposed greenhouse gas emissions prior to calculating proposed building performance per ASHRAE Standard 90.1-2016 Section G 2.4.1. Tier 2 off-site renewable energy as defined in EA credit Renewable Energy may be subtracted from proposed greenhouse gas emissions prior to calculating proposed building performance.

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Table 2. Points for percentage improvement in energy performance – % Greenhouse Gas Emission PCI below PCI; (1-9 points NC, 1-8 points Schools, 1-10 points Healthcare)

New Construction	Healthcare, Major Renovation, CS,	Points BD+C (except Schools, Healthcare)*	Points Healthcare	Points Schools
5%	2%	1	1	1
10%	5%	2	2	2
16%	10%	3	3	3
24%	16%	4	4	4
32%	24%	5	5	5
40%	32%	6	6	6
50%	40%	7	7	7
65%	50%	8	8	
80%	65%	9	9	8



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100%	80%		10	
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*BD+C projects except Data Centers with unregulated energy cost exceeding 50% of the total proposed building energy cost, and BD+C Data Centers projects with at least 40% gross colocation data center area may use the "Healthcare, Major Renovation, CS" column in lieu of the "New Construction" column.

Retail only

For all process loads, define a clear baseline for comparison with the proposed improvements. The baselines in Appendix 3, Tables 1-4, represent industry standards and may be used without additional documentation. Calculate the baseline and design as follows:

- Appliances and equipment. For appliances and equipment not covered in Tables 1-4, indicate hourly energy use for proposed and budget equipment, along with estimated daily use hours. Use the total estimated appliance/equipment energy use in the energy simulation model as a plug load. Reduced use time (schedule change) is not a category of energy improvement in this credit. ENERGY STAR ratings and evaluations are a valid basis for performing this calculation.
- Display lighting. For display lighting, use the space-by-space method of determining allowed lighting power under ANSI/ASHRAE/IESNA Standard 90.1-2016, with errata (or a USGBC-approved equivalent standard for projects outside the U.S.), to determine the appropriate baseline for both the general building space and the display lighting.
- Refrigeration. For hard-wired refrigeration loads, model the effect of energy performance improvements with a simulation program designed to account for refrigeration equipment.



REQUIREMENTS +

DATA CENTERS ONLY

In addition to the requirements above, analyze efficiency measures focused on IT load reduction and HVAC-related strategies. Collocated data centers may use the CS percentage improvement thresholds in lieu of NC thresholds to earn points in Table 1 and Table 2.

OR

Option 2: Prescriptive Compliance: ASHRAE Advanced Energy Design Guide (1-6 points, 1-4 points CS)

To be eligible for Option 2, projects must meet the Scope requirements of the applicable AEDGs (or combination of AEDGs for mixed use), and projects must use the ASHRAE 90.1-2006 prescriptive compliance path in EA Prerequisite Minimum Energy Performance.

Implement and document compliance with the applicable recommendations and standards in Chapter 4, Design Strategies and Recommendations by Climate Zone, for the appropriate ASHRAE 50% Advanced Energy Design Guide and climate zone.

ASHRAE 50% Advanced Energy Design Guide for Small to Medium Office Buildings

- Building envelope: roofs, walls, floors, slabs, doors, continuous air barriers, and vertical fenestration (1 point, 2 points CS)
- Interior and exterior lighting, including daylighting and interior finishes (1 point)
- Plug loads, including equipment and controls (2 points, 0 points CS)
- HVAC Systems and Controls (2 points, 1 point CS)

ASHRAE 50% Advanced Energy Design Guide for Medium to Large Box Retail Buildings

- Building envelope: roofs, walls, floors, slabs, doors, vestibules, and fenestration - all orientations (1 point, 2 points CS)
- Interior and exterior lighting, excluding lighting power density for sales floor (1 point)
- Additional interior lighting for sales floor (1 point, 0 points CS)
- Plug loads, including equipment choices and controls (1 point, 0 points CS)
- HVAC efficiency and control requirements (2 points, 1 point CS)

ASHRAE 50% Advanced Energy Design Guide for K-12 School Buildings



REQUIREMENTS +

(Not applicable for CS)

- **Building envelope:** roofs, walls, floors, slabs, doors, and vertical fenestration (1 point)
- **Interior and exterior lighting,** including daylighting and interior finishes (1 point)
- **Plug loads,** including equipment choices, controls, and kitchen equipment (2 points)
- **HVAC efficiency and control requirements** (2 points)

ASHRAE 50% Advanced Energy Design Guide for Large Hospitals

- **Building envelope:** roofs, walls, floors, slabs, doors, vestibules, continuous air barriers, and vertical fenestration (1 point, 2 points CS)
- **Interior and exterior lighting,** including daylighting (form or nonform driven) and interior finishes (1 point)
- **Plug loads,** including equipment choices, controls, and kitchen equipment (1 point, 0 points CS)
- **HVAC and Service Water Heating Systems and Equipment** (2 points) (1 point CS.)

ASHRAE 50% Advanced Energy Design Guide for Grocery Stores

- **Building envelope:** roofs, walls, floors, slabs, doors, vestibules, continuous air barriers, and vertical fenestration (1 point) (2 points – CS)
- **Interior and exterior lighting, including sales floor** (1 points)
- **Refrigeration, Plug, and Process loads,** including equipment choices and controls (2 points)(0 points CS)
- **HVAC efficiency and control requirements** (1 point) (1 point CS.)

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Option 3, Systems Optimization (1-6 points)

To be eligible for Option 3, projects must use the ASHRAE 90.1-2016 prescriptive compliance path in EA Prerequisite Minimum Energy Performance, and must not have more than 2,000 square feet of data center space, laboratory space, or manufacturing space.

Demonstrate an improvement beyond ASHRAE/ASHRAE/IESNA Standard 90.1-2016, with errata, for the following systems: Interior and Exterior Lighting, Daylight controls, Building envelope, HVAC, and service water heating equipment efficiency, and Equipment and appliances. Use any combination of the strategies in any or all of the categories below, for a maximum of up to 6 points.

- **Interior and Exterior Lighting:**
 - 15% lighting power reduction (1 point)
 - 30% lighting power reduction (1 point)
 - 45% lighting power reduction (1 point)
- **Daylight controls:**

Install daylight-responsive controls for a given percentage of connected lighting load (lighting in non-regularly occupied space with occupant sensor controls may be excluded from connected lighting load).

 - 40% (1 point)
- **Building envelope:**
 - Climate Zones 1 – 2: Achieve 2 of the 3 strategies below for 1 point.
 - Thermal Mass Enclosure: More than 70% of opaque above-grade wall area meets ASHRAE 90.1-2016 definition for "mass wall," and more than 70% of floor area meets ASHRAE 90.1-2016 definition for "mass floor"
 - 25% Envelope UA reduction
 - 50% SHGC reduction (including window shade factors)
 - Climate Zones 3 – 8: Achieve 2 of the 3 strategies below for 1 point.
 - 25% Envelope UA reduction
 - 50% Envelope UA reduction
 - 25% reduction in air infiltration measured during commissioning

REQUIREMENTS +

- **HVAC and Service Water Heating Equipment Efficiency:**
 - Reduction in total fan power allowance of:
 - 20% (1 point)
 - Improvement in efficiency for at least 75% of the combined cooling, heating, and service water heating capacity
 - 20% (1 point)
 - *Electric resistance heating except heat pump auxiliary heat must be included in total capacity.*
- **Equipment and Appliances:**

Install a percentage (by rated power) of eligible equipment and appliances meeting the following requirements:

 - **ENERGY STAR** equipment including appliances, office equipment, electronics, and commercial food service equipment (lighting and building envelope products are excluded from this credit). (Electronic Product Environmental Assessment Tool (EPEAT) equipment may be used in lieu of Energy Star equipment where applicable).
 - Prescriptive commercial kitchen and refrigeration equipment requirements listed in Appendix 3, Table 1.

The project scope of work must include at least 0.25 Watts per square foot of eligible equipment to apply this strategy.

Percent of Eligible Equipment Installed by Rated Power:

- 75% (1 point)

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OR

Option 4. Data Centers only- System Optimization (1-3 points)

Calculate an Overall Systems Design Value as the sum of the maximum design Mechanical Load Component (MLC) and maximum design Electrical Load Component (ELC) in accordance with ASHRAE 90.4-2016 Section 6.2, Section 8.2, and Section 11. Document that the Overall Systems Design value is less than the Maximum Overall Systems Value by:

- 10% (1 point)
- 20% (2 points)
- 30% (3 points)

**If the electrical system design is incomplete, the design values shall be assumed to match the values in Table 8.2.1.1 and 8.2.1.2.*

Collocated data centers: document that the Overall Systems Design value is less than the Maximum Overall Systems Value by:

- 6% (1 point)
- 12% (2 points)
- 18% (3 points)



REQUIRED DOCUMENTATION

Documentation	Option 1	Option 2	Option 3	Option 4
Narrative or report that includes: <ul style="list-style-type: none">The energy target set for the project, the date the energy target was set, and confirmation the target was set no later than schematic design.A summary of the design phase energy analysis performed for the project including how the results were used for design decision making.	X	X	X	X
Target Finder results and summary	X (for applicable building types)			
Greenhouse gas emissions calculations that include credit for new off-site renewable energy (as applicable)	X (where applicable)			
AEDG compliance tables		X		
Calculations demonstrating achievement of systems optimization requirements (e.g. ASHRAE 90.1 lighting power density calculations, lighting fixture calculations, demonstration portion of lighting power with daylighting control, etc.)			X	



EXEMPLARY PERFORMANCE

Achieve 55% savings in the cost metric, achieve 100% savings in the greenhouse gas emissions metric, or use actual utility rates when calculating cost savings and hourly greenhouse gas emissions factors when calculating greenhouse gas emissions savings.



CONNECTION TO ONGOING BUILDING PERFORMANCE



LEED O+M EA credit Energy Performance: Designing for higher levels of energy efficiency helps decrease building operating costs and reduces the environmental and economic harms associated with excessive energy use throughout the building life cycle; this may help improve the building's energy performance score.



REFERENCED STANDARDS



- ✓ASHRAE 90.1-2016
- ✓ASHRAE 50% Advanced Energy Design Guides
- ✓Standard 90.12016 Performance Rating
- ✓ASHRAE 209 - 2018
- ✓ANSI/ASHRAE/IESStandard 90.1-2016 Method ReferenceManual,PNNL 2017
- ✓Developing Performance Cost Index Targets for ASHRAE Standard 90.1 Appendix G - Performance Rating Method



CONNECTION TO ONGOING BUILDING PERFORMANCE



LEED O+M EA credit Energy Performance: Designing for higher levels of energy efficiency helps decrease building operating costs and reduces the environmental and economic harms associated with excessive energy use throughout the building life cycle; this may help improve the building's energy performance score.



TERMS AND DEFINITIONS

✓ **Plug load or receptacle load** the electrical current drawn by all equipment that is connected to the electrical system via a wall outlet.

✓ **Power utilization effectiveness (PUE)** a measure of how efficiently a data center uses its power; specifically, how much power is used by computing equipment rather than for cooling and other overhead

✓ **Process energy** power resources consumed in support of a manufacturing, industrial, or commercial process other than conditioning spaces and maintaining comfort and amenities for building occupants of a building. It may include refrigeration equipment, cooking and food preparation, clothes washing, and other major support appliances. (ASHRAE)

✓ **Process load or unregulated load** the load on a building resulting from the consumption or release of process energy (ASHRAE) regulated load any building end use that has either a mandatory or a prescriptive requirement in ANSI/ASHRAE/IES Standard 90.1-2010



THANK YOU

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