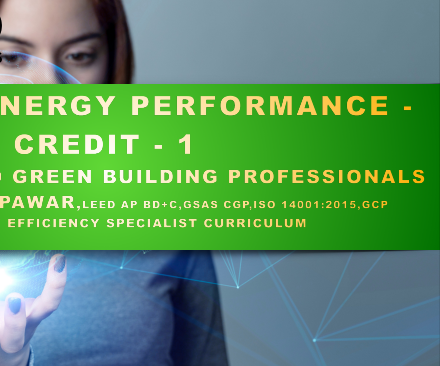




**ENERGY AND ATMOSPHERE - GREEN
BUILDING TECHNOLOGY TRAINING PROGRAM
FOR ENERGY AND GREEN BUILDING SPECIALISTS**

KRISHNAJI PAWAR, LEED AP BD+C, GSAS CGP, ISO 14001:2015, GCP
ENERGY SPECIALIST CURRICULUM





**OPTIMIZE ENERGY PERFORMANCE -
CREDIT - 1**

FOR ENERGY AND GREEN BUILDING PROFESSIONALS

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LEARNING OBJECTIVES

- Intent of Optimize Energy Performance - Credit
- Behind the intent
- Step by Step Guidance
- Requirements
- Required Documentation
- Referenced Standards
- Connection to Ongoing Building Performance
- Terms and definitions



EA- CR(18) - DESIGN

INTENT

To achieve increasing levels of energy performance beyond the prerequisite standard to reduce environmental and economic harms associated with excessive energy use that disproportionately impact frontline communities.

POTENTIAL TECHNOLOGIES & STRATEGIES

Creates an energy model of the proposed design, or expand the scope of the preliminary model, to analyze HVAC system alternatives early in the design process (see EA Prerequisite Minimum Energy Performance, Further Explanation, Modeling Potential HVAC Systems).

OPTIMIZE ENERGY PERFORMANCE

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.

IMPLEMENTATION

REQUIRED DOCUMENTATION

Documentation	Option 1	Option 2
Appendix G energy modeling trade	X	
Input and output reports from modeling software	X	
Baseline energy (if available)	X	
Exhaustion calculations if applicable	X	
Signal Finder results and summary	X	X
Energy consumption and demand for each building end use and fuel type	X	
Peak loads	X	
AECU compliance tables		X
List of excess equipment efficiencies (total only)		X

BEHIND THE INTENT

An optimized building design can substantially reduce energy use—often for a modest initial cost with a short payback period—when it includes load reduction, improved mechanical system efficiency, and smart operational strategies. An integrated building design can lower operating and maintenance costs and improve indoor air quality, thermal comfort, and access to daylight. Either a prescriptive or a performance approach may be used to attain such results.

A simplified, prescriptive approach—applicable to smaller buildings and certain building types, such as offices, retail stores, and schools—presents a limited set of system choices with mandatory performance characteristics. Best suited to projects with smaller budgets, straightforward design, and packaged equipment, the prescriptive approach provides energy-saving guidance for many simple buildings with typical energy systems. Not all projects will be eligible for a prescriptive approach, which can be infeasible, given that all listed requirements must be achieved to attain the prerequisite. Two prescriptive options are available, depending on building size and other factors.

Alternatively, the performance path offers a more flexible, tailored way to evaluate the interactive effects of efficiency measures. This option uses energy modeling to simulate the energy performance of the building as a whole. Design teams can then assess complex systems and make efficiency trade-offs among systems and components that the prescriptive options do not allow.

Partnering with the design team, qualified energy modelers can interpret the results of these complicated analyses to maximize the benefits to the project. When initiated early in the design process, an energy simulation serves as a design tool instead of a compliance check. One of the greatest benefits of early energy modeling is better integration of interrelated design issues, which encourages dialogue about assumptions concerning building components and systems. Information on energy use and costs thereby plays a bigger role as design decisions are made.

ASHRAE 90.1-2010 was chosen as the standard on which to base the requirements because it continues to push building design toward greater energy efficiency. Specifically, a study by the U.S. Department of Energy showed an average improvement of 18% across all building types* when ASHRAE 90.1-2010 was applied instead of ASHRAE 90.1-2007.

STEP-BY-STEP GUIDANCE

STEP 1. REVIEW REQUIREMENTS FOR EA PREREQUISITE MINIMUM ENERGY PERFORMANCE

- Ensure that the related prerequisite will be achieved before pursuing the credit.
- Follow the initials steps of the prerequisite.
- The option pursued in the prerequisite must also be pursued in the credit.
- Projects that achieved the prerequisite under Option 3 (Prescriptive Compliance: Advanced Buildings™ Core Performance™ Guide) are not eligible to pursue this credit.

Option 1. Whole-Building Energy Simulation

STEP 1. REVIEW PREREQUISITE AND CREDIT REQUIREMENTS

Read the requirements and referenced standards for both the related prerequisite and this credit before beginning the simulation. If pursuing the Integrative Process Credit, identify the requirements for concept-level energy modeling to determine how to coordinate the overall model development.

STEP 2. CONFIRM ENERGY USE TARGET FOR BUILDING

Ensure that an energy use intensity (EUI) target has been developed, as outlined in the prerequisite. For credit compliance, the target must be established as EUI in kBtu per square foot-year (kWh per square meter-year) of source energy use.

STEP-BY-STEP GUIDANCE

STEP 3. DEVELOP PRELIMINARY ENERGY MODEL

Determine whether preliminary energy models will be prepared, as outlined in the prerequisite. A preliminary model may satisfy the credit requirement for analysis of energy efficiency measures and can assist with estimating the energy implications of early design alternatives.

- A concept model prepared for compliance with the Integrative Process Credit can form the basis for the preliminary energy model.
- Project teams must perform an analysis of efficiency measures. Past analyses of similar buildings or published data, such as the ASHRAE Advanced Energy Design Guides (AEDGs), may also be used to guide decision making in lieu of a preliminary energy model, though the results will be less project-specific.
- The AEDGs were designed around specific building types and sizes by climate zone, making the recommendations most appropriate for projects with attributes similar to those specified types, sizes, and locations.

STEP 4. MODEL POTENTIAL HVAC SYSTEM TYPES

Create an energy model of the proposed design, or expand the scope of the preliminary model, to analyze HVAC system alternatives early in the design process (see EA Prerequisite Minimum Energy Performance, *Further Explanation, Modeling Potential HVAC Systems*).

STEP 5. UPDATE PROPOSED MODEL

Throughout the design process, add details to the proposed building model to reflect changes that may affect the energy efficiency of other systems (see EA Prerequisite Minimum Energy Performance, *Further Explanation, Building the Proposed Energy Model*).



STEP-BY-STEP GUIDANCE +

STEP 6. UPDATE BASELINE AND PROPOSED ENERGY MODELS BASED ON FINAL DESIGN DOCUMENTS

Update the proposed and baseline energy models to reflect final construction details and specifications (see *Further Explanation, Finalizing the Energy Models for Credit Compliance*) and review the table of common mistakes to avoid (see EA Prerequisite Minimum Energy Performance, *Further Explanation, Common Issues with Energy Modeling*). ➔

STEP 7. DETERMINE ENERGY COST SAVINGS

Compare the proposed model with the baseline model to determine the anticipated energy cost savings (see EA Prerequisite Minimum Energy Performance, *Further Explanation, Energy Cost Savings*). Apply any savings from on-site renewable energy systems after minimum compliance has been demonstrated (see *Further Explanation, Applying Renewable Energy Savings*). ➔

Option 2. ASHRAE 50% Advanced Energy Design Guides (AEDGs)

STEP 1. CONFIRM PREREQUISITE REQUIREMENTS

Ensure that all HVAC and service water-heating equipment meets the requirements of the appropriate AEDG, determined in EA Prerequisite Minimum Energy Performance.

STEP 2. DETERMINE WHICH POINTS TO PURSUE UNDER AEDGS

- Consider the AEDG requirements for additional points.
- Points can be achieved for building glazing and envelope, including opaque elements such as roofs and walls, interior and exterior lighting, and plug loads.
 - Retail projects are subject to the prescriptive retail criteria listed in Appendix 3, Tables 1-4, but have an additional point opportunity addressing sales floor lighting.



STEP-BY-STEP GUIDANCE +

See EA Prerequisite Minimum Energy Performance.

Assure that the additional Optimize Energy Performance requirement credit requirements are met:

- Analyze efficiency measures during the design process, focusing on load reduction and HVAC-related strategies (including passive measures) appropriate for the facility, project potential energy savings and holistic project cost implications, and account for the results in design decision making.

These requirements apply regardless of whether the project is using the performance path (Option 1) or prescriptive path (Options 2, 3 or 4) to document credit compliance.

The best approach for analyzing efficiency measures is a preliminary energy model, which evaluates heating and cooling load reduction strategies, passive HVAC strategies, and HVAC efficiency and control strategies (see EA prerequisite Minimum Energy Performance, *Further Explanation, Developing a Preliminary Energy Model* and *Further Explanation, Modeling HVAC Systems*). ASHRAE Standard 209 provides a standardized methodology which may be used for developing preliminary energy models that are used to inform the design process (See ASHRAE 209 Sections 6.3 - Load Reduction Modeling and 6.4 - HVAC System Selection Modeling).

Projects may also opt to use the AEDGs where applicable, and/or use modeling analyses previously performed for similar projects to meet the design phase analysis requirements.

