



**US Army Corps
of Engineers®**

ENGINEERING AND CONSTRUCTION BULLETIN

No. 2014-17 Issuing Office: CECW-CE Issued: 3 Sep 2014 Expires: 3 Sep 2016

Subject: Application of Energy Models in Design Decisions

Applicability: Directive and Guidance

References:

a. Memorandum, ASA (IE&E), 16 Dec 2013, Subject: Sustainable Design and Development Update (Environmental and Energy Performance)

b. Unified Facilities Criteria 1-200-02, 1 March 2013, Subject: High Performance and Sustainable Building Requirements

c. Unified Facilities Criteria 3-410-01, 1 July 2013, Subject: Heating, Ventilating, and Air Conditioning Systems

1. Purpose. The purpose of this Engineering and Construction Bulletin (ECB) is to provide direction and guidance for the application of energy modeling in design decisions. This ECB is effective when issued. This ECB is mandatory on all projects Program Year 2015 and beyond; and to the extent practical for projects in progress.

a. This directive applies to all MCA projects executed by USACE that are subject to any of the referenced standards regardless of location (CONUS/ OCONUS) that include over 5000 GSF of interior space or the construction cost is greater than \$2.5 million. Projects in process shall implement requirement to the extent practical for the current phase with the expectation to achieve full compliance in follow on project phases. This directive also applies to conducting energy models during design of occupied spaces in Sustainment, Restoration, and Modernization (SRM) and Military Construction (MILCON) activities on Army installations (including government owned/contractor operated installations and tenant activities) regardless of funding source, with the exception of DoD Medical (DoDM) funding and privatization initiatives. For overseas construction activities on permanent basing and in support of contingency operations, this policy will apply to the greatest extent practical considering mission objectives and Host Nation agreements.

b. The building energy model evaluates the energy cost of building operation typically for 12 months (January-December) and is used to evaluate energy conservation measures (ECM's, also referred to as energy efficiency measures, EEM's). It should not be used as an absolute predictor of the energy consumption (electric, gas, etc) meter reading after occupancy but for purposes of building performance verification, it is the only tool available at this time to reference real energy consumption to theoretical consumption.

c. In addition, energy modeling must be accomplished by project delivery teams in order to demonstrate compliance with EPC Act 2005 energy reduction targets and to obtain necessary data to

fill in the LEED templates for the energy optimization credits, and to fulfill the design energy analysis requirements described in the contracts for design or design/build projects.

2. Background. The US Army Corps of Engineers (USACE) is a technical leader in engineering solutions worldwide and is committed to advancing the quality of our built environment while maximizing opportunities for our customers. To further the Corps' effectiveness in delivering sustainable and energy efficient solutions, USACE initiated the Regional Technical Centers of Expertise for Energy, Sustainability and Life Cycle Cost Analysis (RECX) through OPORD 2011-72. The technical centers determined the most effective advancement of High Performance Sustainable Buildings (HPSB) is to incorporate fundamental requirements into the US Army Corps design & construction process. Publication of HPSB ECBs set the framework for the development of the HPSB Design & Construction Engineering Regulation, currently under development. The aforementioned ECBs, including this one, are the first phase in advancing the Corps process to consistently deliver high performance sustainable buildings.

A whole-building energy model is one of the tools used to meet the requirements mentioned in Section 1.c of this ECB. The energy modeling program uses inputs as key building performance indicators, including but not limited to solar heat gain, ambient temperatures, occupancy and lighting schedules, temperature and humidity set-points, and unit energy costs to simulate the performance of a building for an entire year. The resulting model outputs may include energy use and demand based on model inputs. Model outputs, which are dependent on inputs and limitations of the modeling methodology and software, are typically used for comparison purposes in evaluating ECM's such as changes in building envelope insulation or the sizing of heating, ventilation and air-conditioning equipment (HVAC). In the absence of other benchmarking tools, model outputs may also be used to approximate actual building performance and energy consumption trends for comparison purposes. Other criteria, such as Reference c, address the requirements for a load or design model. This ECB focuses on the requirements for the whole-building energy simulation and will refer to this simulation as the energy model or building energy model.

3. Policy. A building energy model shall be performed using approved computerized simulation software which meets ASHRAE 90.1 Appendix G requirements. A simplified approach to the energy model can be used for projects which do not meet the thresholds stipulated below. A simplified approach still requires use of the approved computerized simulation software; however, the number of inputs can be significantly reduced.

a. MILCON: All climate controlled (temperature, humidity, etc.) vertical MILCON shall include energy modeling as a reference for design decisions. The level of detail and complexity of the energy model(s) shall be appropriate for the analysis required. For example, for minor MILCON to partially renovate an existing office building the energy model may include just the renovated area and respective climate controlled systems serving the renovated area. A second example, if the HVAC equipment is replaced for the entire facility, the model should evaluate the entire facility.

(1) Planning and Programming Phase: Energy modeling shall be accomplished to the level necessary for a project delivery team (PDT) to identify energy optimization features and consider the features in their planning efforts. The energy model is an essential part of the PDT and should be integrated in the planning and programming phase in proportion to the complexity of the energy

modeling requirements. Energy optimization features may include structural shape and orientation, day lighting, Installation energy Demand Side Management (to include energy curtailment) programs, building envelope design tradeoffs, and allocation of energy use (values and proportions) of energy use within the facility. Considerations may also include investigations into fossil fuel reduction, poly-generation, energy security (continuity of operations and management of future energy costs), and other strategies.

(2) Interim Design Requirements: Update the concept model and include considerations of design for maintenance and maintenance alerts, and determination of sub-metering required to support (electrical, thermal, and water).

(3) Final Design Requirements: Provide completed energy modeling analyses as part of the design analysis (DA). Include projections of energy varied over the entire range of twelve months of expected degree days and a cumulative annual value. In the DA state whether the discrete energy conservation strategies listed in the DD1391 were supported by the energy model.

b. Sustainment, Restoration, and Modernization (SRM)

(1) Sustainment: Energy modeling is not required for Sustainment projects.

(2) Restoration and Modernization (R&M): R&M projects involving a significant reconfiguration of interior spaces or change of Facility Category Code, changes to heating and cooling equipment, and modifications to insulation or building envelope (except window, door, and/or lighting only replacement projects) shall include energy modeling as if the project were new construction.

(a) 'Significant' is defined as any building over 5,000 square feet and receiving a project contracted value of work of 25% or more of its replacement value.

(b) Buildings less than 5,000 square feet may use simplified approaches for sizing heating and cooling equipment replacement projects. Simplified analyses shall be documented and retained as required for full modeling efforts.

(c) Determination of energy modeling requirements shall be based on the work classification of R&M work. Any modeling requirement applies even if the project is programmed with Sustainment funds.

4. Further information, guidance, and points of contacts related to this subject are available on the MRSI website, Energy Modeling RECX: <http://mrsi.usace.army.mil/sustain/>. At this time, HQ USACE will not be mandating the use of a specific energy modeling tool; rather, teams are encouraged to review the Department of Energy's comprehensive list of software and select the most applicable software for their specific project: http://apps1.eere.energy.gov/buildings/tools_directory/.

5. Exemption. A request for an exemption through HQ USACE (CECW-CE) may be made for any specific requirement included herein or by reference that the PDT determines would adversely affect mission performance, security requirements, health, safety, or welfare. The exemption shall

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only apply to the specific requirements in conflict. Any approved exemptions to this policy shall be documented with reference to the specific requirement in conflict and included in the project documentation.

6. Point of Contact. The Headquarters USACE point of contact is Daniel Carpio (CECW-CE), at 213-452-3667 or Daniel.Carpio@usace.army.mil

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