

Estidama Pearl Rating System: Information Bulletin #8

Subject: Pearl Building Rating System – Credit RE-R1 Minimum Energy Performance
Date: 1 February 2011 **Version:** 1.0

A prescriptive method is provided.

The key changes are detailed as follows:

- **Addition of Prescriptive Methodology based on IECC approach**
- **Modify credit submissions to include Abu Dhabi International Energy Conservation Code based prescriptive methodology and include it in the reference.**

RE-R1: Minimum Energy Performance

Intent	To create a decision-support tool to assist the project team in making informed decisions about the options, implications and benefits of various aspects of the building design in order to achieve a minimum level of energy efficiency.
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Credit Requirements	GENERAL Prescriptive Method: Demonstrate that the building project complies with the requirements of the Abu Dhabi International Energy Conservation Code, Sections 502, 503, 505 in their entirety, and one of the additional options as presented in Section 506. Performance Method: Develop an energy model for the proposed building(s) using appropriate dynamic simulation modeling software and calculate the baseline building energy consumption according to the building performance rating method outlined in Appendix G of ANSI/ASHRAE/IESNA Standard 90.1-2007, (with errata but without addenda), using the minimum acceptable standards for building fabric, HVAC, service water heating, power, lighting and other equipment. Demonstrate a minimum 12% performance improvement compared to the baseline building performance demonstrated by the energy simulation model as per the methodology outlined within Appendix G of Standard 90.1-2007. ADDITIONAL REQUIREMENT/CLARIFICATIONS None
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Requirement Achievement	This is a requirement. There are no Credit Points awarded.
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Credit Submission: Design Rating	Prescriptive Method: ☐ Narrative summarizing all building envelope, mechanical, electrical & lighting systems and any renewable technologies, confirming that the prescriptive credit requirements will be achieved.
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Performance Method:

- ☐ Energy Model Template summarizing the dynamic energy simulation, confirming that the minimum requirements of this credit will be achieved.

Credit
Submission:
Construction
Rating

Prescriptive Method:

- ☐ Updated narrative summarizing all building envelope, mechanical, electrical & lighting systems and any renewable technologies, confirming that the prescriptive credit requirements have been achieved.

Performance Method:

- ☐ Updated Energy Model Template summarizing the dynamic energy simulation, confirming that the minimum requirements of this credit have been achieved.

Calculations and
Methodology

The method for determining reductions in energy consumption is outlined within the Performance Rating Method of ANSI/ASHRAE/IESNA Standard 90.1-2007 (Appendix G). Appendix G provides a methodology for rating the energy efficiency of building designs.

Compliance with the performance rating method requires that the mandatory provisions outlined in sections 5.4, 6.4, 7.4, 8.4, 9.4 and 10.4 of Standard 90.1 – 2007 all be met.

Minimum acceptable standards for building fabric, HVAC, service water heating, power, lighting and other equipment for use within the baseline model must be set at either those given in Standard 90.1 – 2007 or local code, whichever is more stringent.

The air leakage rate must be set identical in the baseline and proposed building models. Where the project can demonstrate an improvement in building air leakage rate (improvements in air leakage rate of the building envelope above 2.0 l/s/m² at reference test pressure 75Pa) compared to the air leakage rate defined in Section 5 of the Abu Dhabi International Energy Conservation Code, this improvement may be included in the proposed building model only if a full envelope air tightness test is to be carried out and the general contractor is under contract to achieve the required air leakage rate. The air tightness test must be carried out by a qualified and competent body (such as ATTMA member organisations or similar UKAS accredited organisations) and all test results and compliance certificates awarded to the project.

Unlike in Appendix G, performance improvements within the Pearl Rating System are based on reductions in annual energy consumption (kWh) rather than cost, thus all reference to energy rates within Appendix G must be ignored.

The proposed building's performance improvement is defined as:

$$\text{Percentage Improvement} = \frac{100 \times (\text{Baseline Building Performance (kWh/yr)} - \text{Proposed Building Performance (kWh/yr)})}{\text{Baseline Building Performance (kWh/yr)}}$$

Both the proposed building performance and the baseline building performance shall include all end-use load components:

- Lighting;
- Heating;
- Cooling;
- Heat rejection;
- Pumps;
- Fans;
- Service water heating; and
- Receptacle and process loads.

All tenant fit-out areas that are not under developer control must be modelled identically in both the baseline and proposed building unless tenant guidelines prescribing relied upon energy efficiency measures are provided as part of IDP-R2 Tenant Fit-Out Design & Construction Guide.

Where any form of mixed mode ventilation is used within areas of the building, the requirements of credit LBi-5.3: Thermal Comfort Modelling must be achieved for those areas in order to document energy savings attributed to mixed mode ventilation.

Performance Calculations

The proposed and baseline building performance must be calculated using the following:

- The same dynamic simulation modeling software (as per Appendix G of Standard 90.1-2007 and with approval from Estidama); and
- The same weather data.

Based on section B2. Major Climate Type Definitions within Standard 90.1-2007, climate zone 1b “Very Hot and Dry” will be assumed for projects within the Emirate of Abu Dhabi.

For components that cannot be adequately modelled by the simulation program, Estidama may approve an exceptional calculation method (as outlined within Appendix G of Standard 90.1-2007) which demonstrates energy savings through calculations performed by design teams, including theoretical and/or empirical information supporting the accuracy of the method.

Mixed-Use Developments: Where a building incorporates more than one occupancy type, for example part residential and part office, the methodology is as follows:

- Baseline HVAC systems are modelled as described within Standard 90.1 Appendix G section G3.1.1.
- Baseline building envelope parameters must be set at those required in Standard 90.1 and be based on occupancy type (residential, non-residential etc).
- The baseline and proposed building must be modelled as a single building including all requirements determined based on occupancy type.

Receptacle and Process Loads

Receptacle and process loads must be modelled identically in both the baseline and proposed building. These loads include all miscellaneous and plug loads within the building. Example loads that are included within receptacle and process consist of, but are not limited to:

- Office equipment;
- Computers;
- Elevators and escalators;
- Kitchen equipment;
- Laundry equipment; and
- Water treatment.

District Cooling (DC)

- Buildings served via a DC network will need to obtain confirmation of the seasonal delivered coefficient of performance (COP) of the district system. This needs to take account of thermal losses within the network in both directions.
- For DC networks already in place, a seasonal delivered COP will need to be obtained from the district cooling operator based on actual data of the cooling plant and associated network over a 12 month period.
- For schemes which have not yet been built, or have been in operation for less than 12 months, confirmation on the proposed performance of the DC network over 12 months must be obtained from the DC developer/operator.
- If sufficient data cannot be provided on the DC network, a seasonal average COP of

4.5 must be assumed.

- The COP of the DC network must be used in the proposed building energy simulation.
- The DC plant will be assumed to be served via grid electricity unless evidence is provided to the contrary.

Renewable Energy

- Energy generated through onsite renewable technologies (those located within the site boundary) may be subtracted from the proposed building energy consumption, including where the energy produced is exported to the electrical grid.

References

- Abu Dhabi International Energy Conservation Code, <http://dma.abudhabi.ae>
 - ASHRAE/ASHRAE/IESNA 90.1 – 2007: Energy Standard for Buildings Except Low-Rise Residential Buildings
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