

Research Trends and Results

Development of Estimation Method for Energy Saving Technique of Residential Envelope Design

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1. Revised Building Energy Standard

The Building Energy Standard for residential houses was revised in 2013, and the energy performance of a building changed to be represented by Design Primary Energy Consumption. In the standard prior to the revision, insulating performance and solar shading performance were only evaluated as the envelope performance. By this revision, envelope performance changed to be able to be evaluated based on heating and cooling loads (Figure 1). This change of the index gives a structure allowing flexible evaluation of the rise of the solar radiation heat acquisition rate, such as improvements of windows, the rise of heat storage performance such as utilization of concrete blocks and earthen walls, cross-ventilation performance in summer and the middle season, etc.

2. Revised Building Energy Standard

Since the standard prior to the revision mainly evaluated insulating performance and solar shading performance, the evaluation of insulating and solar shading techniques can be said to be sufficient, such as insulating reinforcement for heat bridges, utilization of eaves and characteristics of solar shading of various types of glass, i.e. low-e glass. However, the techniques to improve solar radiation heat acquisition performance and thermal storage performance are still not evaluated sufficiently in the revised standard. Therefore, NILIM started a research project named Research on Evaluation Method of Energy Saving Techniques corresponding to Local Home Building Techniques, of which the research period is from 2013 to 2015. In this project, the estimation methods for envelope energy saving techniques which have not hitherto been evaluated sufficiently will be developed. From the techniques discussed in the project, the examples about the solar control techniques are shown in Figure 2.

3. Development of Simple Evaluation Methods

The solar radiation heat acquisition rate (η value) as the index for the performance of openings changes hour to hour depending on the sun's position. This η value can be calculated theoretically taking into account the type of the attached materials such as blinds, the direction of the window and its construction location and so on, but it is not realistic that designers calculate this index because

this calculation is too complex. Therefore, we are developing simplified evaluation methods for η values and other indices.

4. Utilization of Research Results in the Standard

This report introduced the research implemented by NILIM relating to the development of evaluation methods for envelope performance of residential houses. The research results will be utilized in the documents and online programs^{1,2} as the calculation methods for the designed primary energy consumption.

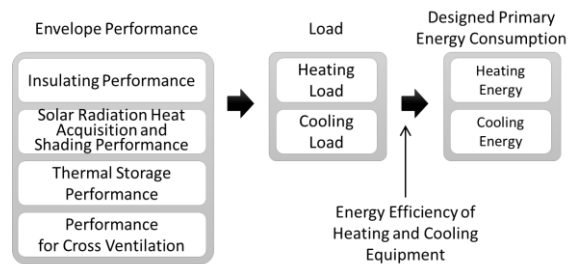


Figure 1 Structure of Evaluation for Envelope Performance in Revised Building Energy Standard

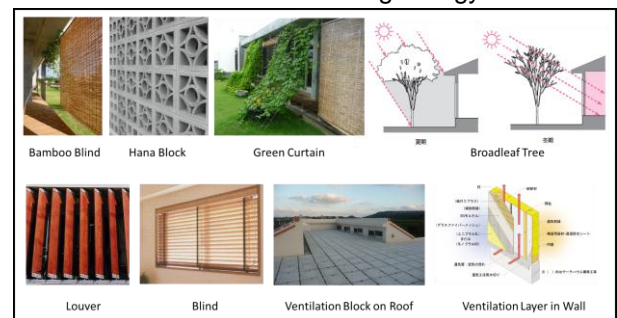


Figure 2 Example of Energy Saving Techniques (Evaluation Methods Developed in NILIM Project)

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