Revision of Japanese Housing Energy Efficiency Standards
Content and Trial of a «Next-Generation Standard»

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1 - SYNOPSIS

This paper discusses the new high-efficiency, flexible, and rational «next-generation standard» for housing in Japan and analyzes its projected effectiveness.

2 - INTRODUCTION

Recently, the diffusion of tightly sealed, highly insulated housing into the northern parts of Japan has increased. As one of its global warming countermeasures, the Ministry of Construction reconsidered and revised energy efficiency standards for housing in March, 1999. Called collectively the «next-generation standard,» the revised standards should result in improved energy efficiency by about 30% in the regions where most of Japan's population is concentrated.

3 - CHARACTERISTICS OF THE «NEXT-GENERATION STANDARD»

The next-generation standard consists of two parts: criteria for homeowner decision-making, and design and construction guidelines showing detailed specifications for insulation, fittings, and so forth. The new standard increases insulation levels as much as possible within the constraints of conventional Japanese house construction, and calls for tightly sealed housing in Japan's northern regions and in other regions sealing as tightly as possible while maintaining the indoor environment via natural ventilation. The present standard uses the "prefecture" as the regional unit. However, to address the issue of differing climatic characteristics within a prefecture, the regional unit used for the new standard is the municipality according to the more detailed climate characteristics of individual cities, towns, and villages, while the original concept of the regions is retained.

The new standard includes the following kinds of measures:
A. Annual cooling/heating load: is calculated by thermal load simulation. *1 The model assumes that the temperature of the entire house is controlled, with heating and cooling temperatures of 18°C and 27°C, respectively. This measure has been newly added to the standards to allow freedom in design reflecting the regional climate. Also, using this measure, heat accumulation and solar gains under differing climate conditions in the same region may be evaluated.
B. Heat loss coefficient: indicates the quantity of heat flow ($W/m^2°C$), and it has been revised to be more detailed and stricter.
C. Supplementary heat loss coefficient: is a newly added measure considers the effect of heat accumulation and solar gains to increase diffusion of passive houses, bringing more incentives to flexible, rational, and inventive ideas for various types of house designs.
D. Standard values for equivalent leakage area: has been previously applied only to the northern Japan. These values are now applied nationwide in order to improve insulation effectiveness while preventing condensation inside walls.

The energy efficiency of a house is considered equivalent if constructed in accordance with any one of the above-described measures, so it need only satisfy one to be considered in compliance. Moreover, detached houses and apartment houses are now evaluated using the same standard values, as opposed to the differing values used in the present standard.

4 - STANDARD VALUES

With its stricter values, in the most populated region IV (Tokyo) the heat loss coefficient of the new standards should be reduced by 36% compared with the present standards. The new standards are on a par with the US, Canadian, and British levels. (cf. Table 1) Moreover, the new standards should result in significant improvements compared to the present standards.

Table 1. Standard Values for Annual Cooling/Heating Load(kWh/ m^2•Year)

Annual Cooling/Heating Load (kWh/ m^2•Year) *2					
Regional unit					
•	•	•	•	•	•
110	110	130	130	95	65

5 - ENERGY CONSERVATION EFFECT

Expected energy savings in new houses due to the next-generation standard, compared with the case of applying the present standards, are on average 18% and 29% for cooling and heating loads, respectively, although effects will vary by region. In one prefecture, annual energy savings for cooling/heating is expected to reach 44% due to altering the regional unit. However, since houses in cold climate areas already meet high standards by using highly effective insulation and tight sealing methods, large energy savings are not expected in those areas. On the other hand, the energy savings in region IV, where most population is concentrated, should be greater. For instance, in Tokyo, the ratio is estimated to reach 25%. *3

6 - CONCULUSION AND DISCUSSION

As a result of new and redefined measures such as annual cooling/heating load and supplementary heat loss coefficient, not only is the next-generation standard on a par with western levels, but it is also flexible and rational, allowing designs reflecting local conditions, prompting the positive introduction of renewable energy, and promoting energy efficiency. Moreover, supplemental housing loan funds, which have been raised from the current 1,000,000 yen to 2,500,000 yen are only available for new houses meeting the new standard. (*4), and it should be expected to raise interest in energy efficient houses. However, as the new standard is voluntary (not mandatory), it lacks strong incentives for fully implementation, and houses not meeting the new standard can still be built. Therefore, the standard may need to be reinforced and made mandatory in the future. Also, the present and new standards only apply to new houses, not existing ones. Taking into account the recent trend of increased heating demand in Japan, it is clear that substantial standards for the existing houses should also be examined in the near future. In the end, not only is there a need for stricter standards, but also for examining retrofit measures to increase the diffusion of energy efficient houses and to make more detailed and comprehensive information available.

7 - ENDNOTES

*1 The thermal load simulation model used for calculating Annual cooling/heating load is a dynamic, commercial software, provided by IBEC. It can examine heart gains and losses in different rooms within a house considering heat accumulation by the hour.

*2 Here, m^2 as part of the standard values refers thermal conductance of dwelling space.

*3 In ordinary Japanese houses, only rooms where people gather are air conditioned and only when people are present. On the other hand, the simulation model assumes a house central air conditioned for 24 hours a day. Therefore, a more realistic energy savings due to the new standard would be around 20%.

* 4 Compared to the situation in western countries, the current share of new houses in Japan (at 4 % of total housing stock) is quite high.