Technical Basis and Institutional Framework For Assuring The Energy Efficiency of Fenestration Systems in Transitional Economy Countries

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ABSTRACT

Energy efficiency improvements in buildings, both new and retrofit, require the availability of cost effective, high quality, energy efficient products with validated energy performance. Fenestration products occupy relatively small area in building envelopes (typically less than 10% of the total area). However, their energy consumption typically represent more than one fourth of all building energy use. Improvements in energy efficiency of windows and related fenestration products in United States has significantly lowered their energy consumption and has stimulated the growth of fenestration related industry in the last 20 years.

This paper will examine the role of accurate simulation software in the design and rating of fenestration, and the lessons learned from the experiences of the NFRC rating system. Current developments in both software and rating systems in the United States and elsewhere will be addressed along with efforts to harmonize the technical basis for rating software. The paper concludes with expectations for improvements in many developed and developing nations in the design, specification and selection of energy efficient windows.

Technically credible, accurate, and cost-effective energy performance simulation software has lead, over the last decade, to a transformation of the building fenestration market and industry in North America, and that transformation continues to spread to other countries. These simulation tools provide the technical basis for fenestration design, rating, labeling, promotion, marketing and regulation (both voluntary and mandatory). The United States Department of Energy (DOE) has been an NFRC partner from its beginning in 1989 and has allocated significant funding for research in support of NFRC mission. As a part of this effort, DOE is providing all fenestration rating software tools at no cost in both the United States and abroad.

The Energy Policy Act of 1992 directed the international harmonization of standards, including the NFRC window standards. Thus, NFRC has worked closely with other countries, and through such organizations as the International Energy Agency (IEA) and the International Standards Organization (ISO), to harmonize window performance standards. In cooperation with the DOE, NFRC has worked closely with a number of transitional economy countries, particularly in Eastern Europe, towards establishing a common technical basis for standards. This effort has produced the technical basis and institutional framework for replicating this experience in other transitional economies. A desired outcome of this effort would be a significant improvement in the quality and energy performance of fenestration products along with significant energy and cost savings in the building sectors of participating countries, as well as strengthened building industry sector.

INTRODUCTION

Through the partnership with industry, US DOE has funded establishment of the Energy Efficient Window Collaborative to equip and educate window practitioners who design, develop, specify and select energy efficient windows. To clearly mark excellence in energy performance, US DOE, in partnership with industry and Environmental Protection Agency (EPA), has established the Energy Star Windows program. The Energy Star Label provides a powerful tool in promoting energy efficiency. Both of these programs are intended to transform the market towards energy efficient fenestration products and NFRC ratings. As a result, in the past 10 years, the energy performance of average installed window in a new construction has increased significantly and has contributed to increased energy efficiency of new buildings.

In the United States, window performance is rated under the auspices of the National Fenestration Rating Council (NFRC). NFRC's rating system utilizes accurate simulations of window energy performance, validated by a limited number of measurements, through administrative and technical procedures to produce fair, accurate and credible ratings of fenestration performance. It is through the use of both good science and good administrative procedures that industry and the marketplace put credence into a rating system that is shaping what products are specified, selected, and thus produced.

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