Selecting low-E glazing for optimum energy performance

Manning, M. M.; Elmahdy, A. H.; Swinton, M. C.; Parekh, A.

Publisher's version / Version de l'éditeur:

Home Builder, 21, March 2, p. 12, 2008-03-01

Selecting low-E glazing for optimum energy performance

NRCC-50427

Manning, M.M.; Elmahdy, A.H.; Swinton, M.C.; Parekh, A.

A version of this document is published in / Une version de ce document se trouve dans:
Home Builder, v. 21, no. 2, March 2008, pp. 12

SELECTING LOW-E GLAZING FOR OPTIMUM ENERGY PERFORMANCE

By M.M. Manning, A.H. Elmahdy, M.C. Swinton and A. Parekh

This article reports the results of a low-emissivity glazing study done in the twin houses of the Canadian Centre for Housing Technology.

Advances in window technology, such as warm-edge spacers, gas filling and low emissivity (low-e) coatings have helped improve the energy performance of houses.

Low-e glazings allow less solar radiation into the living space than clear glass. There are two types, low solar heat gain glazing (LSG) and high solar heat gain glazing (HSG). The LSG products allow less solar entry than HSG.

In order to compare the two types of low-e glazing for year-round energy performance, researchers conducted experiments using the identical twin houses at the Canadian Centre for Housing Technology (CCHT) in Ottawa. The houses, located side by side, face south and have no trees close to them. LSG glazing was installed in one house and HSG in the other. The experiments were run for one month in winter and one month in summer. The thermostat setting was 21°C in winter and 26°C in summer.

The study showed that the difference in the transmitted solar energy through the windows had a large impact on cooling and heating energy consumption. The impact was greatest on the sunniest days, and the effect was most pronounced in winter when the sun is low in the sky and solar radiation strikes the window more directly. On sunny winter days, the house with the LSG glazing had to compensate for its lower solar gains by consuming on average 15% more natural gas. On sunny summer days, the house with the LSG glazing benefited from lower gains by consuming on average 20% less electrical energy for air conditioning.

To sort-out whether the winter saving with the HSG were more important than the summer savings with LSG, researchers used the experimental results to benchmark computer models which were in turn used to predict the energy performance of the two types of low-e glazing for 10 locations across the country. In the models, they compared the performance of the two low-e glazings with that of clear glass, air-filled (conventional) glazing. The calculations took into account the climate, the cost of heating and the cost of cooling in the various locations.

While both the LSG and HSG windows provided energy cost savings compared to the conventional windows, the HSG window produced the best overall energy cost savings for Ottawa and for all the Canadian locations based on the modelling calculations. The HSG window would be expected to produce between 13% to 17% savings in combined heating and cooling costs, while the LSG window would be expected to produce savings between 8% to 10%.

Generally, in locations where there are more than 3000 Celsius heating degree days (which applies to almost all of Canada), the HSG glazing provides the best overall energy performance.

The higher the cost of heating, the greater the benefit from reducing the heating loads through the use of HSG windows. For example, although Halifax does not have the largest heating loads of all the modelled locations, it has the highest heating fuel costs and so has the most to benefit from the use of HSG windows. In Quebec, where electricity is the predominant source of energy for both cooling and heating, energy savings translate directly into cost savings.

Even if a house is operated without air conditioning, HSG glazing should still be selected because of the beneficial effect of winter solar gains and reduced heating energy consumption**.** If air conditioning is used, experiments at CCHT with HSG windows showed that shading on the exterior through the use of shutters or shades can reduce cooling energy consumption on sunny days by up to 26%. Standard Venetian blinds used on the interior had little effect.

Although the CCHT experiment only examined the two types of glazings on a whole-house basis, combinations of glazing according to the orientation of the windows could produce even greater energy savings.

Ms. M.M. Manning *is a technical officer in the Building Envelope and Structure Program at the National Research Council Institute for Research in Construction.* ***Dr. A.H. Elmahdy*** *and* ***Mr. M.C. Swinton*** *are principal research officers in the same program.* ***Mr. A. Parekh*** *is a senior researcher in the Sustainable Buildings and Communities group of Natural Resources Canada.*

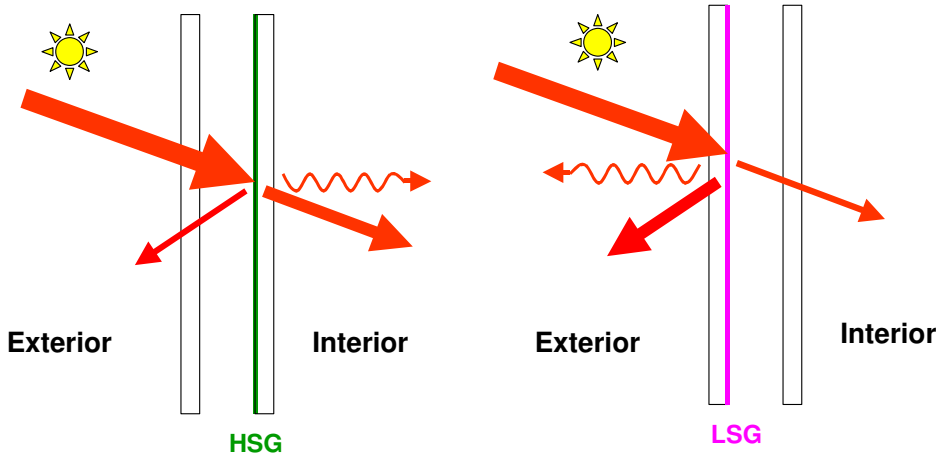
For more information, contact Marianne Manning at 613-991-0967, or marianne.manning@nrc-cnrc.gc.ca.

Project partners for the study were Pilkington North America and Natural Resources Canada.

CCHT is operated as a partnership between NRC, Canada Mortgage and Housing Corporation, and Natural Resources Canada. The research manager is M.C. Swinton.

HSG Glazing

LSG Glazing



The High Solar Gain coating on the interior pane of the window lets in more solar radiation than the LSG window, and also reflects heat back into the home (an advantage during heating season).

The Low Solar Gain coating located on the exterior pane of the window transmits less solar radiation, and reflects heat to the exterior (an advantage during cooling season).

CCHT Twin Houses