



# Technical Bulletin

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## Plant Growth behind Pilkington **Energy Advantage™** Low-E Glass and Pilkington **Solar E™** Solar Control Low-E Glass

### ***Summary***

The question is often asked: will the growth of plants within a house will be adversely affected by glazing the window units with a low emissivity (low-e) coated glass? A healthy plant that flourishes behind glass is the result of many variables, including: the type of plant, necessary wavelengths of light for plant growth, the percentage of light transmittance through the glazing unit at each specific wavelength and the internal room temperature and humidity where the plant is located.

Solar radiant energy in the form of visible light will act as a source of fuel for the internal food factory of a green plant. Through photosynthesis, plants use this visible light to change carbon dioxide and water into the simple sugars and starches they use for food, giving off oxygen in the process.

A green plant does not use all the light that is available to it for growth, however. Although natural sunlight appears white, it is actually composed of separate wavelengths, each with its own color: red, orange, yellow, green, blue and violet. Plants will use some wavelengths more than they use others. In most plants, green wavelengths are merely reflected, causing the plants to appear green to us.

The influence of the invisible infrared (IR) energy on plant growth is still unclear.

Ultraviolet (UV) radiation is generally harmful to seedlings or younger indoor plants; although some data suggest that the longer ultraviolet wavelengths can slightly stimulate photosynthesis if visible light is also present in the correct proportions. Most of the important photochemical processes in a plant use the blue and red areas of the visible spectrum to best promote growth. Red light, for example, stimulates stem and leaf growth, while blue light regulates plant enzyme and respiratory processes and encourages low, stocky growth and dark green leaves. Providing your plants with the right balance of red and blue light is key to successful indoor plant growth.

**Pilkington North America, Inc.**

811 Madison Avenue, Toledo, Ohio 43604-5684

Telephone 800 221 0444 Fax 419 247 451

Therefore, plants will grow best behind a glazing having a neutral daylight transmittance without a strong color. The visible light transmittance through a 3 mm double glazed clear insulated glass unit is 81%. The size of the window and controlling the distance from the plant to the window are key variables in regulating indoor plant growth.

Low-E coatings are designed to transmit visible light and to reflect far IR (around 10 nm wavelength). Clear glass is totally opaque to far IR so the presence or not of a low-e coating has little effect on the direct radiant energy transmission. A double insulating glass unit of: Clear / air / Pilkington **Energy Advantage**™ Low-E Glass, will transmit 75% of the visible light that is available from the sun. Therefore, there is only a 7% reduction in visible light transmittance for the Pilkington **Energy Advantage**™ Low-E Glass option. A double glazed unit with Pilkington **Solar-E**™ Solar Control Low-E / air / Clear insulated will transmit 59% of the visible light that is available from the sun.

The total amount of light received by a plant is important. Some plant types grow best in total shade with no direct solar radiation, while others prefer full sunlight. The hours of daylight, window size and degree of shading, as well as the daylight transmission of the glass will determine the total amount of light available for plant growth. All of these factors should be considered when growing plants indoors.

"Ultraviolet radiation is generally harmful to plants..."\* therefore a glazing having low UV transmittance can be desirable. A comparison between the 3 mm glazing options noted above shows UV transmittance values of 57% for the double glaze clear unit, 45% for the double glaze unit with Pilkington **Energy Advantage**™ Low-E, and 38% for the unit with Pilkington **Solar-E**™ Solar Control Low-E Glass

Finally, most plants grow ideally in indoor temperatures between 65 and 75°F (18 and 24°C). Window units glazed with low-e coated glass will certainly keep plants warmer than windows with plain glass during winter nighttime, with less need for heating energy supplied by the home furnace.

Research into plant growth behind low-e glazings conducted at the Massachusetts Institute of Technology (MIT) concluded: "...neutral-colored... low-e products do not seriously influence yields, plant health, or growth rates if the plants are kept near room temperature"\*.

\* Johnson, Timothy E., "Low-E Glazing Design Guide," Butterworth Architecture 1991

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811 Madison Avenue, Toledo, Ohio 43604-5684

Telephone 800 221 0444 Fax 419 247 4517