

Glass and Shading Analysis Cold Climate

Recommended glass and shading options for building located in a cold climate with a southern exposure.

Orientation & Need/Purpose	Coating and # of panes	Shading / Insulating	Comments
North Lowest U-factor /Highest R-value for good insulation and low air infiltration	Triple glass with 3 Low-E coatings & argon gas fill in insulated vinyl frame: 0.15 U-factor and 0.37 SHGC	Interior insulating drapes to retain heat in house in winter	North-facing transmits minimal solar heat no matter what the season.
South High-performance low shading coefficient to prevent unwanted solar gain in the summer (cooling season) winter: need high solar heat gain coefficient for winter sun gains	Double glass with 2 Low-E coatings & argon gas fill in insulated vinyl frame: .30 U-factor and .44 SHGC	Horizontal exterior overhangs and/or awnings for summer shading or design house to shade itself; Interior blinds or drapes for winter nighttime.	South-facing provides greatest potential for solar heat gain during heating season while contributing relatively minimal solar heat gain during cooling season. Length of overhang or fin can be calculated manually or programmatically http://www.susdesign.com/overhang/ . ¹
West heat-rejecting low U value/high R value lower SHGC	Double glass with 2 Low-E coatings & argon gas fill in insulated vinyl frame: .30 U-factor and .44 SHGC	Exterior shutters to prevent summer high solar gain	West-facing transmits most solar heat during summer, so may warrant lower SHGC.
East heat-rejecting low U value/high R value lower SHGC	Double glass with 2 Low-E coatings & argon gas fill in insulated vinyl frame: .30 U-factor and .44 SHGC	Interior blinds for winter night time; summer: vertical shading: exterior shade screens provide superior performance and allows light to enter	East-facing transmits most solar heat during summer, so may warrant lower SHGC. However, east is not as big an energy waster as west windows as they get morning and evening sunlight in winter.
Skylight heat-rejecting low U value/high R value lower SHGC and shading coefficient	Double pane with 2 Low-E coatings & argon gas fill in insulated vinyl frame: .30 U-factor and .44 SHGC	Exterior Heatblock (MMA) Electric awning	Skylights transmit most solar heat during summer. Dome- and ridge-shaped cannot incorporate low-E or spectrally selective coatings and gas fills. Therefore, only flat, glass skylights should be used. Provides ventilation if can open (Warner, 1993).
Solar most direct gain	Double pane clear .49 U-factor and .58 SHGC	Shading may be required in summer.	Solar specifically for solar-heated spaces

¹ Overhang: $h = D \times \tan(\text{solar altitude}) / \cos(\text{solar azimuth} - \text{window azimuth}) + -$. Fin: $w = D \times \tan(\text{solar azimuth} - \text{window azimuth}) + -$ (LBNL, p. 5-7). Programmatically via an online calculator: <http://www.susdesign.com/overhang/>.