



The Application of ISO 15099 to Russian standard GOST 26602.1-99 “Windows and Doors. Determination of Thermal Resistance” and SNiP II-3-79*

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The method of computing window overall thermal resistance R_o (1/U-factor) in GOST 26602.1-99 is consistent with NFRC 100-02 and consistent in basic features with ISO 15099 document (FDIS, September 21, 2001). In several cases, ISO 15099 suggests that individual national standards will need to be more specific and in other cases the ISO document gives users the choice of two options. This document clarifies these specific issues as they are to be implemented in approved software/algorithms:

- 1) Section 4.1: For calculating the overall U-factor, ISO 15099 offers a choice between the linear thermal transmittance (4.1.2) and the area weighted method (4.1.3). The area weighted method (4.1.3) shall be used.
- 2) The method of computer calculation of SHGC (section 4.2) is not used in GOST 26602.1-99 and SNiP II-3-79*. [Note: at some point in the future, this situation must be revised.]
- 3) Section 6.4 refers the issue of material properties to national standards. Material conductivities and emissivities shall be determined in accordance with the SNiP II-3-79* or more currently adopted (by GOSSTROY) standard on this topic.
- 4) Shading Systems (Section 7) is currently absent in GOST 26602.1-99 .
- 5) Section 8.2 addresses environmental conditions. The following are defined by GOST 26602.1-99:

For R_o calculations:

$$T_{in} = 20 \text{ }^\circ\text{C}$$

$$T_{out} = -20 \text{ }^\circ\text{C}$$

$$T_{rm,out} = T_{out}$$

$$T_{rm,in} = T_{in}$$

$$I_s = 0 \text{ W/m}^2$$

- 6) Section 8.3 addresses convective film coefficients on the interior and exterior of the window product. In GOST 26602.1-99 constant film coefficient is used on all glass and frame indoor surfaces ($h_i = 8 \text{ W/(m}^2\text{ }^\circ\text{C)}$). To accommodate two-dimensional radiation model described under

section 8.4.2.1, this film coefficient is split into convective and radiative part, where convective fraction for glazing is calculated using equations in section 8.3.1 based on the center of glass temperature and the entire window height; this film coefficient shall be used on all glass and edge of glass indoor surfaces. Frame section indoor convective film coefficients shall be constants, which depend on frame material type. These values shall be determined using the algorithms in ISO15099 and using representative frame surface temperatures for each frame material type. The values for typical frame types are listed below:

Wood/Vinyl (13 °C):	$h_{ci} = 2.44 \text{ W}/(\text{m}^2 \cdot \text{K})$
T/B Al (3 °C):	$h_{ci} = 3.00 \text{ W}/(\text{m}^2 \cdot \text{K})$
T/I Al (0 °C):	$h_{ci} = 3.12 \text{ W}/(\text{m}^2 \cdot \text{K})$
Al (-5 °C):	$h_{ci} = 3.29 \text{ W}/(\text{m}^2 \cdot \text{K})$

On the exterior of the window product, constant film coefficient is used ($h_o = 23 \text{ W}/(\text{m}^2 \cdot \text{C})$).

7) Section 8.4.2 presents two possible approaches for incorporating the impacts of self-viewing surfaces on interior radiative heat transfer calculations. GOST 26602.1-99 shall use the method in section 8.4.2.1 (Two-Dimensional Element To Element View Factor Based Radiation Heat Transfer Calculation).