

Table 1: The U-factor of TRR97 Window with Original Material Conductivity

	U of Frame, W/m^2-K	U of Edge-of- glass, W/m^2-K
Head	2.4377	2.253
Sill	2.4369	2.2515
Jamb	2.4586	2.2572
Overall U	1.924	

Table 2: Sensitivity Study of Material Conductivity Change.

Polyurethane (K=0.03 W/m-K)												
	K+5% K				K+10%K				K+100%K			
K, W/m-K	0.0315				0.033				0.06			
	U of Frame, W/m^2-K	%Error	U of Edge-of- glass, W/m^2-K	%Error	U of Frame, W/m^2-K	%Error	U of Edge-of- glass, W/m^2-K	%Error	U of Frame, W/m^2-K	%Error	U of Edge-of- glass, W/m^2-K	%Error
Head	2.4381	0.016%	2.2533	0.013%	2.4386	0.037%	2.2536	0.027%	2.4462	0.349%	2.258	0.222%
Sill	2.4373	0.016%	2.2518	0.013%	2.4378	0.037%	2.2521	0.027%	2.4454	0.349%	2.2566	0.227%
Jamb	2.4591	0.020%	2.2575	0.013%	2.4595	0.037%	2.2578	0.027%	2.4869	1.151%	2.2692	0.532%
	Overall U, W/m^2-K		%Error		Overall U, W/m^2-K		%Error		Overall U, W/m^2-K		%Error	
Overall	1.924		0		1.924		0		1.928		0.208%	
Wood (K=0.14 W/m-K)												
	K+5% K				K+10%K				K+100%K			
K, W/m-K	0.147				0.154				0.28			
	U of Frame, W/m^2-K	%Error	U of Edge-of- glass, W/m^2-K	%Error	U of Frame, W/m^2-K	%Error	U of Edge-of- glass, W/m^2-K	%Error	U of Frame, W/m^2-K	%Error	U of Edge-of- glass, W/m^2-K	%Error
Head	2.5004	2.572%	2.2475	-0.244%	2.5618	5.091%	2.2422	-0.479%	3.4405	41.137%	2.18	-3.240%
Sill	2.4995	2.569%	2.246	-0.244%	2.5604	5.068%	2.2408	-0.475%	3.4346	40.941%	2.1787	-3.233%
Jamb	2.5214	2.554%	2.2517	-0.244%	2.5823	5.031%	2.2465	-0.474%	3.4587	40.678%	2.8141	24.672%
	Overall U, W/m^2-K		%Error		Overall U, W/m^2-K		%Error		Overall U, W/m^2-K		%Error	
Overall	1.933		0.468%		1.941		0.884%		2.068		7.484%	
Aluminum Alloy (K=160 W/m-K)												
	K+5% K				K+10%K				K+100%K			
K, W/m-K	168				176				336			
	U of Frame, W/m^2-K	%Error	U of Edge-of- glass, W/m^2-K	%Error	U of Frame, W/m^2-K	%Error	U of Edge-of- glass, W/m^2-K	%Error	U of Frame, W/m^2-K	%Error	U of Edge-of- glass, W/m^2-K	%Error
Head	2.4725	1.428%	2.2616	0.382%	2.4728	1.440%	2.2618	0.391%	2.4756	1.555%	2.2635	0.466%
Sill	2.4713	1.412%	2.2604	0.395%	2.4914	2.236%	2.2675	0.711%	2.4942	2.351%	2.2692	0.786%
Jamb	2.515	2.294%	2.2715	0.634%	2.5317	2.973%	2.2788	0.957%	2.5346	3.091%	2.2806	1.037%
	Overall U, W/m^2-K		%Error		Overall U, W/m^2-K		%Error		Overall U, W/m^2-K		%Error	
Overall	1.933		0.468%		1.936		0.624%		1.937		0.676%	

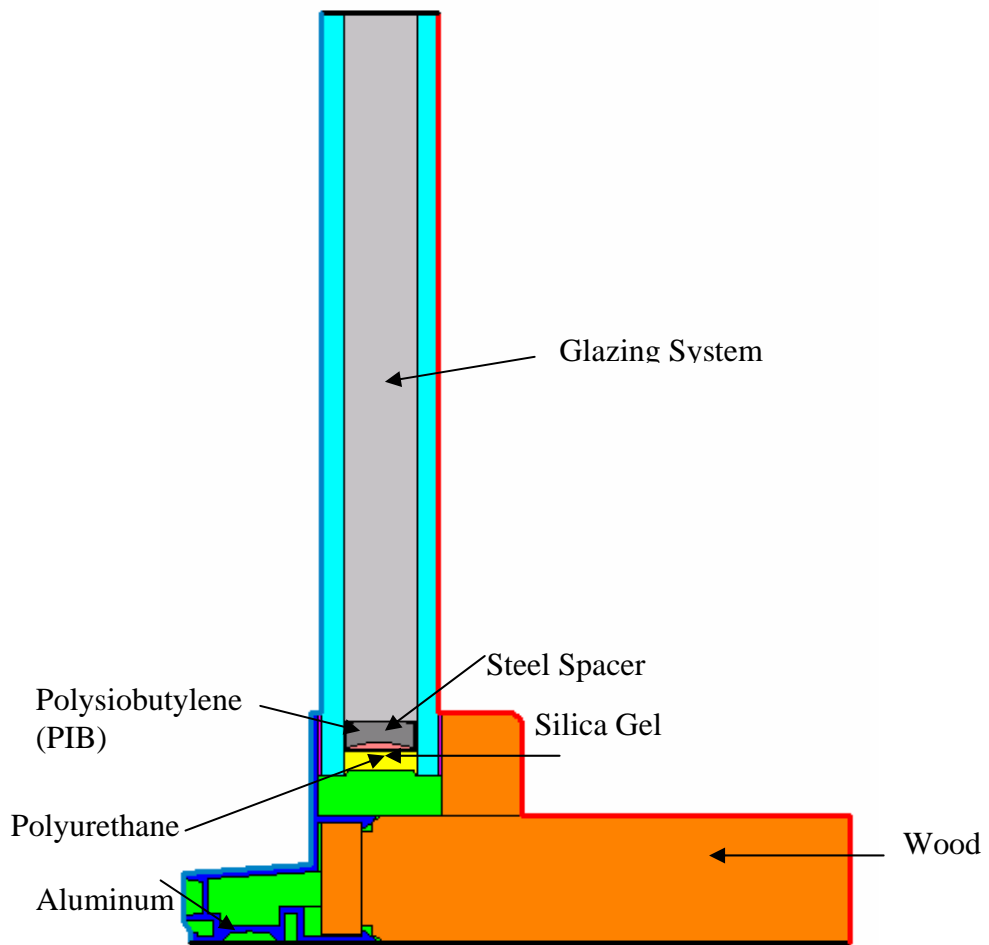


Fig. 1: Schematic Representations Of Frame Materials In A Jamb Cross-Section Of Frame

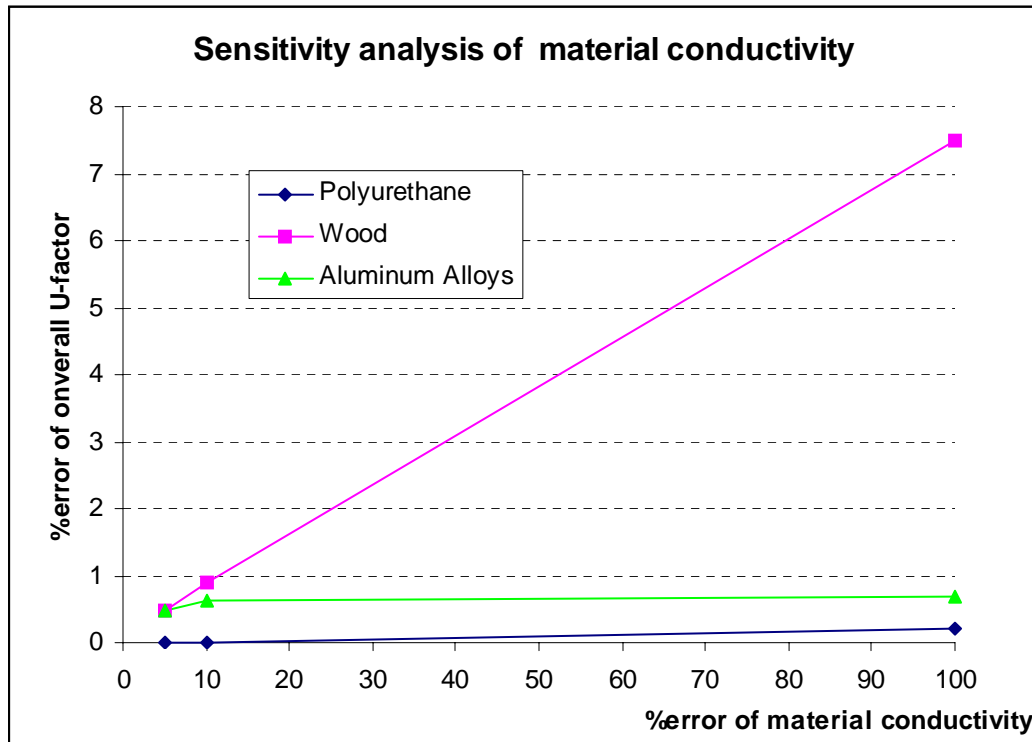


Fig 2. Sensitivity analysis of material conductivity change of TRR97 Window

To study the effect on overall U-factor of a window caused by changing the thermal conductivity of a type of frame material in a whole window, a sensitivity study was performed on TRR97 window.

Three types of material were chosen to vary during the study. 5%, 10% and 100% over the value of the original material were studied, and results were listed in Table 2, and also in Figure 2.

The three types of material are polyurethane as shown in Figure 1 as the sealant, wood and aluminum alloys shown in Figure 1 as frame parts. Among them, polyurethane is highly insulated, with the smallest conductivity value of 0.03 W/m-K; aluminum alloy is highly conductive, with the highest value of 160 W/m-K. The conductivity of wood is 0.14 W/m-K. However, for this particular case of TRR97 window, the frame mainly consists of wood.

From Figure 2, some preliminary results were shown.

1. Effect of changing conductivity of insulation material is comparatively little.
2. The more area the material occupies, the more effect it will have on the overall U-factor of a window to change its conductivity.
3. For those material that doesn't occupy a lot of frame area, and also are not with very high conductivity, even a very huge change of conductivity doesn't make too much effect on the overall U-factor.