High-Performance Windows: **Triple Protection for that Hole in the Wall**

Triple-Pane Windows Offer So Many Benefits

In addition to cutting energy bills, there are many more ways triplepane windows can outperform standard single- and double-pane windows. They can:

- Reduce outside noise
- Improve comfort
- Enable smaller, more compact and efficient HVAC systems
- Give builders a trade-off to help meet the newest energy codes
- Reduce condensation.

Who knew?

No matter how well insulated your walls are, if the windows are poor performers, they can still be big sources of heat gain in summer and heat loss in winter,

bringing down the overall thermal performance of the walls. Researchers at the Pacific Northwest National Laboratory and Lawrence Berkeley National Laboratory have worked with window manufacturers, builders, and contractors across the country in laboratory and field studies to bring to market better windows that can **Triple-Pane Window** help save energy, **High Performance** cut utility costs, and **Low-E Coated Glass** make your home more **Clear Glass** comfortable. These Krypton new and improved Gas Fill windows include Low triple-pane windows, Conductivity Spacers thin-triple windows,





Pacific



Triple-pane windows can help prevent condensation too!

In this field study in Helena, Montana, the home owner noticed that every winter the inside surface of her windows was covered with condensation. In really cold weather, these water droplets turned to ice.

Researchers replaced the doublepane windows with triple-pane windows to see what would happen. The condensation disappeared!



vacuum-insulated glass windows, electrochromic windows, and lowemissivity storm windows.

One PNNL study comparing thin triple-pane versus doublepane clear-glass windows showed that thin triple-pane windows provided annual heating energy savings of 12% in winter and cooling energy savings of nearly 30% in summer compared to the double-pane windows. The triple-pane windows also reduced peak energy loads reducing energy demand during winter morning peaks by 17% and during summer late afternoon peaks by 33%.

16



Here is what gives triple-pane windows their super powers.

Polyurethane primary seal

Researchers helped develop thin triple windows as lightweight high-performance replacements for doublepane windows.

R-30

How much impact do windows really have?



Although windows only make up 7% of the exterior shell of a home, they account for 48% of heat loss through the shell.

How Triple-Pane Windows turn an R-5 Wall into an R-16 Wall

Before Retrofit: Double-pane window has condensation and ice on interior surface.



After Retrofit: Triple-pane window is clear and dry.



When you have single-pane windows, it almost doesn't matter whether you've packed R-10, R-20, or R-30 worth of insulation into your walls. For a wall with a typical number of windows, the effective R-value of the whole wall will be around R-5 because the low insulation value of the windows has that much impact. If you move up to triple-pane windows, a wall with R-30 of insulation will have an overall R-value of R-16—a huge jump in performance!

