



# Making Smart Window Decisions

HOW BUILDERS CAN HELP THEIR CLIENTS  
SELECT WINDOWS THAT FIT BOTH THE  
HOUSE AND THE BUDGET



Windows are usually a significant line in the construction budget for a new house, and it may be tempting to keep costs down by choosing windows on the basis of price first, performance and aesthetics second. But lower price is just one factor, and making a truly smart decision involves many other considerations.

Windows play an important role in the energy performance of a new house—a factor that’s becoming more important to many homeowners—and they are an essential part of the architectural fabric of a house, both on the inside and the outside.

The sheer number of window styles, and the wide range in features and pricing, can make it difficult for homeowners to make the most appropriate choice. This is where savvy builders can step in and guide their clients through a potential minefield. To do so, they need to know the basic performance characteristics of windows, what building codes in the area require, and how to align window selection with the architectural style of the project.

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# Understanding energy performance

Tougher building codes and higher expectations among consumers have highlighted the role that windows play in overall energy efficiency and indoor comfort. Even the best windows don't insulate against heat and cold as efficiently as the rest of an exterior wall, so making sure that windows are appropriate for the demands of a particular climate zone will have a direct impact on the overall quality and livability of the house.



The single-pane windows typical of houses built before the 1970s have all but disappeared, replaced by double- and even triple-glazed units that insulate much more effectively. Double-pane units are the most common type of insulated glass on the market, and suitable for a wide range of building styles and climate zones. But if a client's building a high-performance home in a cold climate, it may be worth discussing the advantages of triple-pane units. Although they're typically more expensive, triple-pane units may offer energy savings that cover the incremental cost of an upgrade over time.

Coatings applied to the glass help control the amount of light and heat that pass through. The most common is a low-e (low emissivity) coating that limits the amount of heat that passes through the glass. The coating is typically applied to the inside face of the glass to protect it from damage. Low-e coatings help houses stay warmer in winter and cooler in summer by slowing

down the heat transfer through the window. The space between the two pieces of glass are typically filled with an inert gas—argon is cheaper, but krypton is a better insulator.

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A key value to watch is the Solar Heat Gain Coefficient (SHGC), which is a measure of how much heat gets into the house through the windows when the sun is shining. In places where heating costs are high, clients will probably be more comfortable (and have lower heating bills) when windows have higher SHGCs. In regions where cooling is a bigger issue, low SHGC values will keep more of the sun's heat out of the house and help homeowners save on cooling bills. Most low-e windows sold in the U.S. have a low SHGC, so builders in cold climates should check the National Fenestration Rating Council label on the window and make sure the SHGC is appropriate for the climate.

The architect or designer may specify different SHGCs depending on which direction the window faces. Be wary, however, of designs that call for a lot of south-facing glass; experts these days are more likely to suggest keeping the number and size of windows on the conservative side if saving energy is the goal. With a lot of big windows, heat gain is likely to be significant in the summer, heat loss significant in the winter. The homeowner should at least be aware of the potential risks of too much glass.

The other key number is the U-factor, the measure of the rate of heat flow through the glass. (U-factors are the inverse of the more familiar R-value, so a lower U-factor indicates a better insulator). No matter where you live, windows with low U-factors are a better choice. But when comparing this number across different windows, make sure it's an apples-to-apples comparison: Don't compare a center-of-glass U-factor with a U-factor for the entire window, which includes the frame.

It's also smart to check current building codes in your area for what's required. The 2015 International Energy Conservation Code, for example, is specific about U-factors in windows, and has regional limits—the U-factor can be no higher than 0.32 in the northern part of the country, and no higher than 0.40 in parts of Texas and Florida. The IECC also sets maximums for the SHGC depending on where you live.

# Comparing window styles

There are a number of window types, which may prompt builders to stick with the basic options they know best. To confidently navigate the wider spectrum of options, Pella's Director of Architectural Solutions, Alan Pickett, recommends dividing the offerings roughly into two groups: hung windows and casement windows.



Choosing a window style, like double-hung (above) or casement (below), is only the beginning of the homeowner's many options.



A hung window consists of an individual sash mounted in a frame. With a double-hung window, both sashes move. With the less common single-hung window, only the bottom sash slides up and down. With a sliding window, the sash moves horizontally rather than vertically.

With a casement window, the sash is hinged so it can open outward. Here, too, there are a few different types: casements can be hinged on one side, on the top (called an awning window) and on the bottom (called a hopper window). A newer type of window called a tilt-and-turn can work either like a casement window or a hopper window.

Non-operable, or fixed, windows may be the best choice from a performance standpoint, assuming ventilation isn't needed in that particular location on the house. Fixed windows aren't as leaky as operable windows, and as a result they can help conserve energy and make the house more comfortable. A key consideration, however, is whether the window meets code requirements for egress in case of fire. The International Residential Code sets minimums for height and width of the opening, and for net clear opening of windows that may be used for egress.

Frames are available in a number of materials, including vinyl, fiberglass, wood, aluminum, and wood with a cladding made of fiberglass, vinyl or aluminum. These materials can be adapted to a number of window styles, but choices will depend in part on what material best matches the house style. Maintenance is another concern. Today's windows are available with wood interiors and with several low-maintenance exteriors, such as aluminum cladding, fiberglass or vinyl. If the customer prefers the historic look of a wood exterior, that's also possible.

Good quality windows are available in all of these different types. Help the client by choosing a window that's in keeping with the architectural style and period of the house, and make sure the window meets size and performance specs for the climate and any applicable codes. One other consideration—if the homeowner plans on using an AC unit in a window, stay away from casements and awning windows. Beyond that, it's really a matter of personal preference.

# Matching windows to the style of the home

Builders have a lot of window options to choose from. Some window types are adaptable to different architectural styles, but others may look out of place when used in a type of house where they are not usually found.

On houses patterned after traditional Colonials, hung windows work best, says Stacy Seelye, Pella's Architectural Program Manager. Strictly speaking, that window historically would have had a single pane of glass. But in modern interpretations of historical styles, an insulated glass unit would be typical. Older windows would have come with a number of individual panes of glass in a single sash, a style called true divided lite, but new windows can mimic the look with applied grilles.

Historic windows were made with mortise-and-tenon joinery and butt joints, Seelye says. There were no mitered corners. That look can be duplicated today, right down to decorative elements called sash lugs below the check rail, only with up-to-date materials and the performance of insulated glass.

"Historic windows, obviously, had more wood and less glass whereas contemporary windows have significantly more glass and less profile," she says.

At the other end of this style spectrum is the contemporary house, Pickett says. For modern designs, clean lines, narrow frames, and uninterrupted areas of glass are typical characteristics. These windows won't have grilles at all. "On a modern window, it's about having really simple, refined details and as much glass as possible," Pickett says. "Modern windows are really about making the window go away."

In between historic and contemporary styles are what Pickett calls transitional houses, which may borrow elements from either historical or contemporary styles. For example, a farmhouse Pella recently worked on had windows with the traditional proportions of a hung window but were actually made as casements because the design called for more modern lines.



With traditional, it's a blended environment: You can have historic details on the outside and modern interior detailing.

Another popular style, the Craftsman Bungalow, would take a hung window, says Seelye, with an exterior profile that looks like traditionally applied window putty and a more elaborate ogee profile on the inside. In its day, the Bungalow window would have been all wood, but a modern rendering can include the correct ogee pattern in wood inside and an aluminum clad exterior that looks like a putty-knife profile. Applied grilles take the place of divided-lite sash.

The frame material also can be an important choice in correctly interpreting an architectural style.

A vinyl casement window, for example, would not be Pickett's first choice on a Craftsman-style house. "Craftsman was all about the wood details and intricate detailing on the inside and outside," he said, "and you want that to go right into the windows."

Pickett sums it up this way: Style is a spectrum that starts with historic homes on one end and runs to modern projects on the other. Older homes had hung units and modern homes have casement or awning units. In the middle, transitional homes can draw on any of those window types.

"That's what makes transitional interesting," he says. "You can have historic details on the outside and modern interior detailing. This is a blended environment. Windows live on both the outside and the inside."

## Special cases: historic and high-performance homes

Window selection can get more complicated when the house is located in an area where decisions are subject to approval by a local historic preservation board. This is mainly a situation limited to renovations and restorations, rather than new construction, but it takes careful planning, research, and possibly help from a design professional to successfully complete the project.

The National Park Service publishes the standards for choosing windows in historic districts, although local boards are the ones who interpret the rules. Don't assume that window choices approved by one local board district will be accepted in another district, even when the age and style of the house are the same. Be sure to consult with local authorities in advance, and be prepared to produce a detailed proposal on how windows will be handled.

Keep in mind that the National Park Service, and possibly many local boards, favor repair over replacement, even when windows are not in the best condition, and repairs may be complicated and expensive. Windows in prominent locations, and windows in historically important buildings, will get closer attention.



Still a relatively small part of the market, houses built to the Passive House or Zero Energy Ready standard are a special case. Here, window performance is even more important because the house will have to meet strict metrics on energy consumption and air leakage. Both the Germany-based Passive House Institute and its U.S. counterpart, the Passive House Institute U.S., require that houses be tested with a blower door and meet strict air leakage limits that are far lower than an average built-to-code house. In these cases, window selection will probably be guided by energy modeling software. That means you'll have to enlist the help of a specialist, if one isn't already onboard.

Even if you're not building to that exacting standard, keep in mind that helping your clients invest in

better quality, better insulated windows can help them save money by allowing smaller and less expensive heating and cooling systems. Boston-area architect Steve Baczek puts it this way: "With much better performing windows, I can sometimes do one \$5000 minisplit HVAC system instead of a \$30,000 ducted distribution system."

Choosing windows that best serve the client's interests may take a little homework, but the rewards are many. No matter what the locale, the house will be more comfortable in both summer and winter. Appropriately selected windows will save the customer money by lowering heating and cooling bills, a benefit the homeowner will enjoy for as long as they live in the home. And builders who take the time to recommend windows that are architecturally accurate will be helping the customer get the best long-term value possible from their investment.

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