

TOOLBASESM TECHSPECS

Panelized Wall Systems

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TECH @ A GLANCE

BENEFITS (+) / DRAWBACKS (-)

- + **AFFORDABILITY:** Reduced on-site construction time; reduced labor costs
- + **QUALITY/DURABILITY:** Increased product consistency; potential resistance to earthquakes, high winds, debris impact, moisture, and rodent/insect infestation
- + **ENVIRONMENTAL PERFORMANCE:** Provides increased soundproofing and decreased noise pollution for the indoor environment
- **AFFORDABILITY:** Material costs are higher, requiring higher up-front cost; once panels are designed and produced, changes in layout and openings are difficult and costly

INITIAL COST

Initial costs can vary by panel type, the amount of customization needed, and job proximity to manufacturing plant. In general, panelized wall systems have higher material costs and lower labor costs than traditional stick-built construction.

OPERATIONAL COST

Panelized systems can offer an improved thermal insulative barrier, which can result in lower heating and cooling costs.

CODE ACCEPTANCE

For proprietary walls systems, each manufacturer must obtain individual code approval for its product, and many have done so. Some jurisdictions require an engineer's review and seal of the structural design, which usually can be obtained through the manufacturer.

RESULTS FROM THE FIELD

Field evaluations have demonstrated higher material costs, but reduced labor costs.

WARRANTY

Warranties vary by manufacturer.

MAKING THE SWITCH

Prefabricated panelized systems require additional planning to ensure that panels are manufactured to specification. However, they are generally easy to install, and many systems can provide significant labor savings.



THE BASICS

Panelized systems consist of prefabricated, or factory-manufactured, panels that form a structural envelope, and significantly simplify on-site framing.

A variety of panelized systems are available. The most common, structural insulated panels (SIPs), are detailed in a separate Tech Spec write-up. Other panelized systems include light-gauge steel, aluminum, concrete, and fiberglass components.

The systems can provide structural and insulating capacity, and most lend themselves to quick on-site assembly, which can reduce labor costs. Different systems offer various additional advantages; they may be lightweight or constructed to provide resistance to damage from earthquakes, high winds, debris, moisture, and insect infestation.

Installation techniques differ by manufacturer, but many include connections along the top and bottom of the panel and at adjoining panel edges. In general, manufacturers must obtain individual code approval.

Panels are manufactured in a factory, which ensures their quality and consistency, but may limit flexibility. For example, concrete foundations must be placed precisely, and on-site design changes can be costly and difficult. The initial cost of prefabricated panels may be higher than that of conventional framing materials. However, labor savings are often significant enough to offset the initial cost difference.

DOLLARS AND SENSE

Total cost for panelized wall systems should be the **same or less than conventionally framed construction**, depending on design. There should be significant labor cost savings. Additional design time may be required, and manufacturers often charge \$500-\$1000 to provide an engineers seal on a panel layout.

For example, Howard Building Company documented a **43% increase in materials** cost using Thermasteel™ wall panels. Labor time, however, was **reduced 48%** over conventional framing. In this case, the panelized system cost more; energy savings were projected to provide a **simple payback of 6 years**.

DEFINITIONS

EPS

Expanded polystyrene foam, a rigid foam insulation.

Prefabrication

Manufacture of structural components offsite in a factory-controlled environment. Panels are not exposed to weather conditions during fabrication, and are delivered to the job site ready to be assembled.

SIPs

Structural insulated panels (SIPs) are panels made from a thick layer of foam (polystyrene or polyurethane) sandwiched between two layers of Oriented Strand Board (OSB), plywood or fiber-cement board, and are the most common type of panelized construction. SIPs are detailed in a separate Tech Spec report.



RESULTS FROM THE FIELD

This technology has been used by other builders in real-world building situations – learn from their experiences.

Roanoke, Virginia, Premium Steel Building Systems (Mid-Atlantic Steel Framing Alliance)

- Took 0.1 hours per square foot to erect this typical panelized steel framed home
- Framing labor cost per square foot was \$1.72
- Cost per square foot would have been reduced to \$1.54 per square foot, if cost of the panelized foundation walls was excluded



Rougemont, North Carolina, Howard Building Company (PATH Field Evaluation)

- 3,100 square-foot raised ranch was constructed of Thermasteel™ wall panels, which consist of EPS core panels with steel framing elements
- Panels measured 4' x 8' x 5 1/2" at basement walkout walls and 4' x 8' x 3 1/2" at first floor walls; panels custom fabricated to builder's plan with 24-gauge, G-90, galvanized steel channels and EPS foam
- Initial cost of panel was approximately 43 percent more than estimated cost of materials for conventionally-built wood walls
- Project showed 48 percent labor savings attributed to using the panels



MAKING THE SWITCH

What is required to transition from your current building practices to using this technology?

Review local codes – Consult your local code requirements pertaining to panelized systems before selecting a system. Be sure to find out if an engineers stamp will be required on panel layouts.

Select a system – There are a wide range of panelized systems available offering various performance advantages. Consider proximity, easy of installation, compatibility with your home designs, design assistance, and local codes when reviewing manufacturers. Many systems also provide advantages that may be particularly valuable in some areas, such as resistance to termite and insect infestation, high wind, wind-borne debris, and earthquake damage. Detailed use guides are available at each manufacturer's website, or upon request.

Review your home designs - Panelized homes may be produced from pre-designed configurations or customized to fit the builder's design. For custom designs, the manufacturer uses the builder's architectural plans to create shop drawings, which are then sent to the builder for review and approval. Changes can be made easily at this stage. Some regions require a stamp from a licensed structural engineer. The manufacturer may be able to provide engineering for an additional fee.

Revise your schedule - Once plans are approved, the manufacturer will begin production. Production turn-around time depends on the manufacturer's current demand as well as the

FOOD FOR THOUGHT

This section provides some things to think about before switching to this building technology – make sure it's the right choice for you.

Because panels are precisely prefabricated to specifications, their on-site flexibility is limited. Making alterations to the home's design on site can be very expensive or unfeasible. Additionally, if the foundation is not poured precisely, it will have to be redone or gaps will have to be patched in the panels. Using panelized foundations can prevent this.

The cost of designed and prefabricated panels can be higher than the cost of conventional framing materials, depending on the design. However, installing panelized systems often results in labor savings that are substantial enough to offset higher initial cost.

Although panelized systems are comparatively easy to assemble, trades may require some additional training. Some manufacturers may require that

only their own certified installers can assemble the panels. Additionally, because the systems can significantly reduce air leakage, mechanical ventilation may be required.

Some local codes may require a stamp from a licensed structural engineer. The manufacturer may be able to provide engineering or local recommendations.

Panelized construction offers benefits for many climates. Because they are prefabricated in an indoor factory setting, they can be constructed any time of year, and are not subject to weather delays.

Panelized systems can be designed to offer a uniform and continuous air barrier that improves insulation and helps homeowners stay comfortable while reducing their heating and cooling costs.

Improved insulation helps homeowners reduce energy costs, and provides builders with an additional selling point. Several also provide additional benefits – such as resistance to damage from earthquakes, termites, or high winds and debris - that add regional value.

The systems have gained popularity among production builders because of their ability to reduce framing errors and improve schedules.



MAKING THE SWITCH *continued*

complexity of the home's design. Most panelized homes can be constructed quickly; generally the shell is assembled within a few days.

Tools- A light crane may be needed to lift panels. Otherwise, basic framing tools are usually all that is needed. Check your system for more detail.

Examine shipping options - Following their production, panels are shipped directly to the jobsite. The manufacturer usually provides shipping, but may allow the builder to arrange their own delivery.

Work with your trade contractors – Review the new technology and sequence of construction with trade contractors to avoid conflicts during your first installation. Make plumbers, electricians, and HVAC contractors aware of systems that are entirely filled with insulation.

TECH CHECK

This checklist outlines the steps to follow if you decide to implement this technology in your next building project.

- Provide design information to manufacturer.** Manufacturers can produce panel kits based on pre-designed configurations or customized designs. Builders using customized designs should provide the builder with architectural plans. Complex custom designs will increase turn-around time.
- Evaluate installation procedures and guidelines.** Manufacturers may provide their own certified installers for panel assembly. Otherwise, most installers will require basic framing skills. Assembly details vary by manufacturer.
- Educate the Homeowner.** Review the unique construction of the home with homeowners. This will aid in future resales and remodeling efforts. Be certain to point out features such as metal studs or insulation filled panels that will affect their ability to customize their home.
- Prepare for design planning and review.** If using a customized design, manufacturers must receive detailed architectural plans in order to create shop drawings for panel production. Builders should be prepared to review the manufacturer's shop drawings carefully before production begins. Making changes after panels have been fabricated will be more difficult and costly.



The Partnership for Advancing Technology in Housing (PATH) is dedicated to accelerating the development and use of technologies that radically improve the quality, durability, energy efficiency, and affordability of America's housing. Managed by HUD, the PATH partnership includes the homebuilding, manufacturing, insurance and financial industries, and Federal agencies concerned with housing.

PATH addresses barriers to innovation, provides information on advanced building technologies, and advances housing technology research; making affordable, quality American homes a reality.

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Tech Specs are Prepared for PATH by the NAHB Research Center.

RESOURCES

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