Table 2 provides a summary of data collected during construction of the two 3,100 square foot triplexes discussed in this document. Five key indicators researched during this project provided the necesary information for conducting the economic comparison.

These included:

- man-hours needed to construct each triplex
- total consumption of lumber
- total consumption of OSB
- on-site lumber waste
- on-site OSB waste.

Table 2. Build Alberta construction data

	On-site Building Time	Lumber Consumption	OSB Consumption	Lumber Waste	OSB Waste
	Man-hours	FBM	Sq. Feet	FBM	Sq. Feet
Panelized	395	13,421	6,784	482	357
Stick Framed	551	13,107	6,912	745	570

Funding Provided By:

Alberta Government of Alberta

Western Economic Diversification Canada / Diversification de l'économie de l'Ouest Canada

With Participation From:

Alberta Truss Ltd. "The Truss Specialists Since 1982"

Buchanan Lumber, High Prairie, Alta.

Celtic Homes

Habitat for Humanity Edmonton

GLYNN Construction Ltd.

LaCrete Sawmills "Quality is our Priority"

LP Building Products

LTC Construction Inc.

Millar Western

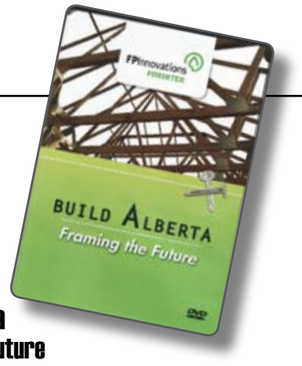
Palliser

Rocky Wood Preservers

Tolko Industries Ltd.

Vanderwell

West Fraser



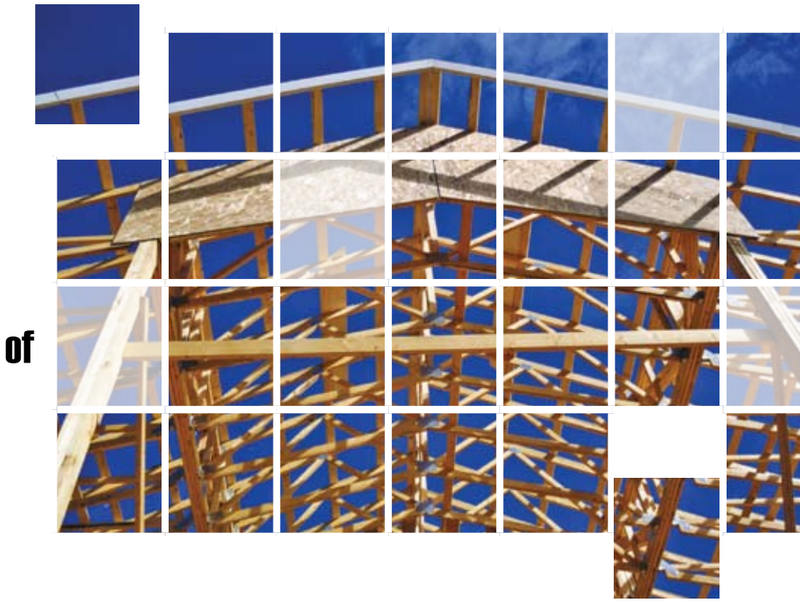
Build Alberta
Framing the Future

DVD available through FPInnovations – Forintek Division.
To obtain your copy, contact:

Dalibor Houdek
Secondary Wood Products Specialist
dalibor.houdek@fpinnovations.ca
Phone: (780) 413-9031

Rhonda L. Gibson
Industry Advisor
rhonda.gibson@fpinnovations.ca
Phone: (780) 413-9031

Build Alberta
Framing the Future



An Economic Impact Analysis of Stick Framed vs. Panelized Home Construction Methods through Case Study Analysis

High energy prices, strong employment gains, robust in-migration, and substantial capital investment projects have helped Alberta's economy surge ahead. Almost every sector of the economy has been operating at or near full capacity, and the construction sector is no exception. All aspects of construction activity in Alberta, particularly new housing construction, have been experiencing booms. While slowdowns have been long predicted, housing demand has continued to defy forecasts.

Despite this phenomenon, construction labour shortages have proven problematic for the industry. Labour shortages, combined with rising costs of materials, are already lengthening construction timelines and adding to project costs. With a tight housing supply, one might ask, "Is there a way to build houses differently to help ease the labour issue while not compromising quality?" Simply answered, "Yes!"

The concept of panelized home components is emerging as one of the most promising avenues in the homebuilding industry. Simply defined, it focuses on manufacturing buildings or building components in a controlled factory environment as opposed to on the building site. Various studies completed by FPInnovations – Forintek Divison and other research organizations have substantiated the benefits of panelized components which include reduced construction cycle time, labour requirements and waste disposal, along with improved framing quality.

While some regions of North America are using this construction technique successfully, the Alberta construction industry is only beginning to see its value, so most Alberta homes continue to be framed on-site using the conventional stick frame method. It remains the case that outside of the usage of wood roof trusses, panelized home components such as floor and wall systems, have not made significant inroads in Alberta's homebuilding sector.

In an effort to reach out to industry, Forintek, supported by the Province of Alberta and the Government of Canada, partnered with Habitat for Humanity to provide a hands-on approach to communicate the benefits of panelized component construction. Two identical triplexes were built side-by-side – one using conventional stick framing methods, the other with panelized wall components.

Here is what was learned.

The Task:

Build two identical triplexes (3,100 sq ft), side-by-side in Edmonton, Alberta

The Players:

Glynn Construction is building one triplex using the stick frame method; LTC Construction is building the other one using panelization

Day 1

LTC Construction began standing the exterior walls (right). By day's end, interior walls were in place. Glynn Construction framed and erected several exterior walls.

Day 4

LTC Construction started standing second floor walls, while Glynn Construction started building the second floor. In comparison, the panelized team gained two days over stick framing.

Day 6

LTC Construction began placing the trusses. By day's end, the roof was ready for sheathing. With Glynn Construction only standing second floor walls, LTC was about three full days ahead.

Day 9

Glynn Construction was unable to work today. Like most builds, there was a delay as some materials did not arrive on time. LTC Construction, however, was able to completely finish their build.

Day 12

Material for the second triplex arrived so Glynn Construction was able to start framing the roof. The roof was framed on the ground in three sections that were braced for lifting.

Day 13

It rained for several days and as a result, the site was too muddy for the crane to set up. It took extra time to stabilize the crane so that the roof could be lifted safely into place.

Day 15

Glynn Construction finished sheathing on the roof. They completed the clean up and the last inspection of the frame before leaving the site. Both buildings were framed.

Finished Product

With both homes nearly complete, no visual differences are evident despite the different styles of framing.

With both builds complete, the results were analyzed. Delays caused by material delivery were excluded from the results to ensure fair evaluation. In a relative comparison between panelized construction (100% baseline) and traditional stick framing (Figure 1), results showed that panelization:

- was almost 40% faster than stick framing (man-hours used to lock up)
- generated nearly 55% less on-site lumber waste and 60% less sheathing waste
- used virtually the same amount of material, with panelization using only 2.3% more lumber but 1.8% less OSB.

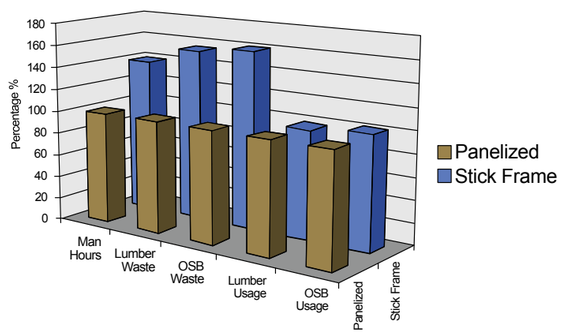


Figure 1. Relative comparison between panelized and stick framing technologies

While the side-by-side cost comparison between panelized and stick frame methods shows that panel cost and distance of the building site from the panel manufacturing facility can play a key role in the economic benefit to a builder/framing contractor, there are other factors that give an advantage to panelization. The savings in time (i.e., labour) resulted in a significantly faster lock-up for the panelized unit. The increased speed of framing provides significant benefits to a builder/contractor despite a relatively small difference in the project cost between panelization and the stick frame method (Table 1).

Table 1. Cost comparison of panelized and stick framed methods

	Panelized	Stick Framed
Lumber [1]	$2,439	$7,150
Panels [1]	$10,247	$0
Transportation [3]	$1,630	$220
Labour [4]	$17,775	$24,775
Tipping Fee (Waste) [2]	$56	$85
Roof & Floor System [2]	$12,500	$12,500
Crane [2]	$800	$800
Total	$45,447	$45,530

[1] Average price quoted by multiple suppliers. [2] Estimate. [3] Average price quoted by multiple suppliers assuming transportation distance of 25 km for the stick framing material package, and 250 km for the panelized package. [4] Calculated based on man hours needed to complete each unit at $45/man hour.

So what does the increased speed of framing mean for a builder/framing contractor? It has long been argued that the benefit of using panelized walls (or any prefabricated component) lies in volume. The more homes that can be built in a given time frame, the more profit a builder will realize. The Build Alberta project clearly demonstrates this.

Using data collected from this project, it can be projected that a framing contractor using panelized walls could potentially build 25 triplexes in a year, while a contractor using the stick framing method could only build 18 units. Given the total per-project cost is nearly identical for both systems, and an estimated 15% profit margin assigned, the crew using panelized walls would gross 28% more profit in a given year based on higher volume of units built with the same number of workers (Figure 2). The total profit gained could be further increased if the builder/framing contractor also owned its own component plant, as both trusses and wall panels have profit margins included in their price.

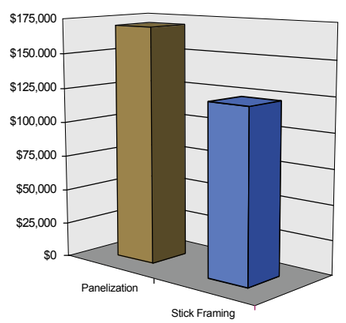


Figure 2. Estimated annual profit of five-man framing crew using different construction methods

Although panelization can be utilized in single-family, multi-family or commercial construction, there are factors to consider before panelized construction can be chosen. These include:

- Site conditions – panelized walls take up more space than lumber. Building sites need adequate space for panel storage otherwise a just-in-time delivery system must be set up.
- Labour pool – builders working with a small crew per site are ideally suited for panelized wall utilization as less workers are needed for stand up.
- Scheduling and delivery – builders using panels need to adopt and learn how to organize the construction process using panelized walls. Planning, delivery, and execution require a different organization of scheduling and preplanning.
- Equipment – erecting panelized walls often requires the use of a zoom-boom forklift, which a stick frame builder may or may not need. With multi-storey construction, builders might even require a crane.