# Ontario gets tough on energy efficiency

## With EnerGuide 80 set to become Building Code standard in 2012, SIPs offer solutions to home builders and buyers alike

How happy would you be if you bought a new car knowing that in just two more years, the same model would instantly have 35% better fuel economy?

That's the dilemma facing today's new home buyers, only on a much bigger scale. The latest revisions to Ontario's Building Code kick in after January 1, 2012, introducing sweeping changes to residential construction, particularly as it relates to energy efficiency.

According to the Ministry of Municipal Affairs and Housing, homes built in 2012 will be 35% more efficient than when the OBC was last overhauled in 2006. All homes with building permits applied for in 2012 and beyond will be subject to the new requirements.

### EnerGuide 80: What it means

So how is the Building Code expected to achieve such significant improvements in efficiency? Quite simply by adding actual performance criteria to the Code: Ontario will join British Columbia as the second province to mandate an EnerGuide 80 energy efficiency rating.

The "80" refers to a rating on the 100-point EnerGuide Rating System scale, administered by National Resources Canada's Office of Energy Efficiency (NRC OEE). A zero represents a home with major air leakage, no insulation and extremely high energy consumption. On the other end of the scale, a rating of 100 represents a house that is airtight, well insulated, sufficiently ventilated and requires no purchased energy on an annual basis.

**EnerGuide Efficiency Ratings**

| Type of House | Rating |
|---|---|
| New house build to building code standards | 65-72 |
| New house with some energy-efficiency improvements | 73-79 |
| Energy-efficient new house | 80-90 |
| House requiring little or no purchased energy | 91-100 |

*Source: National Resource Canada's Office of Energy Efficiency*

ENERGUIDE FOR NEW HOUSES

*EnerGuide for New Houses is a trademark of Natural Resources Canada.*

A rating is only awarded when a home is fully constructed, after a certified energy advisor inspects the house to verify any energy efficient upgrades and performs a blower door test. Using collected data and energy simulation software, a rating will be issued, complete with an EnerGuide label for the homeowner to affix to the electrical panel door.

Mandating EnerGuide 80 is quite a departure for Ontario's Building Code. Traditionally, building codes mandate specific material inputs (for example R-19 insulation for exterior walls) and construction methods. Now for the first time, the code looks at the house as a full system, after (not during) construction. It's a bold new approach that acknowledges a key principle of building science: that energy usage is a complex interdependency of many factors, such as insulation, building envelope design, windows, heating/cooling systems, air tightness and more.

> *"...you need to ensure that your new home is built to the newest standards; otherwise your investment is at risk."*

### EnerGuide 80: Is it practical?

How practical is the EnerGuide 80 approach? Despite the fact that many foresighted builders have been promoting and building to EnerGuide ratings for years, the building industry as a whole opposed the E80 requirement from the outset. The Ontario Homebuilders Association argued that the new regulation *"was not going to give municipalities, builders and consumers the kind of surety that they have come to expect from the Building Code."*

The Canadian Homebuilders Association was even blunter: *"The CHBA strongly opposes the use of the ERS as a regulatory tool for new homes, incorporated into provincial building codes."*

Reading between the lines, how could a builder be absolutely certain any new build would reach an 80 rating? What if a new house only measured a 79? Would that home not be "to code"? The Ministry itself admitted that *"should the rating achieved fall below 80, it is unclear what remedial measures, if any, can be incorporated to ensure the building meets the minimum provisions of the Building Code."*

And with only a handful of Certified Energy Advisors listed on NRC's web site, how could they possibly manage to audit the tens of thousands of new homes built each year across the province?

Enter the "prescriptive standards" amendment. In late 2009, the Ministry of Municipal Affairs and Housing introduced an alternative stream for compliance. If a builder chose not to take their chances on an EnerGuide study, they could follow a series of guidelines designed to "substantially" comply with E80 standards. This approach was much more familiar to builders, since it specifies precise materials and methods during the building process.

### Complying With Code: Two Approaches

**Performance Path:**
A new home must rate 80 or more on the EnerGuide scale

**Prescriptive Path**:
A builder must build with specified materials & methods

Exterior wall insulation, for example, must be rated at R-24 to R-29 (depending on which of the 10 "compliance packages" is used), a significant jump from the current standard of R-19.

The prescriptive path provides experienced and less-experienced builders alike the kind of detailed guidance they may need to build better performing building envelopes.

Judging by the experience in B.C., the vast majority of home builders in Ontario are expected to build to the prescriptive path, not the EnerGuide 80 performance path.

## 2012 and beyond: what should you do?

Any debate on the merits of performance vs. prescriptive is moot. The changes to the code come into effect on January 1, 2012, and whichever path builders take, new homes across Ontario will be much more energy efficient than their predecessors. With escalating energy costs, depleting fossil fuel resources and climate change, the 2012 OBC changes are more than welcome.

But what should a prospective new homeowner do with 2012 on the horizon? Well the most important thing is get a jump on the upcoming OBC. Just like the new car analogy in the opening of this article, you need to ensure that your new home is built to the newest standards; otherwise your investment is at risk.

Beyond the immediate and ongoing savings from living in a more efficient home, the resale potential of a 2012-compliant home is considerably higher than the equivalent home built to 2011 standards. So tell your builder to build with 2012 in mind. Sure, tract builders are notoriously reluctant to alter their building habits, but they'll have to one way or another come 2012. Some may even welcome the opportunity to get a jump on their building methods and enhance their marketing message.

## Why build with SIPs – prescriptive approach

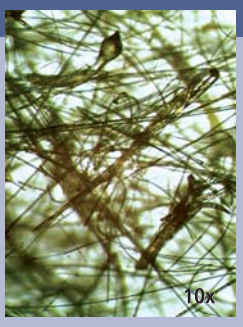
The prescriptive requirements for exterior wall insulation is anywhere from R-24 to R-29, a considerable increase from the current R-19 requirement. Fiberglass batt insulation typically has an R-Value of 3.25 per inch, so reaching R-19 with 2x6 framing is easily achievable. But reaching even R-24 within a 5½ inch wall cavity requires premium high-density fiberglass batts, or an outside layer of extruded polyurethane foam insulation board (a one inch thick board supplies an R-5). Reaching R-29, obviously, involves an even higher material cost.

Ultimately the better way to build is to start looking to alternative insulations. Open-cell fiberglass batt insulation appears to have reached its limits in thermal resistance, so closed-cell materials emerge as the best way to achieve the higher R-values

### UNDER THE MICROSCOPE

**Fiberglass Insulation**

Fiberglass insulation consists primarily of air trapped between strands of molten glass, as seen under a microscope at 10x. It is an OPEN CELL insulation, since the air pockets are not fully enclosed and air can enter and escape the system freely.




**EPS Insulation**

In comparison, the EPS used in Thermapan SIPs is a CLOSED CELL insulation. Air within the system is permanently trapped, giving the EPS its rigidity and preventing any air or moisture leakage whatsoever.

mandated by the OBC's prescriptive path. Expanded polystyene (EPS), used in the core of Structural Insulated Panels (SIPs), is one of several closed-cell insulations that puts fiberglass to shame.

In a nutshell, the E80-alternative prescriptive requirements strengthen the already formidable case for building with SIPs. With an R-29 rating, a 6.5" exterior wall panel meets or exceeds all 10 compliance packages, without requiring premium fiberglass or additional foam board.

**Table 1: OBC R-Values: Current vs. EnerGuide 80 Equivalent**

| | Current Ontario Building Code | EnerGuide 80 Minimum | Thermapan Solution (Panel Thickness) | Thermapan Solution R-Value |
|---|---|---|---|---|
| **AREA OF HOME** | | | | |
| Exterior Wall | R-19 | R-24 to R-29 | 6.5" | R-29 |
| Foundation Wall | R-12 | R-20 (full height) | 8.25" | R-37 |
| Vaulted Ceiling | R-30 | R-31 | 8.25" | R-37 |

When it comes to basements, the 2012 code will now require full height insulation for the first time, with R-20 as the new standard. This too makes PWF foundation SIPs very attractive, as they replace concrete foundation walls, provide an impressive R-37 rating and eliminate the need for any basement framing to contain insulation.

As these examples suggest and as demonstrated in Table 1 there is an ideal SIP solution for every new prescriptive compliance package under the 2012 rules.

In addition to more costly materials, the prescriptive approach also requires significantly more labour, particularly in ensuring continuity of a home's air barrier system. Currently, the Code clearly states that all air barrier joints and penetrations must be sealed. The 2012 revisions go into considerably more detail on installation techniques, and explicitly mandate vapour barriers to meet the same requirements.

This attention to extreme detail favours SIP construction over traditional framing. With SIPs, the air and vapour barriers are easily achieved by sealing panel joints with tape, caulk or a poly strip. With stud framing, a continuous poly vapour barrier is required, and must be carefully sealed along the entire length of the top and bottom plates, plus anywhere the poly is interrupted.

The issue of vapour barrier penetration is even more problematic. Sealing around electrical boxes and plumbing cut-outs is straightforward, but what happens when the barrier is in place and drywalling begins? Hundreds if not thousands of drywall screws penetrate the poly and compromise the integrity of the barrier. This isn't an issue with SIPs. Because of the solid, rigid construction of a SIP, drywall screws can be driven into the panel without affecting its function as a vapour barrier – thus preventing moisture condensation within the wall cavity that can cause mould growth.

## Why build with SIPs – EnerGuide 80 performance path

While the prescriptive path is expected to be the approach most builders will take come 2012, they still have the option to follow the performance path. There are certain marketing advantages to this approach, since the official EnerGuide label on the electrical box becomes a guarantee to the home buyer that their new house performs to true E80 standards. The prescriptive approach, in contrast, may or may not reach an 80 rating.

As mentioned earlier, an energy advisor will assign an EnerGuide rating based on house plans and HVAC systems information that are inputted into energy modelling software. This is followed by an on-site inspection, to verify any energy-savings upgrades and to perform a blower door test for measuring air leakage.

The tightness of a building is measured by "air changes per hour", or how many times the entire volume of air in an area is exchanged in an hour. To qualify for an EnerGuide 80 rating, a house must produce less than 1.5 air changes per hour at a differential pressure of 50 pascals (1.5 ACH @ 50 PA).

### Typical Air Leakage Estimates

A blower door test determines the air tightness of a house by measuring how many "air changes per hour" will occur at a given differential pressure.

Average Ontario home
**6.5 ACH (50 PA)**

Average home, built 1900
**11-12 ACH (50 PA)**

Average home, built 1950
**9 ACH (50 PA)**

Average home, built 2000
**3 ACH (50 PA)**

EnerGuide 80 standard
**1.5 ACH (50 PA)**

Air leakage can represent 25-40% of home energy loss, particularly for older, less airtight houses. In traditionally-constructed homes using fiberglass batt insulation, leakage occurs through open cells of the insulation, as well through tiny cracks, gaps and openings throughout the lumber frame.

Poly vapour barrier is designed to minimize air flow between the inside and outside faces of the wall, but as previously discussed, punctures from drywall screws, electrical wiring and plumbing often compromise the integrity of the barrier. Furthermore, installers do not always seal the seams of the vapour barriers, reducing its effectiveness.

While it is true that new homes are being built more and more airtight nowadays, SIP construction provides giant leaps in tightness.The closed-cell insulation and rigid, continuous nature of a panel minimizes seams and gaps, and consequently air leakage.

A 2001 Brock University study compared the air leakage of two side-by-side homes, identical in construction except that one was built with 4.5" SIPs and the other with 2x6 studs. The SIP house, with 1.55 ACH @ 50PA, significantly outperformed its neighbour's measurement of 2.60 ACH @ 50PA.

In a Brock University study conducted by Dr. Tony Shaw, the house on the left (built with SIPs) was 33% more energy efficient than the house on the right (built with traditional lumber framing)

The fact that the SIP home came very close to the E80 performance standard of 1.5 ACH @ 50PA was impressive considering that the panels were 4.5" thick, were assembled without caulked/sealed joints, and the home's ceiling was insulated with typical fiberglass materials. Moreover, the house was built to an earlier building code, as was in effect in 1997. It is also important to note that the 4.5" wall SIP house was 33% more energy efficient over the 2x6 R19 wall house.

Air tightness is ultimately a factor of many aspects of a home: materials used, attention to detail in installing vapour barrier, careful sealing of windows, doors and other openings, and more. But clearly one of the most important decisions a homebuyer can make to help improve tightness and reach EnerGuide 80 standards is to build with SIPs.

## Looking ahead

2012 is just around the corner. Regrettably, the provincial government and homebuilding industry alike have done little to educate the public about the implications of the new building code requirements. Prospective homebuyers must be serious about protecting their investment, and that should start by convincing their builder to build to 2012 standards, even if the shovel hits the ground in 2010 or 2011.

It is also essential for new homebuyers to understand the difference between the Code's EnerGuide 80 performance path and its alternative prescriptive path. More importantly, by insisting on Structural Insulated Panels, homebuyers can protect their investment regardless of their builder's intended compliance path. The benefits are impressive: superior energy efficiency and increased home resale value down the road.

## White Paper Summary

- **New building code regulations come into effect starting January 1, 2012**
- **New homes must achieve an EnerGuide 80 performance rating**
- **Builders can bypass the performance approach by building to prescriptive standards requiring enhanced materials and methods for better energy efficiency**
- **Structural Insulated Panels (SIPs) are an ideal solution regardless of the chosen compliance path**

Thermapan Structural Insulated Panels

The better way to build.™

**Thermapan Structural Insulated Panels**
1380 Commerce Parkway, Fort Erie, ON, L2A 5M4
Phone: (905) 994-7399 | Toll-Free: 1-877-443-9255
www.thermapan.com | info@thermapan.com