Risky Business?

Assessing risks and applying objectives for "Alternative" approaches

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February 3, 2016

Designer and builder using "alternative methods and materials"

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Opposition to, disrespect for and disagreement with building codes

Without descending into a "slow-clap" moment…

I have a lot of respect for the codes.

I appreciate that codes have dramatically reduced injury and death due to structural failure and fire, and that buildings today are more comfortable, accessible and efficient now than at any other time in history.

Building code enforcement is about the best example of public service. You and your peers have made the lives of me and my family safer and better.

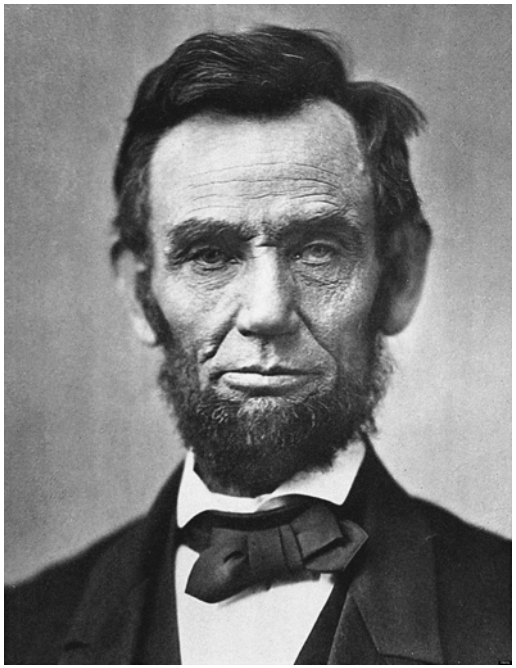
As a designer and builder, I take the codes *very seriously*

I want to design buildings that are:

- ***Safe (OS)***
- ***Protected (OP)***
- ***Accessible (OA)***

I would not cut corners here, and expect you feel the same. *(And you wouldn't let me, even if I did…)*

Q: When does a well-intentioned "alternative builder" run into code problems?



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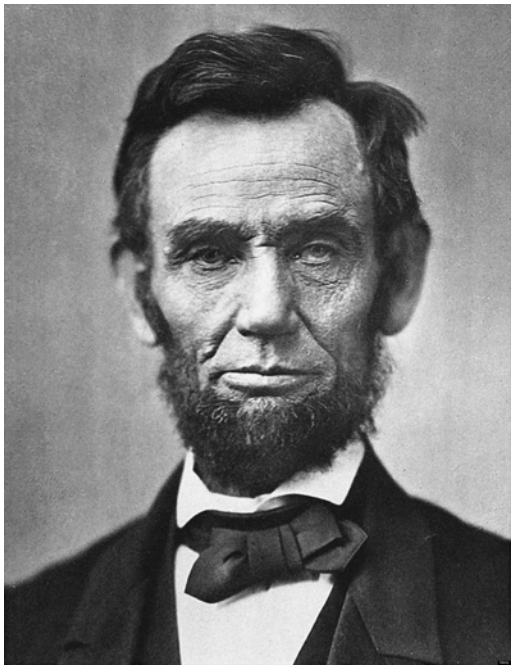

= *Code troubles ?*

A: When he tries to take the code twice as seriously as any "conventional" builder

Let me show you what I mean…

When it comes to Health:

OH 1.1 ***…an unacceptable risk of illness due to indoor conditions caused by inadequate indoor air quality.***

Our buildings:

We ensure that *no* questionable chemical content comes into our buildings. We install the best quality air handlers and filters.

OH 1.2 ***…an unacceptable risk of illness due to indoor conditions caused by inadequate thermal comfort.***

Our buildings:

We far exceed the code for insulation and air tightness, aiming for a minimum 70% better thermal performance and less than 1.0 ACH/50.

OH 1.3 ***…an unacceptable risk of illness due to indoor conditions caused by contact with moisture.***

Our buildings:

We provide permeable wall systems, modeled in WUFI and calculate the moisture storage capacity of interior materials to ensure that condensation will not occur. We also choose the best HRV/ERV units and filters.

Let me show you what I mean…

When it comes to Resource Conservation:

OR 1.1 ***…water resources will be exposed to an unacceptable risk of depletion due to the consumption of water.***

Our buildings:

We aim for a minimum of 50% water use reduction from Ontario average. We often use rainwater harvesting and/or grey water recycling. We do a water-intensity analysis of all material choices.

OR 1.2 ***…a resource will be exposed to an unacceptable risk of depletion due to the consumption of energy.***

Our buildings:

In addition to a minimum 70% energy use reduction from code requirements, we incorporate no fossil fuel use into our buildings. Renewable energy makes up at least 50% - and often 100% - of the energy make-up.

OR 2.1 ***…the capacity of the infrastructure supporting the use, treatment or disposal of a resource will be exposed to an unacceptable risk of being exceeded due to excessive demand on the infrastructure.***

Our buildings:

We have a policy of 80-90% less landfill from our projects, and we do a waste-intensity analysis of all our material choices.

Let me show you what I mean…

When it comes to Environmental Integrity:

OE 1.1 ***…the natural environment will be exposed to an unacceptable risk of degradation due to emissions of greenhouse gases into the air.***

Our buildings:

We do a carbon footprint analysis of every building, and aim to make zero carbon buildings. In many cases, our buildings are actually carbon negative.

OE 1.2 ***…the natural environment will be exposed to an unacceptable risk of degradation due to the release of contaminants, other than greenhouse gases, into the air.***

Our buildings:

Our material selection process examines all air pollution associated with materials, and we will not use materials that create output of red list chemicals, and limit the use of materials with questionable air output.

OE 2 ***…unacceptable risk of degradation due to excessive release of contaminants into water or soil.***

Our buildings:

Our material selection examines all ground and water pollution associated with materials, and we will not use materials that create output of red list chemicals, and limit the use of materials with questionable water and soil output.

It’s kind of like doing a science fair project that should win the Google Science Fair…

…And being beaten by the kid who does the old volcano project

Well, not really, because getting a permit is not a competition, and building officials aren’t judges. But we strive to uphold *all* the objectives of the code. Our environmental performance is driven by – and recognized by – the code, and not an “extra” that is outside code parameters .

Your jobs are about risk management

– *"to limit the probability of exposure to an unacceptable risk."*

When I bring you an "alternative solution," I understand that I am *altering* the risk exposure for you and the municipality. *But…*

I see a very different side to the risk assessment. I see my "alternative solution" as the ***less-risky option***.

OH 1.1

Accepted solution materials with high quantities of known red list chemicals (carcinogens, endocrine disrupters, neurotoxins):

- Spray foam insulation
- XPS and EPS
- Drywall mud
- Paint (even no-VOC)
- Vinyl windows and flooring
- Laminates
- MDF and particle board
- Urethane finishes
- Carpets
- Most caulking and adhesives (especially PL)
- OSB (a lot) and plywood (a bit)
- Fiberglass and mineral wool
- *…running out of room but the list goes on much longer…*

Alternative solution materials with red list chemicals:

- None. That's why we choose them.

In the San Antonio Statement*, over 300 leading health scientists from 30 countries asked for brominated flame retardants to be banned as the evidence of their bio-accumulation and potency is undeniable.* Worldwide production of HBCD, according to the United Nations Persistent Organic Pollutants Review Committee, totaled about 62 million pounds in 2012. About 90% of all HBCD is used for treating XPS and EPS building insulation.

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OE 1.1

Accepted solution materials with *very high* carbon emissions:

- Cement/concrete (world's largest CO_2 emitting industry)
- Foam insulation
- Fiberglass and mineral wool
- Brick
- Steel
- Vinyl
- Asphalt
- Glues and adhesives
- *…and the list goes on much longer…*

Alternative solution materials with very high carbon emissions:

- None. That's why we choose them.

Carbon footprint analysis of building shell, typical accepted solution home (1500 sf):

13.7 metric tons of CO_2

Carbon footprint analysis of building shell, "typical" alternative solution home (1500 sf):

3.4 metric tons of CO_2

75% reduction in CO_2

195,500 starts 2015 = 2,678,350 tons vs 664,700 tons

I see a very different side to the risk assessment. I see my "alternative solution" as the ***less-risky option***.

OE2 & OH2

Accepted solution:

Regular flush toilet hooked to sanitary sewer or approved septic system

Our friend the flush toilet has a failure rate of 100% in the home and ~100% in the environment

Alternative solution:

Composting toilet.

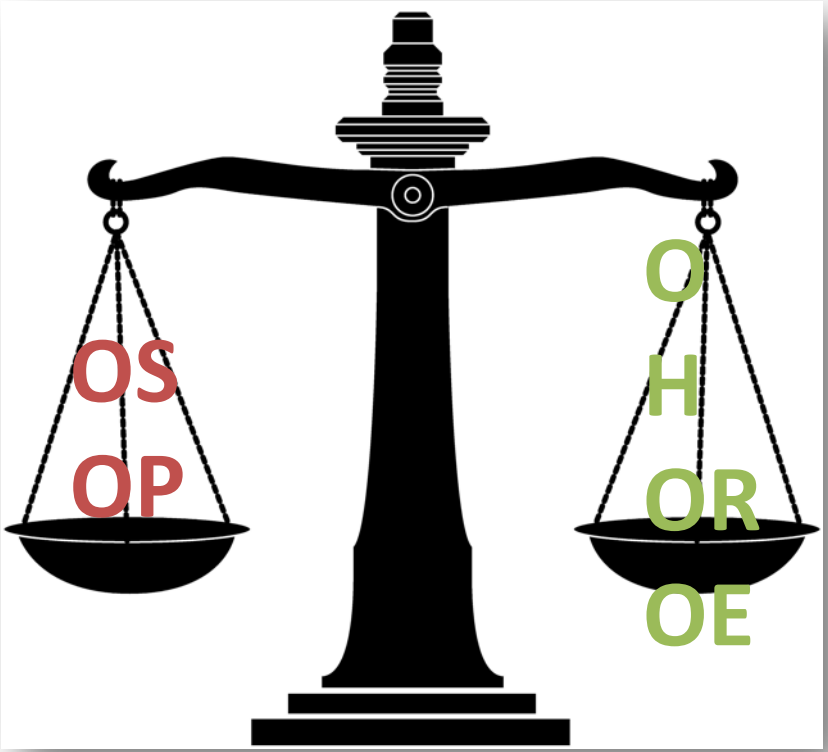
Number of issues reported by the US Centre for Disease Control related to grey water or composting toilets in the history of their record keeping: 0

"Over one trillion liters of primary or untreated sewage is collectively dumped into our [Canadian] waters every year by [the 21] cities evaluated in this report. This volume would cover the entire 7800 km length of the Trans-Canada Highway to a depth of nearly 20 meters – six stories high."

- Sewage Report Card 2, Sierra Legal Defense Fund Report, 1999

Balancing Risk

Hempcrete insulation: *3 different European fire tests show 75 minute fire rating and very low flame/smoke spread, no mold growth, excellent dynamic thermal & hygroscopic performance*



Hempcrete insulation: *Carbon sequestering, zero toxins, high moisture storage/release capability, zero waste*

Equivalencies, test results from other jurisdictions, past performance/precedent – when there is *reasonable evidence* here, the **risk to public safety is quite low**

Unaddressed issues of climate change, air and water pollution, exposure to toxins and construction waste – completely unaddressed, the **risk to public safety is quite high**

So, I'm going back to school in September, and my project is to create tools for use with the code to assist with assessing building applications for OH, OE and OR.

The idea is to use a similar format to the SB-12 form for energy efficiency. This puts the onus on the applicant to show that the building meets the energy efficiency requirements according to one of several compliance pathways.

I'm envisioning similar forms for carbon emissions and red list chemicals. These could be introduced with very low thresholds that can be increased at regular intervals, as has been the case with energy efficiency.

Energy Efficiency Design Summary
(Part 9 Residential)

This form is used to summarize the energy efficiency design of the project. Information on completing this form is on the reverse

For use by Principal Authority	
Application No:	Model/Certification Number

A. Project Information

Building number, street name		Unit number	Lot/Con
Municipality	Postal code	Reg. Plan number / other description	

B. Compliance Option

☐ *SB-12 Prescriptive* [SB-12 - 2.1.1.]	Table: Package: A B C D E F G H I J K L M Select O
☐ *SB-12 Performance** [SB-12 - 2.1.2.]	* Attach energy performance calculations using an approved software
☐ *ENERGY STAR®** [SB-12 - 2.1.3.]	* Attach BOP form
☐ *EnerGuide 80**	* House must be evaluated by NRCan advisor and meet a rating of 80

C. Project Design Conditions

Climatic Zone (SB-1):	Heating Equipment Efficiency	Space Heating Fuel Source		
□ Zone 1 (< 5000 degree days)	□ ≥ 90% AFUE	□ Gas	□ Propane	□ Solid Fuel
□ Zone 2 (≥ 5000 degree days)	□ ≥ 78% < 90% AFUE	□ Oil	□ Electric	□ Earth Energy

Windows+Skylights+Glass Doors			Other Building Conditions		
Gross Wall Area =	m^2	% Windows+ _____ %	□ ICF Basement	□ Walkout Basement	□ Log/Post&Beam
Gross Window+ Area =	m^2		□ ICF Above Grade	□ Slab-on-ground	

D. Building Specifications [provide values and ratings of the energy efficiency components proposed, or attach *Energy Star* BOP form]

Building Component	RSI / R values	Building Component	Efficiency Ratings
Thermal Insulation		**Windows & Doors**[1]	
Ceiling with Attic Space		Windows/Sliding Glass Doors	
Ceiling without Attic Space		Skylights	
Exposed Floor		**Mechanicals**	
Walls Above Grade		Space Heating Equip.[2]	
Basement Walls		HRV Efficiency (%)	
Slab (all >600mm below grade)		DHW Heater (EF)	
Slab (edge only ≤600mm below grade)		NOTES	
Slab (all ≤600mm below grade, or heated)		1. Provide U-Value in W/m2.K, or ER rating 2. Provide AFUE or indicate if condensing type combined system used	

E. Performance Design Verification [complete applicable sections if *SB-12 Performance*, *Energy Star* or *EnerGuide80* options used]

SB-12 Performance:
The annual energy consumption using Subsection 2.1.1. SB-12 Package_____ is_____Gj (1 Gj =1000Mj)
The annual energy consumption of this house as designed is_____Gj
The software used to simulate the annual energy use of the building is:_____
The building is being designed using an air leakage of _____ air changes per hour @50Pa.

ENERGY STAR: BOP form attached. The house will be labeled on completion by:

ENERGY STAR and *EnerGuide80*:
Evaluator/Advisor/Rater Name: Evaluator/Advisor/Rater Licence #:

F. Designers [names of designers who are responsible for the building code design and whose plans accompany the permit application]

Architectural	Mechanical

Form authorized by OHBA, OBOA, LMCBO. February 6, 2012

Building officials can be environmental heroes, using the code tools at their disposal to fight against climate change and embedded toxins, continuing the tradition of important public service work that benefits everybody

Thank you for your time.

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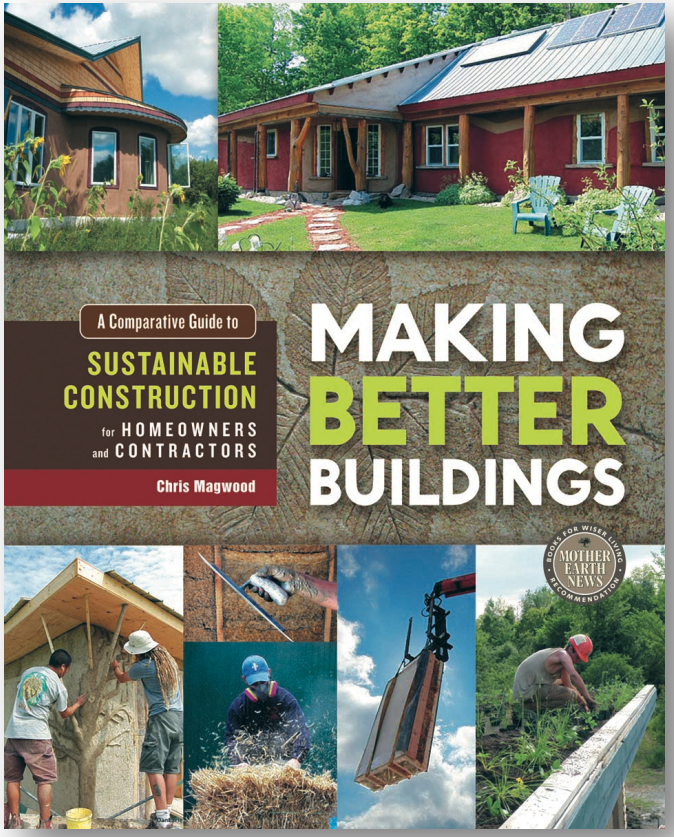
www.endeavourcentre.org



If you would like to learn more about "alternative" building materials, **Making Better Buildings** examines carbon, environmental impacts, embodied energy, energy efficiency, indoor air quality and durability information for a wide variety of structural and finishing materials and mechanical systems.