



innovative learning, building & living
presents:

Alternative Materials & Systems – the State of the Art **Bruce King seminar at Ryerson University, July 27, 2012**

Module 1:

1. Introduction

- a. What are “alternative materials and systems”? 1) as defined by building codes 2) in the context of history & vernacular building 3) in the context of climate change, peak oil, and toxicity concerns
- b. What are “normal” or non-alternative materials and systems? 1) the myopia of the Industrial Revolution 2) the rampdown of fossil fuel dependency
- c. How do we design and build with *any* material? 1) risk vs. uncertainty 2) anecdotal knowledge 3) testing knowledge 4) and just knowledgeable knowledge
- d. And we’re going to focus on:
 - 1) materials and some products for structure, enclosure and insulation 2) *not* systems such as HW, HVAC, electrical, lighting

2. Building Basics

- a. Binders – holding a wall together 1) with chemical bonds such as lignin, clay, cement, ceramics 2) with containment such as nails, sheathing, bale strings, mesh, tires
- b. Benders – spanning over your head 1) the cost and rarity of things that can span (resist bending) 2) Benders in Nature such as wood, bamboo
- the cheaters in the desert – arches, vaults and domes 3) Manufactured benders such as LVL, steel beams, reinforced concrete
- c. Barriers – keeping the rain out 1) Love those petrochemicals! Hate those petrochemicals! 2) Natural barriers such as clay, planks, leaves 3) Metal, the durable middle path
- d. Bubbles – staying warm 1) Insulation is captured air 2) Foams & blowing agents 3) Improving batts & spray foams 4) Natural insulations & insulation products

3. Mainstream alternative

- a. Concrete 1) A new definition 2) Cements & limes 3) Pozzolans - Industrial: slag, RHA, and the dreaded fly ash - Natural: calcined clay, natural (Roman) tuffs 4) Clays
- b. Insulating Concrete Forms 1) Interior concrete 2) Exterior concrete
- c. Structural Insulated Panels 1) OSB skins / polystyrene cores 2) Others

4. Not so mainstream alternative – the bleeding edge of ancient building

- a. Straw bale 1) structural 2) non-structural 3) behavior of plasters and bales 4) structural capacity 5) thermal behavior
- b. Earthen building (clay-based concrete) 1) Adobe 2) Rammed earth 3) Cob 4) Compressed earth blocks 5) Earth bag, tube & tire structures 6) Sprayed earth 7) Straw-clay 8) ASTM standard 9) Structural behavior 10) Thermal behavior 11) Hybrids
- c. Plasters 1) Lime 2) Clay 3) Fibers
- d. Bamboo 1) Mechanical properties 2) Joinery 3) Local? 4) Products
- e. Industrial Natural 1) Papercrete and other ---crete cement-bound systems 2) Shipping containers 3) Repurposed plastics 4) Concrete rubble

5. A big Las Vegas wrapup

- a. Trends & barriers b. Codes & Standards

Module 2:

"Getting it permitted" -- Alternative building materials and the codes

1. Introduction

a. What are "alternative materials and systems"? 1) as defined by building codes 2) As defined in the culture

2. Codes & standards

a. What are standards – professional consensus / industry standards / bogus standards / "standard of care" -- alphabet soup: ASTM, ANSI, ISO, UL, USGBC, FSC

b. What are codes – local, legal

c. Code officials and standards development

3. To permit, or not to permit – that is not the question

a. Why get a building permit?

b. Why not to get a building permit

c. Permit or not, design it right

4. Pitching your alternative material or system

a. To your self

b. To your engineer / builder / team "How to raise and train an engineer . . . "

c. To your building official

d. Taking thoroughly into account: 1) Seismic 2) Other structural concerns 3) Fire 4) Moisture durability 5) Ventilation 6) Thermal performance

e. Review: How do we design and build with *any* material? 1) risk vs. uncertainty 2) anecdotal knowledge 3) testing knowledge 4) and just knowledgeable knowledge

5. Failures and successes with permitting

a. Success stories with building permitting

b. "beyond code" stories, where regulations as written are inadequate, overreaching, or just plain misleading, and how both builders and regulators can adapt to these situations.

Module 3:

Integrative Design – the art of cat herding

1. Design

a. Beauty is in the eye of the beholder, but

b. Physics is physics

c. You lose when you fight, and you gain when you work with: 1) Climate – sun, wind, storm patterns 2) Earth – topography, soils, seismic hazard 3) Culture – what people like, what people know how to build 4) Place – what kinds of materials and skilled labor are available

2. Can we talk? Integrative Design

a. Bill Reed: Focus on the following four aspects from the top down, not bottom up: 1) Mental Model – design team - mindset, attitude, and will 2) Process – integrated, all parties engaged 3) Tools – metrics, benchmarks, modeling programs 4) Products / Technologies – stuff

b. Talk early, talk often, include everyone, listen for opportunity, repeat forever

c. This ain't rocket science

d. But it is a process

e. And it must be driven by the people writing the checks

3. How to reduce building impacts without even trying

a. Ain't no such thing as "zero energy building".

b. Get over it, move on and move towards zero energy

c. Why materials don't really matter

d. Why materials matter much, much more than you thought

4. The future of building

- a. This is not your father's mud hut
- b. Minestrone architecture
- c. Fun

For more information & to register:

<http://endeavourcentre.org/2012/07/engineering-outside-the-box/>