Six Layers:
A Framework for More Sustainable Building

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through design llc

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Learning Objectives

1. Apply a practical, holistic future-oriented definition of sustainability to building.
2. Review the basic concepts of integrated design.
3. Learn about the Theory of the Shearing Layers presented in the book book “How Buildings Learn/What happens after they’re built.”
4. Using lessons from the book “How Buildings Learn,” see how longevity and adaptability of a building affects its usefulness and sustainability.
5. Think about how the hierarchy in the layers can impact the longevity and usefulness of a building, both good and bad.
6. Understand the significance of the 6 Layers framework as a guide to help inform decisions in design and construction.

What's At Stake?

"Well, the first thing is that buildings consume a lot of resources. And I think most of us know that, but they don't realize the extent to which buildings use resources. It's the most consumptive kind of industry on the planet.

… And they also pollute, displace, and destroy habitats."

-Professor John Straube, University of Waterloo, 2009

Sustainability

"What we need to learn is to make not just any thing, but (to make) the right thing, and make it to last for as long as possible."

John Ehrenfeld, "Flourishing – A Frank Conversation about Sustainability"

“The Right Thing” according to the Whole Building Design Guide (c.2018)

“The main objectives of sustainable design are to reduce, or completely avoid, depletion of critical resources like energy, water, land, and raw materials; prevent environmental degradation caused by facilities and infrastructure throughout their life cycle; and create built environments that are livable, comfortable, safe, and productive.”

https://www.wbdg.org/design-objectives/sustainable

The Right Thing, Simplified

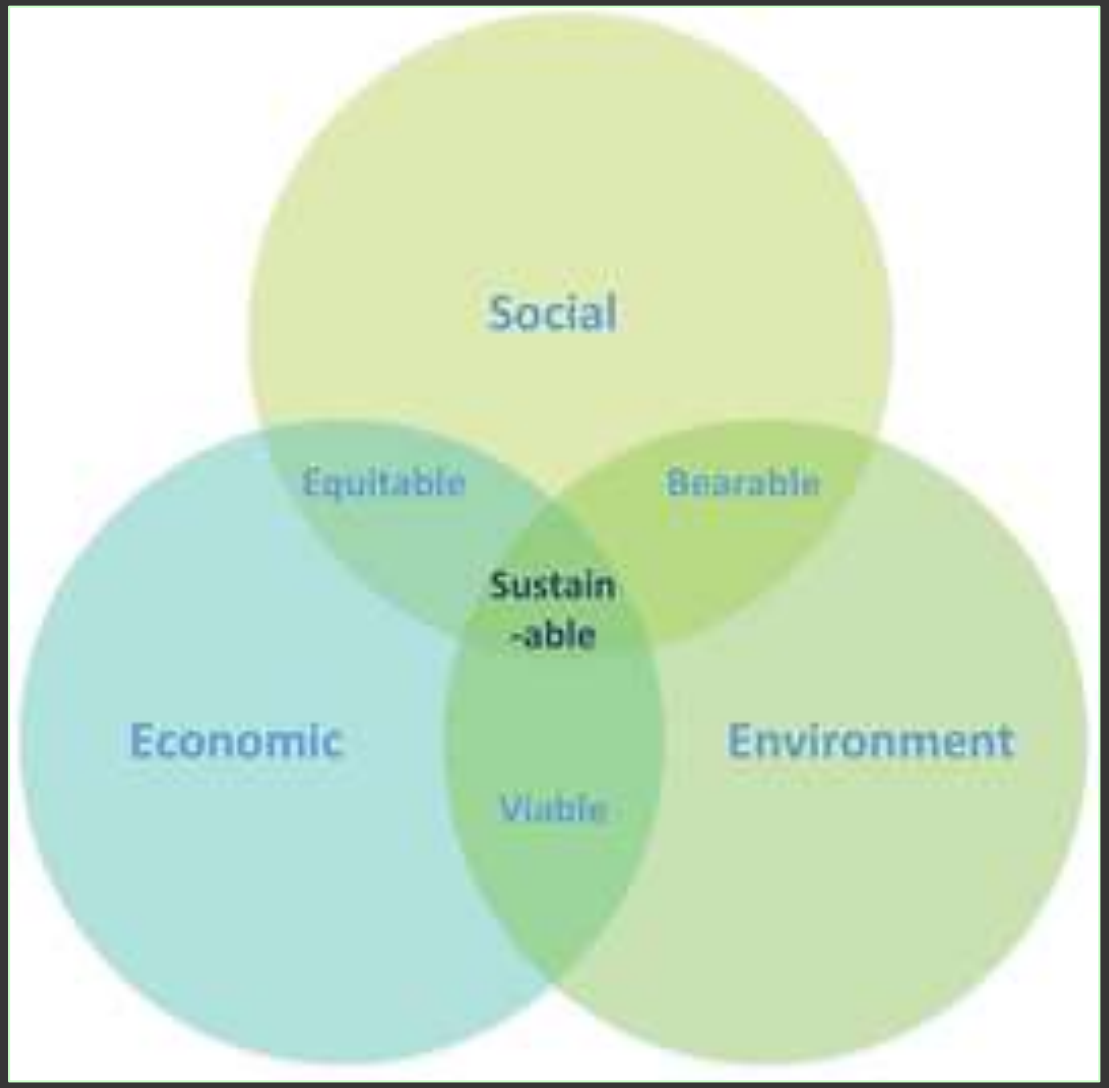


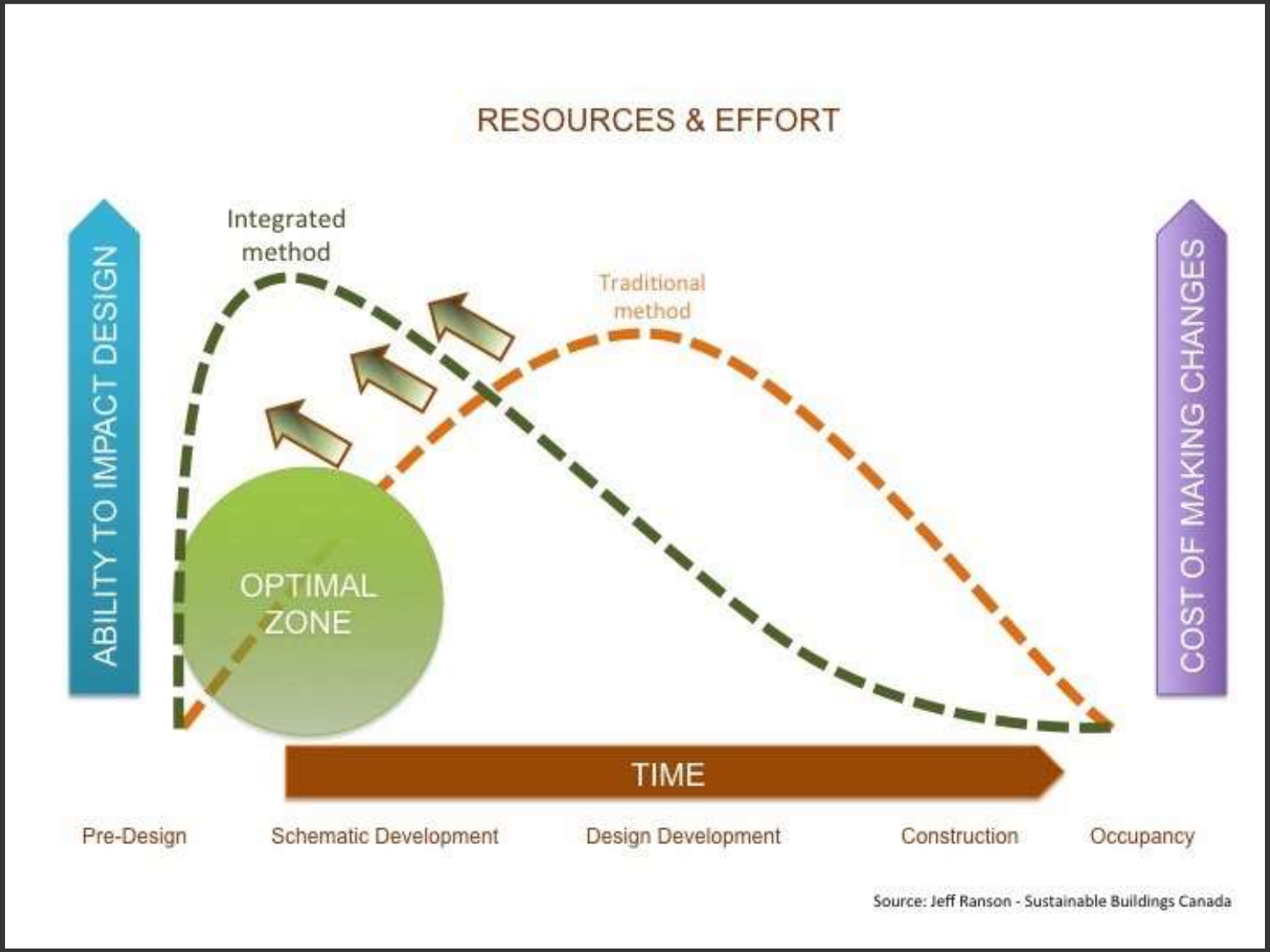
Image from circularecology.com

Integrated Design

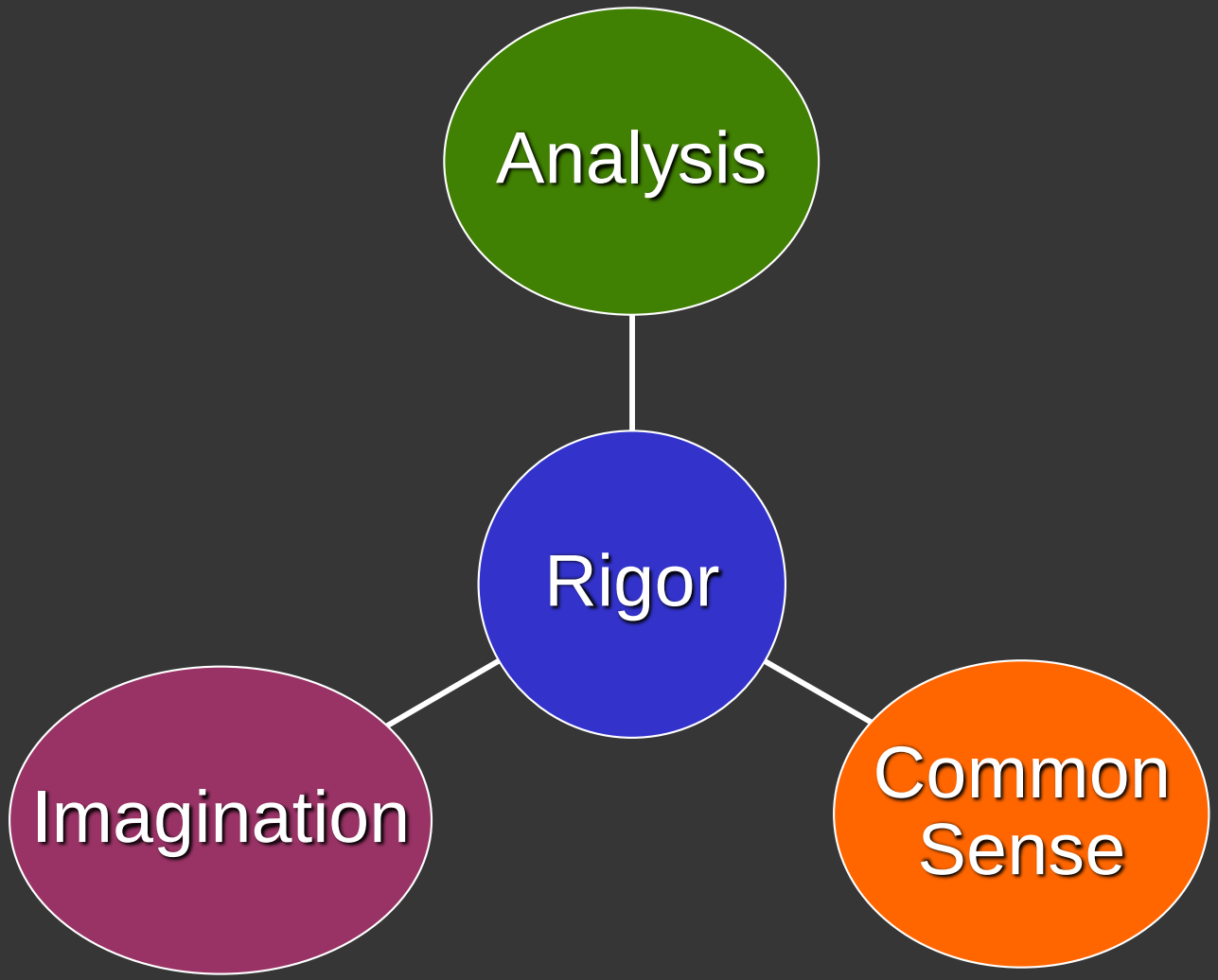
"When we try to pick out anything by itself, we find it hitched to everything else in the Universe."

- John Muir (1838-1914), engineer, naturalist

Think critically and early

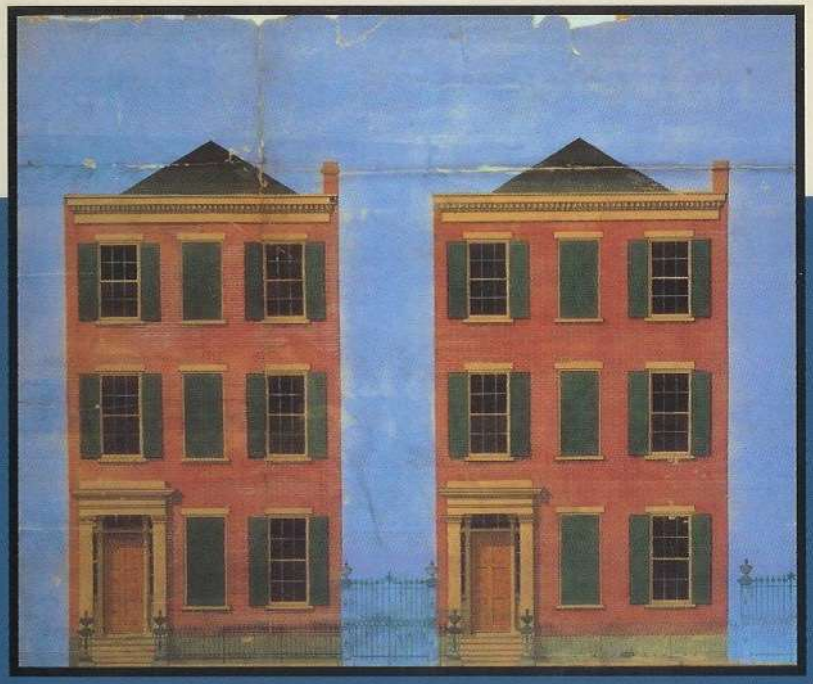


Critical Thinking



HOW BUILDINGS LEARN

What happens after they're built



New Orleans, 1857

The same two buildings, 1993

STEWART BRAND

creator of *THE WHOLE EARTH CATALOG*

Theory of Shearing Layers

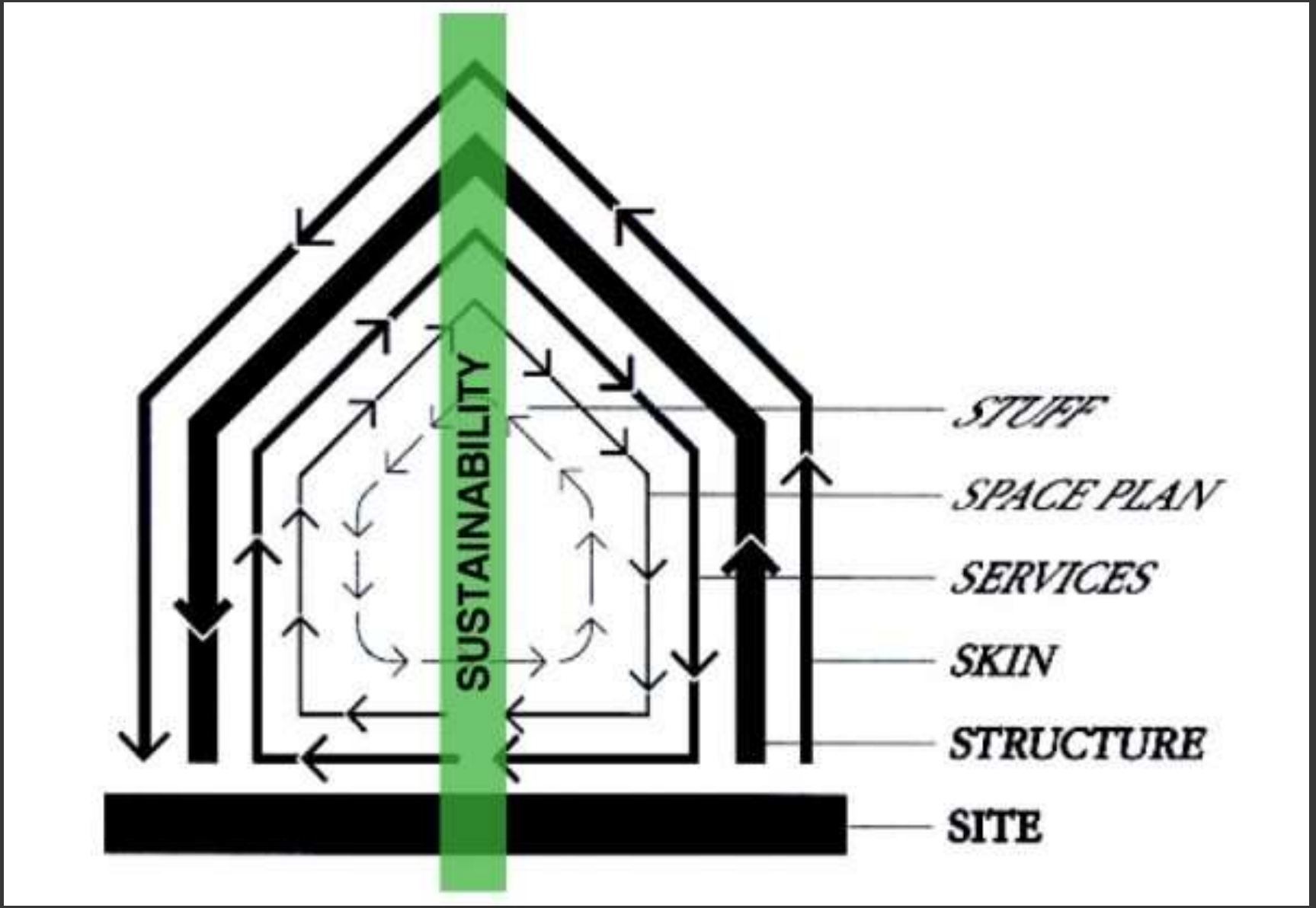


Image from communionarchitect.com

Shearing Layers of Change

"A building properly conceived is several layers of longevity of built components."

Frank Duffy, as told to Stewart Brand, "How Buildings Learn"

"Because of the different rates of change of its components, a building is always tearing itself apart."

Steward Brand, "How Buildings Learn"

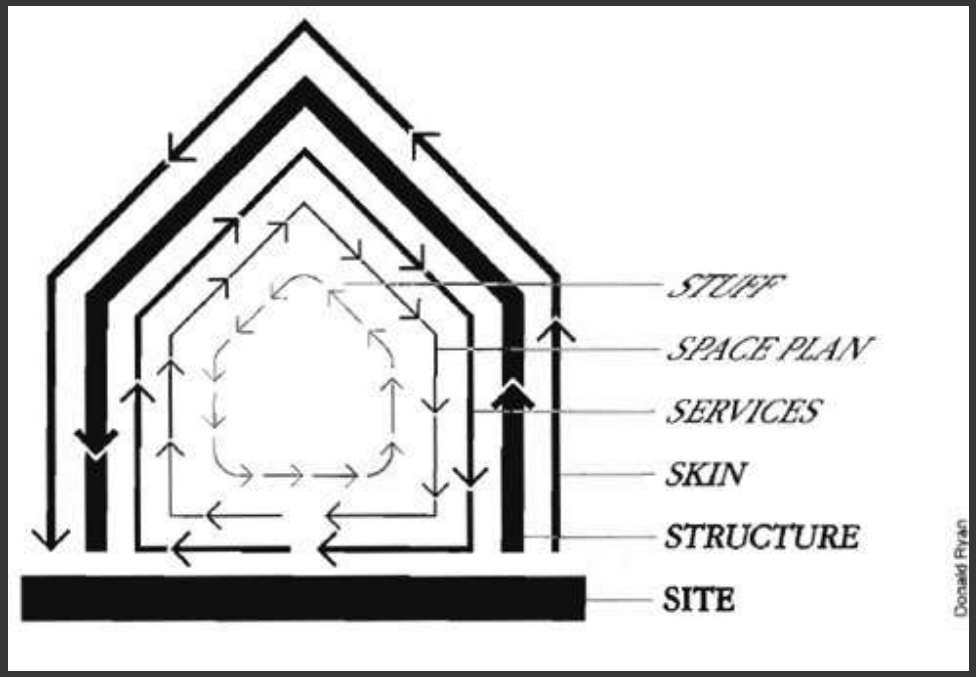
“Thinking about buildings in this time-laden way is very practical. As a designer you avoid such classic mistakes as solving a five-minute problem with a fifty-year solution, or vice versa.”

Frank Duffy, “How Buildings Learn”

Significance

The approach to every layer has implications for long-term economic, social and environmental impact…

In essence, Sustainability.

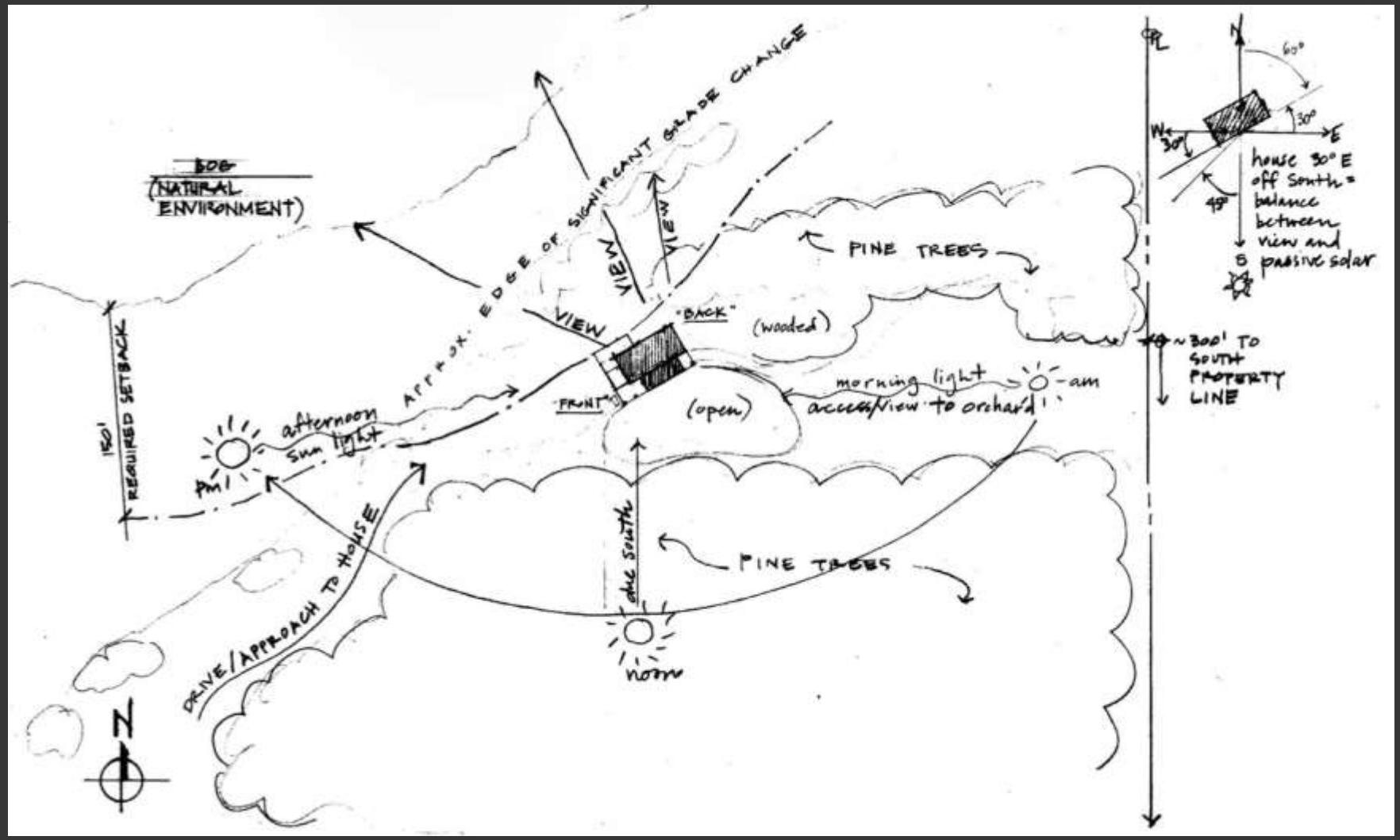


Site

- Essentially eternal
- Geographic location
- Land features, boundaries
- Surrounding context

“Site is eternal.”

Frank Duffy, “How Buildings Learn” by Steward Brand



There is a hierarchy to the layers

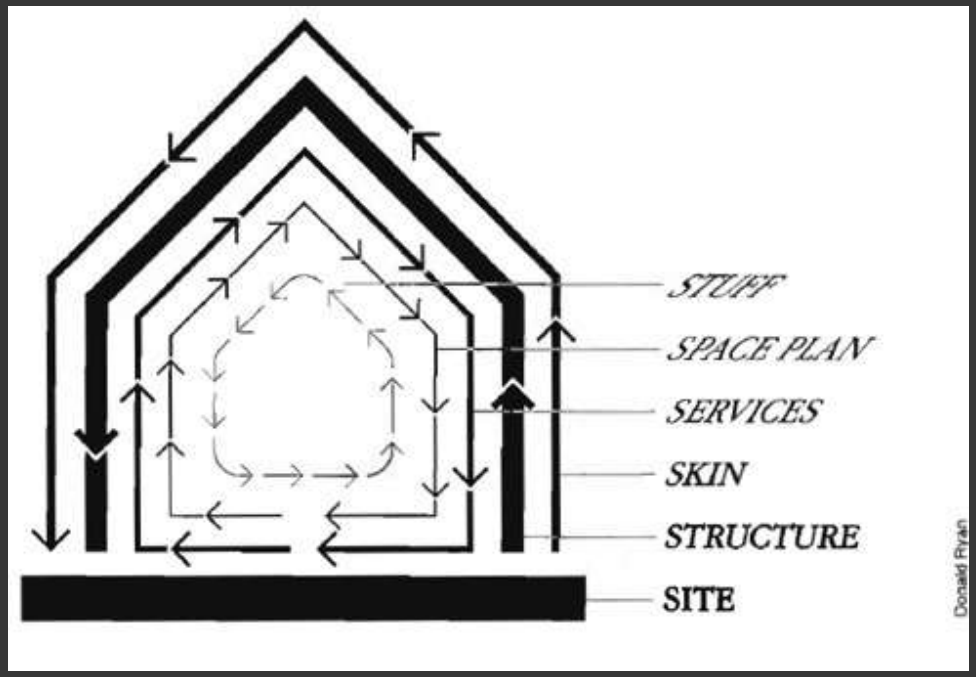
What is done initially to the first two layers, Site and Structure, is the least easily changed after the initial construction and may have the longest impact (positive or negative).

What we choose to develop matters.

Image from kissmytractor.blogspot

Location, Location, Location

Image from www.financial-planning.com



Structure

- 60 - 100 years or more
- Foundation
- Load bearing structure
- Longest lasting of the built elements
- Insulation and services may be embedded here

Placing a building has lasting impact

Good water management begins with the SITE.

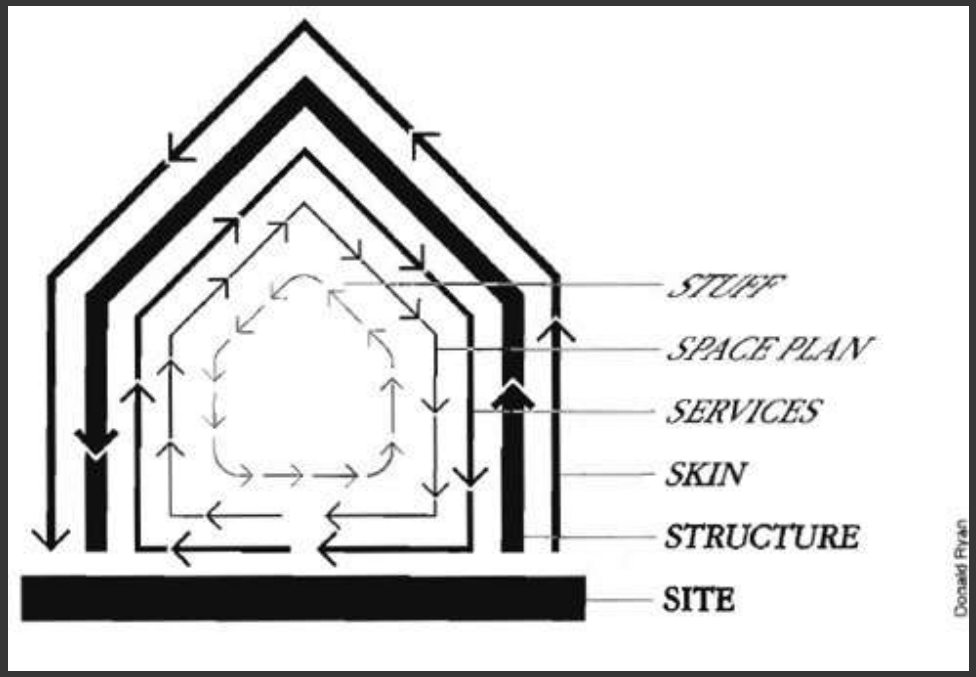
Keep the Structure Strong and Durable

Done Right the First Time

Image from concreteconstruction.net

Fixing Things

It’s only easy to insulate under the foundation once



Skin

- 20 – 100 years
- Water management/protective layer
- Exterior surfaces: roof, siding, sheathing, windows
- Not all elements wear out at the same rate
- Insulation and services may be embedded here

The “Skin” often has the biggest impact on long-term durability, occupant comfort and building energy performance.

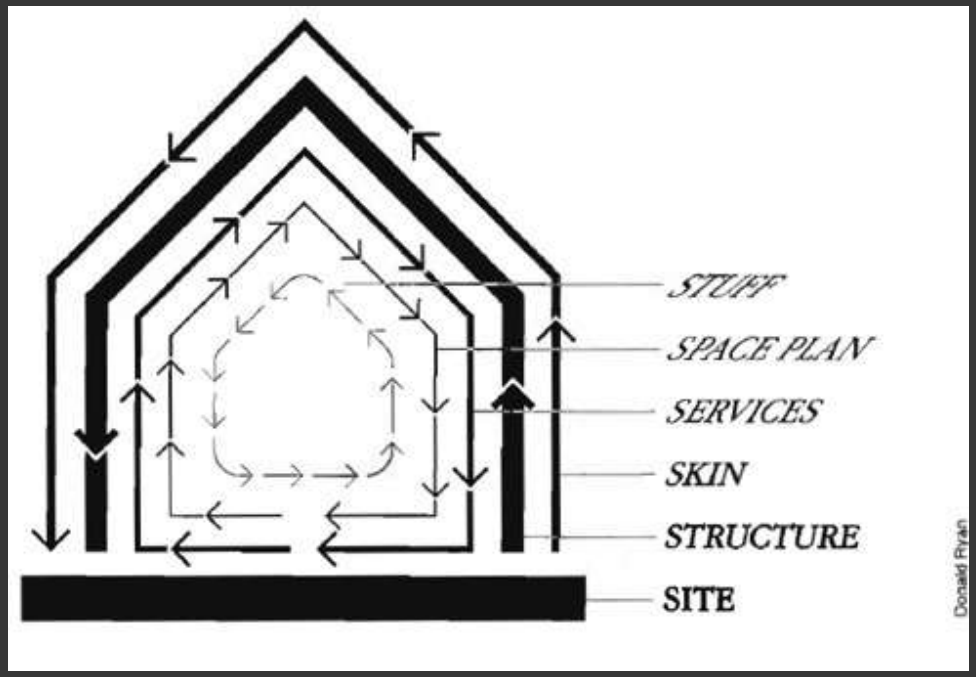
Image by Mark Teskey

More Than Skin Deep

Integrated Design in Practice

"How a room is heated depends on how it relates to the heating and cooling Services, which depend on the energy efficiency of the Skin, which depends on the constraints of the Structure."

Steward Brand, "How Buildings Learn"



Services

- 7-30 + years
- Plumbing, heating, cooling, ventilation, electrical
- Distribution systems harder to change than plants
- Replaced from wear or obsolescence
- Kitchens and Baths are most remodeled rooms

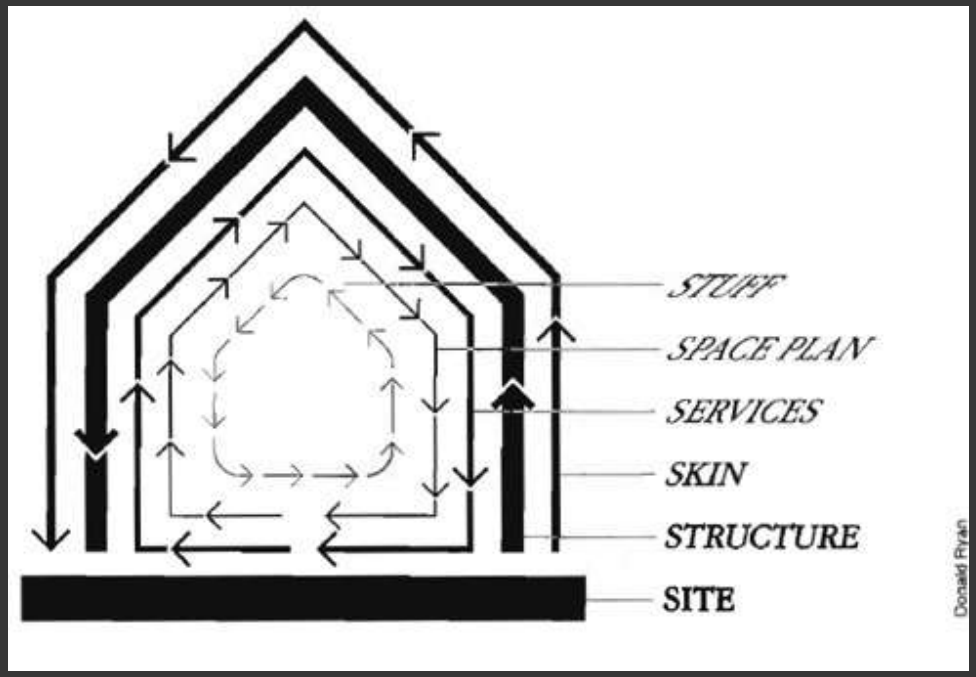
Avoiding obsolescence

“The longevity of buildings is often determined by how well they can absorb new Services technology.”

Stewart Brand, How Buildings Learn

Access to Services Aids Adaptability

Does the Investment Match the Lifespan?

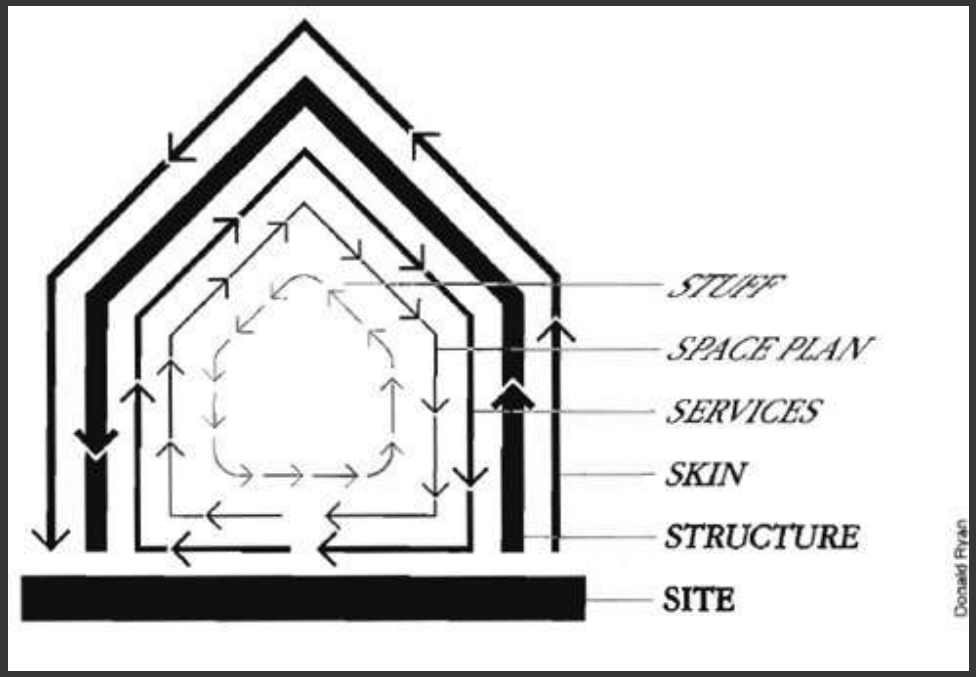


Space

- 5 – 40 years
- Considered mutable, changeable without changing structure, services, or skin
- The building interior:
  - Partitions, surface finishes, fixtures, doors

Often a big investment, and often changed.

Image from www.batchelor-resort.com



Stuff

- Impermanent
- Things easily movable
- Most frequently changed by occupant
- Appliances, lamps, electronics, furniture, art

What doesn’t last goes somewhere.

“The opposite of adaptation in buildings is graceless turnover.”

Steward Brand, “How Buildings Learn”

The Significance of the Framework: Context and Perspective

Sustainability Takes the Long View

"An adaptive building has to allow slippage between the differently-paced systems of Site, Structure, Skin, Service, Space Plan, and Stuff.

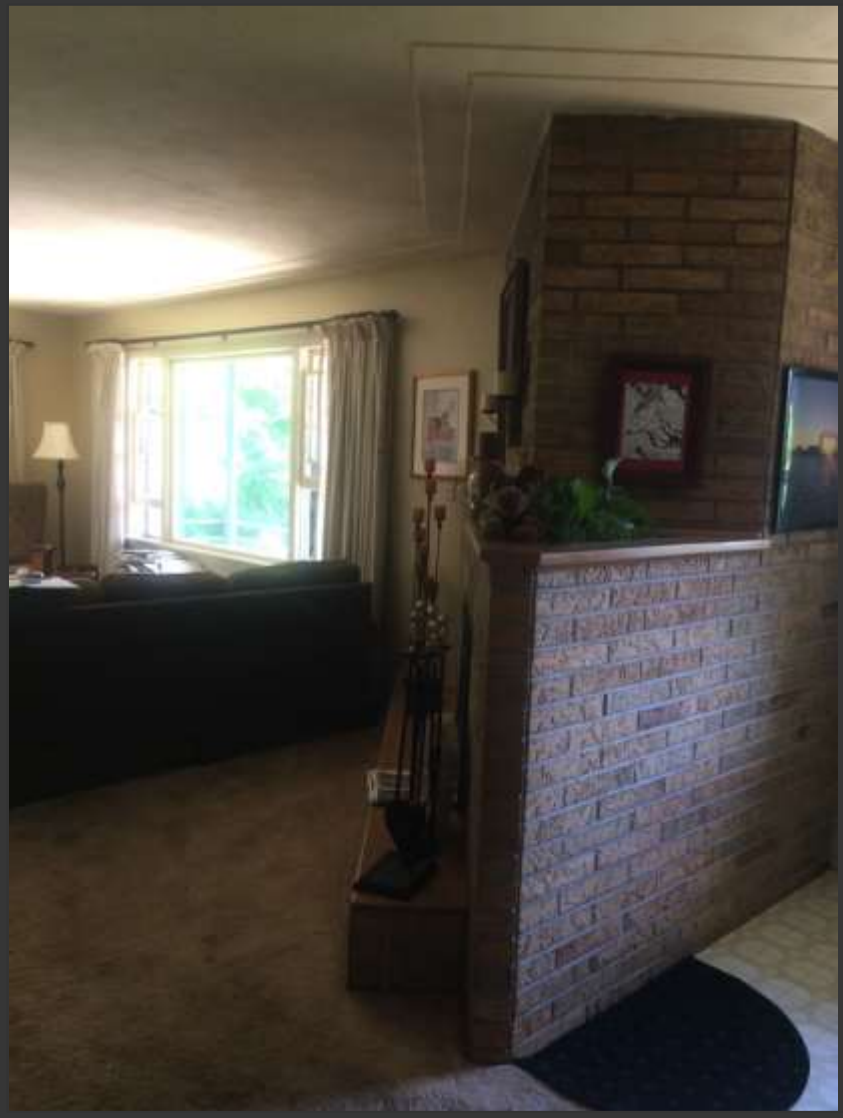
… Embedding the systems together may look efficient at first, but over time it is the opposite, and destructive as well."

Stewart Brand, "How Buildings Learn"

Walls are Inherently Complicated

- They may be structural.
- They connect to foundation, floor, and roof.
- We cut holes in them.
- We attach things to the outside of them.
- We attach things to the inside of them.
- They may contain MEP systems.

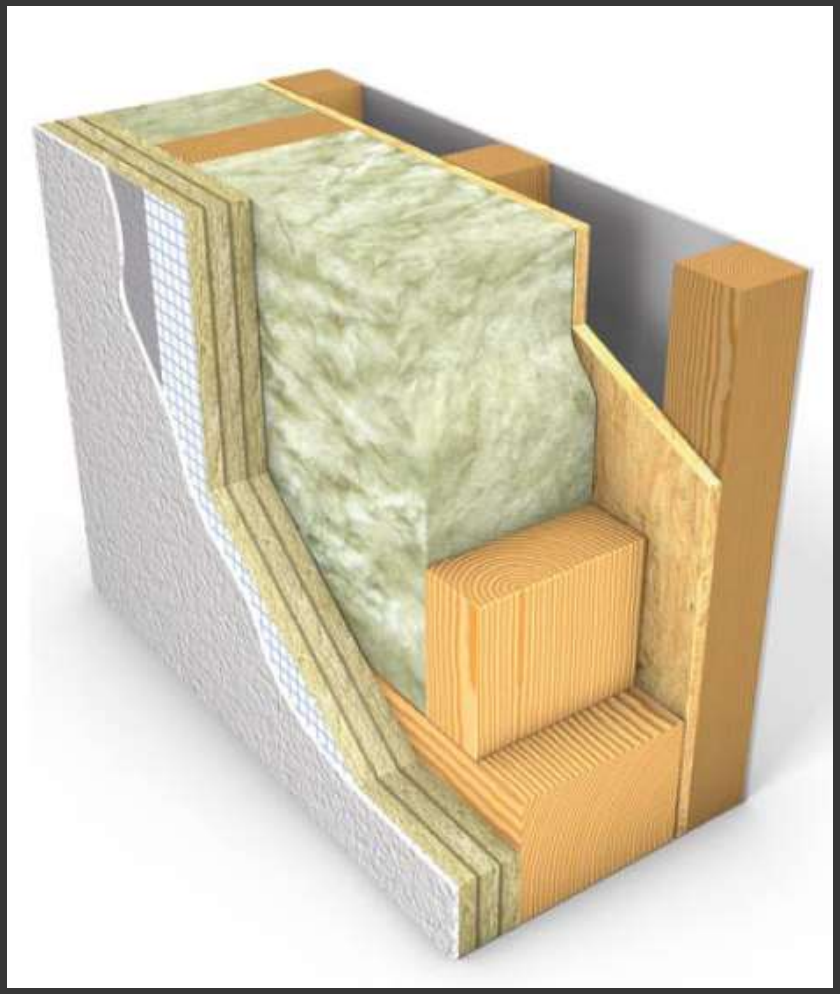
Structure, Skin and Space Collide



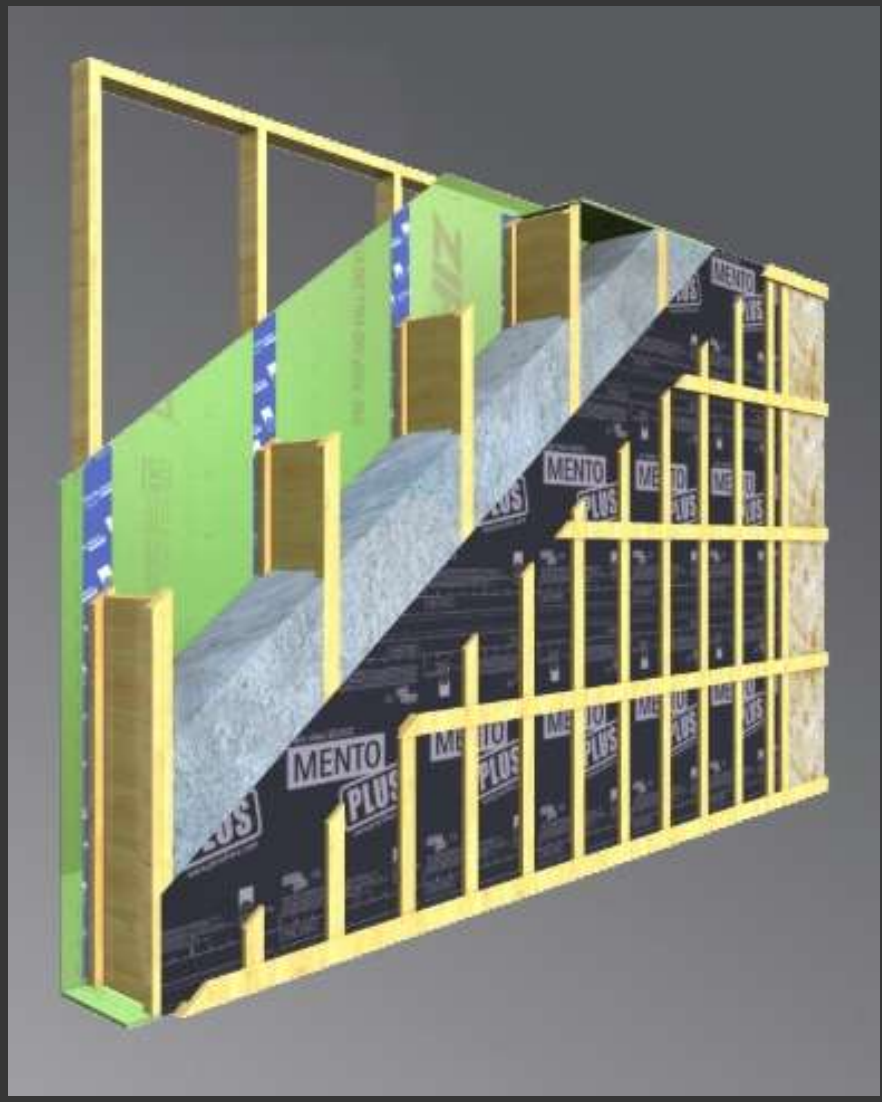
Separate Structure, Plan for Change

- Create cavities for services:
  - Walls
  - Soffits
  - Dropped ceilings
  - Chases
- Allow for window replacement without dismantling surrounding finishes
- Don’t embed exterior elements into interior elements (decks, awnings)
- Expose some mechanicals

Toward Creating an Adaptive Building



Wolf Haus wall with Service Cavity www.wolf-haus.de



Ecocor’s Passiv Wall www.ecocor.us/walls

Using the Framework: Questions to Ask

1. Which layer(s) will this choice impact?
2. Are we investing enough in Site and Structure?
3. Are we over-investing in Space and Stuff?
4. Will the Services be easily accessible for repair, maintenance and replacement?
5. Do the details support longevity of structure?
6. How does the design allow for alteration?

"Age *plus adaptivity* is what makes a building come to be loved."

Steward Brand, "How Buildings Learn"

Resources

- Bioregional https://www.bioregional.com/bedzed/
- Green Building Advisor https://www.greenbuildingadvisor.com/
- Canada Green Building Council https://www.cagbc.org/
- U.S. Green Building Council https://new.usgbc.org/
- Building Green https://www.buildinggreen.com/
- Myths about Green Building https://www.byggmeister.com/our-world/blog/common-myths-about-green-building
- Ecocor https://www.ecocor.us/

Good Books

- How Buildings Learn/What happens after they're built by Stewart Brand
- The Timeless Way of Building by Christopher Alexander

Thank you.

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