

# BUILDINGENERGY NYC

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## **A Dimensional Grammar for an Interoperable Construction Industry**

**Tedd Benson, Seth Clarke, and Joseph Murray  
Bensonwood**

*Curated by Christina Aßmann & Lara Caballero Sayalero*

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**Northeast Sustainable Energy Association (NESEA) | October 15, 2026**

# A Dimensional Grammar

## for a More Interoperable Construction Industry



**TEDD BENSON**  
Author, Builder Founder  
/ CEO



**SETH CLARKE, AIA**  
Architect  
Director of Business  
Development



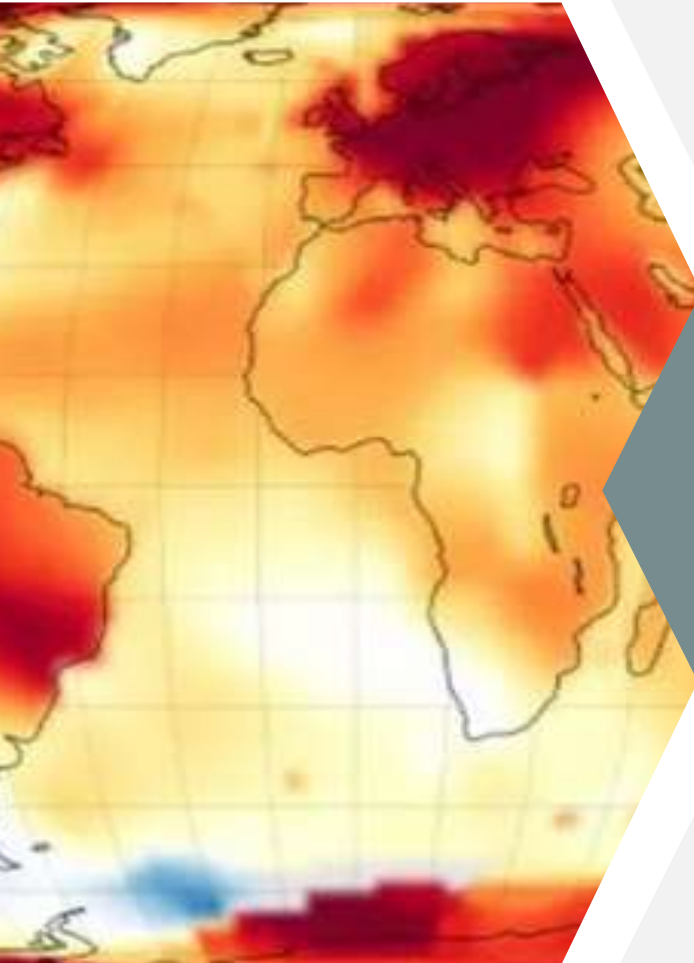
**JOSEPH MURRAY**  
Author, Architectural Researcher  
**Visiting Assistant Professor,**  
SUNY ESF

THE PROBLEM

# Managing Fragmentation

A DIMENSIONAL GRAMMAR FOR A MORE INTEROPERABLE CONSTRUCTION  
INDUSTRY

## THE PROBLEM: OUR POLY-CRISIS



Global  
Warming

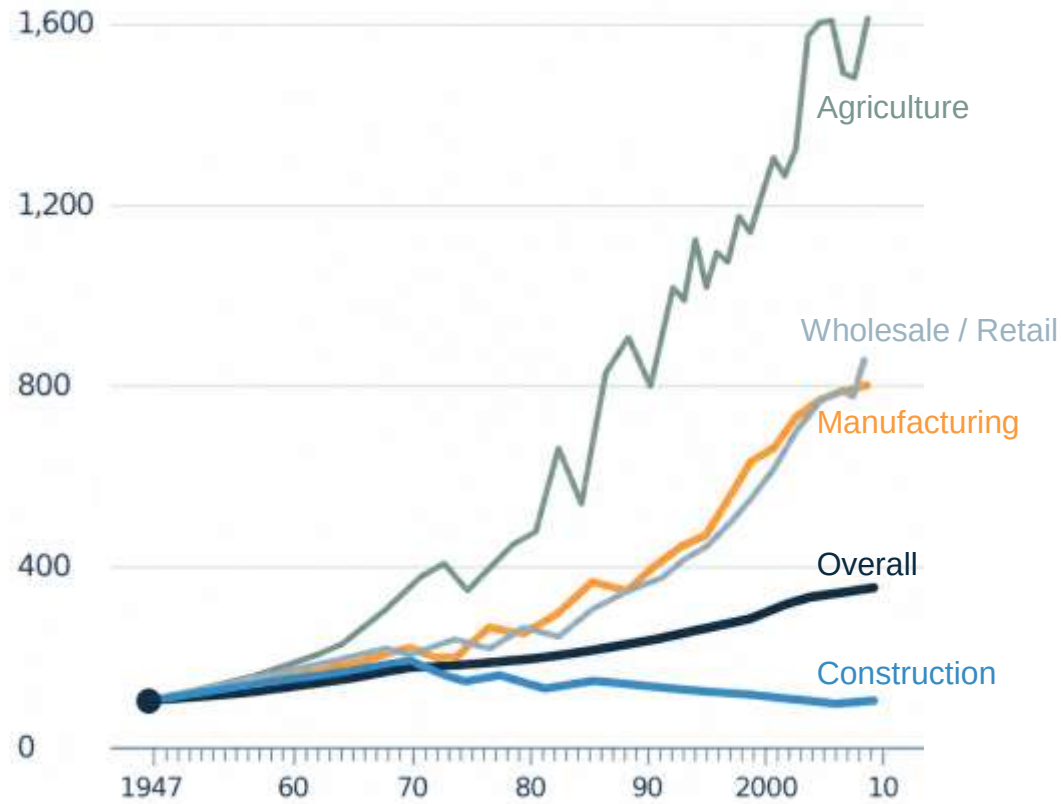
Skilled  
Labor  
Shortage

Affordable  
Housing  
Shortage



# THE PROBLEM: STAGNANT PROGRESS + UNBRIDLED COMPLEXITY

United States, gross value-added\*  
Per hour worked, 1947=100

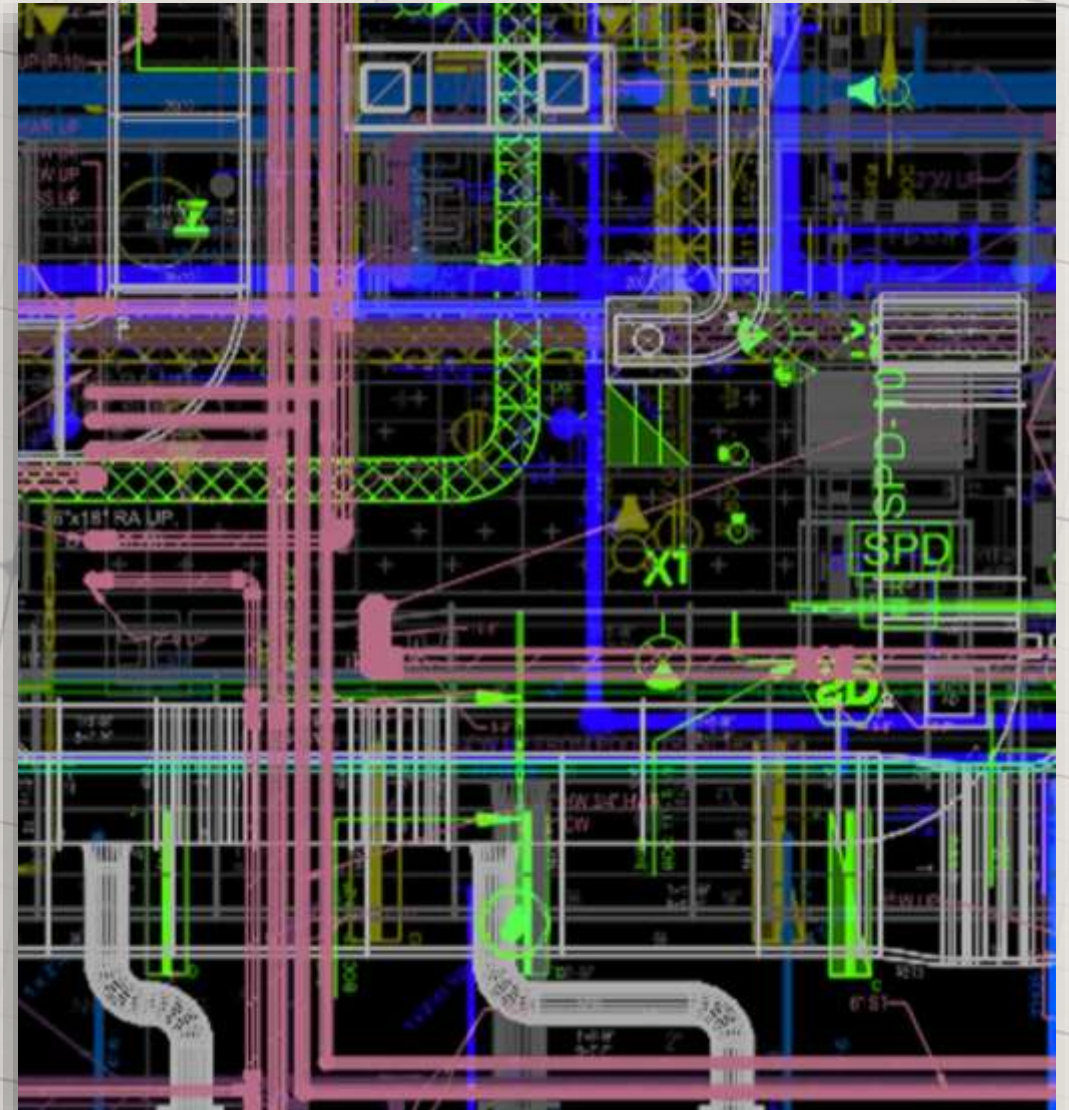


Source: McKinsey Global Institute

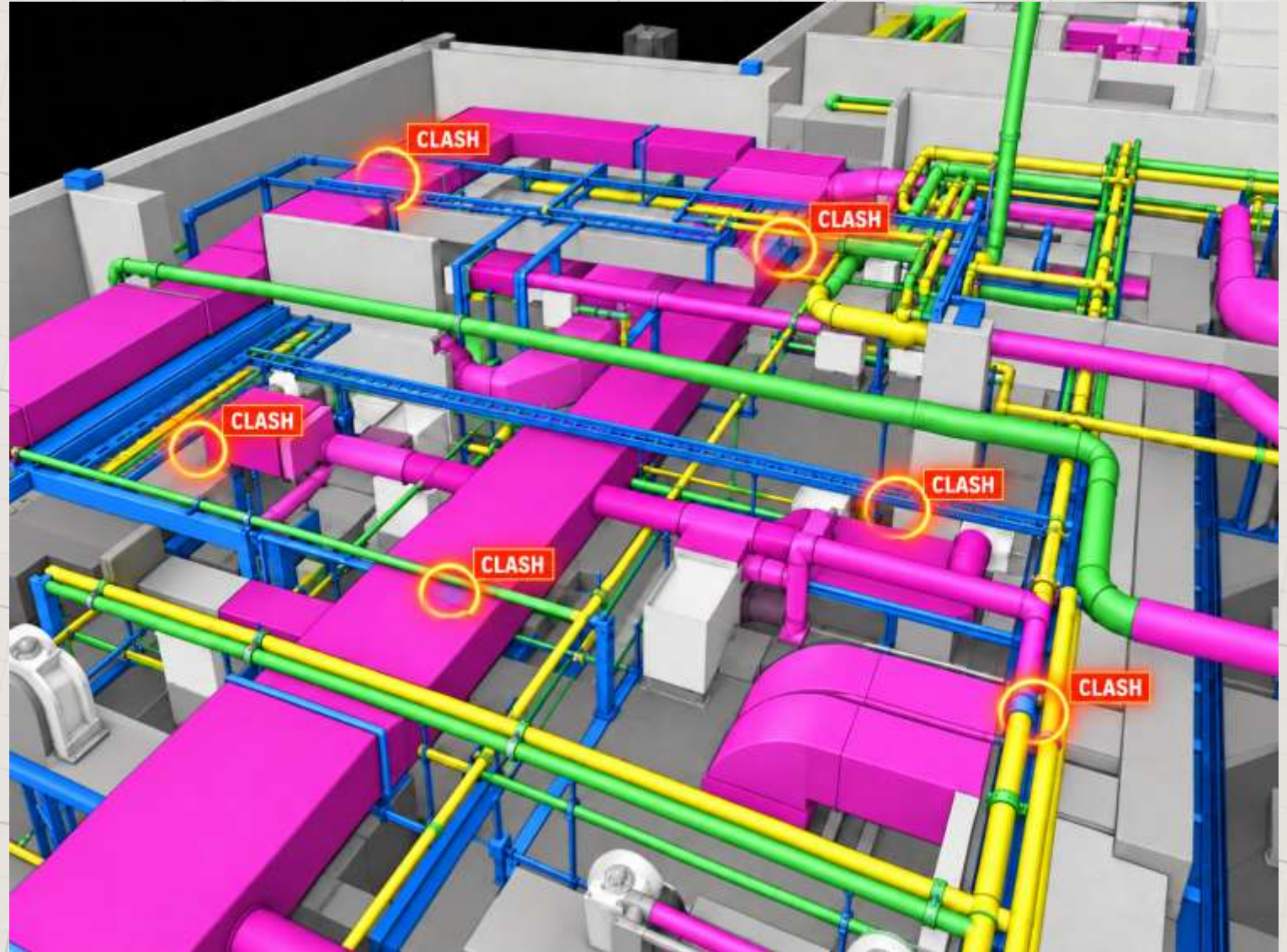
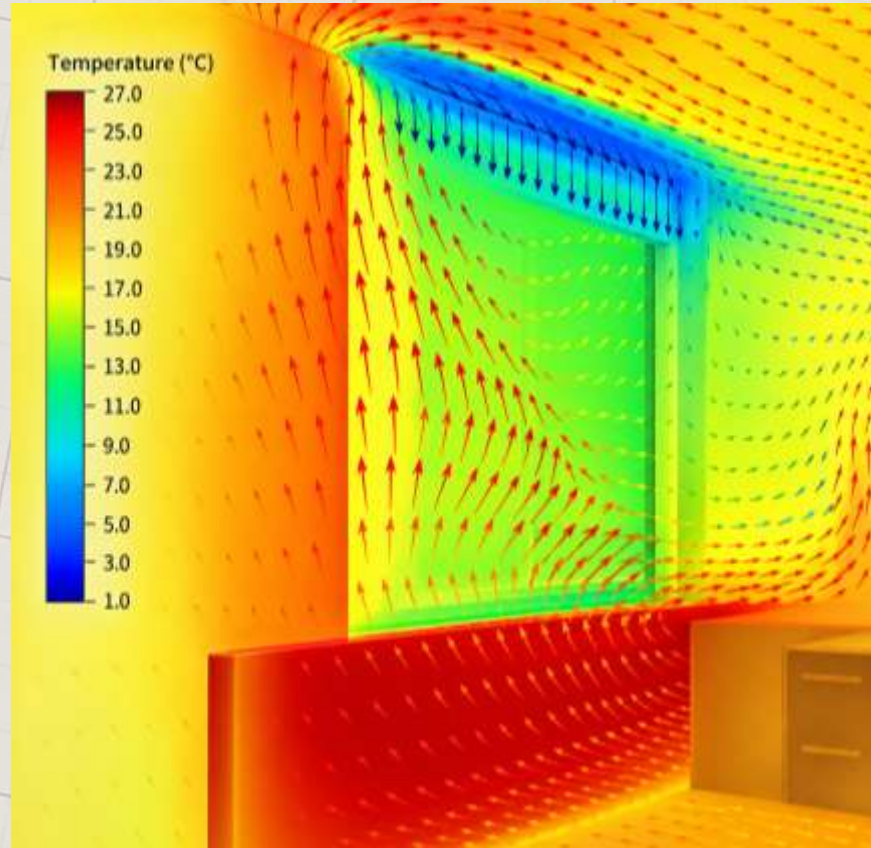
\*At constant prices



# THE PROBLEM: STAGNANT PROGRESS + UNBRIDLED COMPLEXITY

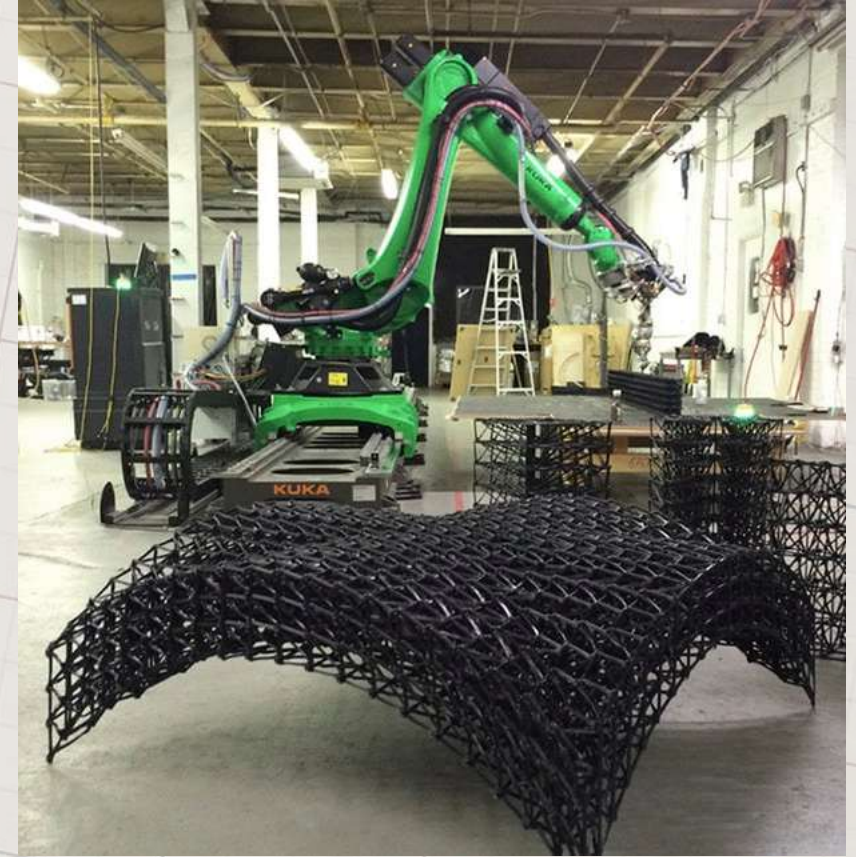


# POWERFUL NEW TOOLS, SAME PERSISTENT PROBLEMS



A DIMENSIONAL GRAMMAR FOR A MORE INTEROPERABLE CONSTRUCTION INDUSTRY

# POWERFUL NEW TOOLS, SAME PERSISTENT PROBLEMS



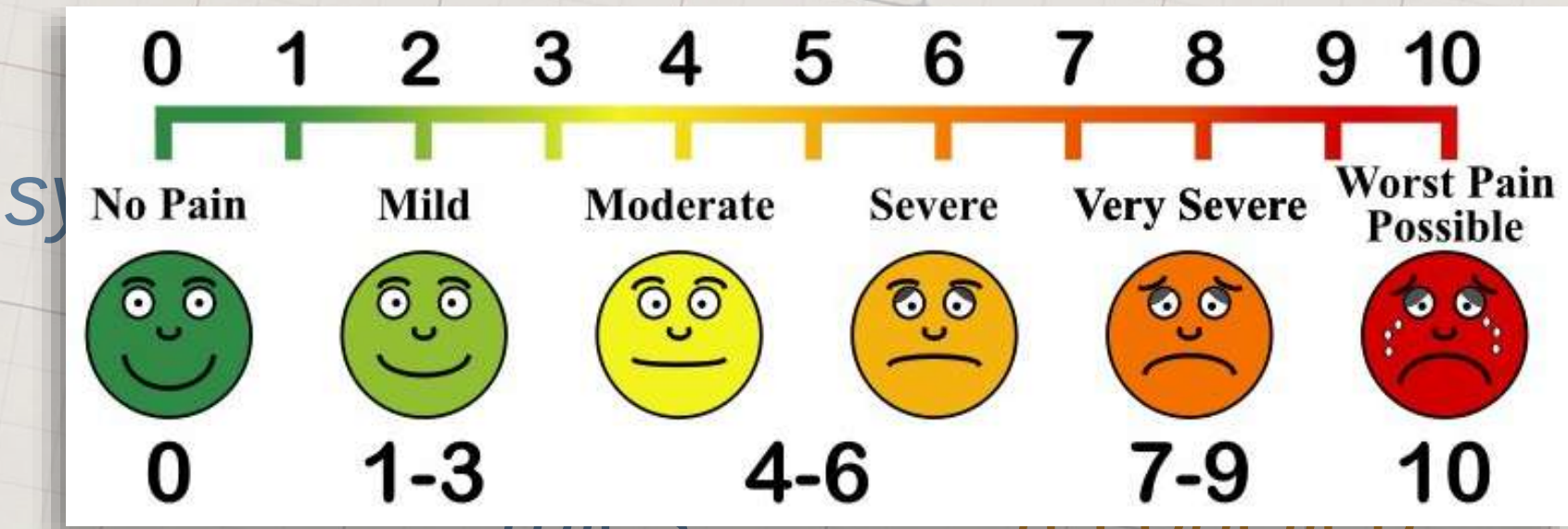
*Credit: Branch Technology*

## THE PROBLEM: PAIN AT THE INTERFACE

It's not that we lack clever tools.  
The problem is that so little can be assumed about placements and interfaces between independently designed systems.



# THE PROBLEM: INTERFACING SYSTEMS



# Shared Dimensional Grammar

AND WHAT WE LEARN FROM THE PAST

# THE VISION: GENERATIVE RATHER THAN RESTRICTIVE

A shared  
grammar  
unlocks  
complexity  
without  
chaos.





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HISTORIC LINEAGE

# What's Different Now?

## CONCEPTUAL BRIDGE

A **positional grammar** establishes levels of control for the levels of the built environment in acknowledging different rates of change and social needs.

A **dimensional grammar** is a shared understanding of compatible units and interfaces so that different actors can make compatible things independently.



Mainstream architecture's product is a "shoe-box": a simple shape with a void inside.



Shoe-boxes are not always of a regular shape: they can be deformed.



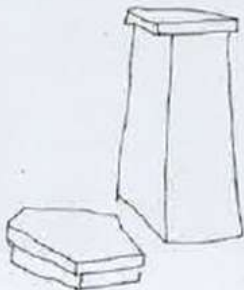
They can be round or triangular...



They can even be completely irregular, deformed.



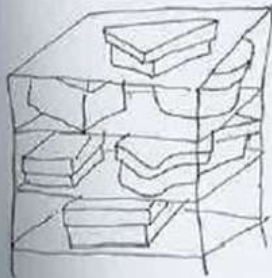
"Functionalist" shoe-boxes are shaped to indicate their content.



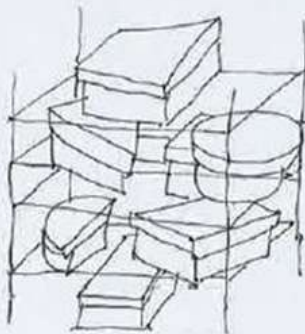
They can be flat or high as a tower.



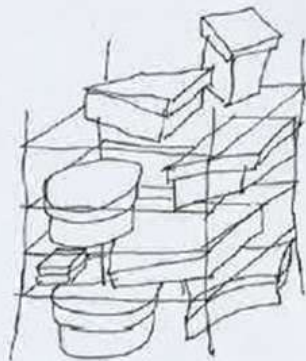
Assembling several shoe-boxes is the utmost effort of architecture.



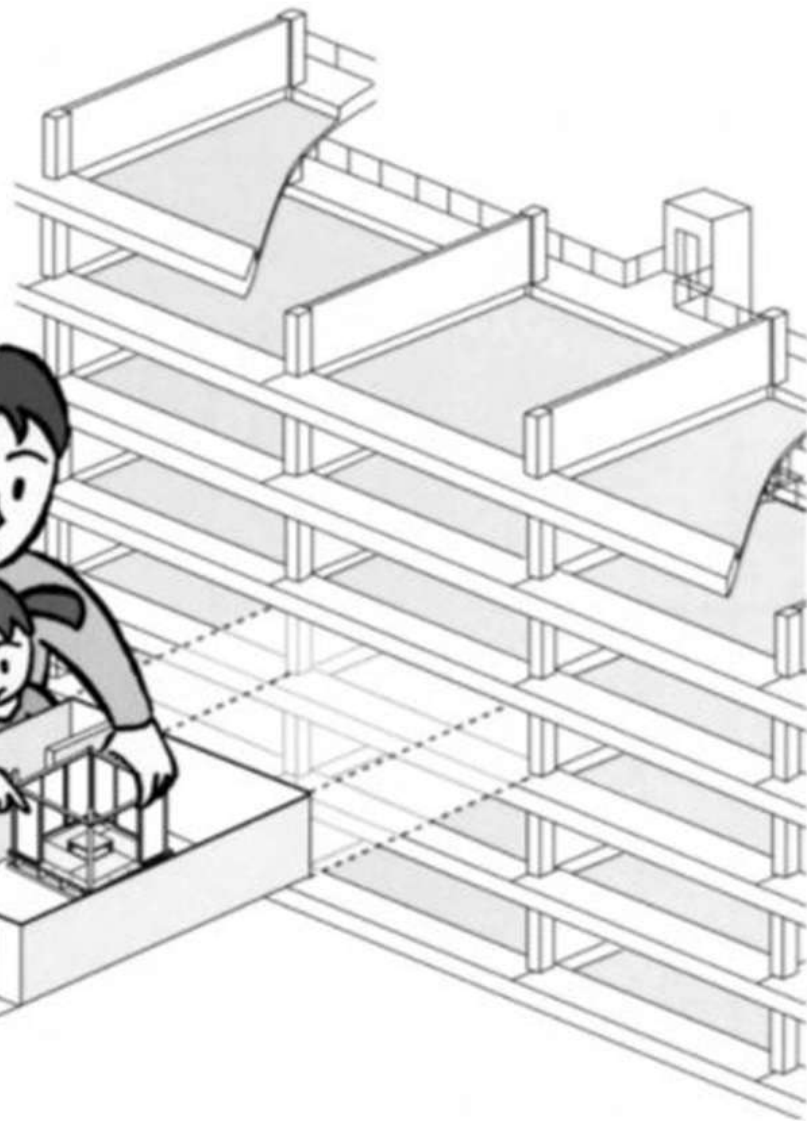
A new way for architecture could be placing the boxes onto a shelf.



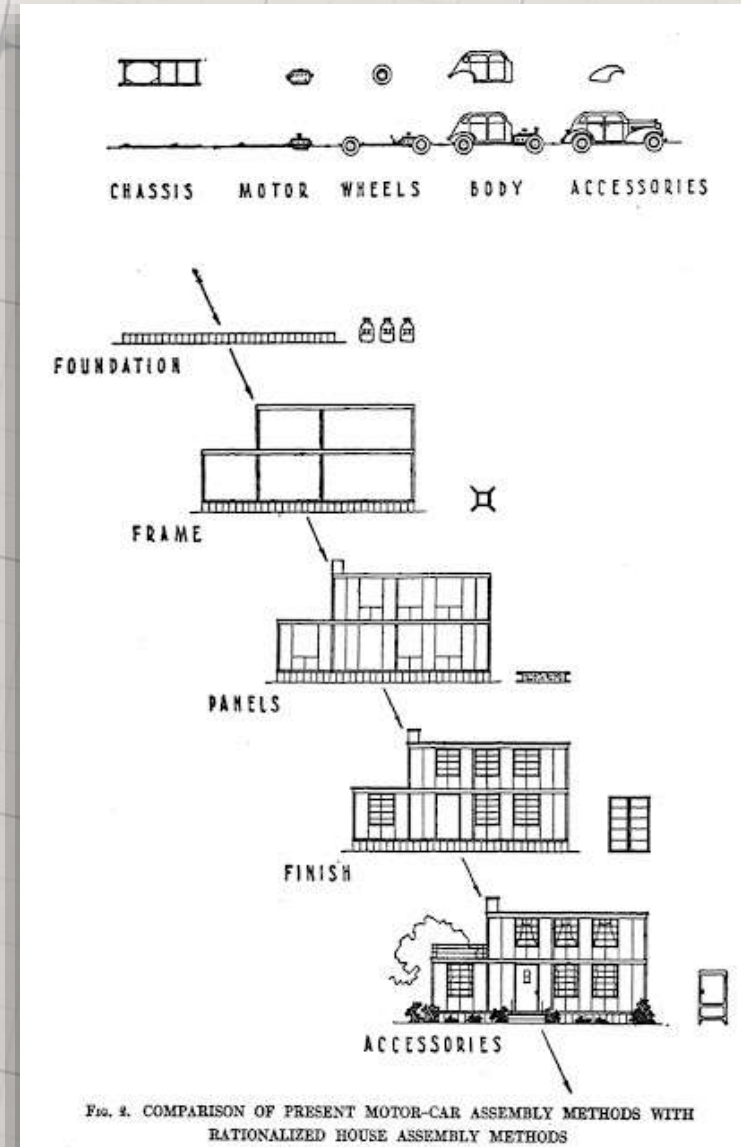
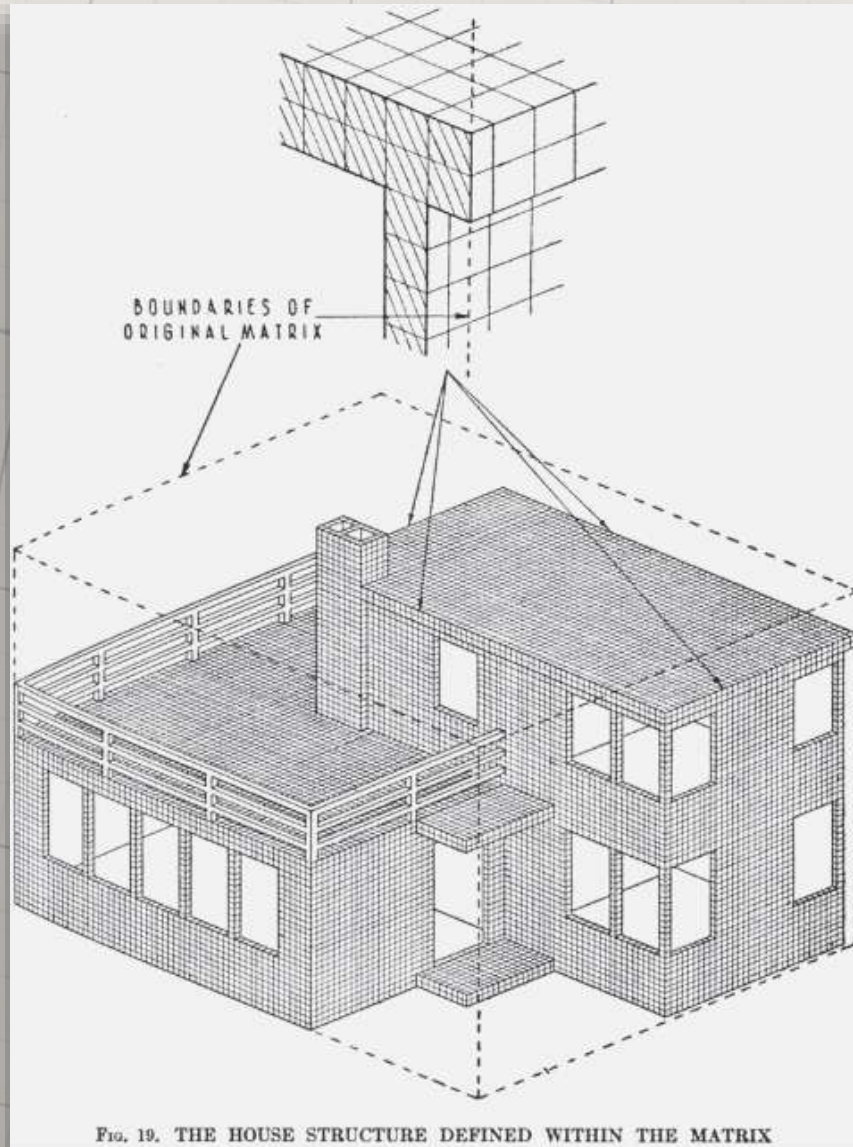
On a transparent shelf the assembled boxes look interesting.



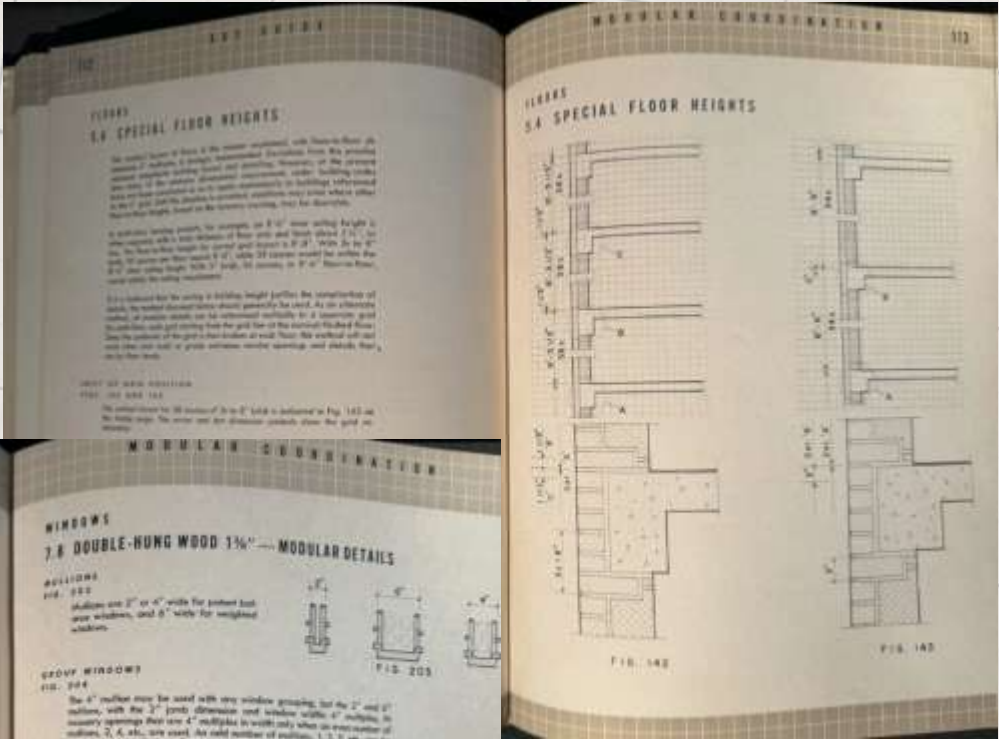
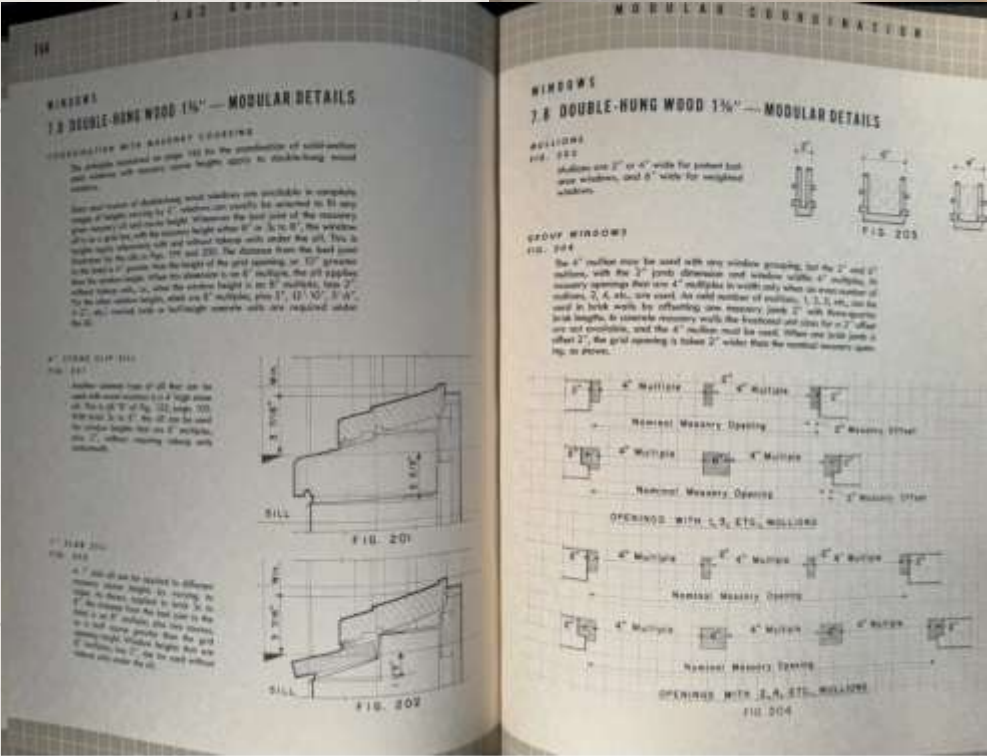
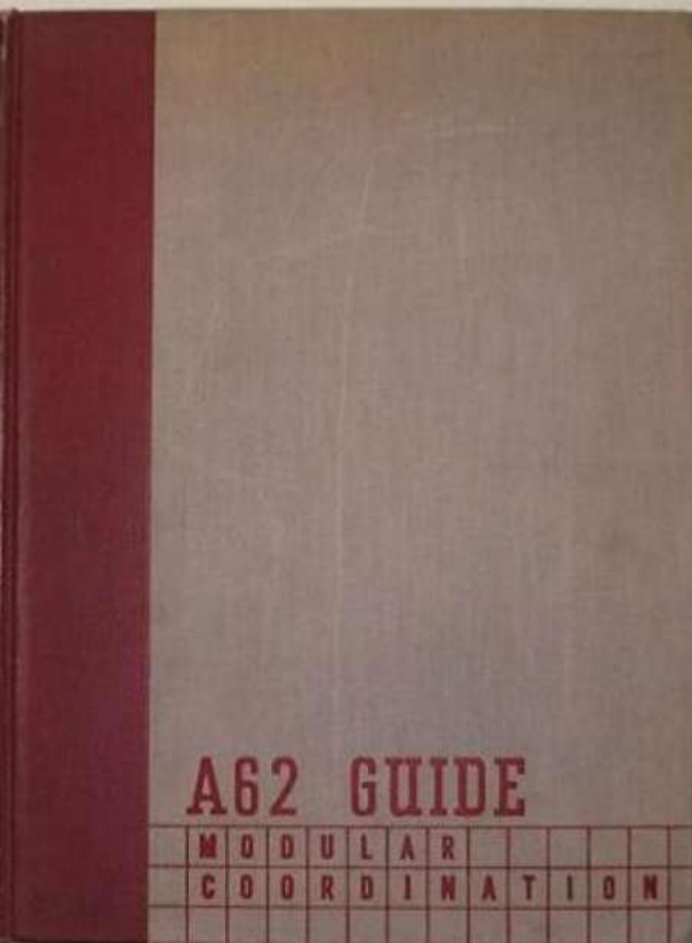
Besides, on a shelf you can move one box without moving the others. Architecture is "mobile".



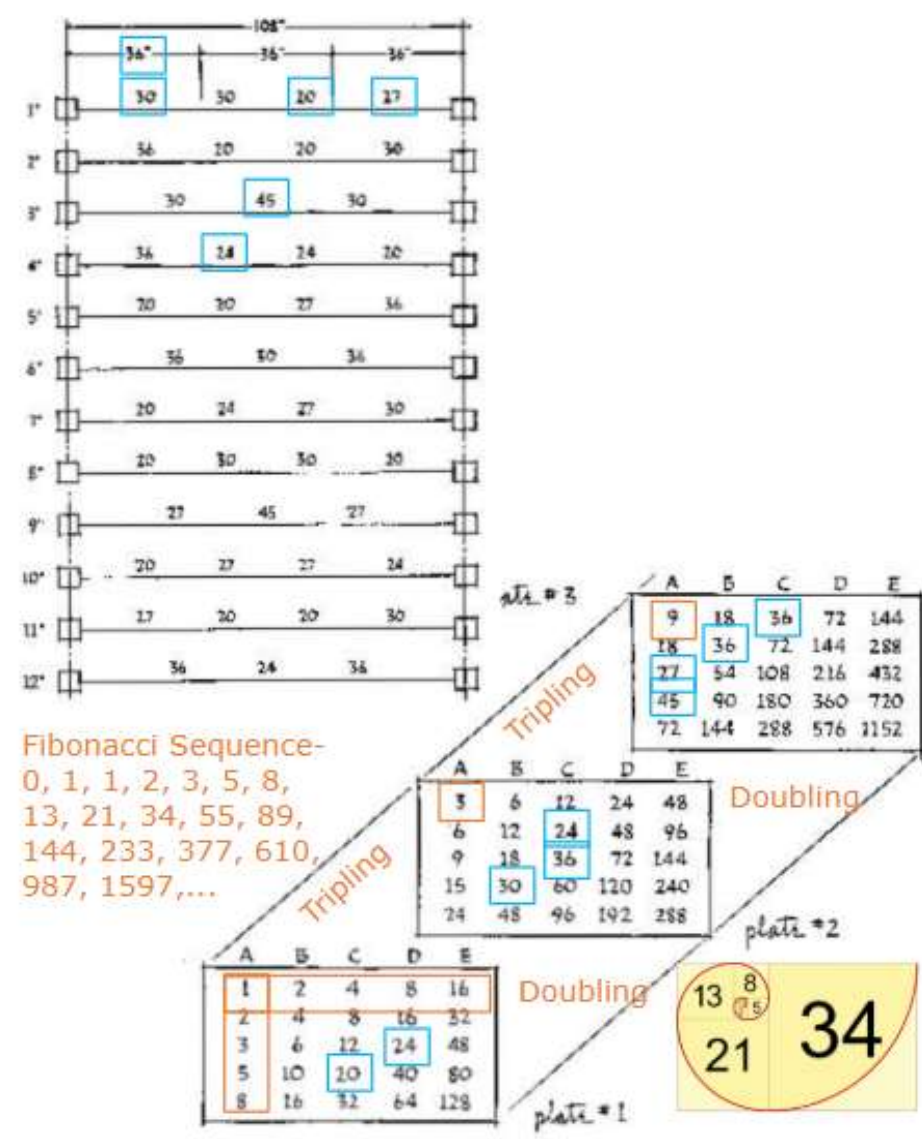
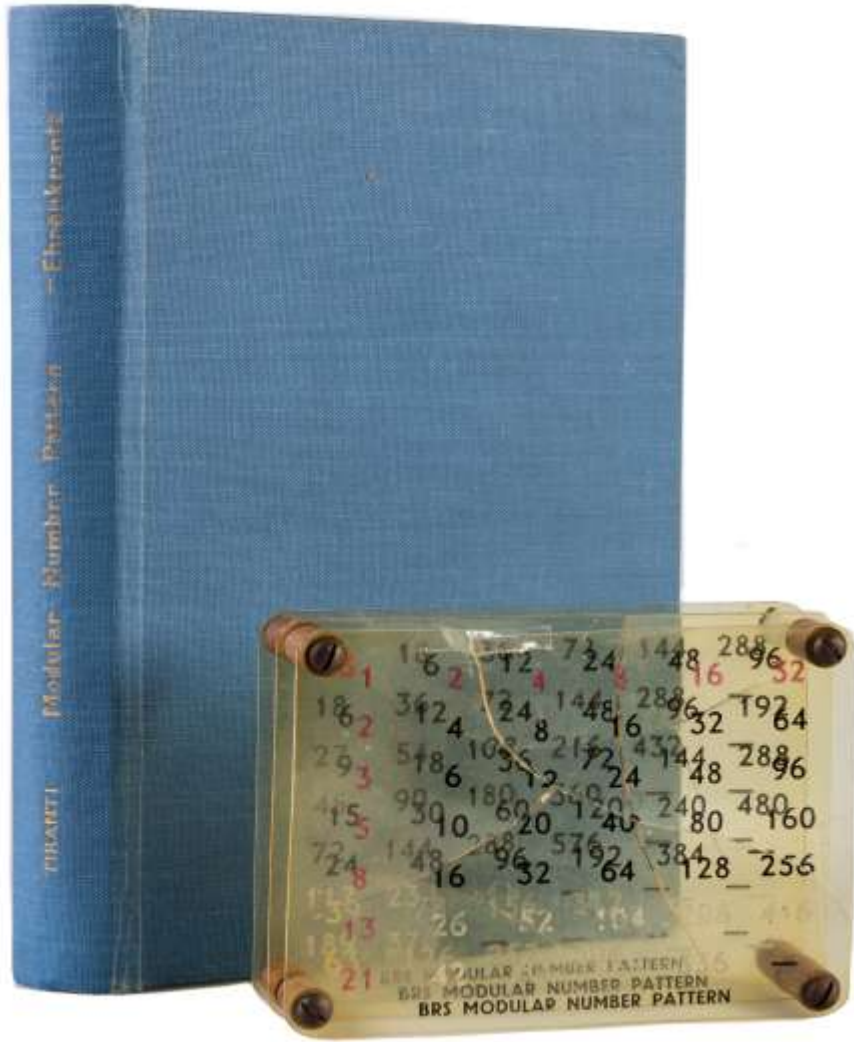
## LINEAGE: BEMIS / EARLY MODULAR COORDINATION (1936)



LINEAGE: A62 GUIDE (1946)



# LINEAGE: EHRENKRANTZ AND THE SCSD (1956)



## LINEAGE: EHRENKRANTZ AND THE SCSD

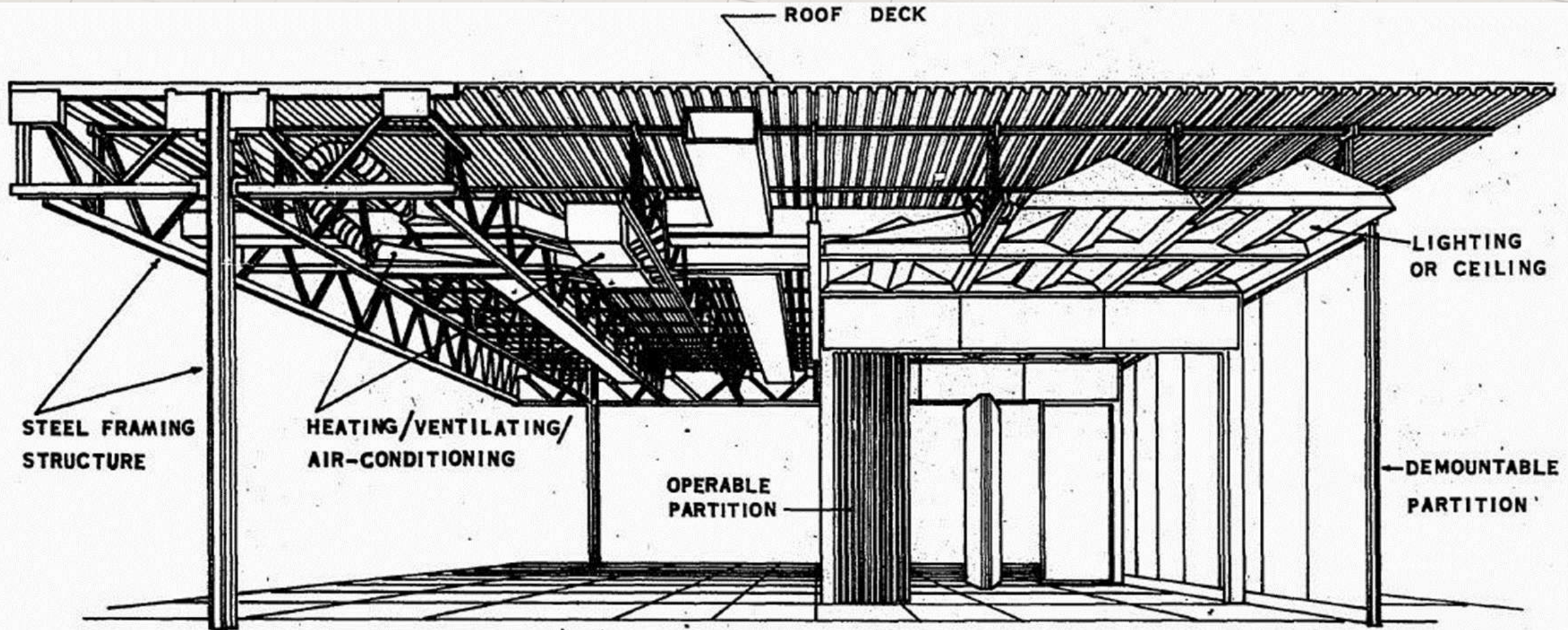
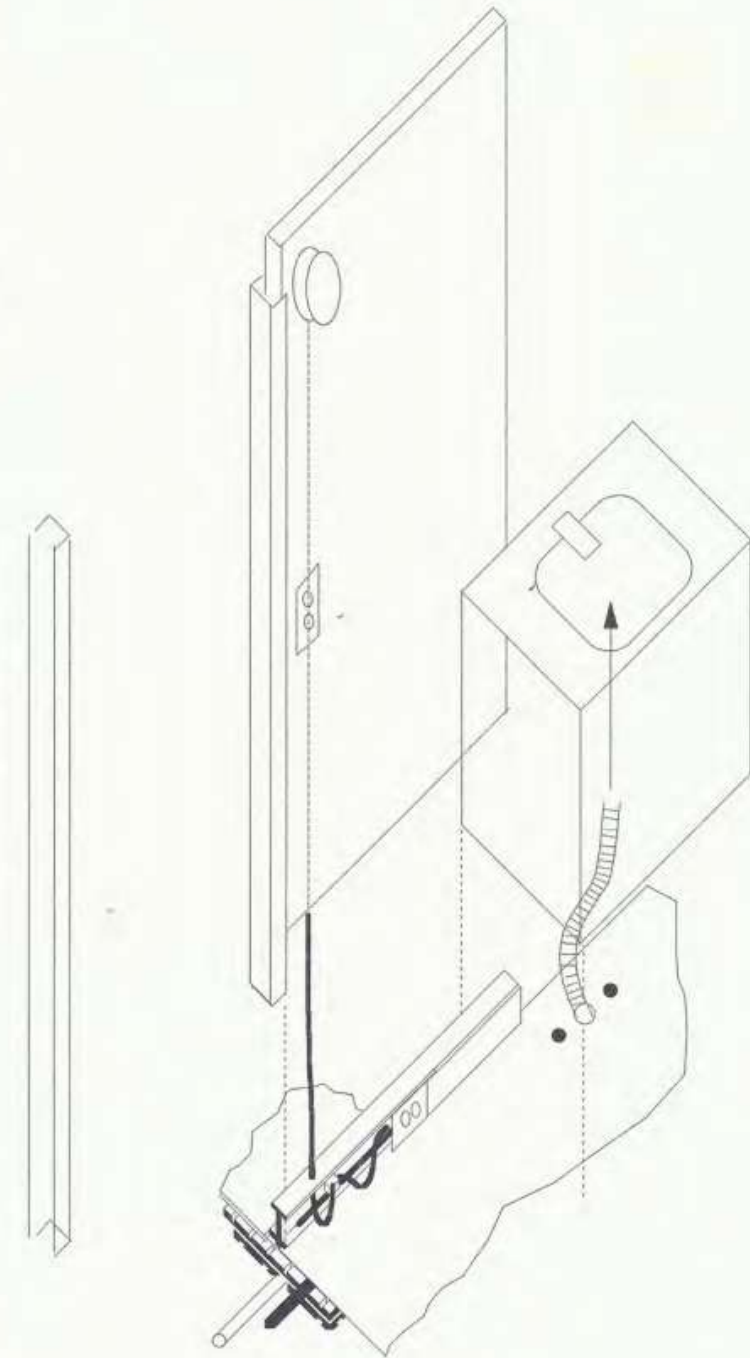
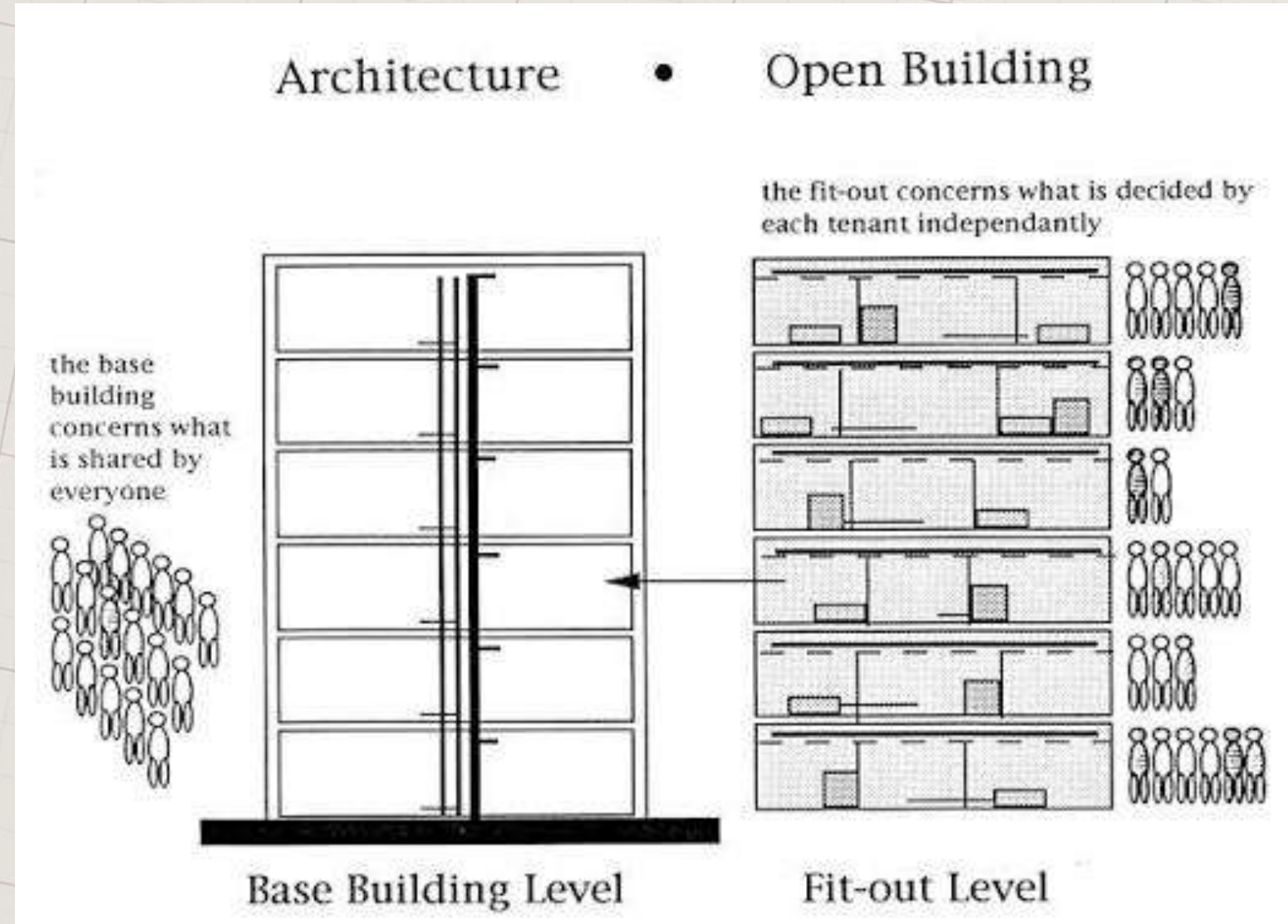


Fig.19. Major components of S C S D system

# HABRAKEN / OPEN BUILDING AND MATURA



A DIMENSIONAL GRAMMAR FOR A MORE INTEROPERABLE CONSTRUCTION INDUSTRY

## LINEAGE: MATURA



## NEW YORK APPLICATION

- Logistics
- Retrofit
- Change of use
- Performance
- Territorial  
Autonomy



Shared rules do not require total control. They are most useful precisely when different people act at different times within constraints they did not create.

TWO MODELS FOR STUDY

# Cabinetry Industry

## THE CABINETRY INDUSTRY: THE BEFORE TIMES

Prior to the 1980s, kitchen cabinets were largely built on site or in small custom shops.

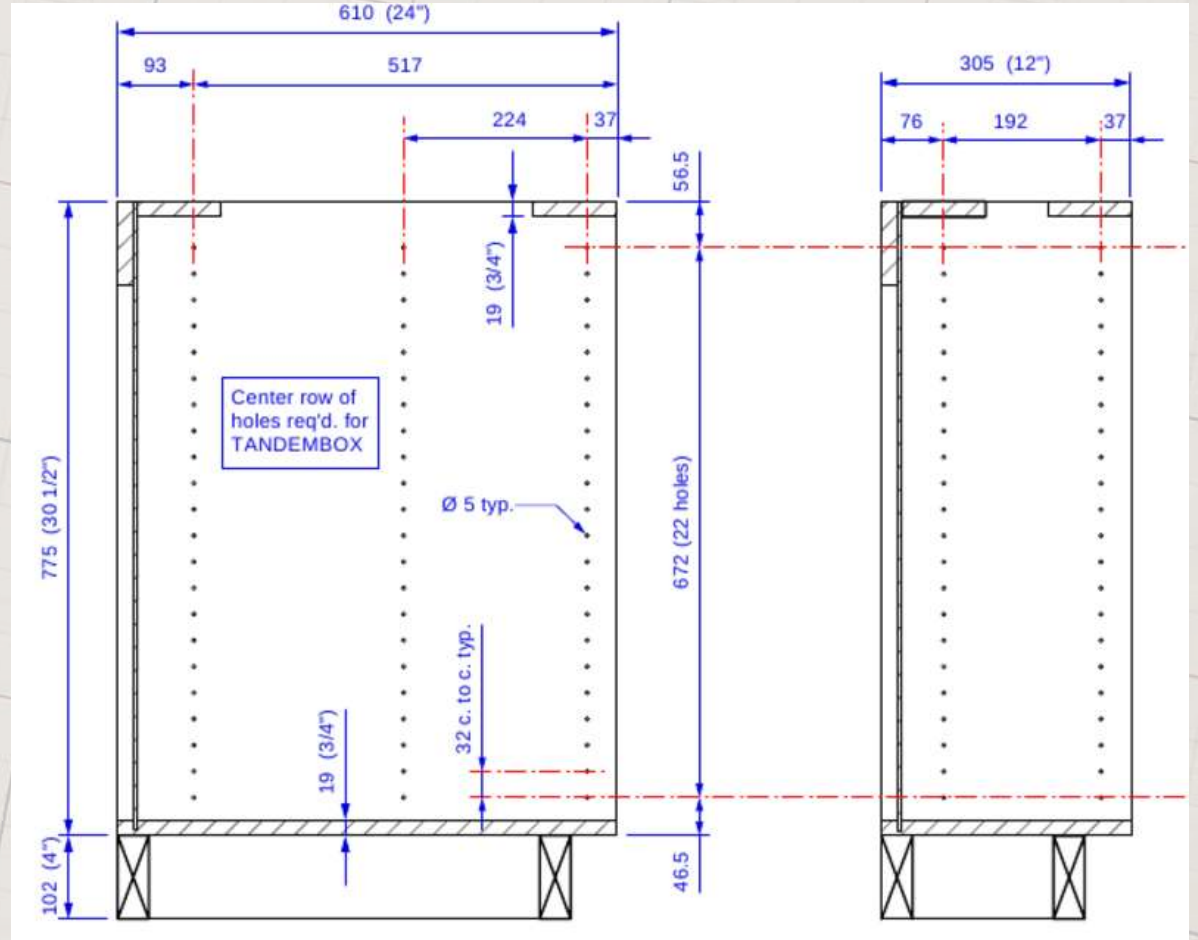


## THE CATALYST: SYSTEM 32

### Vertical and internal system: the 32 mm European system (metric)

#### 5 mm holes to mount:

- Hinges for doors
- Adjustable Shelves
- Drawer slides
  - Under mount or side mount



# THE CABINETRY INDUSTRY: A PRACTICAL STANDARD

## Horizontal dimensions: 3-inch module (Imperial)

### Base and wall cabinet widths:

9", 12", 15", 18", 21", 24", 27", 30",  
33", 36", 42", 48"

Base cabinet depth: 24"

Wall Cabinet depths: 12", 15", 18"

### Typical Appliance widths:

24", 30", 36", 48"



## THE CABINETRY INDUSTRY: A PRACTICAL STANDARD

A small number of shared dimensional standards unified a fragmented industry, opening the field for integrated, even-flow manufacturing *independent of specific projects.*



## THE CABINETRY INDUSTRY

Dimensions were fixed.

Variation came from the materials, finishes, hardware and joinery.



THE CABINETRY INDUSTRY

Market stratification without fragmentation

10×10 kitchen, cabinets only:



| Cost                          | \$1.7K-\$4K | \$3K-\$5K | \$12k-\$25K      | \$25K – \$60K |
|-------------------------------|-------------|-----------|------------------|---------------|
| Attribute                     | IKEA        | Fabuwood  | KraftMaid        | Plain & Fancy |
| Uses standard cabinet modules | ✓           | ✓         | ✓                | ✓             |
| Meets structural load norms   | ✓           | ✓         | ✓                | ✓             |
| Soft-close available          | ✓           | ✓         | ✓                | ✓             |
| Primary difference            | Materials   | Materials | Finish + options | Craft + fit   |
| Functional adequacy           | High        | High      | High             | High          |

A DIMENSIONAL GRAMMAR FOR A MORE INTEROPERABLE CONSTRUCTION INDUSTRY

# THE CABINETRY INDUSTRY: MEASURES OF SUCCESS



Custom

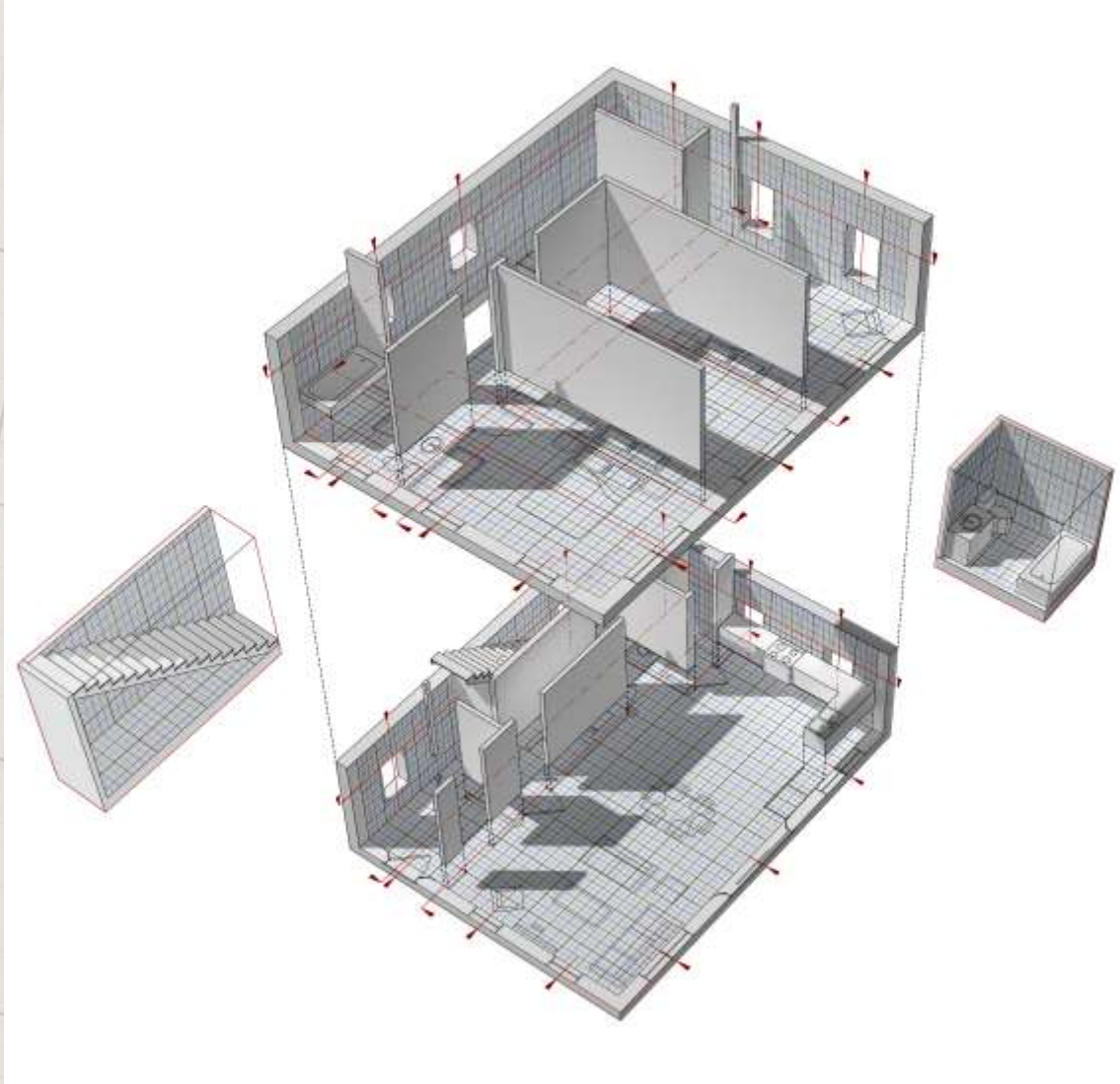


Wayfair

TWO MODELS FOR STUDY

# Panelized Construction

## APPLYING OPENBUILT: 55 YEARS OF SYSTEMIZATION



- Building Components and Equipment “snap” to fit
- Library floor plan spaces and patterns
- Library Building Shell Elements
- Predictable detail and dimensions
- All elements, large and small, are Products

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# PANELIZED CONSTRUCTION: BENSONWOOD



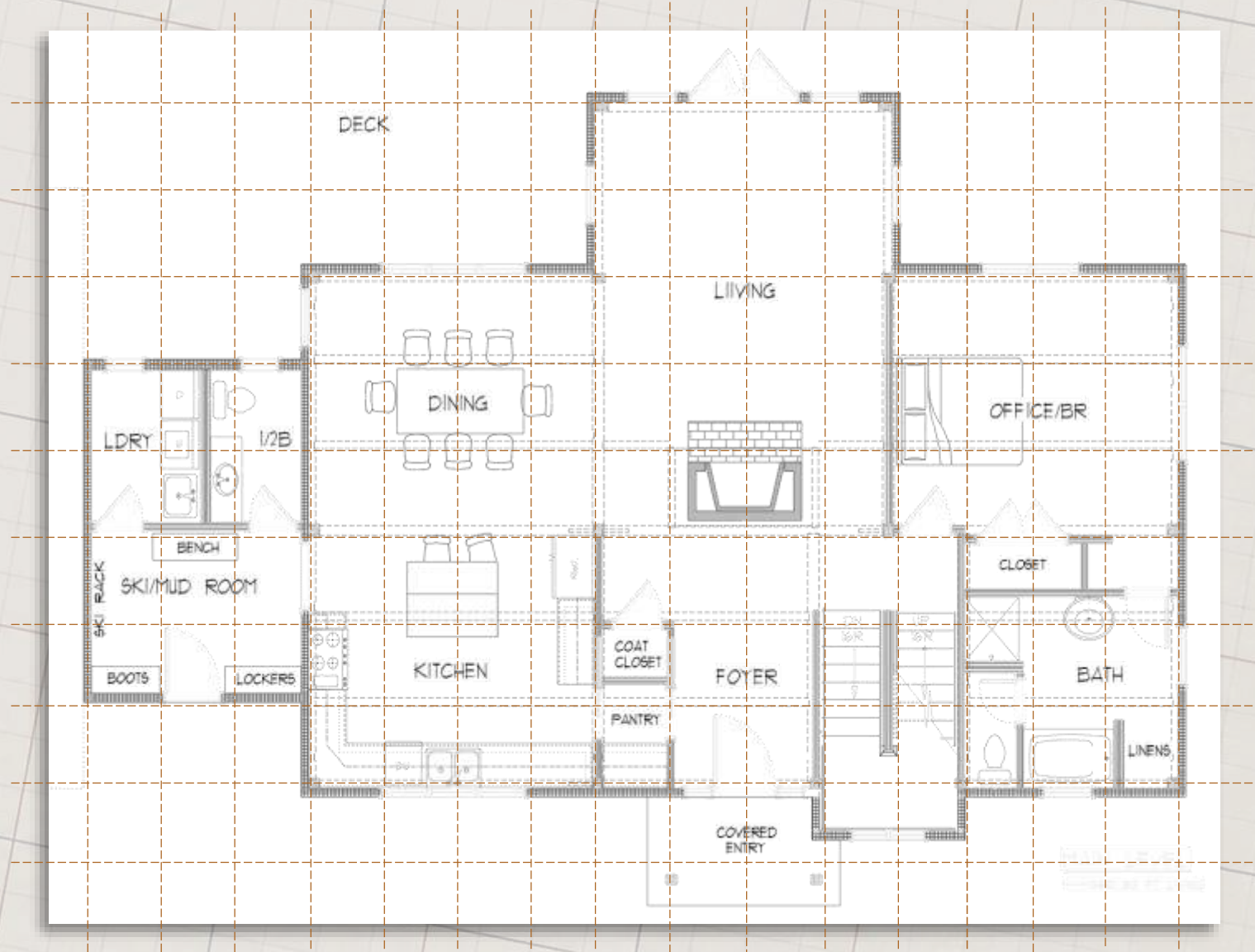
A DIMENSIONAL GRAMMAR FOR A MORE INTEROPERABLE CONSTRUCTION INDUSTRY

## PANELIZED CONSTRUCTION: BENSONWOOD



## APPLYING OPENBUILT: REGULATING 3D GRID

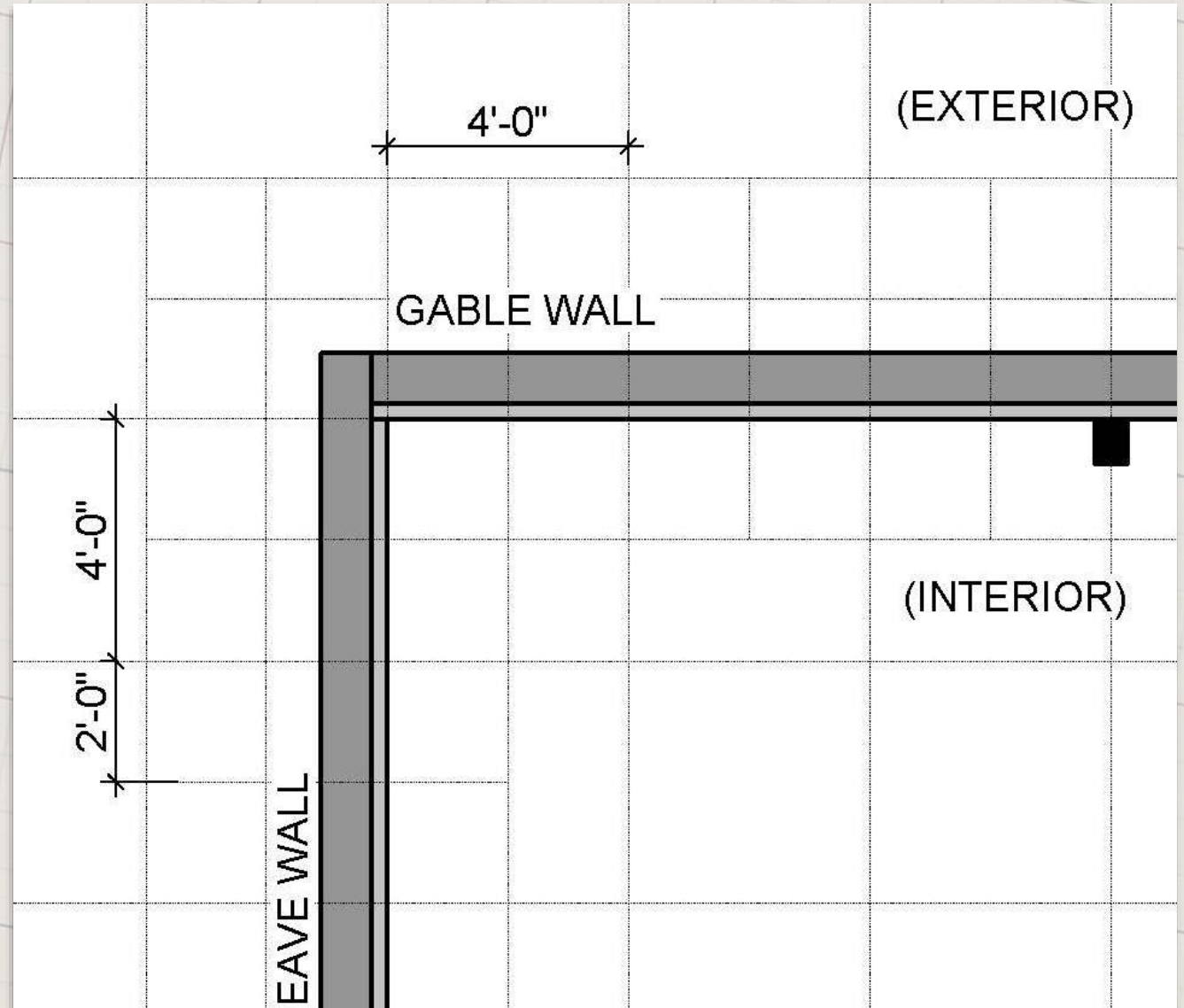
The grid creates a shared spatial logic—defining where things can go and the dimensional rules they follow.



# THE OPENBUILT GRID

## Macro Grid Rules

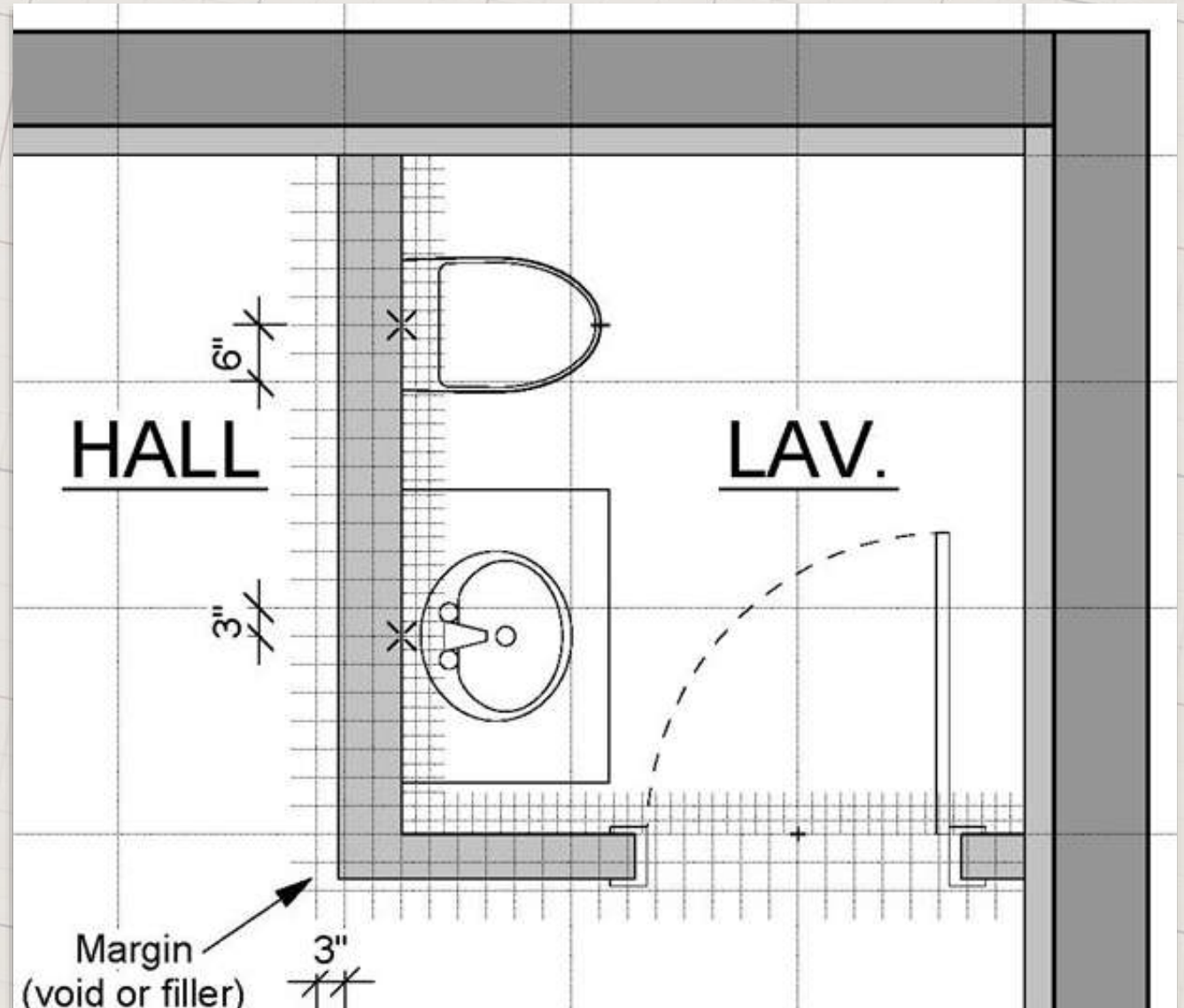
- 2 ft x 2 ft:
- 4 ft dominant
- Sub-MaG regression
  - #1: 2 ft/2
    - #2: 2 ft/4
      - MiG
  - I.D. > O.D. (exterior walls)



# THE OPENBUILT GRID

## Micro Grid Rules

- 3 in x 3 in
- 6 in dominant
- Sub-MiG regression
  - #1: 3 in/2
  - #2: 3 in/4
    - Margin (void or filler)
- I.D. > O.D. MiG or #1 MiG

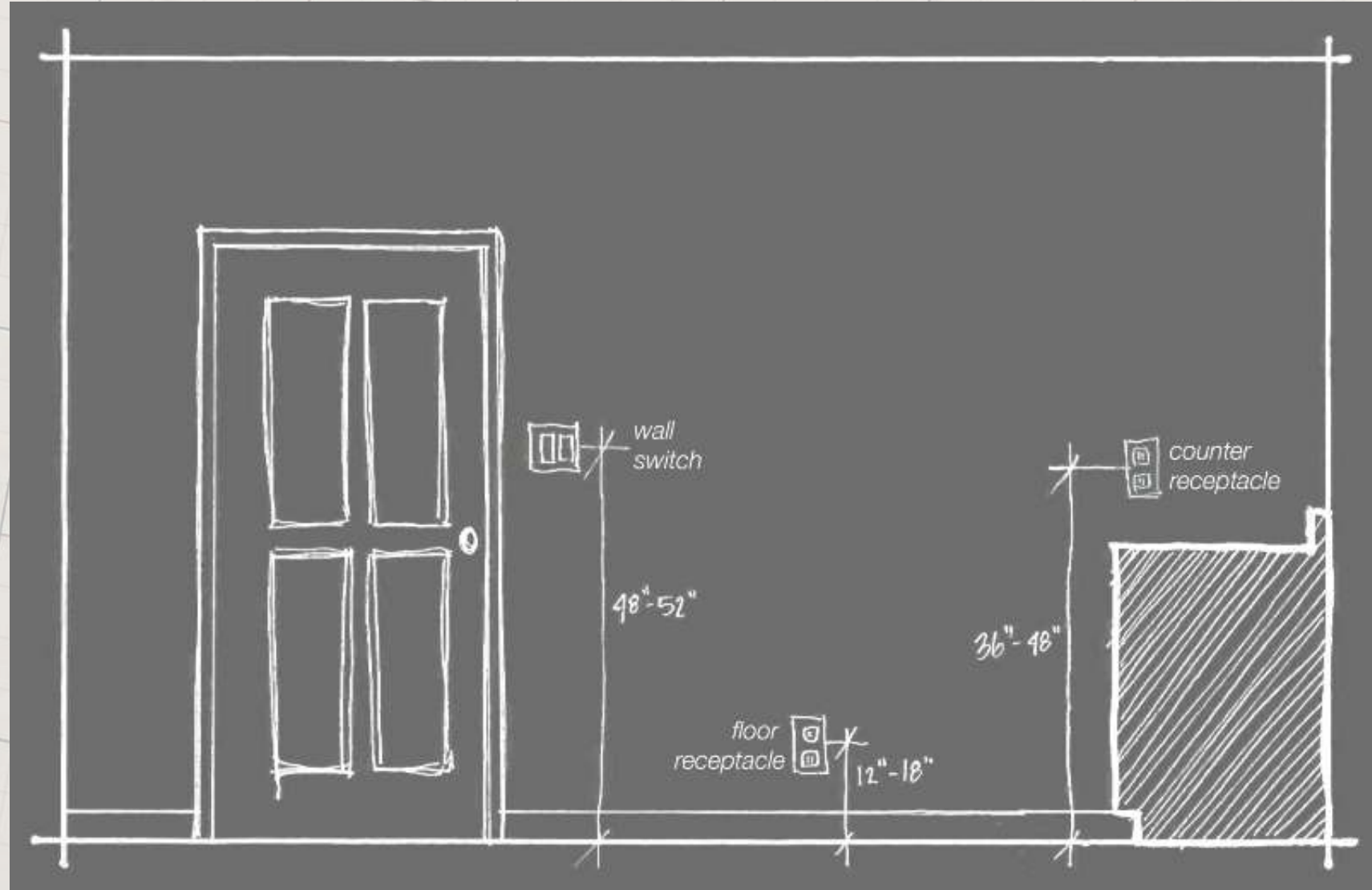


# UNIFYING 3D DIMENSIONAL COORDINATION

## Micro Grid Rules

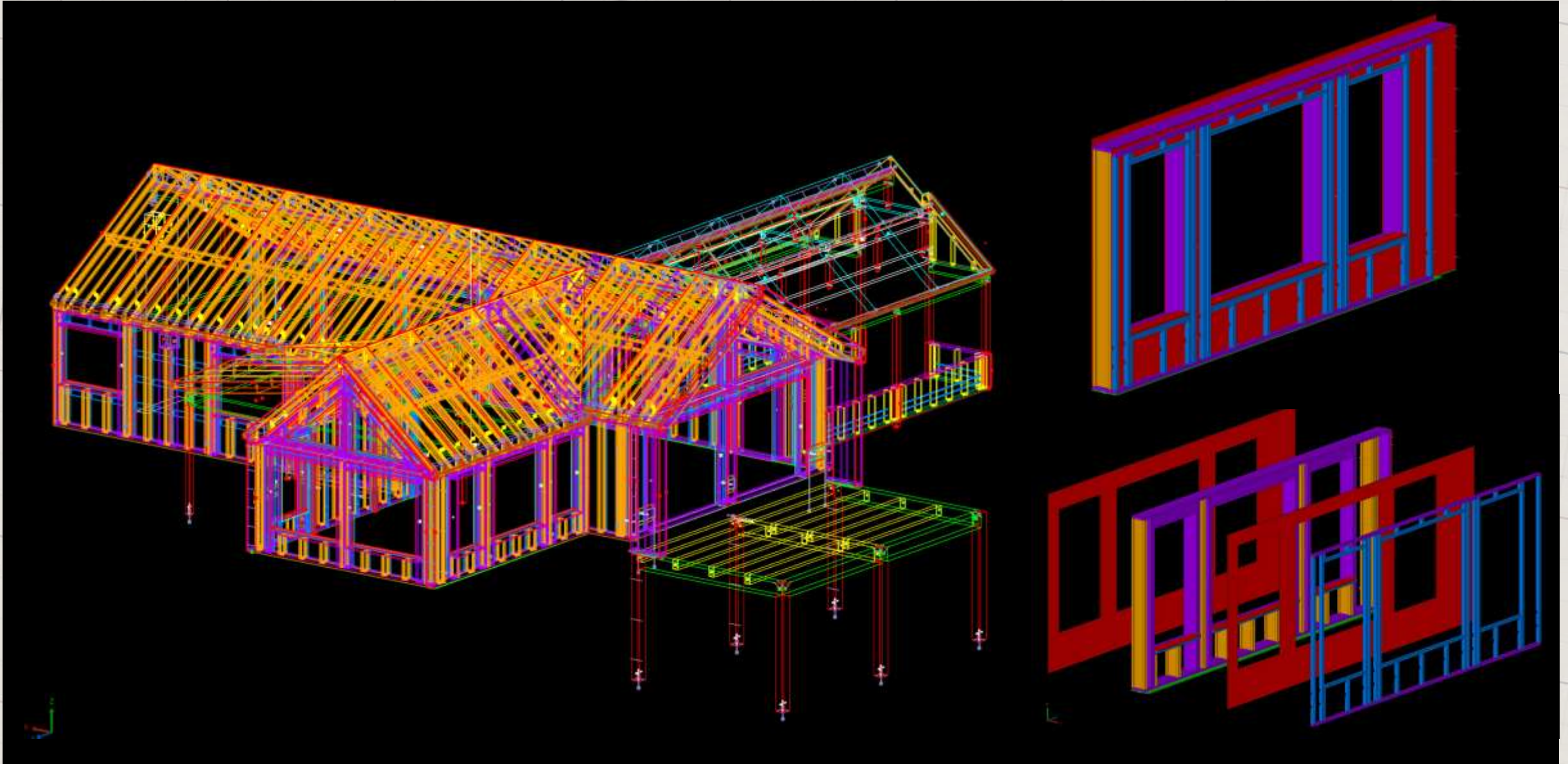
(3 in)

- Window and Door head heights
- Electrical fixture positions (C/L)
  - Outlets (12, **15**, 18)
  - Switches (45, **48**, 51)
  - Sconces (75, **78**, 81)
- Plumbing
  - Shower head (75, **78**, 81)

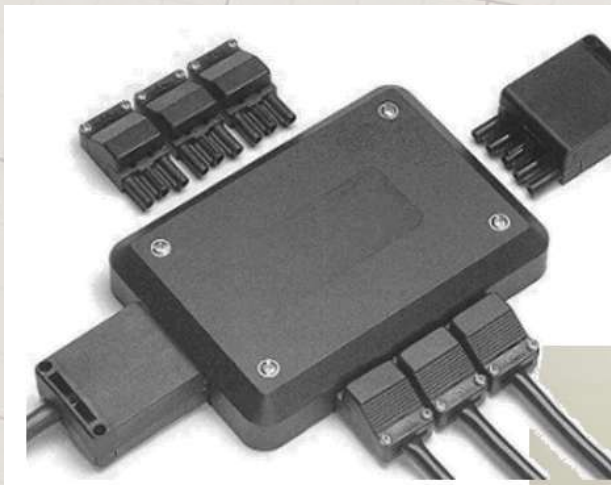
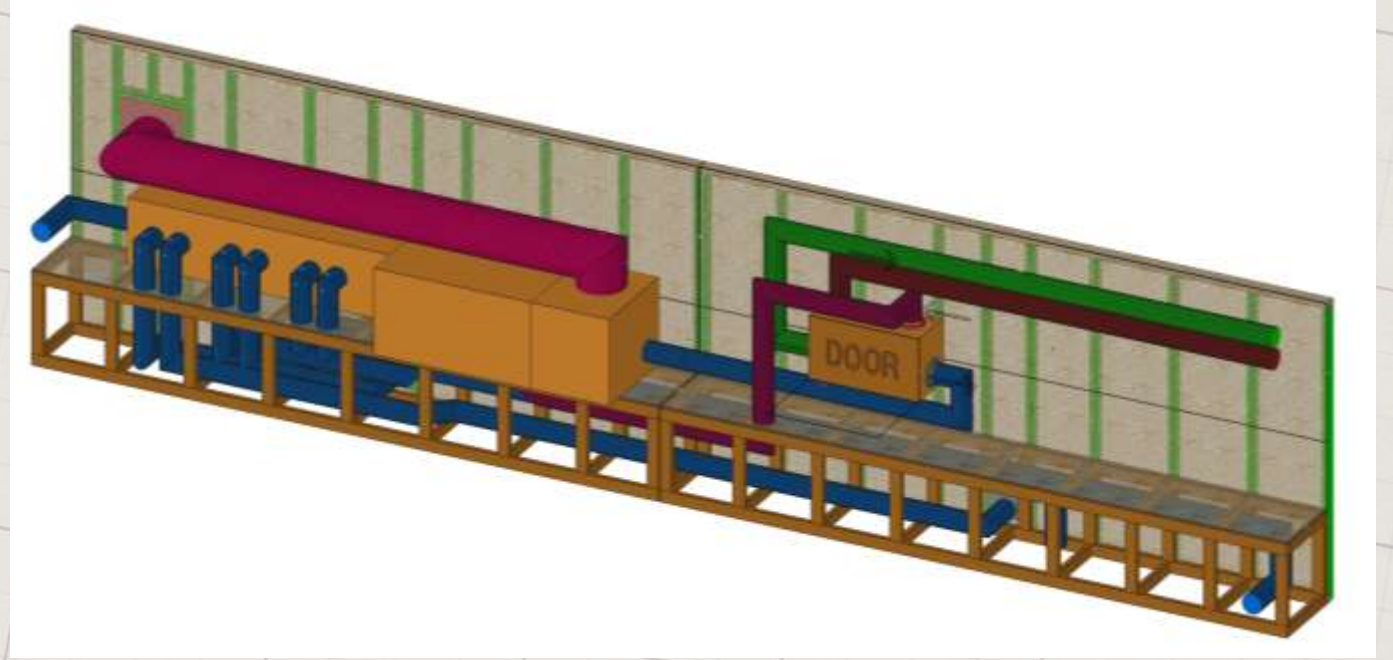
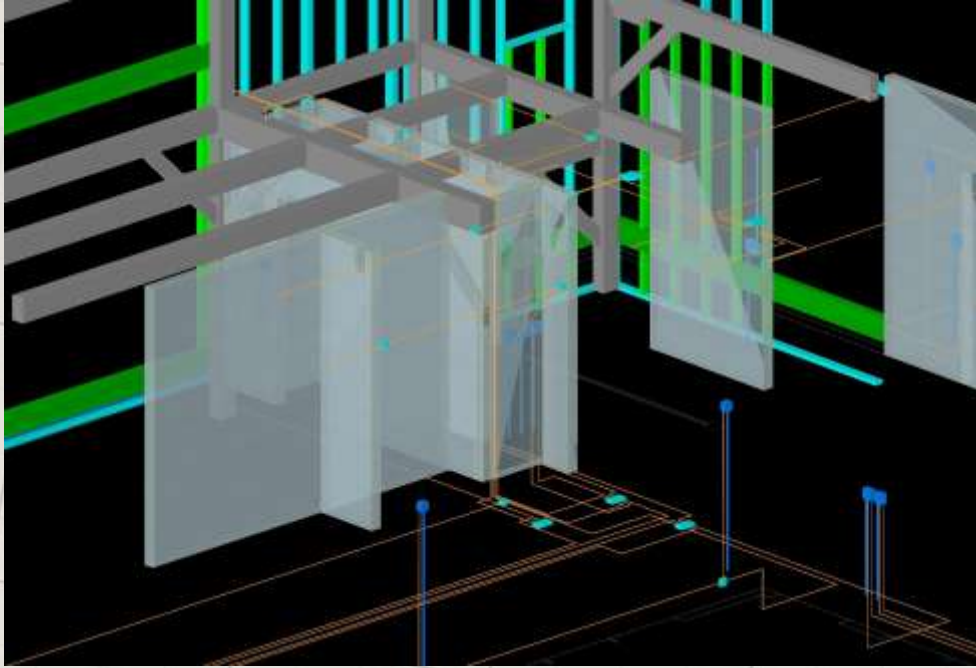


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# UNIFYING 3D DIMENSIONAL COORDINATION



## REWARDS OF DIMENSIONAL GRAMMAR



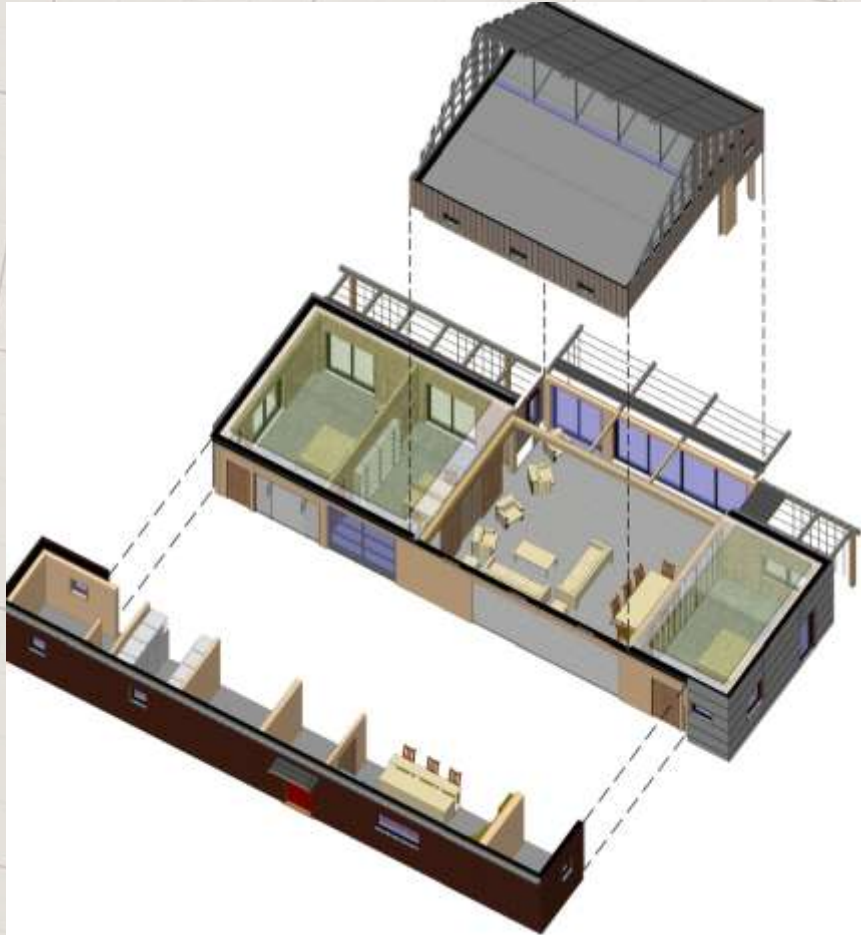
### WITH STANDARDS

- Cost and risk decrease while quality increases
- Value creation moves off-site across the industry
- Specialization is rewarded
- Innovation explodes

A DIMENSIONAL GRAMMAR FOR A MORE INTEROPERABLE CONSTRUCTION INDUSTRY

## COMPONENT-DRIVEN DESIGN

2007: Unity House: Structure Kit, 2D, 3D, Millwork Kit



## COMPONENT-DRIVEN DESIGN

2007: Unity House: Structure Kit, 2D, 3D, Millwork Kit



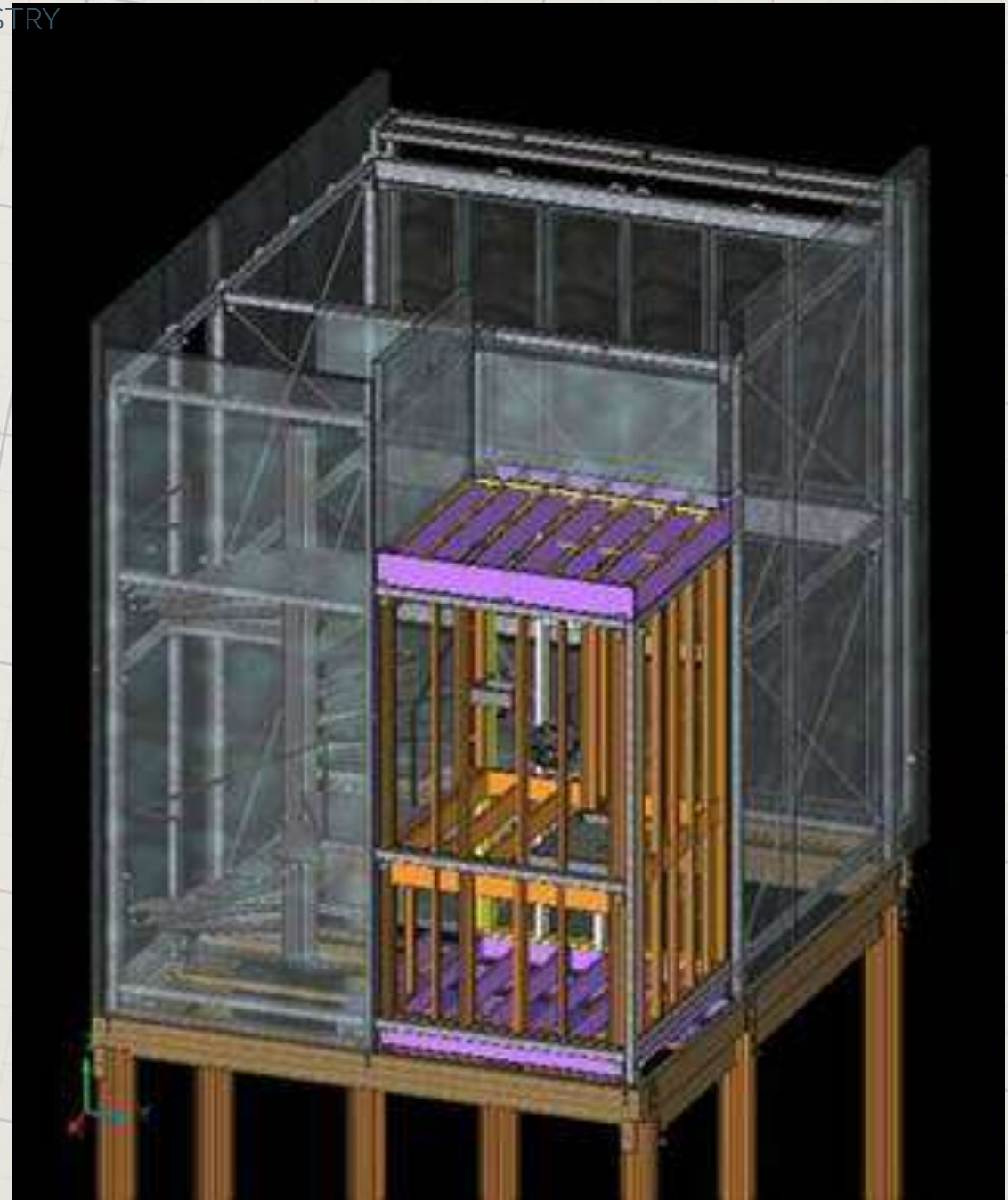
## COMPONENT-DRIVEN DESIGN

2006: Loblolly House: Structure Kit, 2D, 3D, Integrated Components  
KIERAN TIMBERLAKE ARCHITECTS



## COMPONENT-DRIVEN DESIGN

### Bath Module component



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# SYSTEM DESIGNED HOMES

## Unity Homes Collection



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# PRODUCT HOMES FROM SYSTEM COMPONENTS



**Mass Customization** via 3D BIM Libraries of Components, Systems, and Assemblies . . .

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## SYSTEM DESIGNED CUSTOM HOMES

Each basic platform offers *thousands* of configurations to customize.



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# SYSTEM DESIGNED HOMES

## Legacy Homes Collection



## Featured Collaborations



A DIMENSIONAL GRAMMAR FOR A MORE INTEROPERABLE CONSTRUCTION INDUSTRY

# BEYOND RURAL SINGLE-FAMILY HOMES

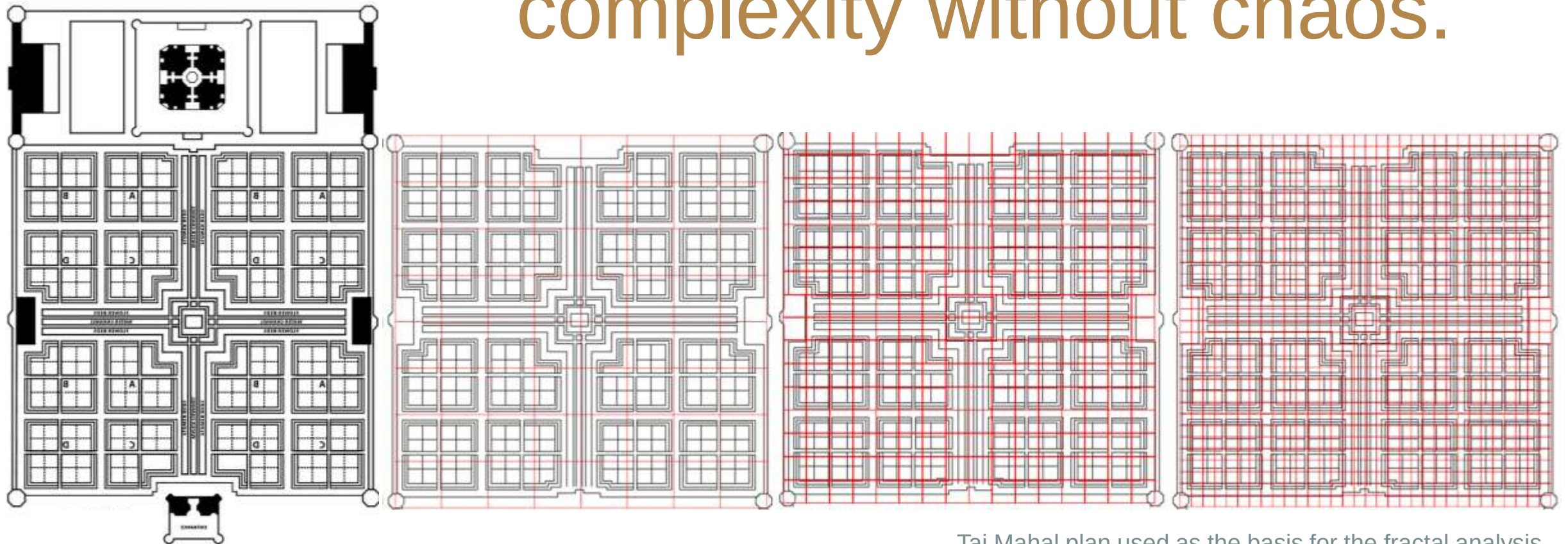


TOWARD A NEW

# Interoperability

## GENERATIVE RATHER THAN RESTRICTIVE

A shared grammar unlocks  
complexity without chaos.



Taj Mahal plan used as the basis for the fractal analysis.

## APPLICATION + DISCUSSION

The opportunity is not to standardize architecture. It is to standardize enough of the relationships between systems that integrated design and construction can occur across companies rather than only within them.

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or: [nesea.org/eval](https://nesea.org/eval)

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