HIGHPOINTS

HURDLES IN OFFSITE MODULAR CONSTRUCTION

EEBA 2024, Salt Lake City

LEARNING OBJECTIVES

01

Absorb the data that shows the increased need for off site construction due to demographics, density, and dollars.

02

Understand the different types of off-site construction, including components, panels, modules, and full structures.

03

Compare and contrast the various types of companies involved in modular construction.

04

Recognize how offsite modular building can make it easier to build high performance and where it can be more difficult.

05

Head to your next session with more knowledge and awareness.

MANAGING EXPECTATIONS

High level; broad and not deep

For “regular” builders

Starting point and not the conclusion

15 minutes of Q&A at the end

SCOTT SANDERS

Chicago, IL
Kinexx Modular and
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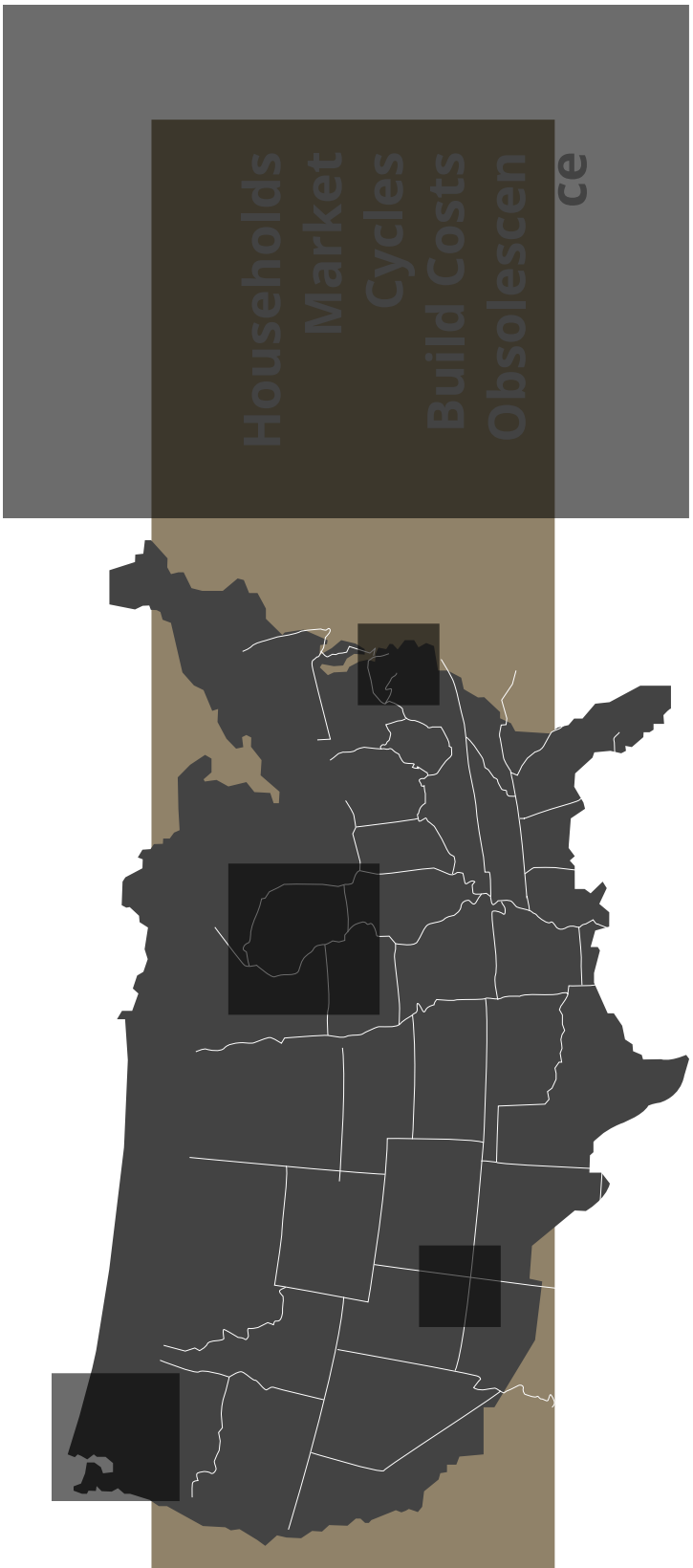
Development

BRANDON WEISS

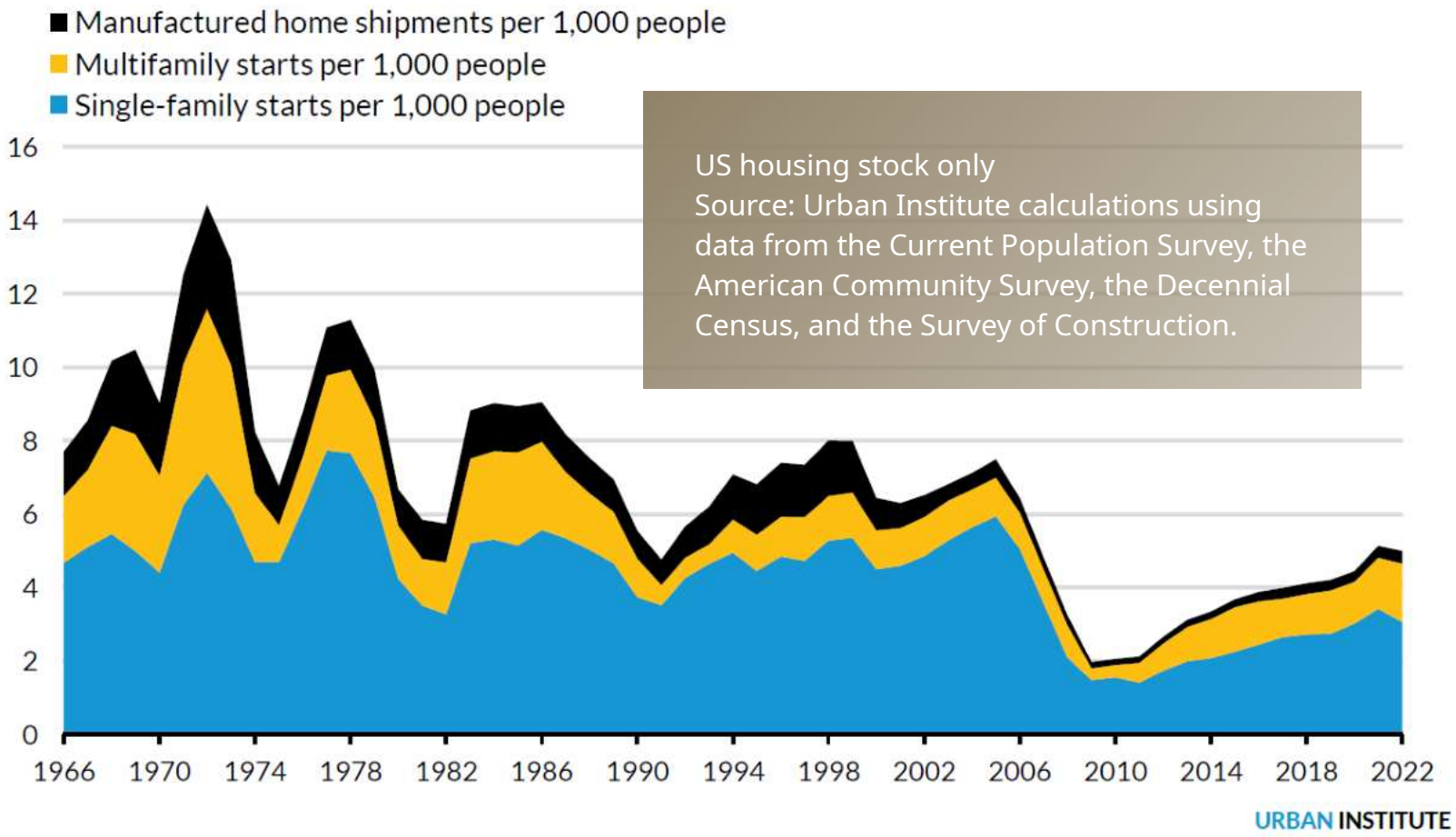
San Diego, CA
Dvele

THE NEED FOR HOUSING



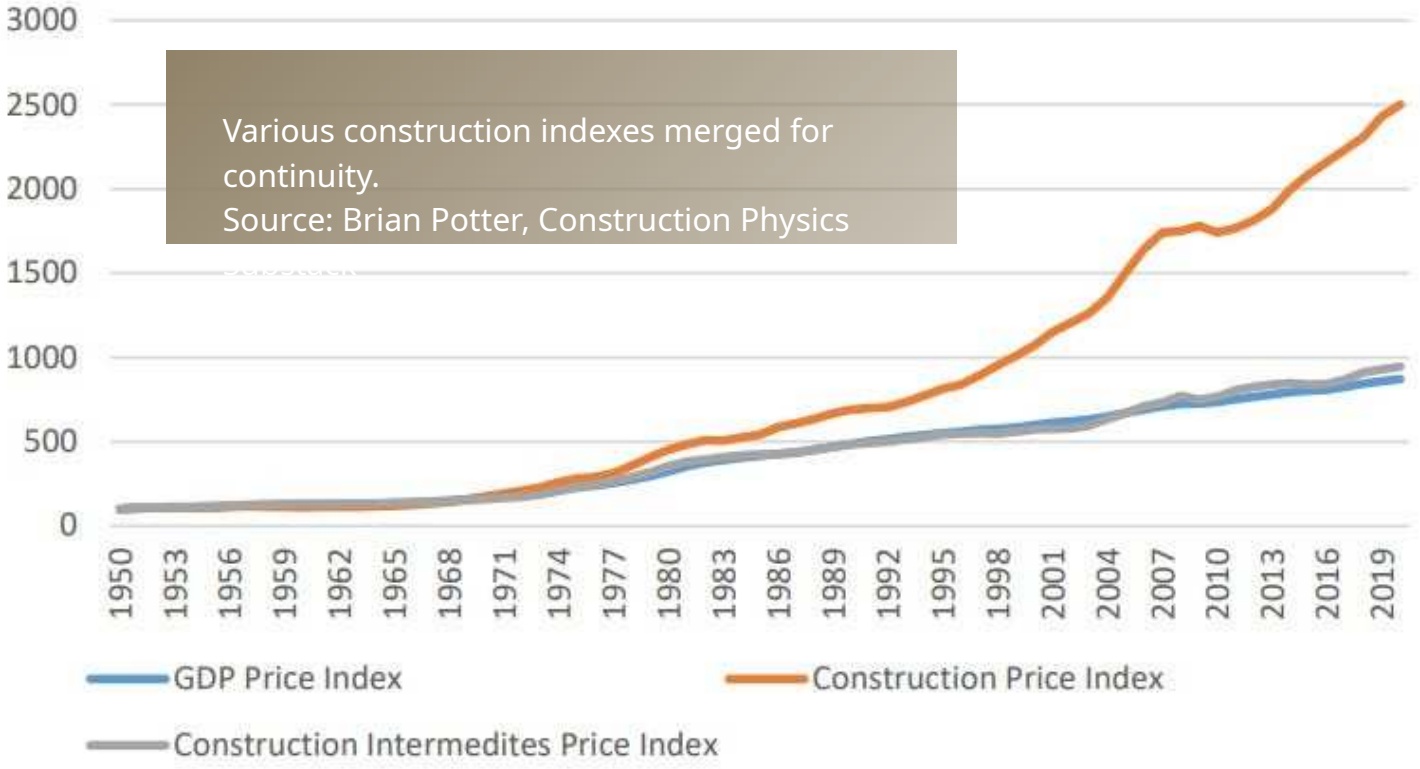
Population-Adjusted Housing Starts

Population-adjusted housing production falls below historic averages



URBAN INSTITUTE

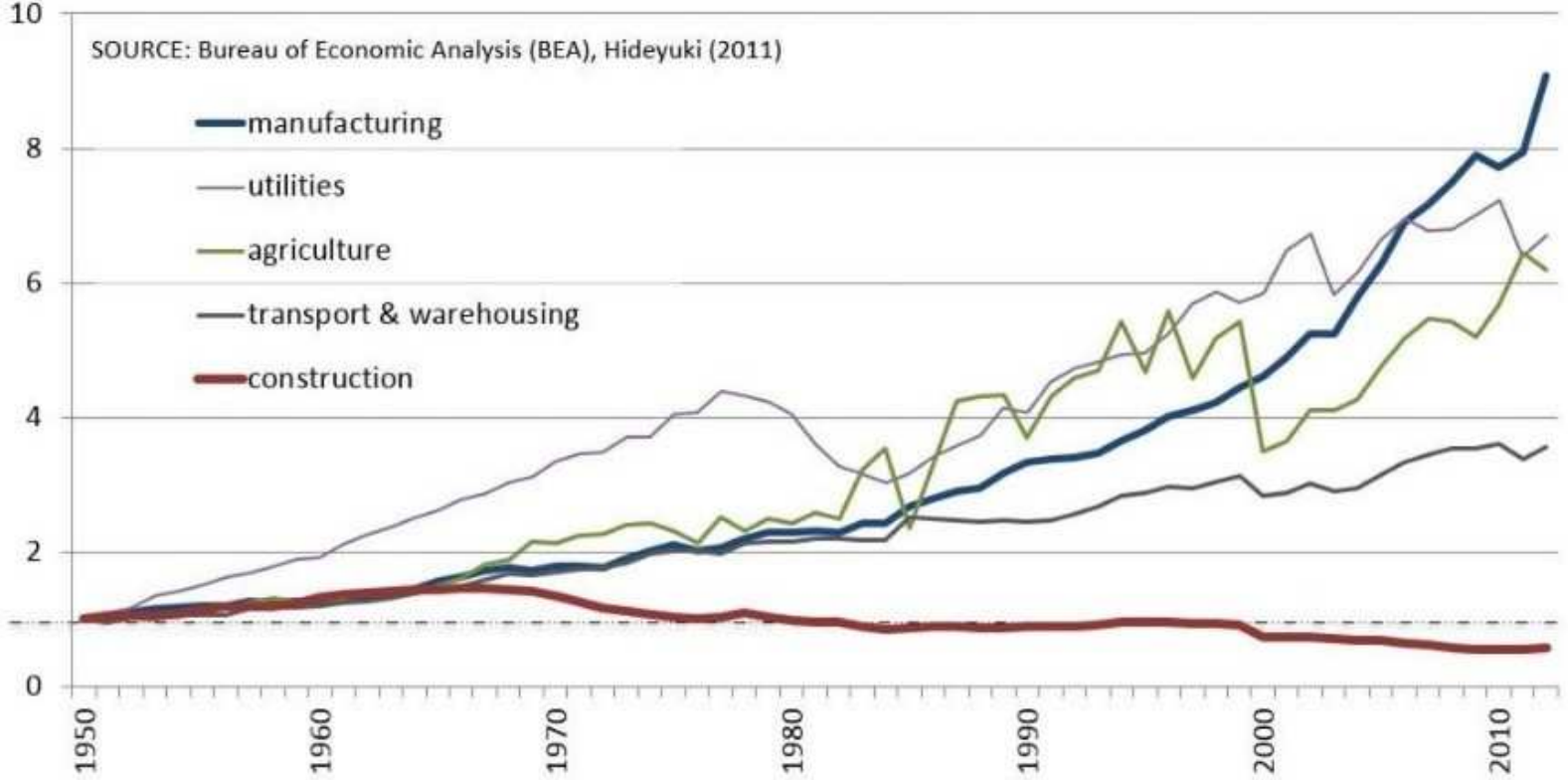
Construction and GDP Output Price Index Compared to Construction Intermediates Price Index



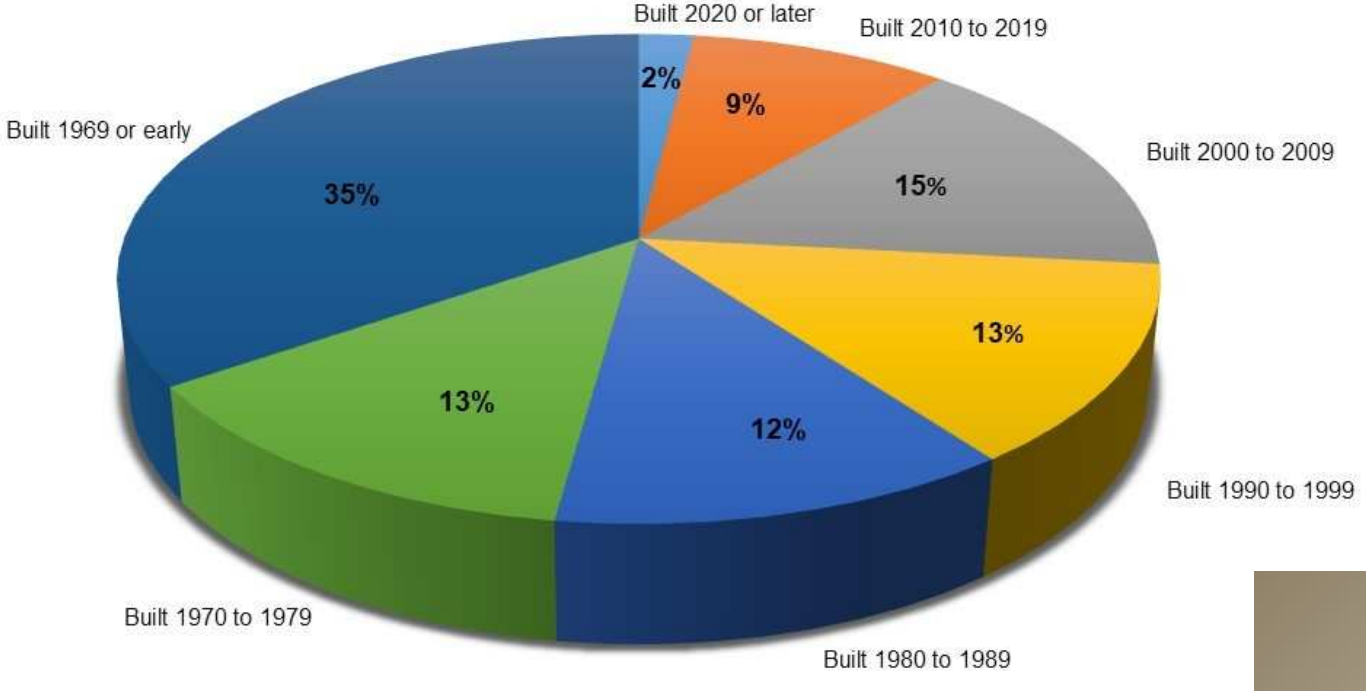
Various construction indexes merged for continuity.
Source: Brian Potter, Construction Physics

Construction productivity 1950-2012

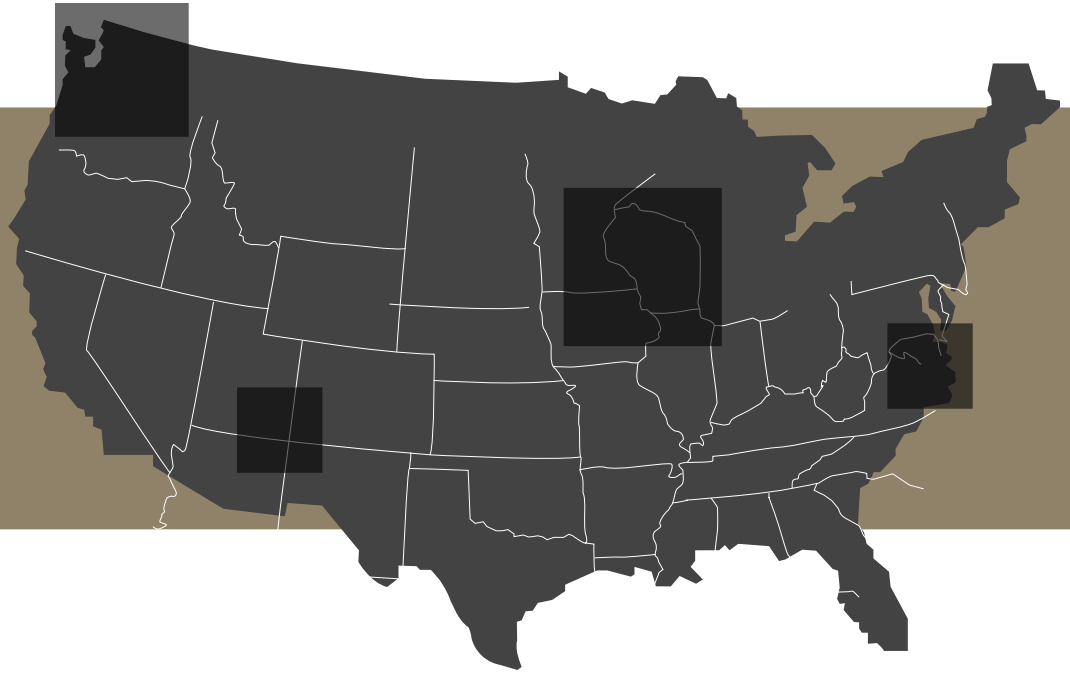
Real productivity (GDP value-add per employee) by industry in the US
Indexed; 1950 = 1.0



Share of Owner-Occupied Housing by Year Structure Built



Source: 2024 NAHB data

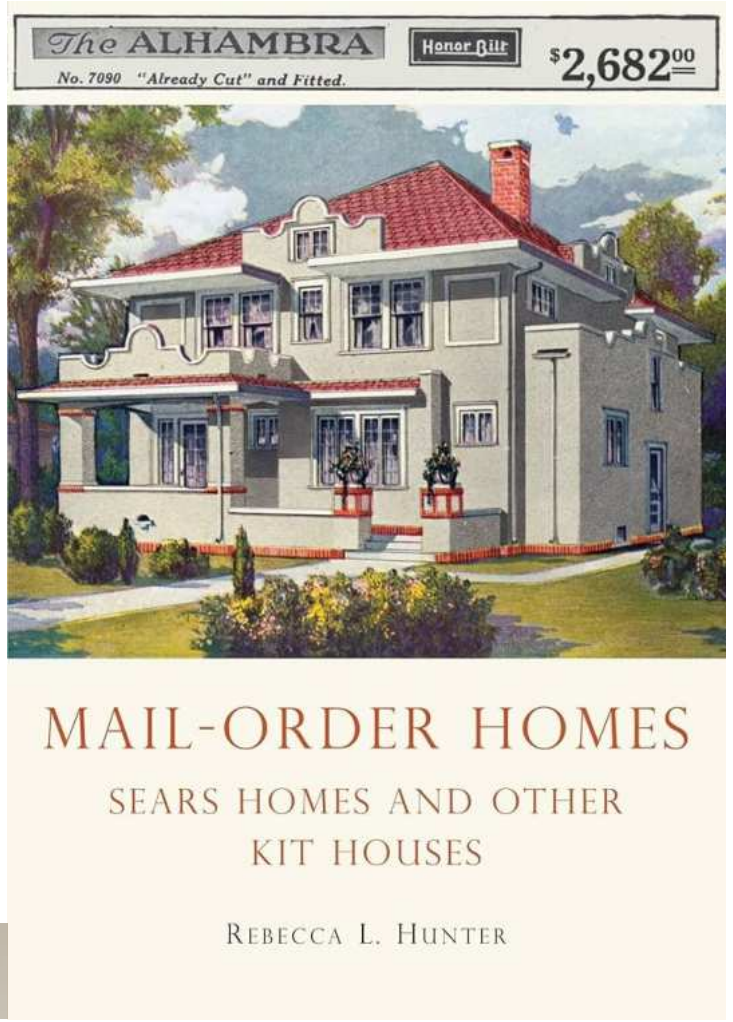


Offsite
Prefab
Modular
Industrialized
Factory Built
Systems
Built
Manufactured

NAMES FOR OFFSITE WORK

Lustron Kit Homes; 1950

Sears Kit Homes; 1908



OFFSITE OPTIONS

COMPONENTS

Trusses, windows, cabinet assemblies, etc

PANELS (and cassettes)

Walls, floors, and roofs

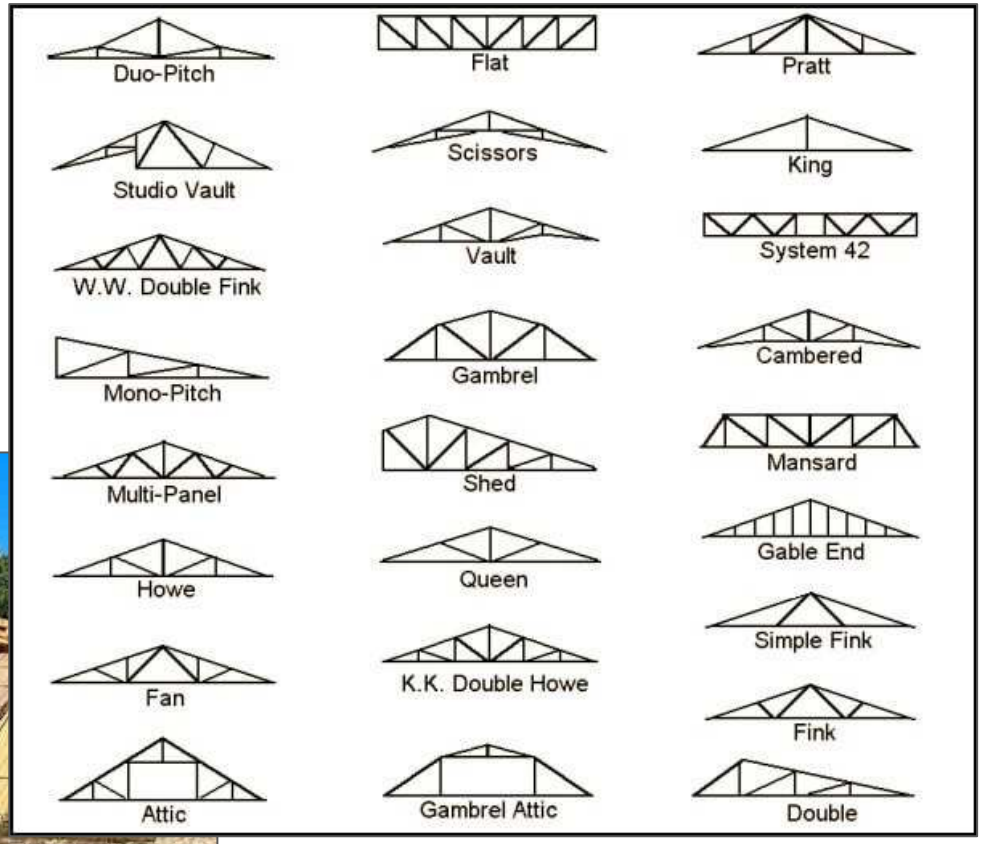
MODULES

Big pieces of larger structures

STRUCTURES

ADUs, containers, tiny houses

COMPONENTS



ROOF TRUSSES

COMPONENTS

FLOOR TRUSSES

COMPONENTS

STEEL TRUSSES

COMPONENTS

OTHER STUFF

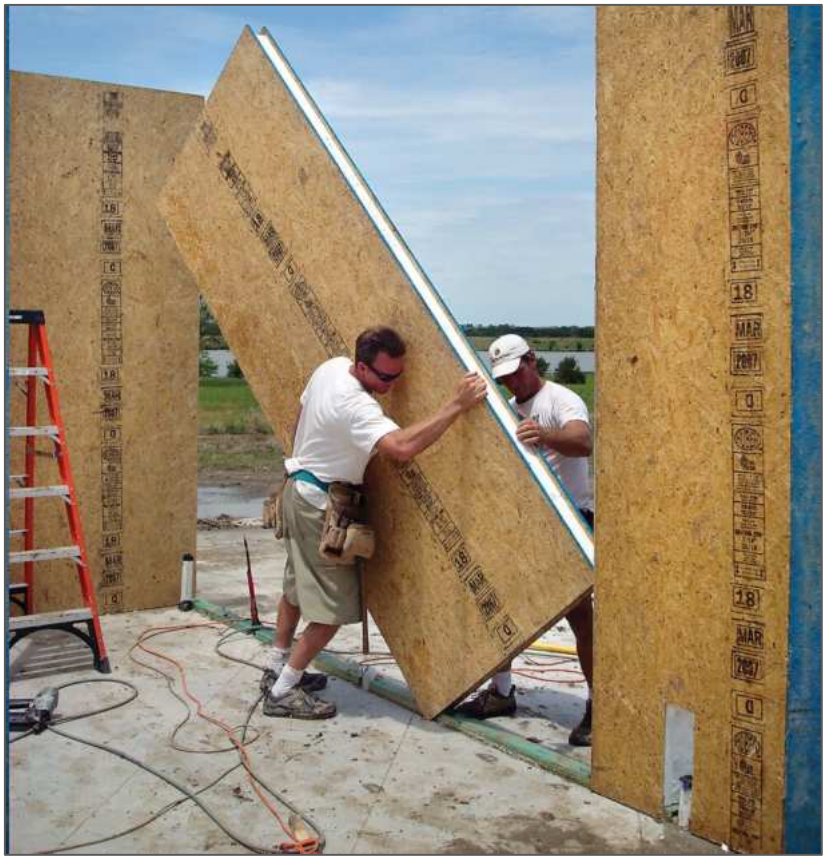
PANELS

OPEN WALL

PANELS

CLOSED WALL

PANELS



STRUCTURAL INSULATED

PANELS

CONCRETE

PANELS

FLOORS

MODULES

BIG ONES

MODULES

SMALLER ONES

STRUCTURES

ADUs/CONTAINERS

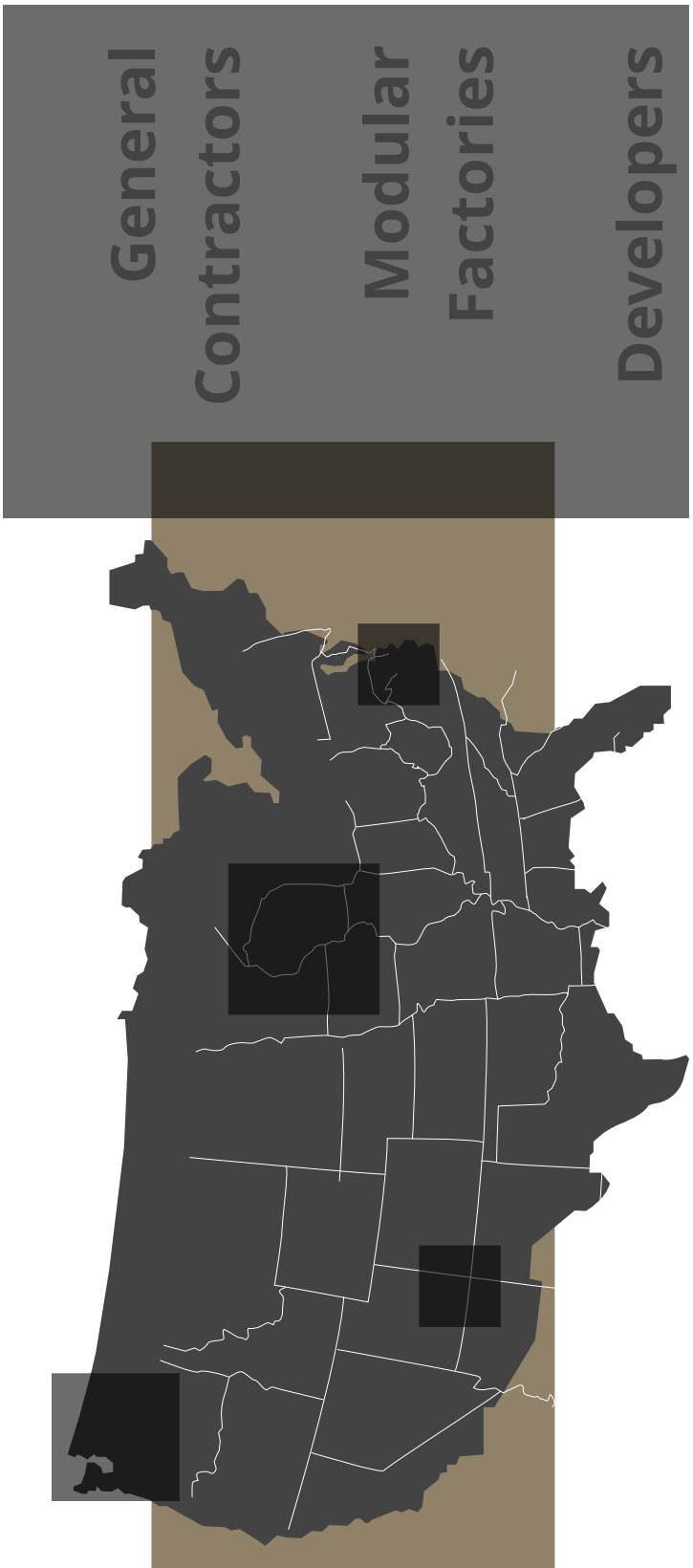
STRUCTURES

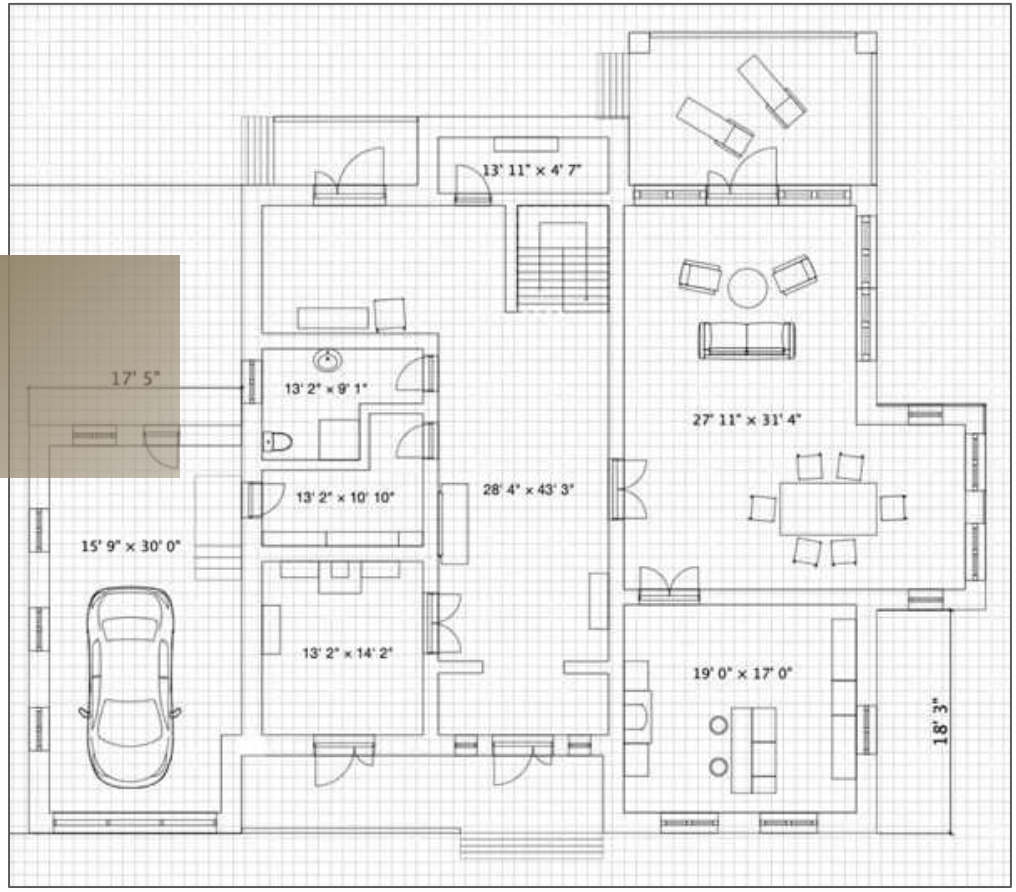
CUSTOM/HYBRID

STRUCTURES

MOBILE/HUD

OFFSITE MODULAR PLAYERS





GENERAL CONTRACTORS

Have plans
Need modules

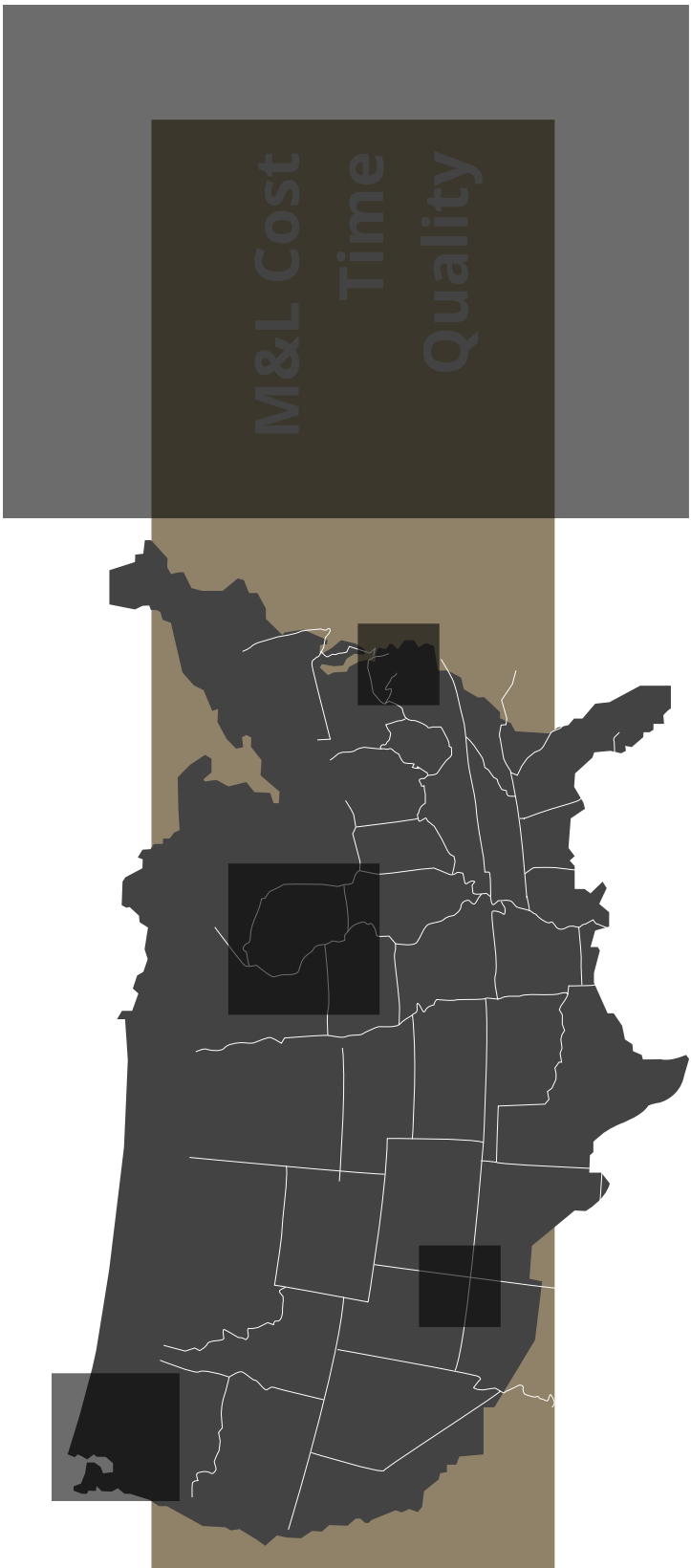
MODULAR FACTORIES

Have a facility
Will build to spec

DEVELOPERS

Plan projects
Build modules
(maybe)
Sell or rent units

THE CASE FOR OFFSITE



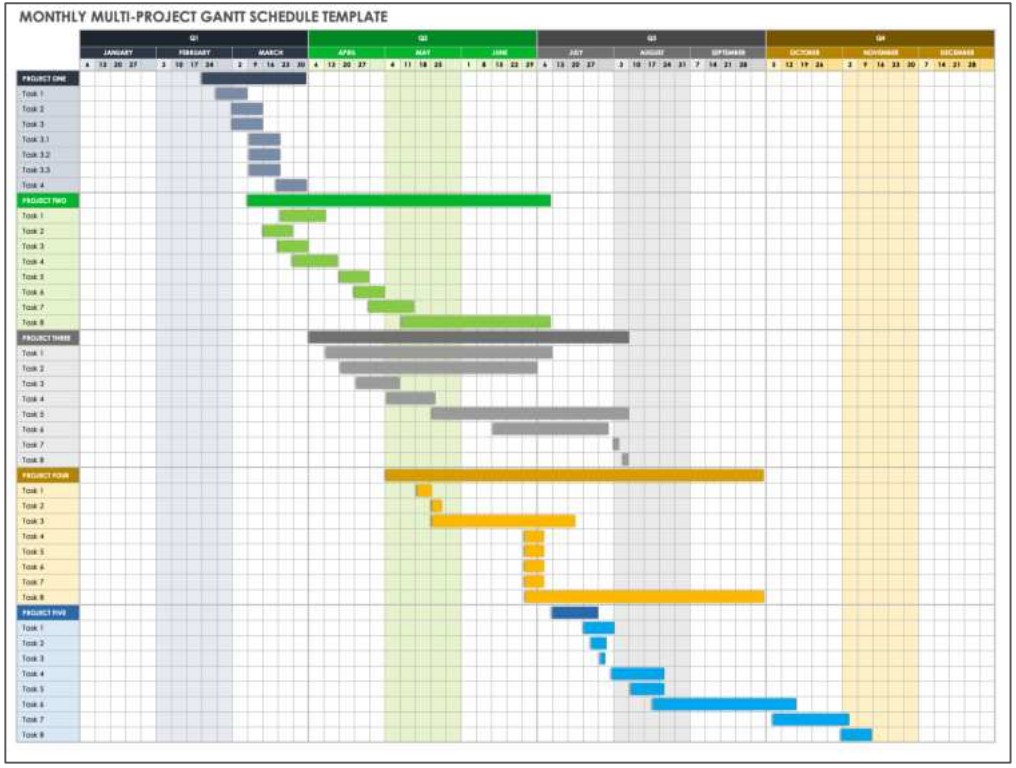
MATERIAL COST BENEFITS

- Accurate cutting
- Efficient material use
- Minimized loss from weather, theft, and damage by others
- Potential volume

LABOR COST BENEFITS

- Increased productivity
  - Reduced rework
  - Indifferent to weather
  - Tools and materials on station
- Higher retention

SCHEDULE TIME BENEFITS



- Concurrent work
  - Site development
  - Structure and finishes
- Reduced overall weather impact

QUALITY BENEFITS

INSIGHT Quality Services

Quality Inspection Checklist: Doghouse

Part 1-Generic Information *Date: Feb 4, 2017*

Item No.		**Customer**	
Item Description	Doghouse		

Part 2 -AQL Level

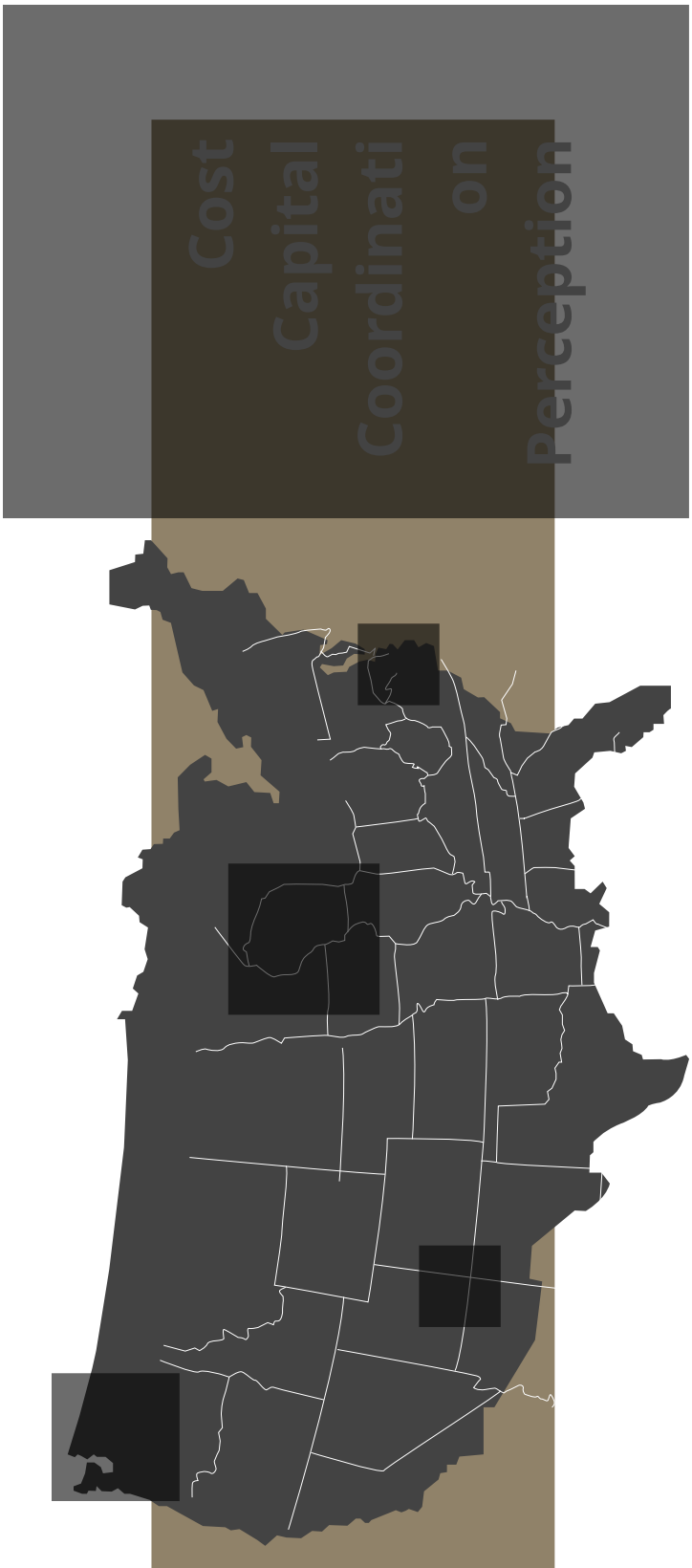
	AQL Level	Critical	Major	Minor
	Default	**0**	**2.5**	**4.0**
	Customer specific			

Part 3 -Defect Classification, Sampling Level & Inspection Check Point description

	Inspection Check Points	Sampling Level	Classification			
			CR	MA	MI	Hold
A	**Package Requirements**					
1.	Shipping mark clear and legible on outer carton (inner carton if applicable) has correct PO information. If any key information on the carton is blurred or missing, this is considered a major defect, otherwise it is minor defect.	Level II		V	V	
2.	Carton markings aren't correct or carton is damaged	Level II		V		

- Controlled climate environment
- Manufacturing style QA/QC programs
- Standardized layouts and plans

OFFSITE CHALLENGES



COST CHALLENGES

I. Sale Price Breakdown	Average		Share of Price
Finished Lot Cost (including financing cost)	$	114,622	17.8%
Total Construction Cost (Hard Cost)	$	363,048	56.3%
Total Soft Cost	$	167,081	25.9%
Total Sales Price	$	644,750	100.0%

- Material cost parity and actual achievable savings
- Labor cost efficiencies might be offset by allocated overhead

Fraction of SFH Cost, 1945 vs 2021

	1945	2021
Framing	16.69%	15.90%
Painting	4.37%	3.60%
Roof	5.24%	7.17%
Foundation	7.21%	4.90%
Plumbing	8.04%	7.30%
HVAC	2.93%	2.90%
Plaster	13.19%	-
Drywall	-	4.70%
Finish Hardware	1.65%	0.20%
Brick	2.88%	0.70%
Floors	4.80%	4.40%
Electrical	1.95%	3.20%
Square foot Cost* (inflation adjusted)	$69.27	$104.62

CAPITAL CHALLENGES

- Volumetric space
- Tools, equipment & automation
- Pipeline and contracts

CAPITAL CHALLENGES

- Upfront material spending
- Draw timing and speed

COORDINATION CHALLENGES

- Factory and on site work interfaces
- Module or component joints
- Utility and MEP connections

COORDINATION CHALLENGES

- Inspections
- Transport logistics
- Staging and lifting
- Interior and exterior finishing

PERCEPTION CHALLENGES

- Mobile home stigma
- 6-7% market share
- High profile venture capital company failures

MAKING SENSE OF IT ALL

Macroeconomic factors are likely to force growth of offsite construction

Huge potential (and need) for innovation and expansion

Temper expectations that modular is tremendously cheaper or easier

QUESTIONS & COMMENTS

BRANDON **SCOTT**

EEBA 2024, Salt Lake City

FURTHER LEARNING

- **Offsite Builder, industry magazine**
- ***Why Is It So Hard (and Expensive) to Build Anything in America?, podcast by Freakonomics***
- **Construction Physics Substack, blog series by Brian Potter**
- ***How Much is the Milk*, book by Ken Pinto**