Market Outlook Construction Forum

Summary

as of February 5th, 2021

Presenters

- Sid Sanders, Senior Vice President Construction, Houston Methodist
- Richard Vermeulen, Co-CEO, Vermeulens
- Sam Dicke, Business Development Representative, Swinerton Mass Timber

Healthcare Sector Economic Update, Houston Methodist

- construction projects put on hold during the first surge of COVID-19 in March-April 2020
- recently resumed design to get major projects shovel ready for Q4 2021 to Q1 2022
- 70% to 80% of client facing staff now vaccinated

Trends in the Mass Timber Industry, Vermeulens and Swinerton Mass Timber

- timber costs have been very volatile due to surging demand and supply chain disruptions
- the growth of forests throughout North America allow for significant carbon capture and low cost construction materials
- nonresidential design will accelerate timber adoption and technologies
- forest reserves are much larger than current demand; home and wood prices will spur rapid growth in supply
- the growth of forests can offset liquid fuel transportation emissions, medium term
- ICI timber/stick construction can grow to equal residential
- urban canopy can comprise a significant share of forest cover
- wood fuels can comprise a significant share of power generation
- mass timber reduces finish cost

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Service Beyond Estimation

Design & Construction Market Outlook

Sid Sanders – Houston Methodist

Sam Dicke – Swinerton Mass Timber

Richard Vermeulen – Co-CEO

North America's Construction Economist

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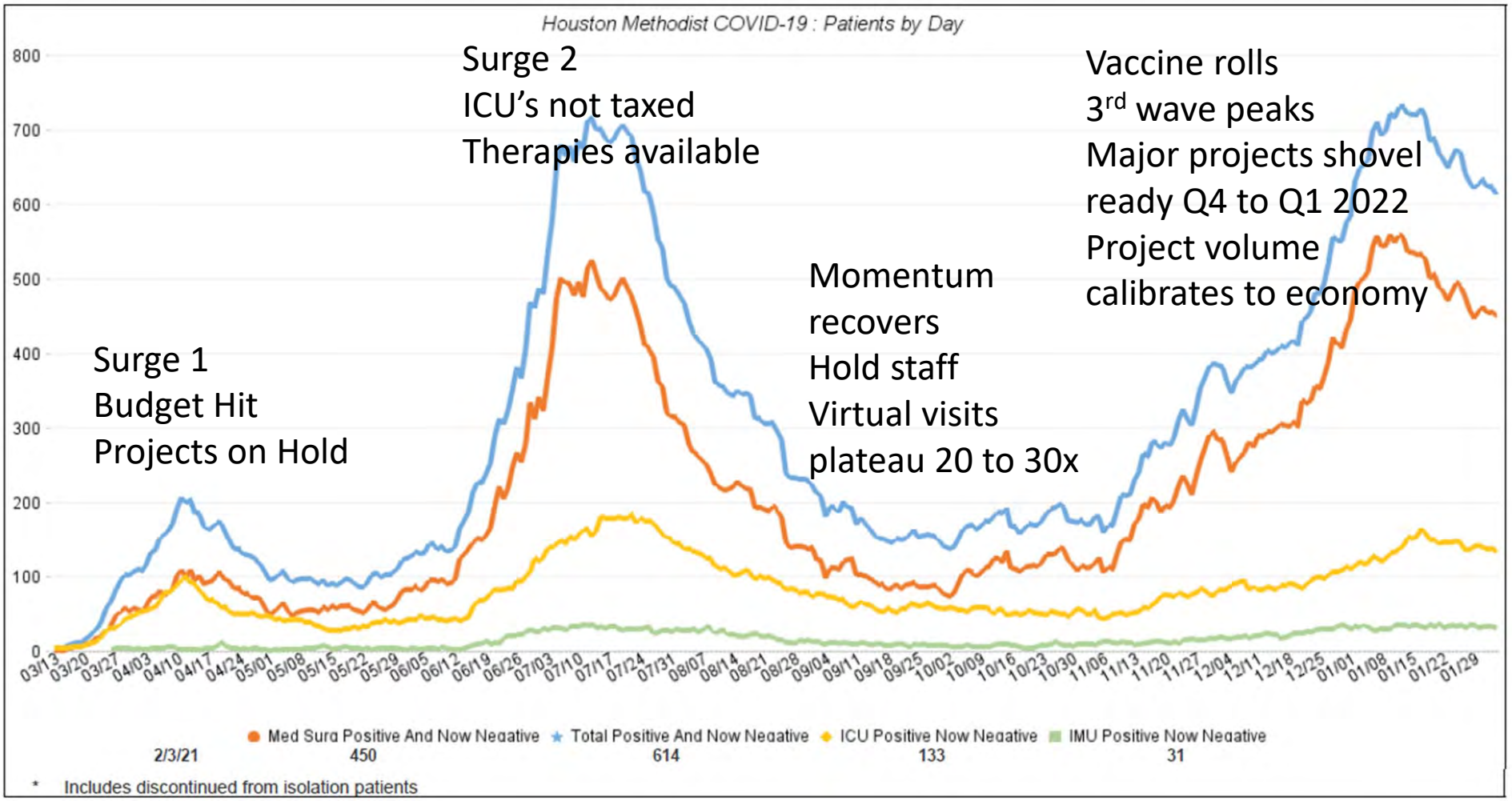
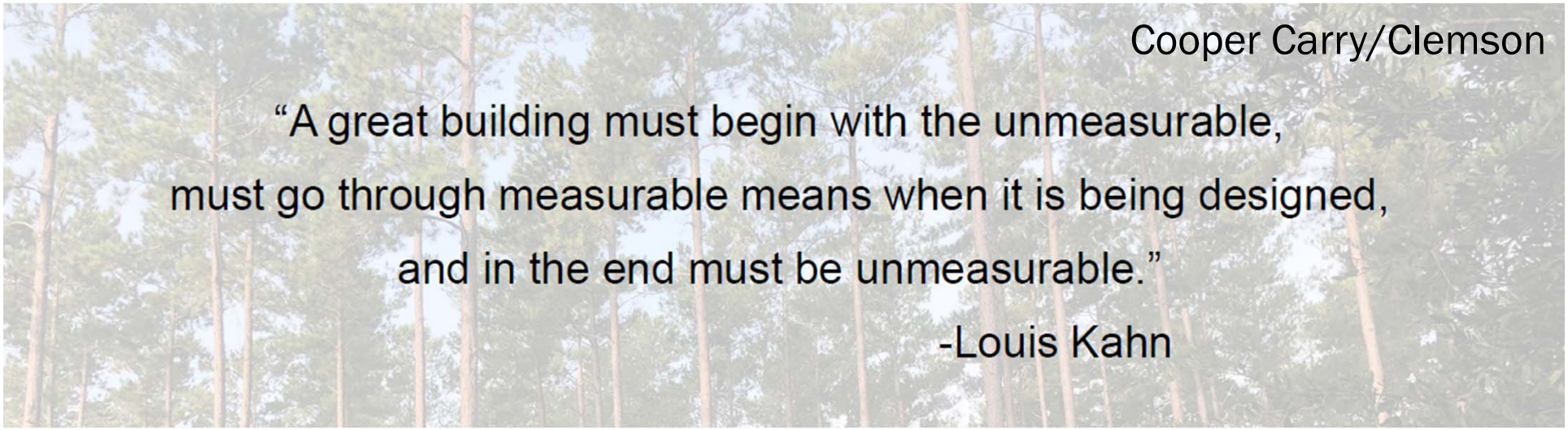
Logistics

- Please mute mics except for those speaking
- Please keep camera function off
- Interim questions and comments via chat
- Publication of slide deck & audio link – following talk
- Summary report – following week
- Next session Monthly – March 5th


Houston Methodist COVID-19 : Patients by Day
Surge 1
Budget Hit
Projects on Hold
Surge 2
ICU's not taxed
Therapies available
Momentum
recovers
Hold staff
Virtual visits
plateau 20 to 30x
Vaccine rolls
3rd wave peaks
Major projects shovel
ready Q4 to Q1 2022
Project volume
calibrates to economy
800
700
600
500
400
300
200
100
0
03/13 03/20 03/27 04/03 04/10 04/17 04/24 05/01 05/08 05/15 05/22 05/29 06/05 06/12 06/19 06/26 07/03 07/10 07/17 07/24 07/31 08/07 08/14 08/21 08/28 09/04 09/11 09/18 09/25 10/02 10/09 10/16 10/23 10/30 11/06 11/13 11/20 11/27 12/04 12/11 12/18 12/25 01/01 01/08 01/15 01/22 01/29
Med Surg Positive And Now Negative
Total Positive And Now Negative
ICU Positive Now Negative
IMU Positive Now Negative
2/3/21
450
614
133
31
* Includes discontinued from isolation patients



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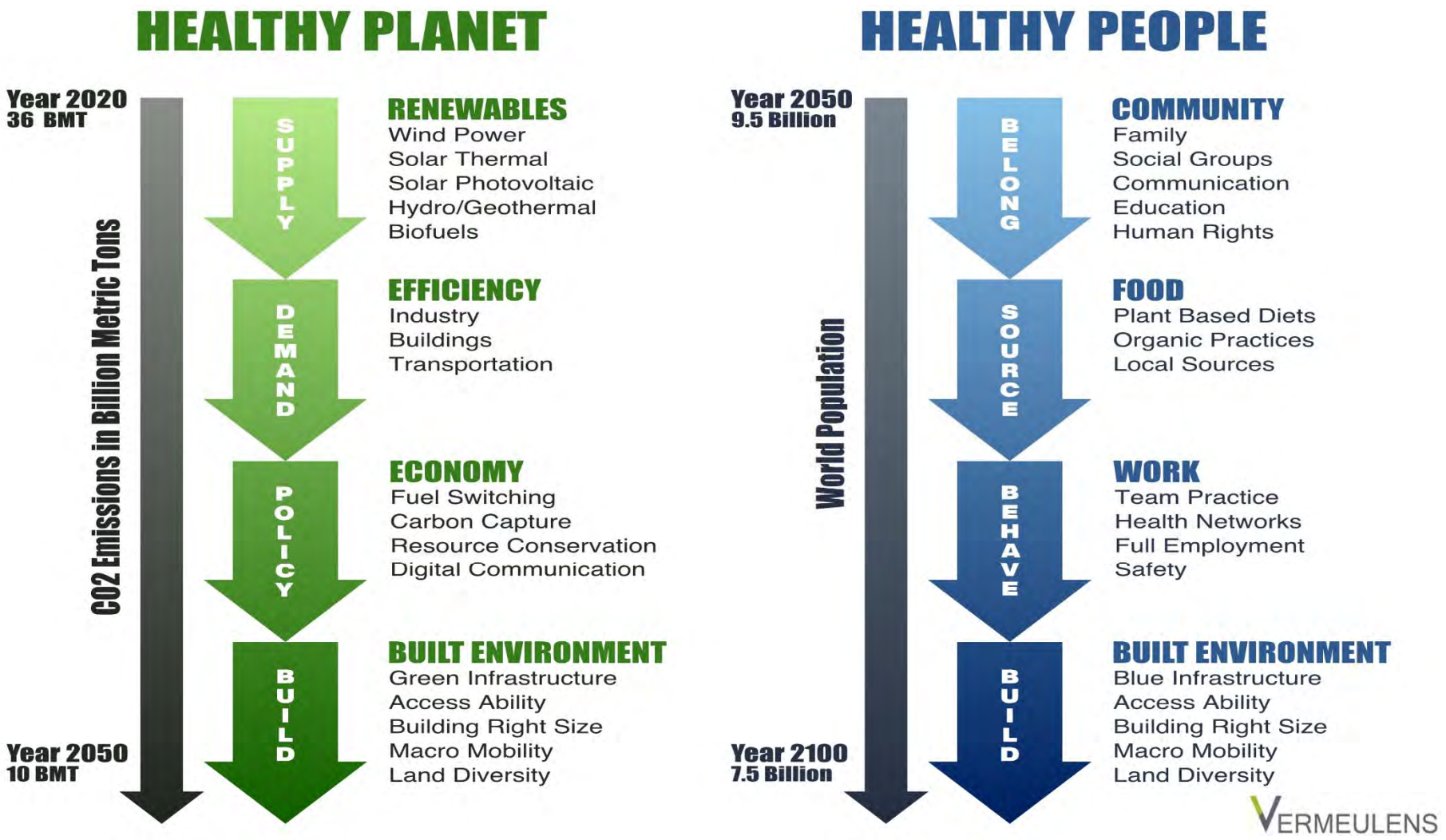
A Better Built Environment through Measured Value


HEALTHY PLANET
Year 2020
36 BMT
CO2 Emissions in Billion Metric Tons
Year 2050
10 BMT
SUPPLY
RENEWABLES
Wind Power
Solar Thermal
Solar Photovoltaic
Hydro/Geothermal
Biofuels
DEMAND
EFFICIENCY
Industry
Buildings
Transportation
POLICY
ECONOMY
Fuel Switching
Carbon Capture
Resource Conservation
Digital Communication
BUILD
BUILT ENVIRONMENT
Green Infrastructure
Access Ability
Building Right Size
Macro Mobility
Land Diversity
HEALTHY PEOPLE
Year 2050
9.5 Billion
World Population
Year 2100
7.5 Billion
BELONG
COMMUNITY
Family
Social Groups
Communication
Education
Human Rights
SOURCE
FOOD
Plant Based Diets
Organic Practices
Local Sources
BEHAVE
WORK
Team Practice
Health Networks
Full Employment
Safety
BUILD
BUILT ENVIRONMENT
Blue Infrastructure
Access Ability
Building Right Size
Macro Mobility
Land Diversity
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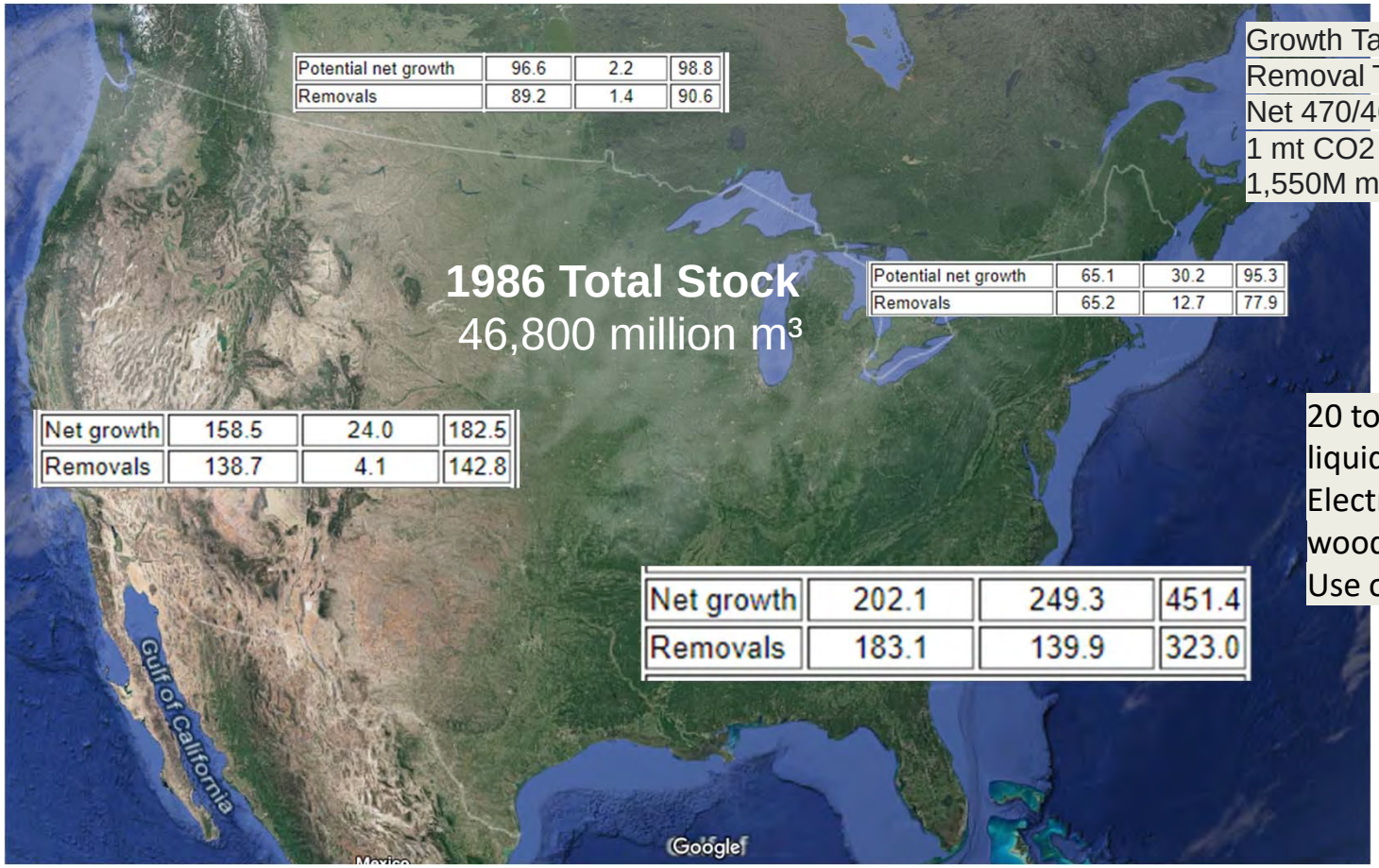


Growth Target 1,470M m3
Removal Target 1,000M m3
Net 470/46,800M m3 = 1% per year
1 mt CO2 captured per m3 wood
1,550M mt CO2 gas/diesel emissions

20 to 30 year onstream time for liquid fuels
Electrical switches coal/oil to wood
Use of surplus wood

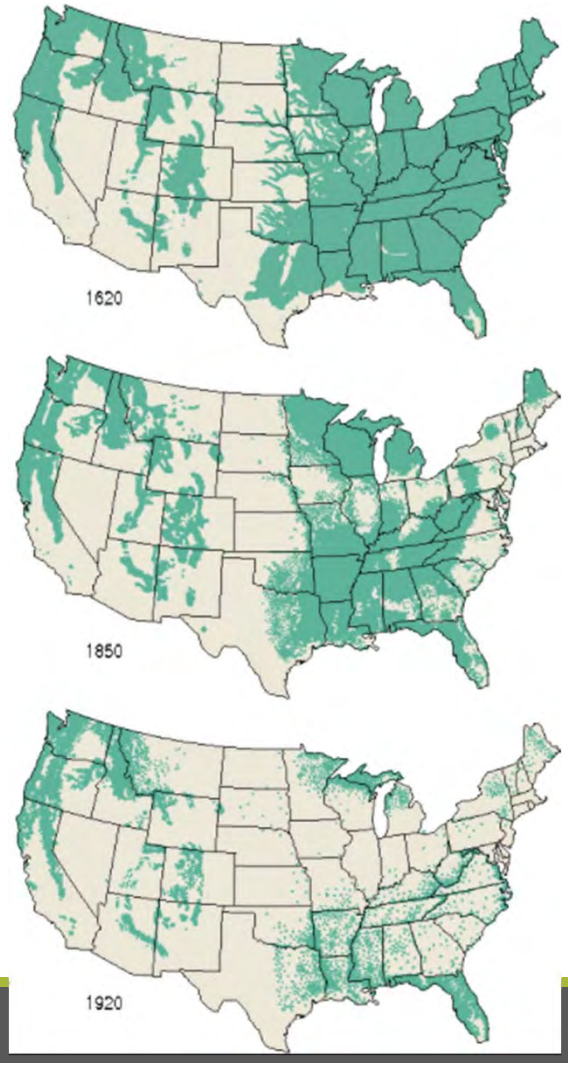
5

10

15

20

Biofuels
Carbon Capture
Fuel Switching
Conservation
Green Infrastructure
Access Ability
Building Right Size
Land Diversity
Local Sources



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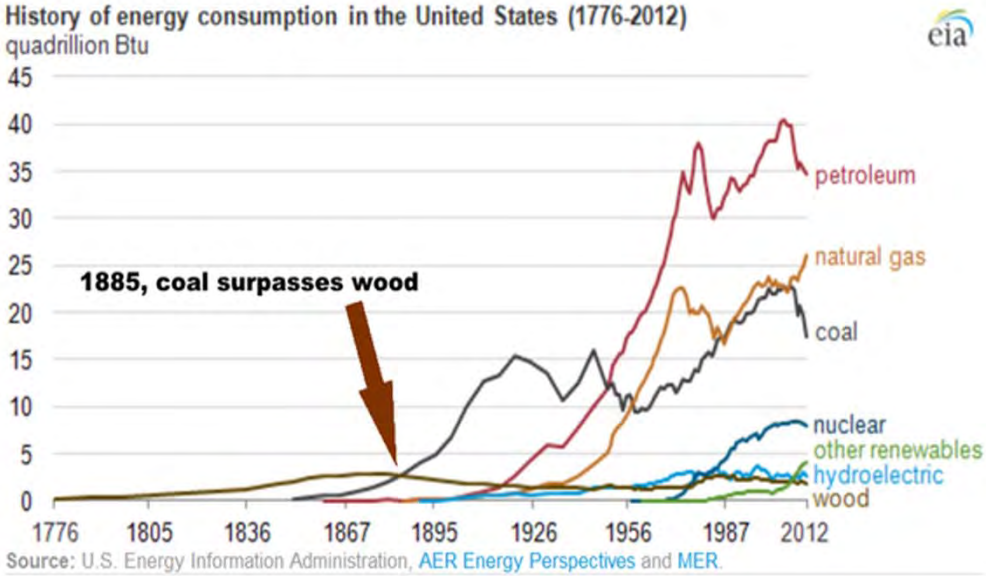

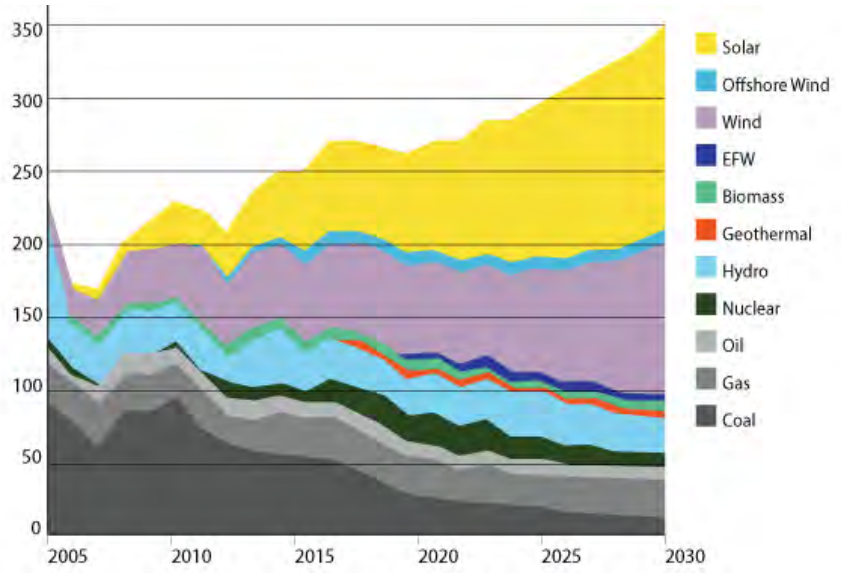

Unit Cost of Energy Contained in Various Heating Fuels

Fuel, unit	40% moisture Wood Chips, ton	Seasoned Cord Wood, cord	Natural Gas, mcf	Wood Pellets, ton	Propane, gallon	Fuel Oil, gallon	Electricity, kWh
mmBtu/unit	10	20	1	16	0.09	0.14	0.003412
Cost/unit	$40.00	$120.00	$7.00	$220.00	$2.00	$3.25	$0.12
Cost/mmBtu	$4.00	$6.00	$7.00	$13.75	$22.22	$23.21	$35.17

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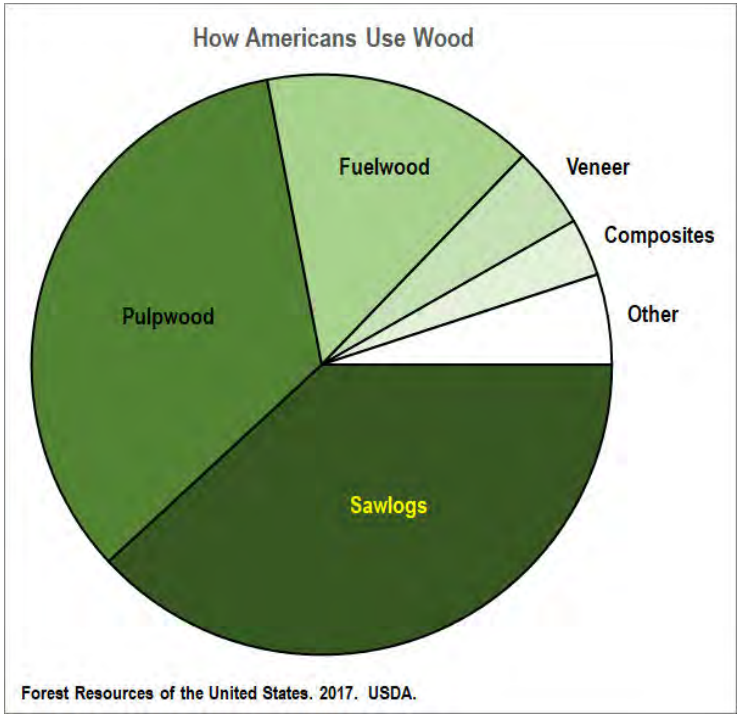
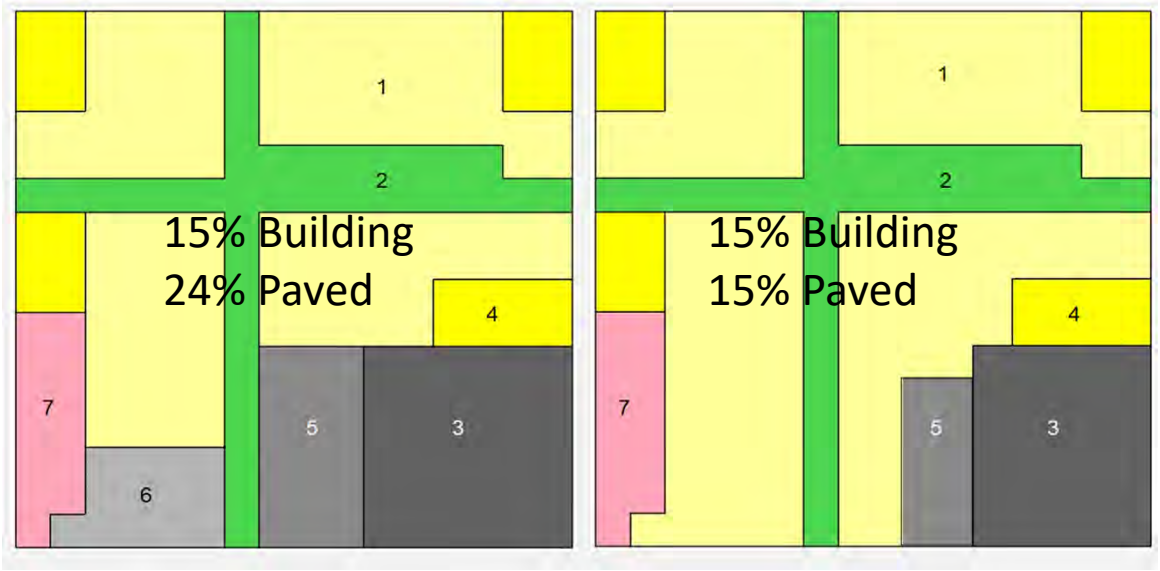


190M tons (280M m3) total wood residues USA Forest Service 2010

Source	Generated	Recovered Combusted Not Usable
	million tons	
Primary timber processing residues		
Wood residues	59.6	58.7
Bark residues	23.8	23.5
Total timber residues	83.4	82.1
Urban wood waste		
Municipal solid waste		
Wood component	15.9	8.6
Woody yard trimmings	18.4	14.4
Total, MSW	34.3	23.1
Construction & demolition waste		
Construction waste wood	6.7	1.8
Demolition waste wood	29.7	17.2
Total, C&D	36.4	19.1
Total, Urban wood waste	70.6	42.1



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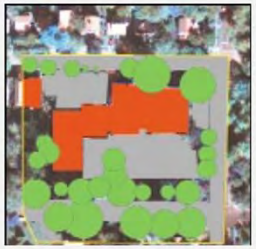
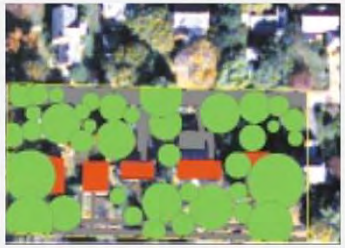
Current	Park City	Difference	
44%	55%	+25%	Private And Adjacent Green Space
15%	15%	0%	Park
14%	12%	-14%	Streets
10%	10%	0%	Residential Buildings
7%	3%	-57%	Residential Parking And Driveway
5%	0%	-100%	Parking Lots
5%	5%	0%	Commercial/Institutional Buildings

Carbon Capture
Access Ability
Building Right Size


10%


25%


35%


45%

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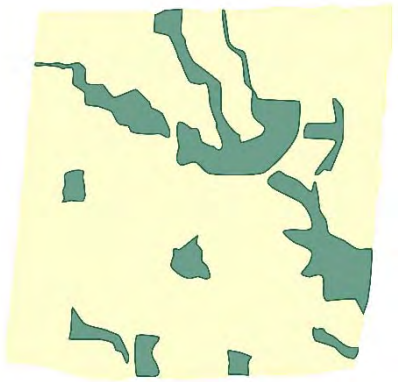
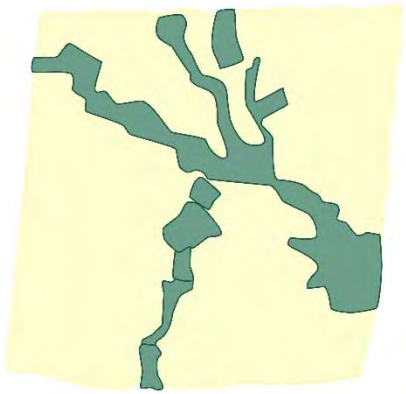
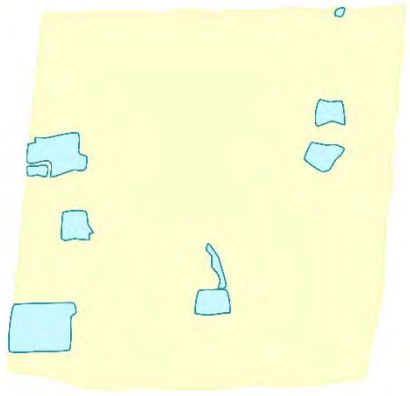
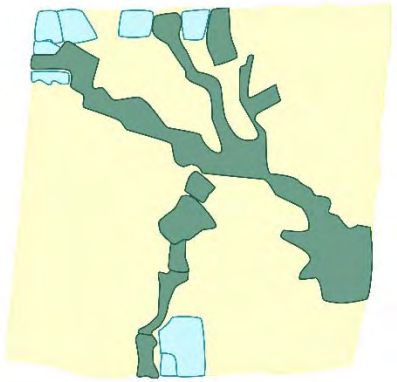
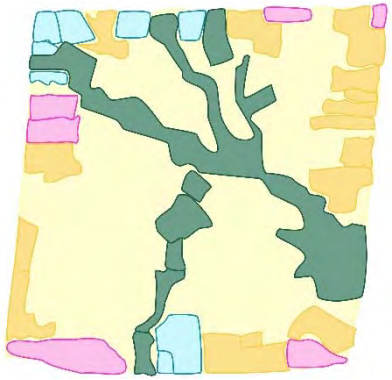




Carbon Capture
Conservation
Green Infrastructure
Access Ability
Land Diversity
Local Sources







Urban forest
Green and Blue corridors
Access to parks
Aesthetic appeal
Managed forest
Uses existing topography
Micro farms

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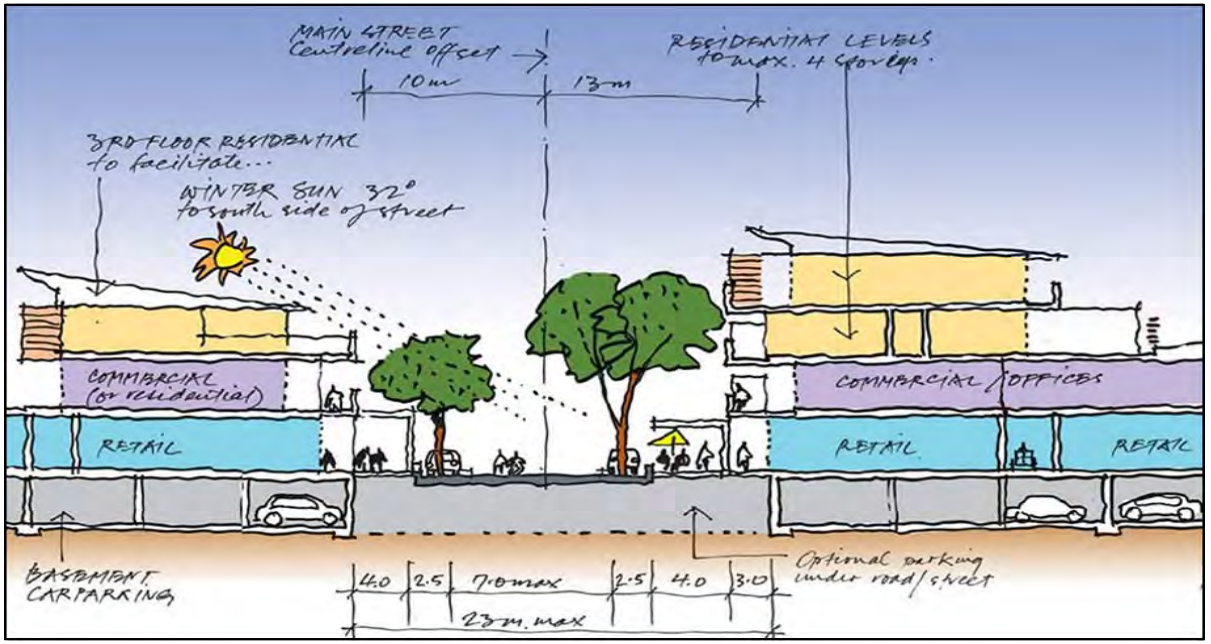
Carbon Capture
Conservation
Green Infrastructure
Access Ability
Building Right Size

Passive energy savings
Curbside parking
Basement parking
Aesthetic appeal
Urban forest canopy
Uses existing topography
Timber or stick construction



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Access Ability

Mixed use synergies
Curbside parking
Basement parking
Aesthetic appeal

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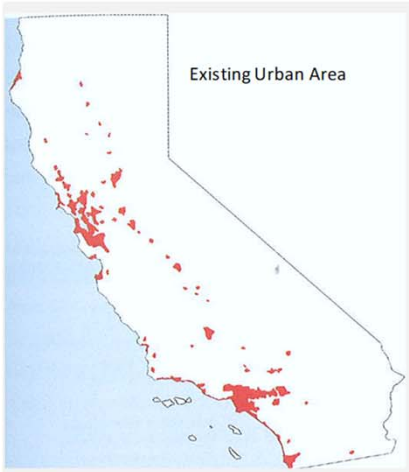

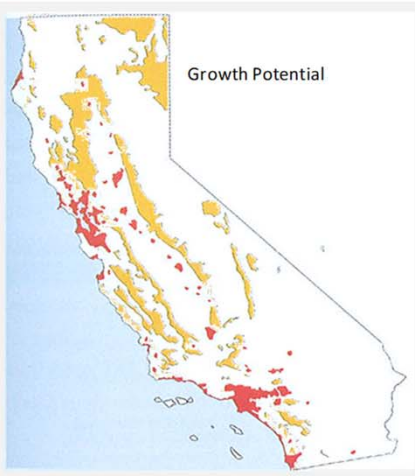

Carbon Capture
Conservation
Land Diversity
Local Sources

Room to grow
Affordability
Aesthetic appeal
Urban forest canopy
Uses existing topography
Increased utilization
Restores old growth
Increased area for new growth

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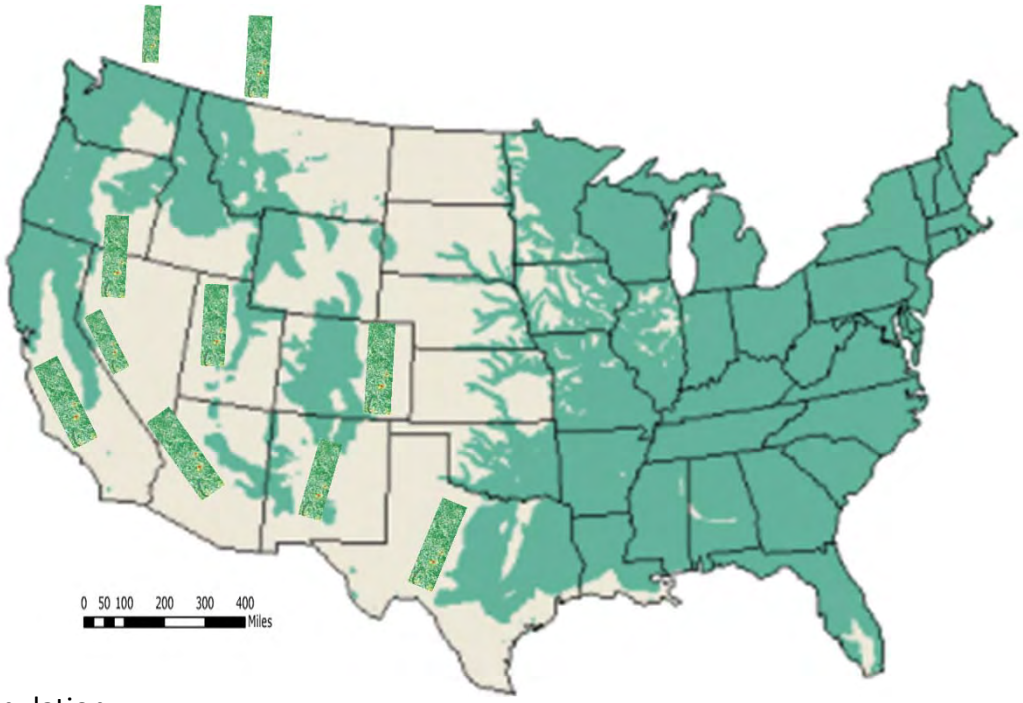
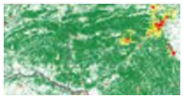
Houston / Atlanta / Ontario 3,200 people / square mile	
Apartment	0%
Townhouse	5%
Residence, Detached	69%
Commercial	5%
Institutional	3%
Park	18%
Parkway	2.50 miles
Rail Grid	0.00 miles
Freeway Grid	0.31 miles

New York City 26,000 people / square mile	
Apartment	28%
Townhouse	24%
Residence, Detached	3%
Commercial	16%
Institutional	16%
Park	13%
Parkway	1.25 miles
Rail Grid	2.5 miles
Freeway Grid	5 miles

New Urban Canopy



80% Urban Canopy
4k people/mile2



25% Urban Canopy
20k people/mile2

US Population

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Optimize ICI Timber/Stick Construction

Vision – nature, precision, aesthetics

Mission – carbon sequestration, reduce time / money / energy

Outcome - Forest growth can offset liquid fuel transportation emissions medium term. ICI timber/stick construction can grow to equal residential. Urban canopy can comprise a significant share of forest cover. Wood fuels can comprise a significant share of power generation. Mass timber reduces finish cost.

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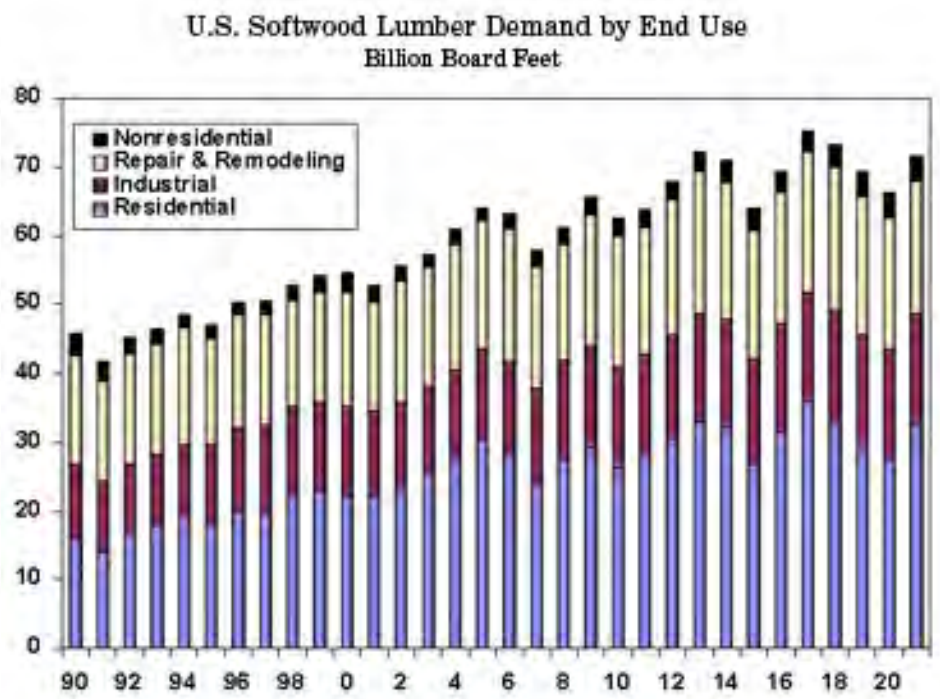
100M m3 -



"Given the market for new construction, there is enormous potential to use mass timber in non-residential construction," says Kenneth Bland, American Wood Council who estimates that "probably tens of thousands of mass timber buildings," dating back to the mid-1800s, are still in use across the country.

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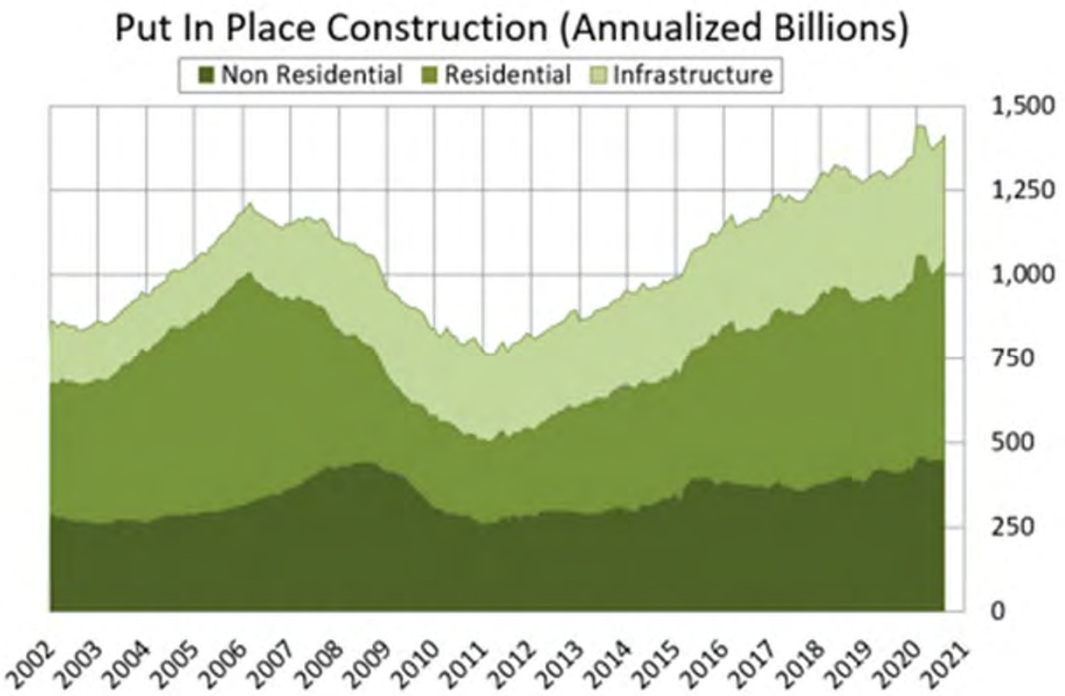

8.1 bf/sf (@.5$/bf = $4.1/sf) =
1% construction cost
$400B x 1% / .5$/bf = 8B bf
10% of softwood lumber

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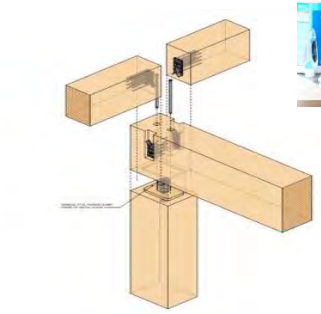
SAVING/BENEFIT OPPORTUNITIES

Wood Look
Elimination of Ceilings
Elimination of Soffits
Sealants, finishes, stain
Projections and Thermal Breaks
Moisture mitigation
Balconies
Efficiencies of Spans
Reduction of Framing
Construction Time
Lower Building Heights?
Temporary protection, cleaning?
Swelling and shrinkage?
Sound isolation?
Sealing and firestopping?
Hard piped power vs flex?
Insurance?

DESIGN

Construction Type Analysis
Code Compliance (FRR)
Material Selection
Lateral System Selection
Conceptual Structural Design
Grid Layout Optimization
Mechanical System Integration
Connection Detailing
Fire Stopping for Timber Structure
Building Geometry Determination
BIM Coordination



PROCUREMENT

Cost Estimation
Supply Chain Mastery
Schedule Coordination

DETAILING & FABRICATION

Fabrication-Level Modeling
Single Piece Shop Drawings
Glulam Fabrication

PLANNING & EXECUTION

Strategic Phasing
Truck Load Planning
Erection Engineering
Weather Protection Plan
Lifting & Handling
Structure Install

Wingspan Conference & Event Center

50$/sf	SAVING/BENEFIT OPPORTUNITIES
15	Wood Look
5	Elimination of Ceilings
5	Elimination of Soffits
5	Projections and Thermal Breaks
0	Balconies
5	Efficiencies of Spans
5	Reduction of Framing
5	Construction Time
5	Installation

Manufacturer to Mass Timber Buildings

UMASS: Total SQ FT: 76,030
76 Truckloads delivered to jobsite
1,025,808 bd ft of Mass Timber: 245,136 Glulam Beams + 780,672 CLT.
Interestingly, for this project, which used HBV connectors to create composite floor slabs, the steel accounted for 20% of the material structural cost (not accounting for labor)

1.0 mbf / 76 ksf = 13.5 bf/sf

Platte 15: Total SQ FT: 128,410
70 Truckloads delivered to jobsite
1,013,940 bd ft of Mass Timber: 559,680 Glulam Beams + 454,260 CLT

NORDIC

1.1 mbf / 128.4 ksf = 7.9 bf/sf

Quattlebaum: Total SQ FT 16,500
354,000 bd ft of Mass Timber: 72,000 bd ft Glulam Beams + 282,000 bd ft of CLT (885 -- 20" dbh trees)

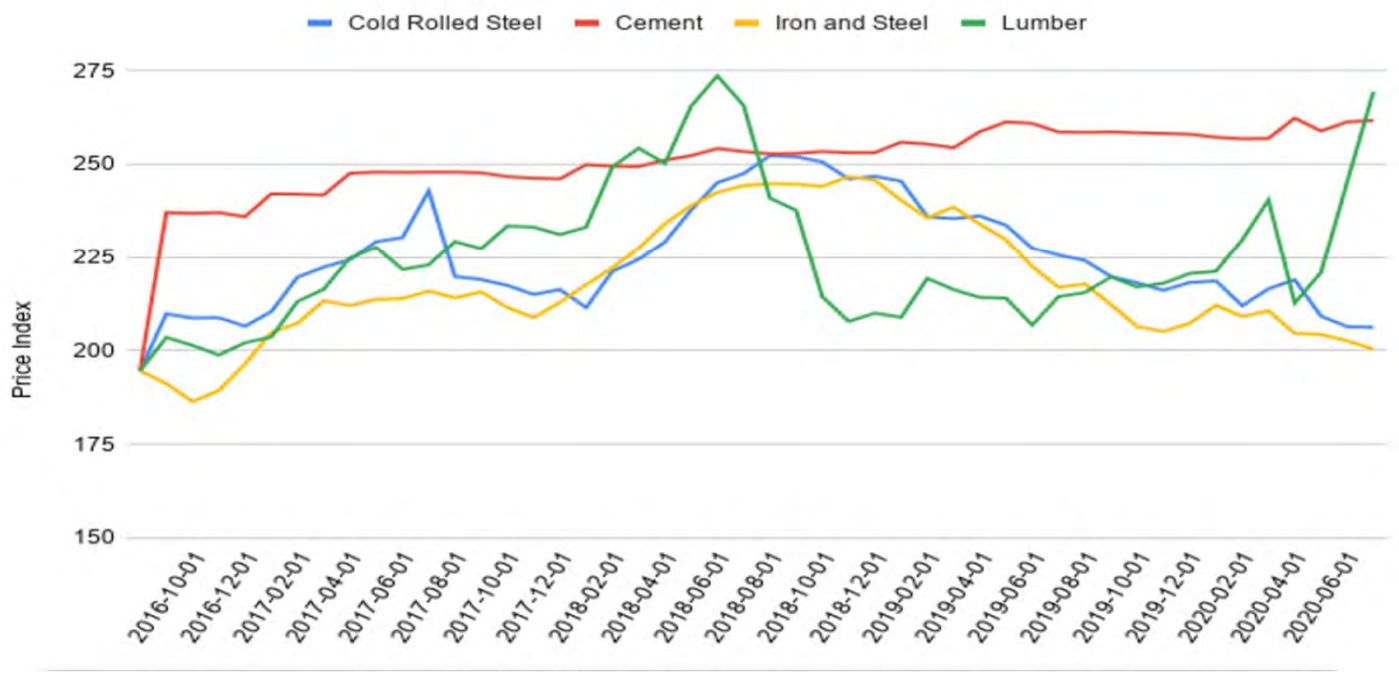
Cooper Carry

354 kbf / 16.5 ksf = 21.5 bf/sf

Walmart – 18.3 mbf / 2.25 msf = 8.1 bf/sf

LUMBER VOLATILITY VS. STEEL & CEMENT 2016 – 2020

STRUCTURLAM MASS TIMBER CORPORATION



8 bf/sf (@.5$/bf = $4.1/sf) = 1% construction cost

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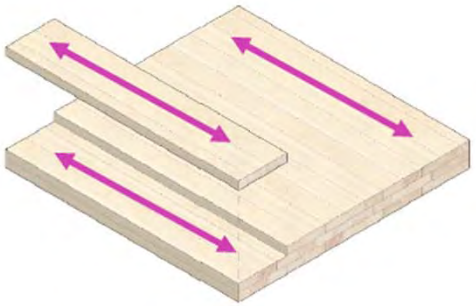
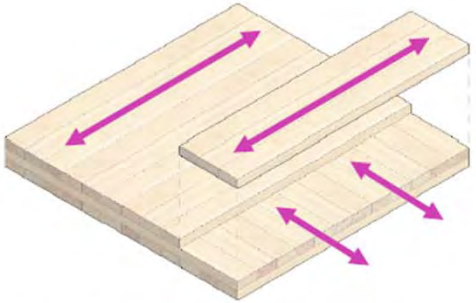
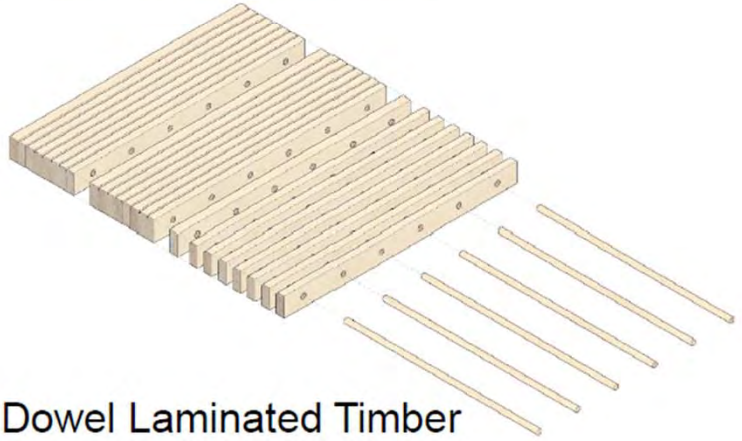
- Nail Laminated Timber



Glue Laminated Timber



Cross Laminated Timber



Dowel Laminated Timber

FIGURE 1: HYBRID LIGHT-FRAME SYSTEM

FIGURE 1: POST AND PANEL SYSTEM

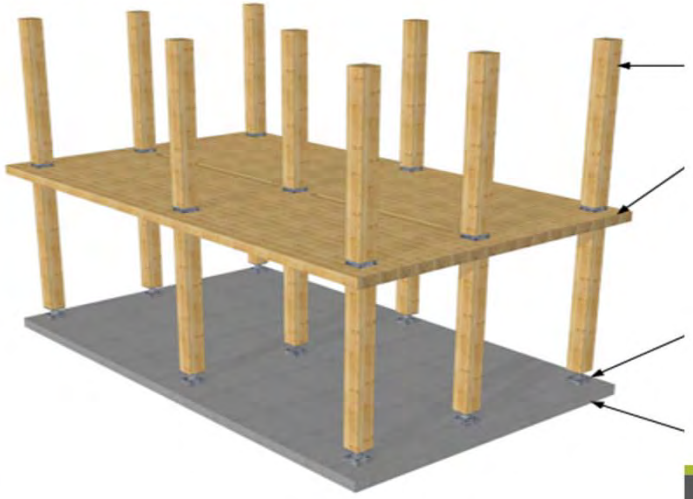
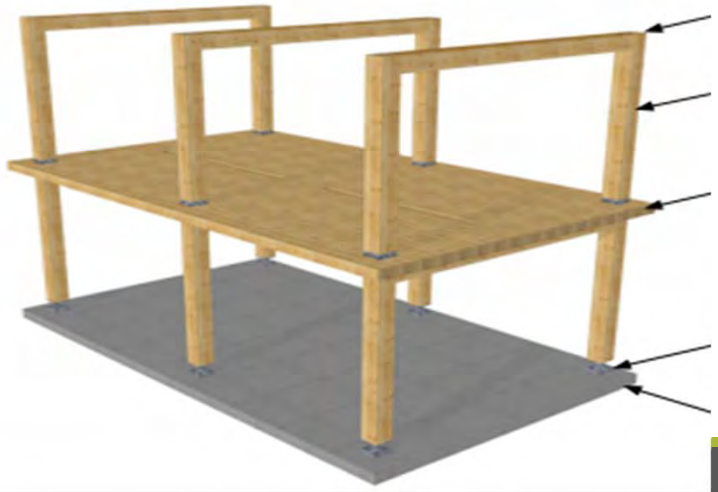
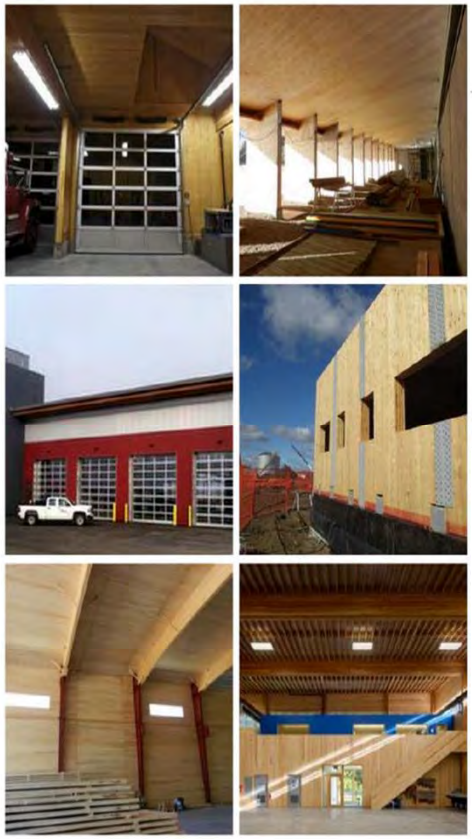


FIGURE 1: POST-BEAM-PANEL SYSTEM



INDUSTRIAL "TILT-UP"

- Warehouses, Gyms, Garages, Firehalls, etc.
- CLT Wall systems
- Industrial grade interiors or encapsulated
- High speed installation
- Light weight system
- More cost effective than Pre-Cast
- Easy MEP service integration
- Easy integration with Rapid Deployment model



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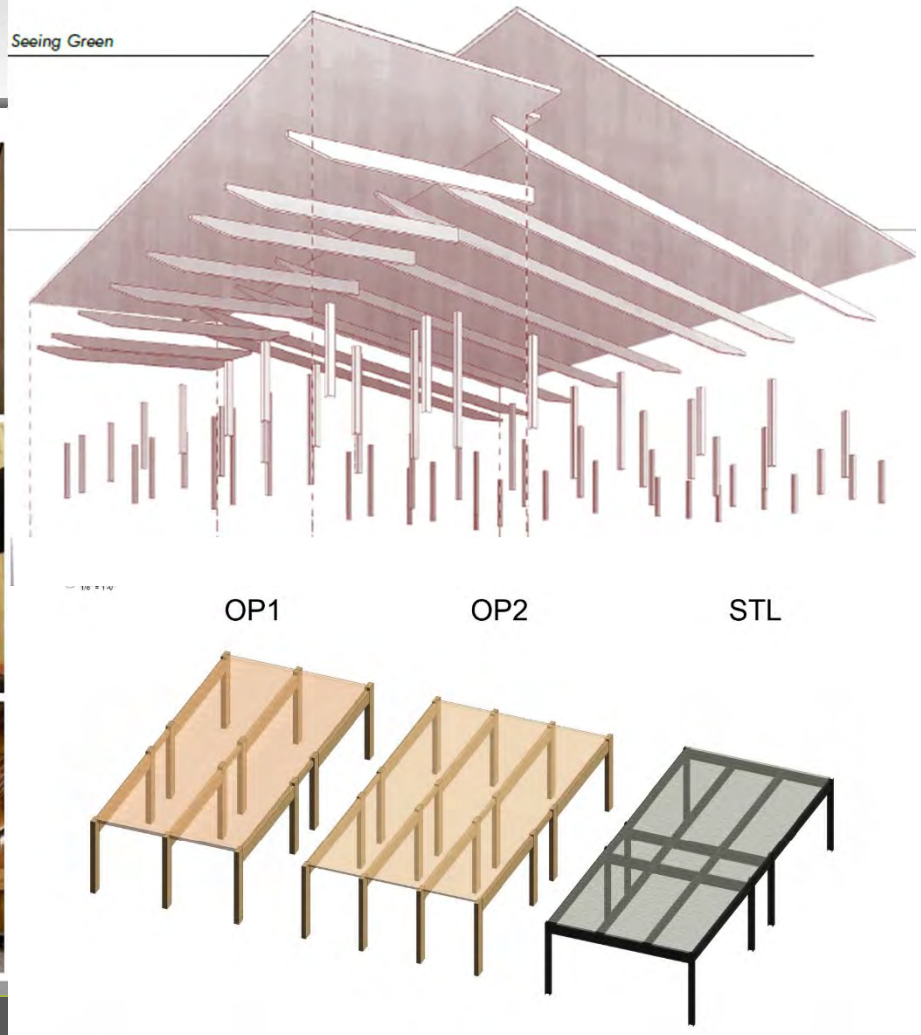
MASS TIMBER CORPORATION



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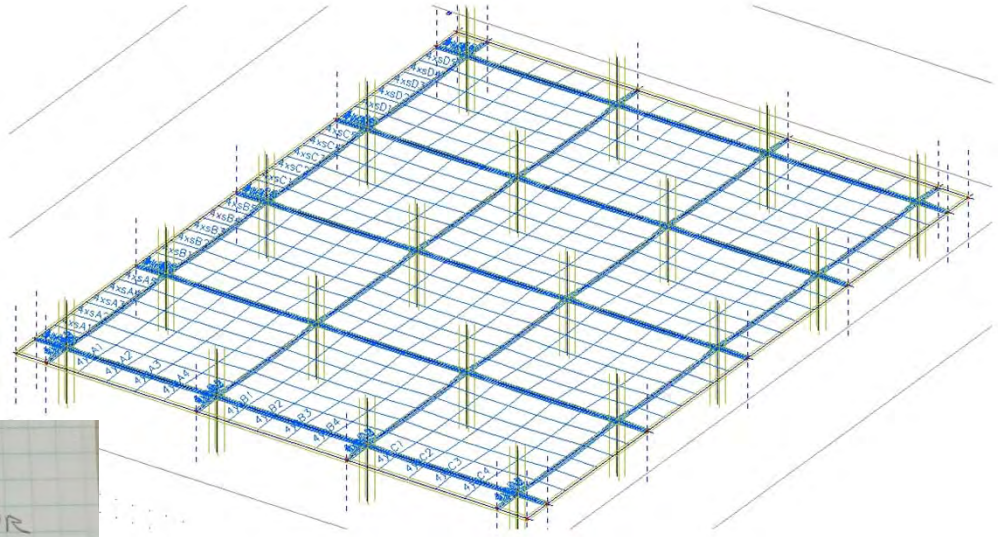

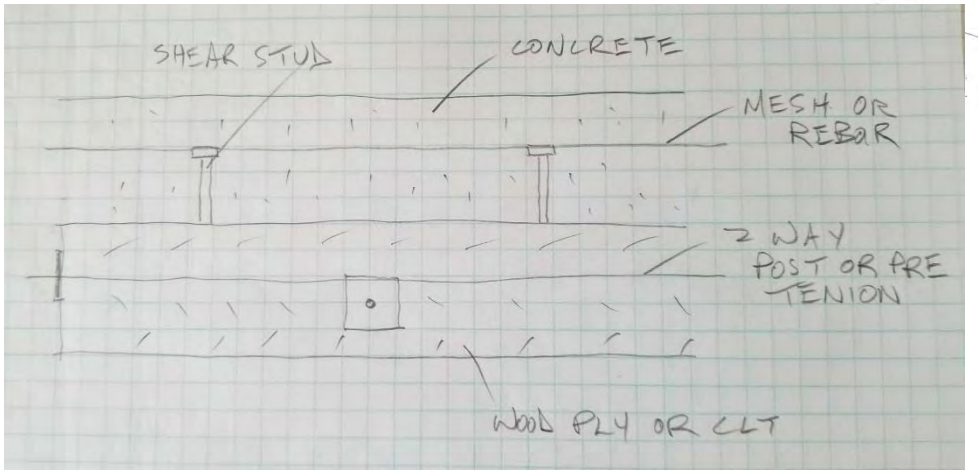
SHEAR STUD
CONCRETE
MESH OR REBAR
2 WAY POST OR PRE TENION
WOOD PLY OR CLT

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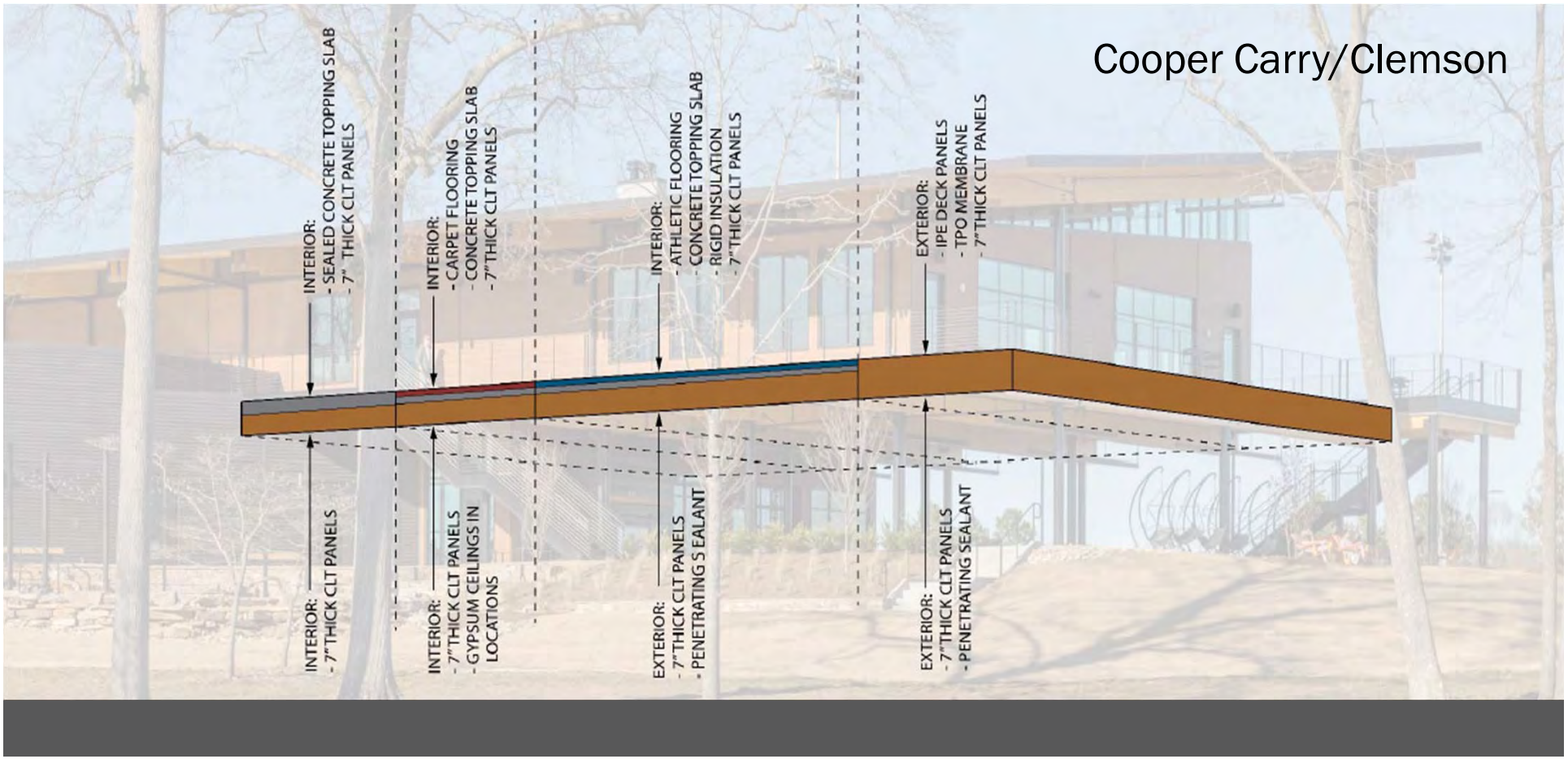
Cooper Carry/Clemson



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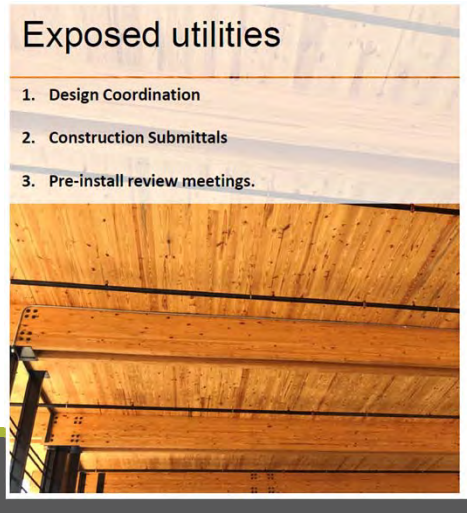
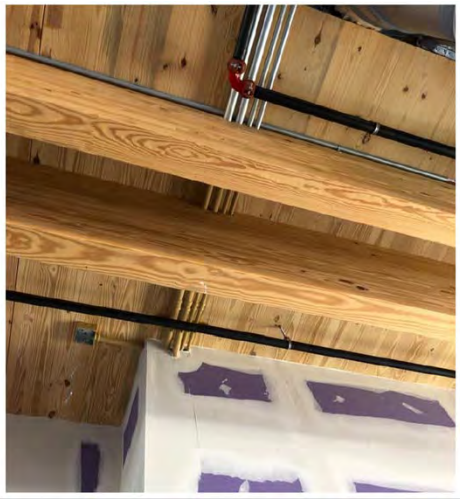
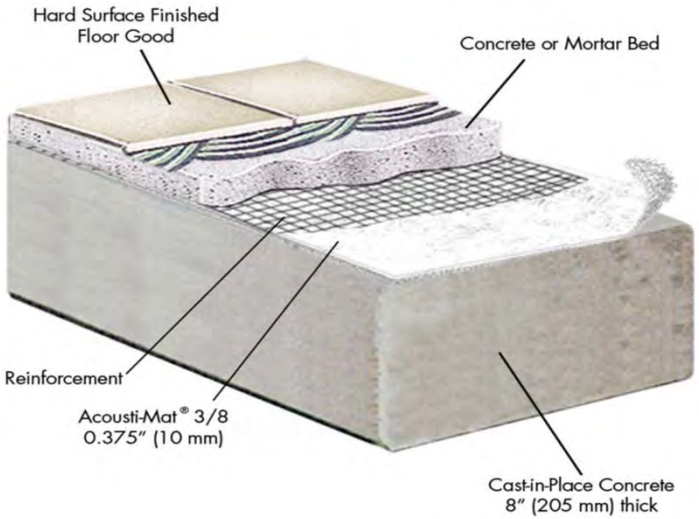
20 Glulam post-beam
12.5 CLT deck
3.5 2” concrete
3.5 acoustic mat
3.5 stain ceiling
43

10 concrete column-beam
22.5 concrete slab 8”
2.5 paint ceiling
35
8 aesthetic break-even
43







Total Benefit – Mass Timber

VERMEULENS

Forest growth can offset liquid fuel transportation emissions medium term
ICI timber/stick construction can grow to equal residential
Urban canopy can comprise a significant share of forest cover
Wood fuels can comprise a significant share of power generation
Mass timber reduces finish cost

HEALTHY PLANET

Year 2020
36 BMT

CO2 Emissions in Billion Metric Tons

Year 2050
10 BMT

SUPPLY — RENEWABLES
Wind Power
Solar Thermal
Solar Photovoltaic
Hydro/Geothermal
Biofuels

DEMAND — EFFICIENCY
Industry
Buildings
Transportation

POLICY — ECONOMY
Fuel Switching
Carbon Capture
Resource Conservation
Digital Communication

BUILD — BUILT ENVIRONMENT
Green Infrastructure
Access Ability
Building Right Size
Macro Mobility
Land Diversity

HEALTHY PEOPLE

Year 2050
9.5 Billion

World Population

Year 2100
7.5 Billion

BELONG — COMMUNITY
Family
Social Groups
Communication
Education
Human Rights

SOURCE — FOOD
Plant Based Diets
Organic Practices
Local Sources

BEHAVE — WORK
Team Practice
Health Networks
Full Employment
Safety

BUILD — BUILT ENVIRONMENT
Blue Infrastructure
Access Ability
Building Right Size
Macro Mobility
Land Diversity