MASS TIMBER+ SM

OFFSITE CONSTRUCTION CONFERENCE

PRODUCED BY WOODWORKS WOOD PRODUCTS COUNCIL

FEA Forest Economic Advisors

Mass Timber Multi-Family: Studies in Carbon, Cost, and Constructability

Credits: 1.0 AIA/CES HSW LUs, 1.0 PHD credit, 0.10 ICC credit

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Ben Harrison
SCB

David Robb
Turner Construction

MASS TIMBER+ SM

Mass Timber Multi-Family

Studies in Carbon, Cost, and Constructability

October 29, 2025

Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.

Meet the Team

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LeMessurier Turner

LEARN MORE ABOUT THE DATA AND METHODOLOGY HERE: OLIFANT.ORG

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

AIA Approved Continuing Education

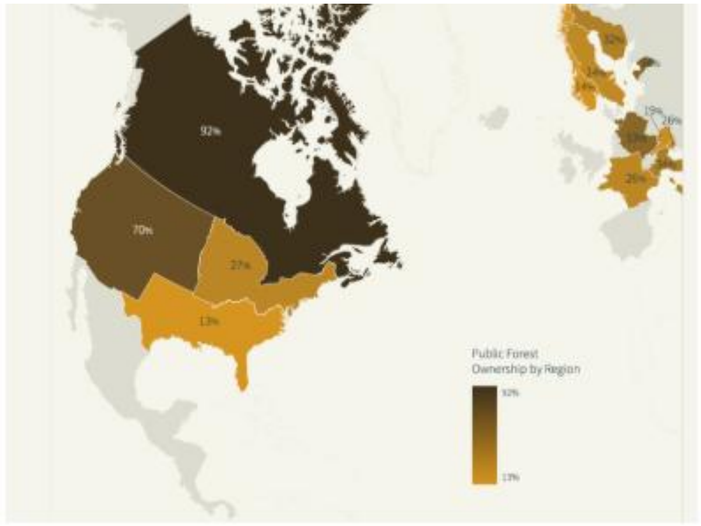
Course Description

This session will look at the Three Regions Study, which took prototypical multi-family residential structures from three different U.S. cities and reimagined them in mass timber using construction types IV-A, IV-B, and IV-C. Representatives from SCB, LeMessurier, and Turner Construction will present the study's results, including comparative costs, construction conditions, and GWP. They will share implications for zoning and code adoption, demonstrating how mass timber allows for the maximization of housing units and the minimization of GWP with minimal cost implications. The presenters will share their analysis of the potential benefits and design considerations of mass timber construction at three scales, demonstrating the potential for mass timber to be more readily adopted into many different U.S. markets.

Learning Objectives

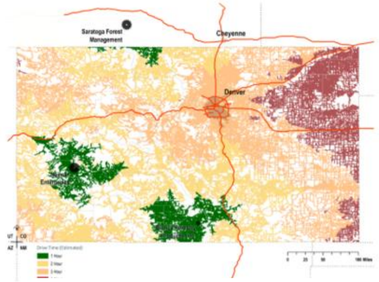
1. Explore construction types IV-A, IV-B, and IV-C as code-compliant pathways that allow the use of mass timber in building configurations typically built with other materials.
2. Understand the unique aspects of mass timber design and detailing to meet structural safety, fire resistance, and acoustical performance requirements.
3. Examine how the use of a mass timber structural system can reduce a building’s global warming potential (GWP) as compared to more conventional construction materials.
4. Learn how building codes can be adapted or leveraged to promote high-density housing that optimizes environmental benefits without compromising quality or safety.

Forestry Supply Chain Analysis

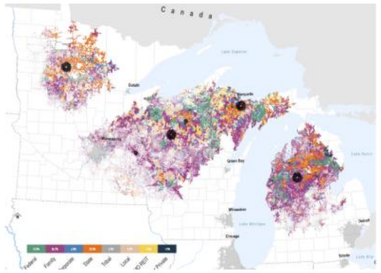


North American Mass Timber

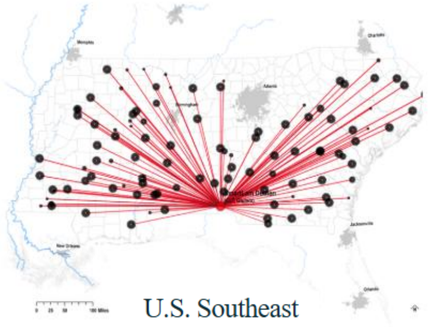
We chose forests to study in all three regions of the forests. These analyses of species, forest products industry infrastructure, certifications, ownerships and challenges examine each region's potential to play a role in the mass timber supply chain through sustainably grown wood products.



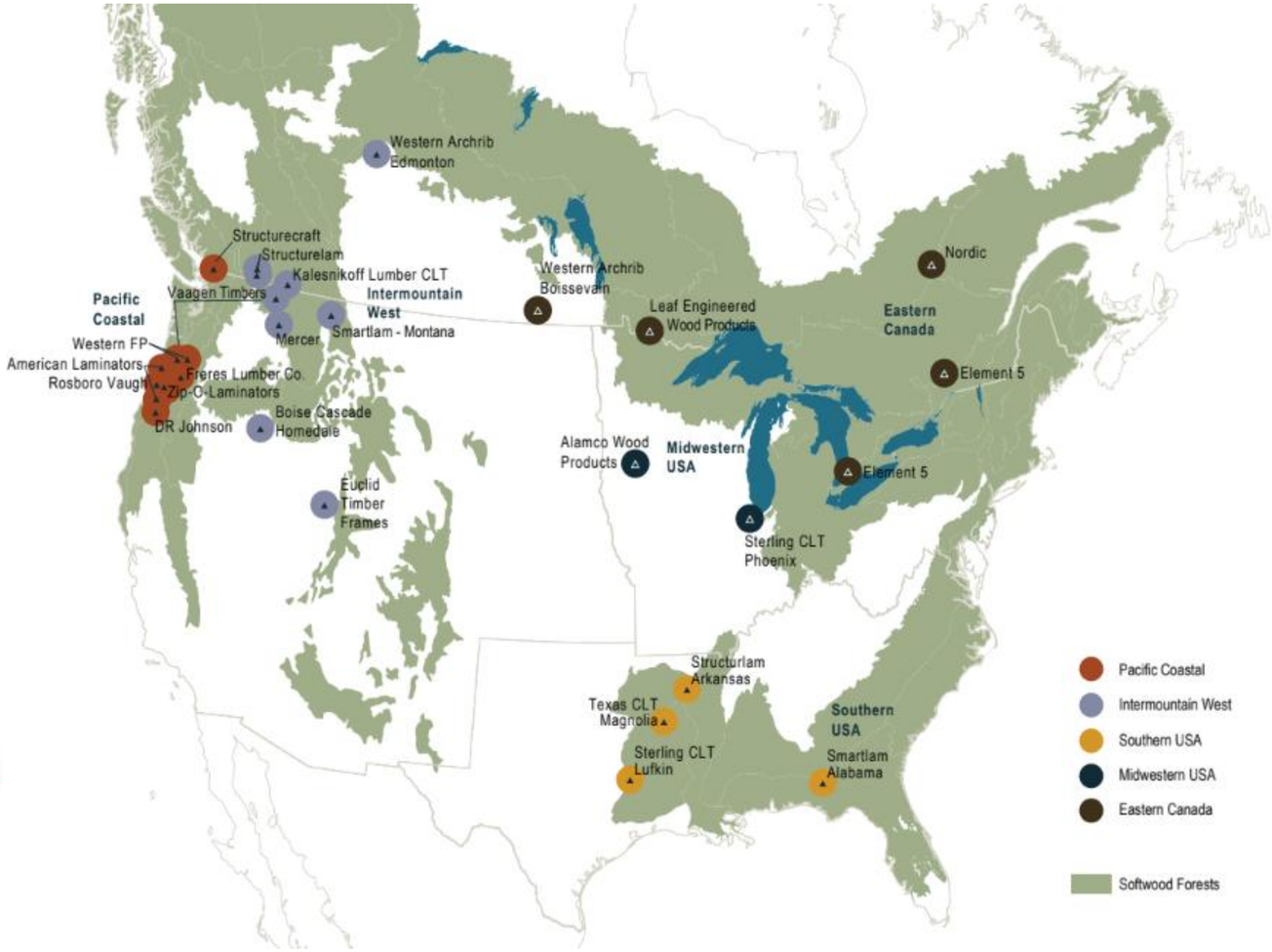
Rocky Mountain Colorado



Minnesota, Wisconsin, and Michigan



U.S. Southeast



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Wood Innovation Grant Scope and Contributors

Minneapolis

Stick-Built

Denver

Cast-in-place concrete

Atlanta

Cast-in-place concrete

LeMessurier Turner BSA AIA Minnesota AIA Colorado AIAGA CLF Carbon Leadership Forum MEYER BORGMAN JOHNSON KL&A Lambert Sustainability DEPARTMENT OF NATURAL RESOURCES Michigan Technological University MISSISSIPPI STATE UNIVERSITY UNIVERSITY OF GEORGIA Olifant

https://www.woodworks.org/resources/mass-timber-in-three-regions-comparative-lca/

Mass Timber in Three Regions

Comparative Life Cycle Assessment Study

Author: LeMessurier

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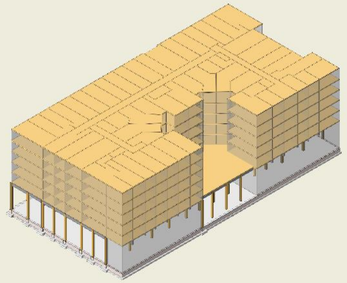
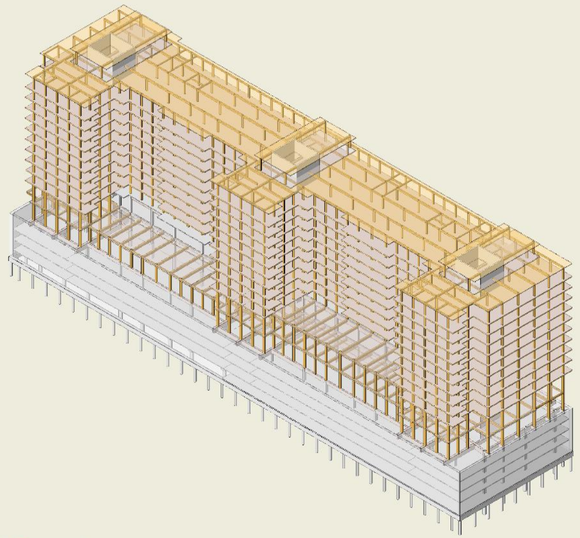
Rendering: SCB

Minneapolis



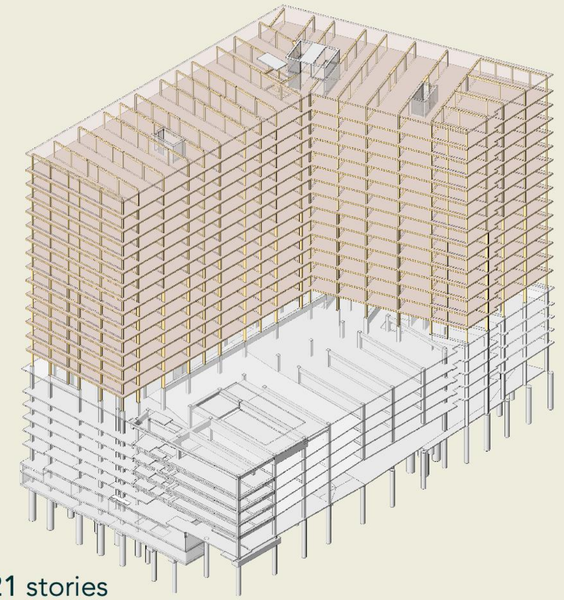
6 stories
165,340 GSF
130 Residential units

Denver



12 stories
755,300 GSF
395 Residential units
241,500 SF of parking

Atlanta



21 stories
758,483 GSF
353 Residential units
268,000 SF of parking

All analysis reflects mass timber equivalent calculations of existing cast-in-place concrete or stick-built structures. Cost, carbon, and constructability data all show significant gains even so; gains that will likely increase when actually designed for mass timber.

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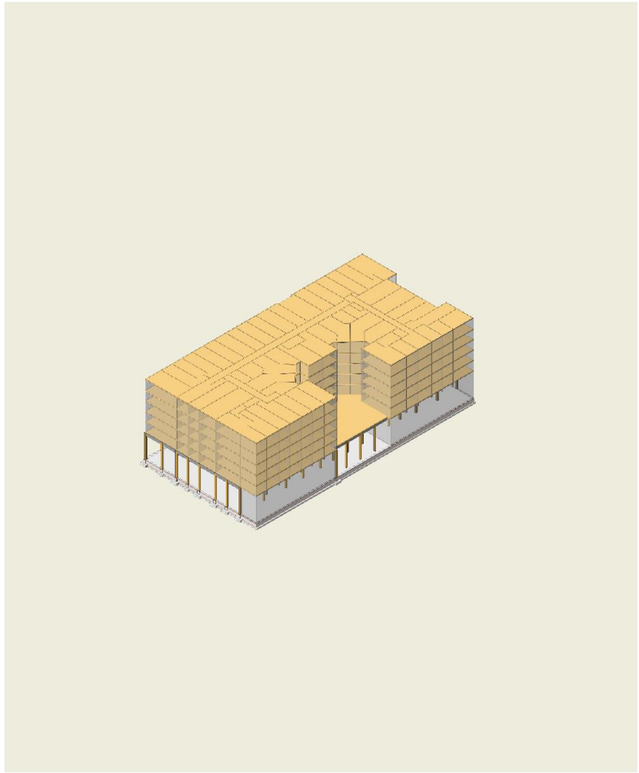
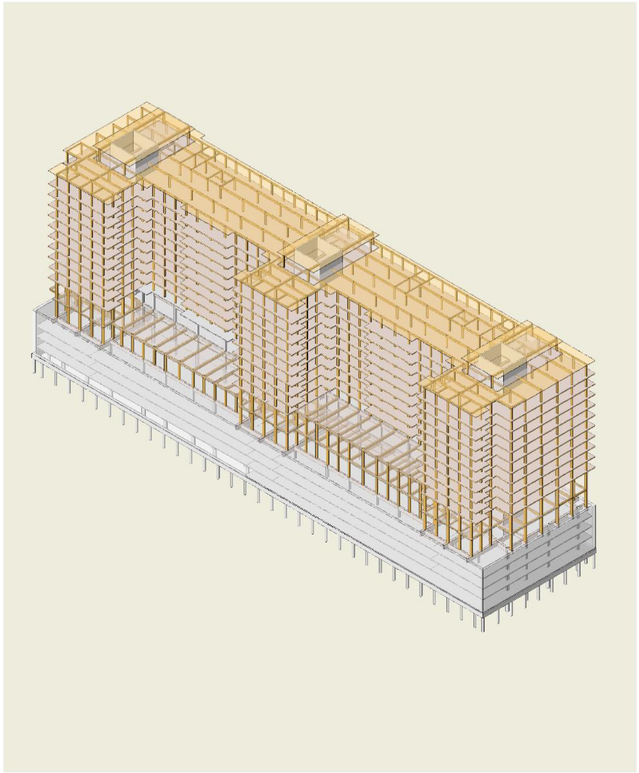
Minneapolis



Type IV-C

Max # of stories	9 stories
Building height	85’
Allowable area	405,000 sf
Average area per story	45,000 sf
Amount of unprotected timber	100%
Primary structure	2 hr rated

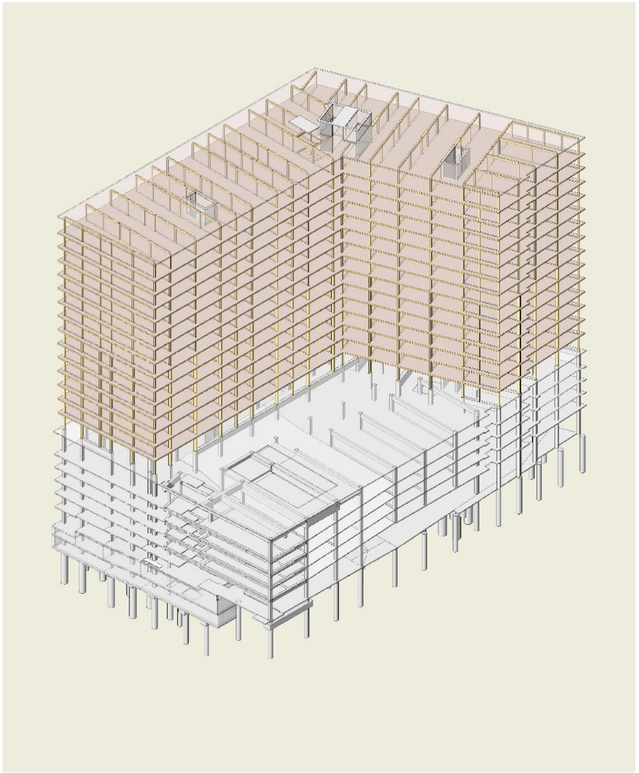
Denver



Type IV-B (IBC 2024)

Max # of stories	12 stories
Building height	180’
Allowable area	648,000 sf
Average area per story	54,000 sf
Amount of unprotected timber	100% ceiling 40% walls
Primary structure	2 hr rated

Atlanta



Type IV-A

Max # of stories	18 stories
Building height	270’
Allowable area	972,000 sf
Average area per story	54,000 sf
Amount of unprotected timber	0%
Primary structure	3 hr rated

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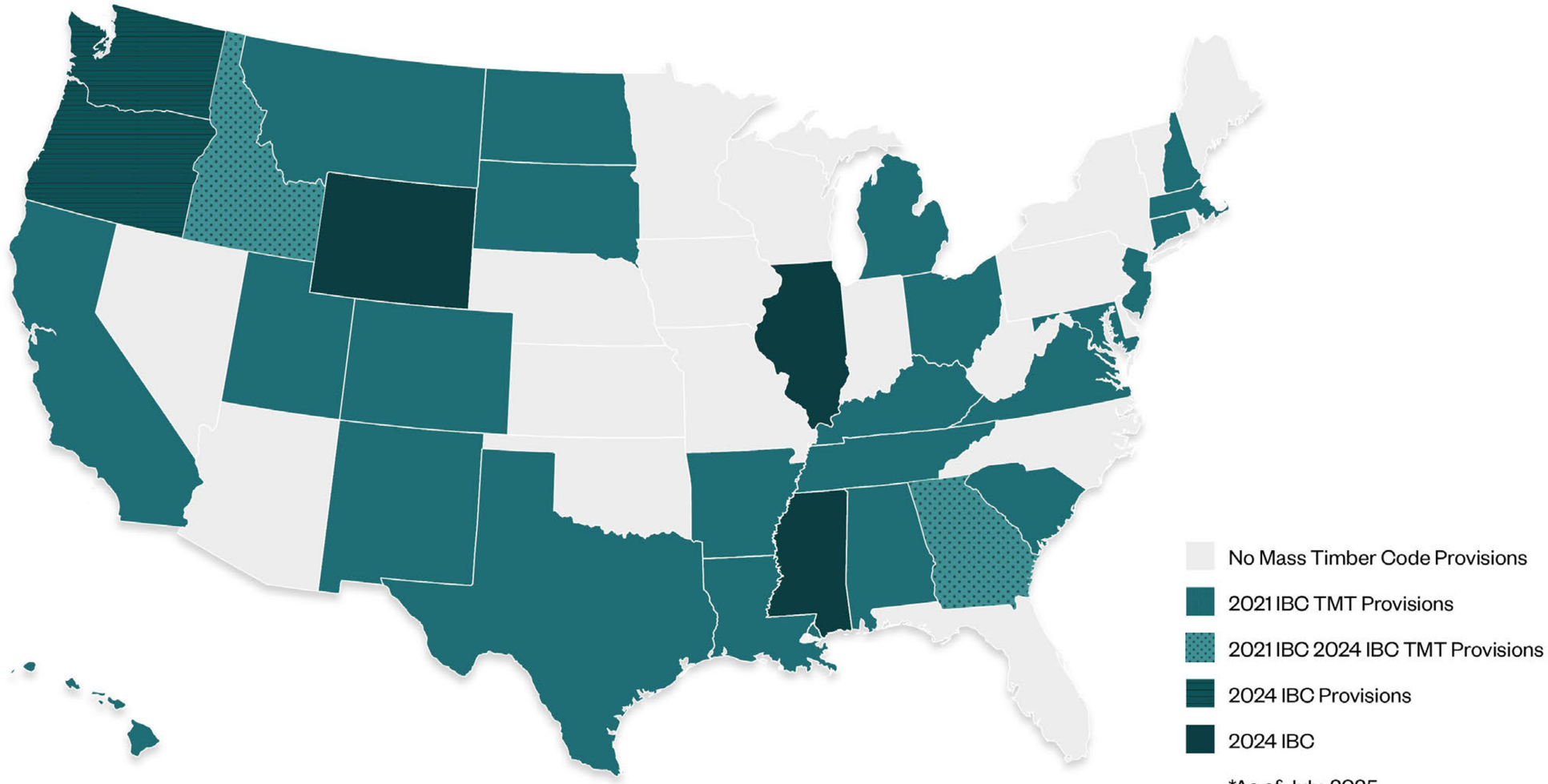
Tall Mass Timber Code Adoptions



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Atlanta case study

IBC 2021 TYPE IV-A

18,765,000
kgCO2eq

Cast-in-place concrete

MATERIALS EMISSIONS & CARBON STORAGE

755,300 SF IBC 2021 TYPE IA

- Fire protection - ceilings
- Fire protection - walls
- Roofing
- Exterior enclosure
- Floor structure
- Column & structural walls
- Parking
- Foundation

16%

Total reduction

GWP
kgCO2eq

15,680,000
kgCO2eq

Mass timber

MATERIALS EMISSIONS & CARBON STORAGE

755,300 SF IBC 2021 TYPE IV

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Atlanta case study

IBC 2021 TYPE IV-A

18,765,000
kgCO2eq

Cast-in-place concrete

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- Foundation

16%

Total reduction

GWP
kgCO2eq

15,680,000
kgCO2eq

Mass timber

MATERIALS EMISSIONS & CARBON STORAGE

755,300 SF IBC 2021 TYPE IV

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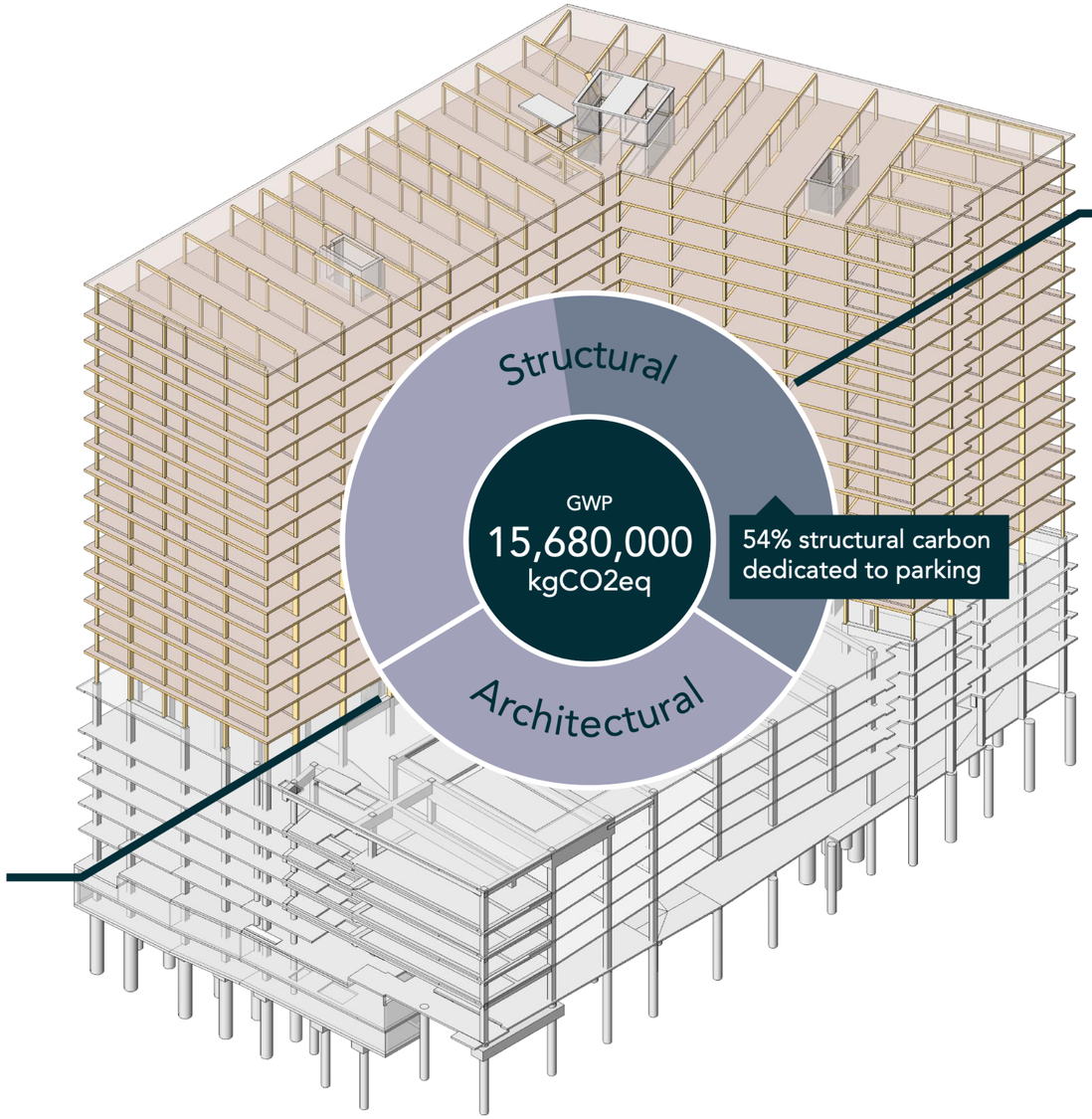
Atlanta case study

IBC 2021 TYPE IV-A



-29%

decrease with
mass timber

14,932,000 → 10,644,000

+31%

increase with
mass timber

3,833,000 → 5,036,000

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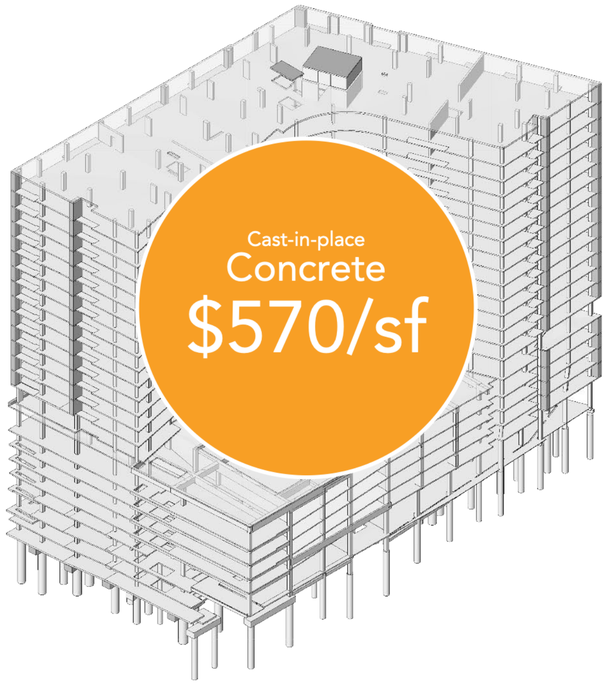
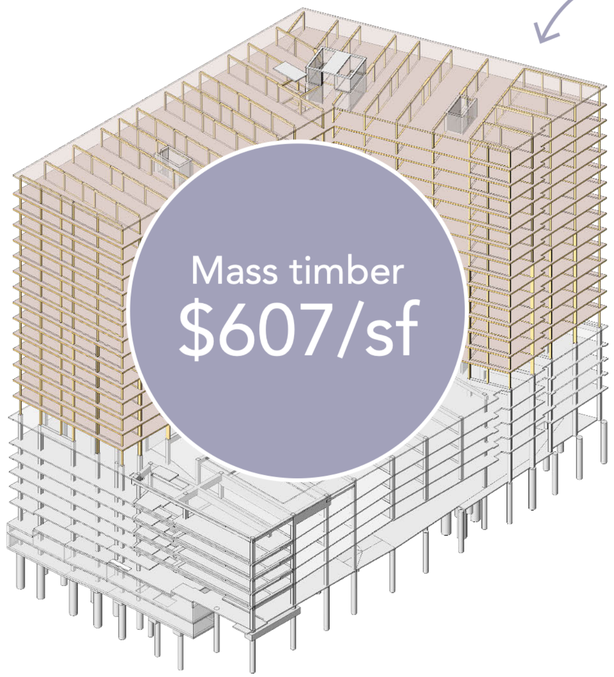
METHODOLOGY HERE: OLIFANT.ORG

Atlanta case study

IBC 2021 Type IV-A

+$37/sf
(6% increase)





Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc. Costs are based on residential area only. Garage costs were excluded since they remained a constant in each scenario.

16 Stories
417,417 GSF of residential
340 Residential units

LEARN MORE ABOUT THE DATA AND METHODOLOGY HERE: OLIFANT.ORG

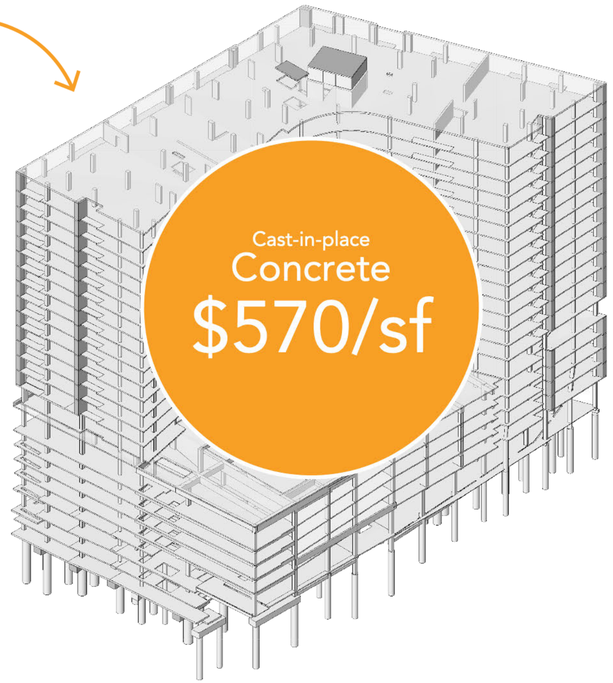
Atlanta case study

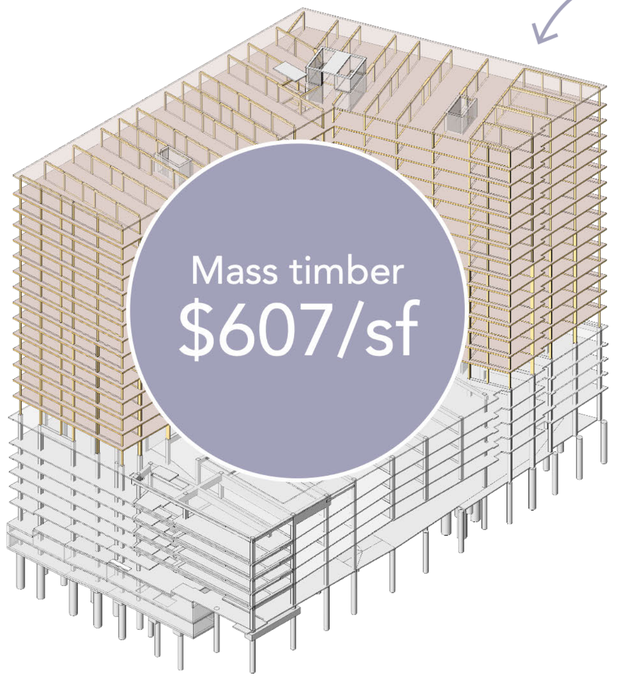
IBC 2021 Type IV-A

Structural

Concrete structure
$30,139,000

Indirect costs[1]
$3,177,000





Structural

Mass timber structure
$31,468,000

Fire protection: floor plates
$5,507,000

Fire protection: beams & columns
$3,181,000

Floor build up
$3,671,000

Transfer structure
$543,000

Exterior envelope
$509,000

Indirect costs[1]
$4,546,000

Schedule savings
($1,750,000)

Cost comparison

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16 Stories
417,417 GSF of residential
340 Residential units

[1] INDIRECT COST: SUM OF SUBCONTRACTOR BONDS, CONSTRUCTION CONTINGENCY, INSURANCE, AND CM FEE; AS A VOLUME PERCENTAGE OF DIRECT PROJECT COST

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Denver case study

IBC 2024 TYPE IV-B

17,622,000
kgCO2eq

Cast-in-place concrete

MATERIALS EMISSIONS & CARBON STORAGE

758,500 SF IBC 2024 TYPE IA

- Fire protection - ceilings
- Fire protection - walls
- Roofing
- Exterior enclosure
- Floor structure
- Column & structural walls
- Parking
- Foundation

22%

Total reduction

GWP
kgCO2eq

13,800,000
kgCO2eq

Mass timber

MATERIALS EMISSIONS & CARBON STORAGE

758,500 SF IBC 2024 TYPE IV-B ON TYPE IA PODIUM

LEARN MORE ABOUT THE DATA AND METHODOLOGY HERE: OLIFANT.ORG

Denver case study

IBC 2024 TYPE IV-B

17,622,000
kgCO2eq

Cast-in-place concrete

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& CARBON STORAGE

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Total reduction

GWP
kgCO2eq

13,800,000
kgCO2eq

Mass timber

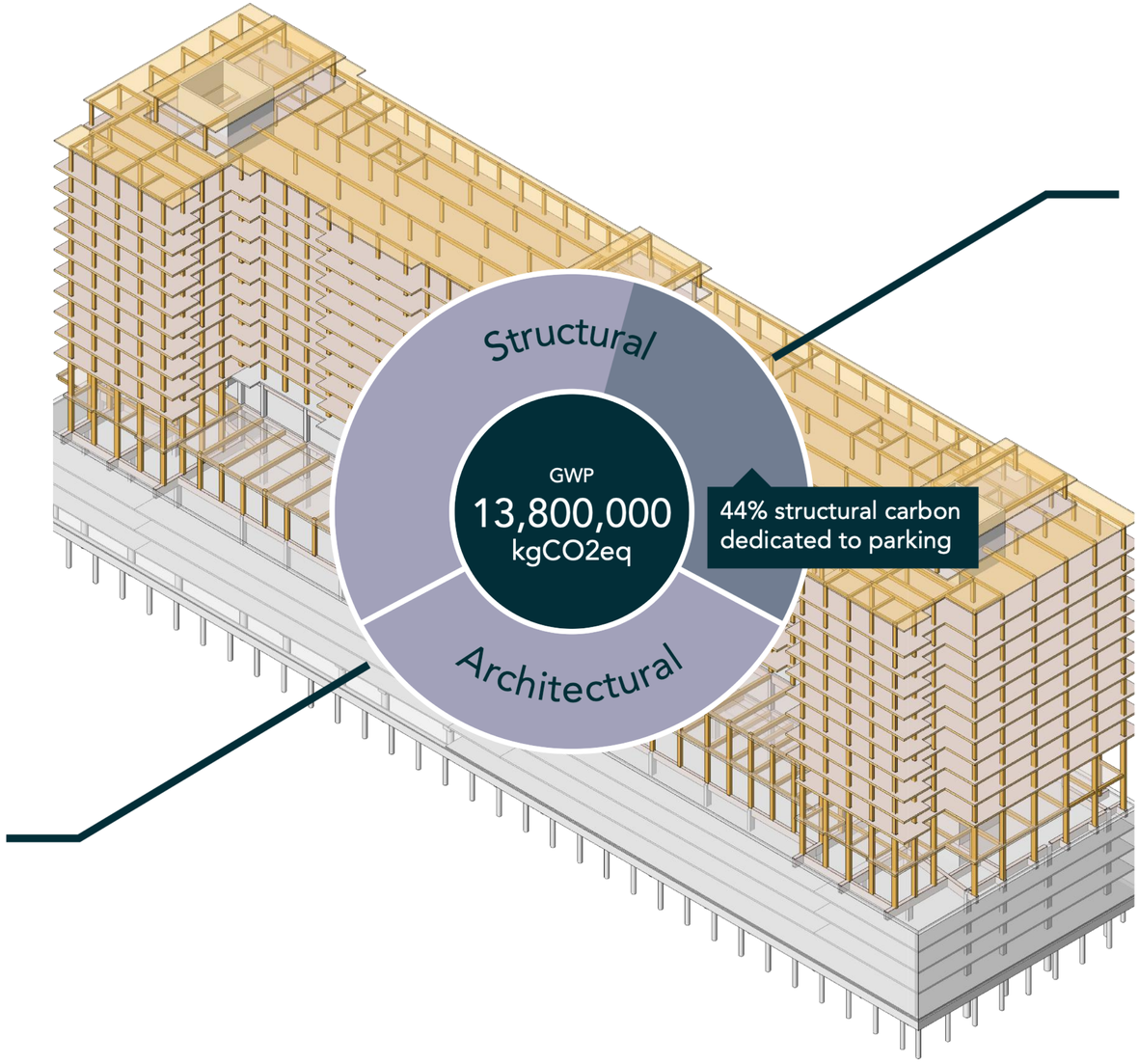
MATERIALS EMISSIONS
& CARBON STORAGE

758,500 SF IBC 2024 TYPE IV-B ON TYPE IA PODIUM

LEARN MORE ABOUT THE DATA AND
METHODOLOGY HERE: OLIFANT.ORG

Denver case study

IBC 2024 TYPE IV-B



-31%

decrease with
mass timber

13,144,000 → 9,049,000

+5%

increase with
mass timber

4,518,000 → 4,752,000

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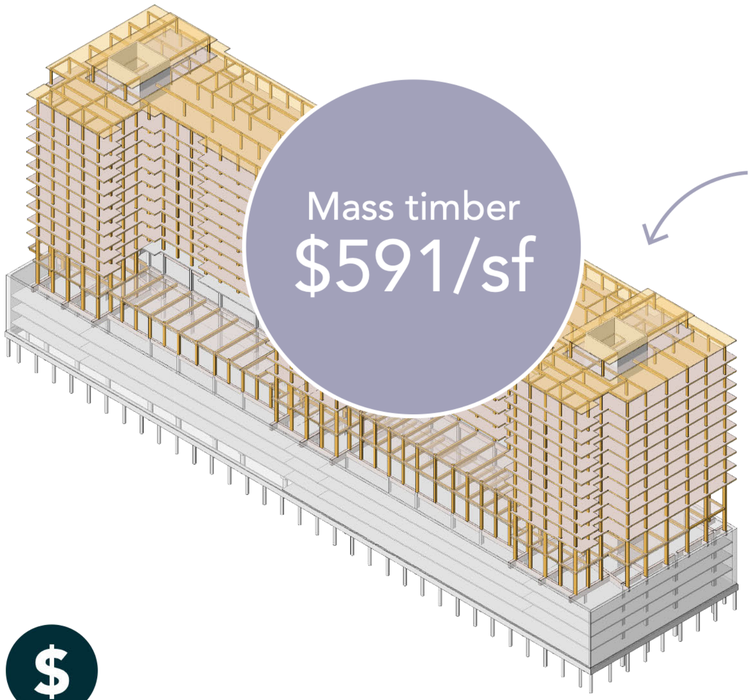
METHODOLOGY HERE: OLIFANT.ORG

Denver case study

IBC 2024 TYPE IV-B



+$19/sf
(3% increase)

Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc. Costs are based on residential area only. Garage costs were excluded since they remained a constant in each scenario.

12 Stories
513,800 GSF of residential
395 Residential units

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Denver case study

IBC 2024 TYPE IV-B

IBC 2024 allows for more wood exposure, less cost, and less added carbon through additional materials.

Structural

Concrete structure
$45,828,000

Indirect costs[1]
$4,830,000

Structural

Mass timber structure
$36,009,000

Concrete
$8,969,000

Floor build up
$4,801,000

Fire protection: beams & columns
$3,364,000

Transfer structure
$2,810,000

Fire protection: floor plates
$1,201,000

Exterior envelope
$900,000

Indirect costs[1]
$5,832,000

Schedule savings
($1,750,000)

Interior ceiling finishes
($975,880)

$ Cost comparison

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513,800 GSF of residential
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[1] INDIRECT COST: SUM OF SUBCONTRACTOR BONDS, CONSTRUCTION CONTINGENCY, INSURANCE, AND CM FEE; AS A VOLUME PERCENTAGE OF DIRECT PROJECT COST

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Minneapolis case study

IBC 2021 TYPE IV-C

3,154,000
kgCO2eq

Stick-built

MATERIALS EMISSIONS
& CARBON STORAGE

165,340 SF IBC 2021 TYPE III-A ON TYPE IA PODIUM

- Fire protection - ceilings
- Fire protection - walls
- Roofing
- Exterior enclosure
- Gypcrete topping
- Acoustic underlayment
- Floor structure
- Column & structural walls
- Foundation

42%

Total reduction

GWP
kgCO2eq

1,823,000
kgCO2eq

Mass timber

MATERIALS EMISSIONS
& CARBON STORAGE

165,340 SF IBC 2021 TYPE IV-C

LEARN MORE ABOUT THE DATA AND
METHODOLOGY HERE: OLIFANT.ORG

Minneapolis case study

IBC 2021 TYPE IV-C

3,154,000
kgCO2eq

Stick-built

MATERIALS EMISSIONS
& CARBON STORAGE

165,340 SF IBC 2021 TYPE III-A ON TYPE IA PODIUM

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- Column & structural walls
- Foundation

42%

Total reduction

GWP
kgCO2eq

1,823,000
kgCO2eq

Mass timber

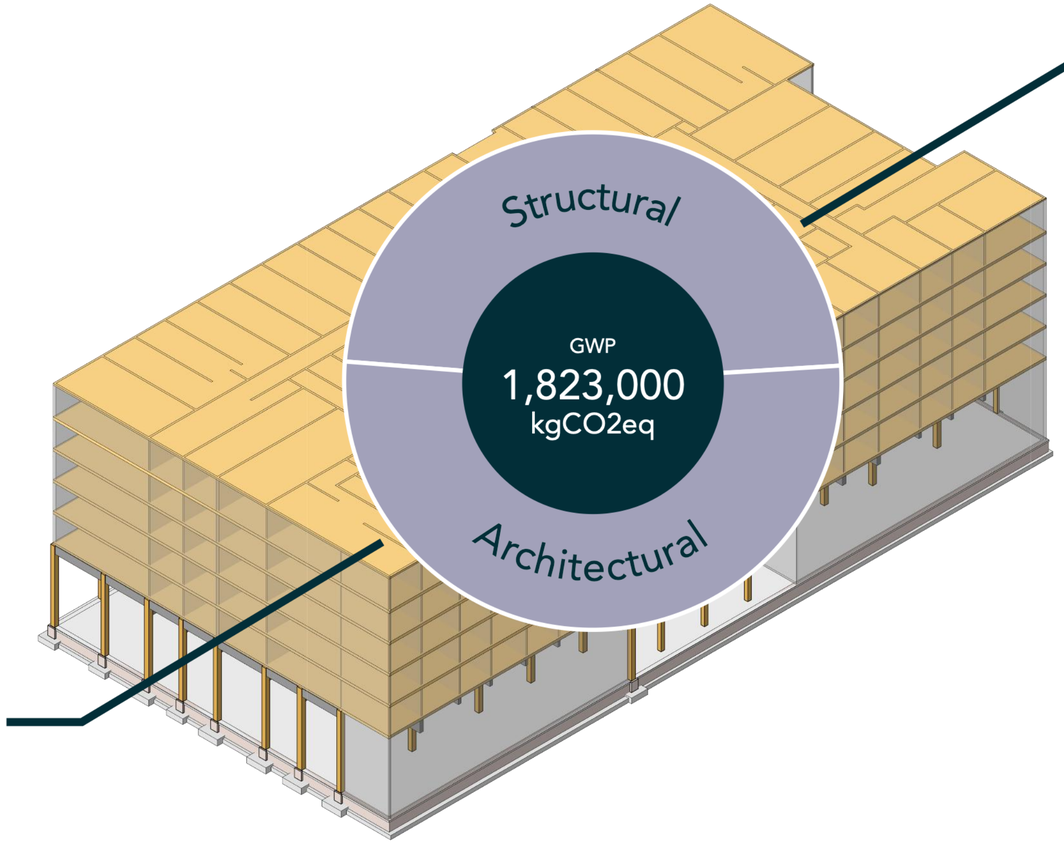
MATERIALS EMISSIONS
& CARBON STORAGE

165,340 SF IBC 2021 TYPE IV-C

LEARN MORE ABOUT THE DATA AND
METHODOLOGY HERE: OLIFANT.ORG

Minneapolis case study

IBC 2021 TYPE IV-C



-46%

decrease with mass timber

1,625,000 → 870,000

-38%

decrease with mass timber

1,529,000 → 952,000

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Minneapolis case study

IBC 2021 TYPE IV-C

+$16/sf
(3% increase)

Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc.

6 Stories
165,340 GSF of residential
130 Residential units

LEARN MORE ABOUT THE DATA AND METHODOLOGY HERE: OLIFANT.ORG

Minneapolis case study

IBC 2021 TYPE IV-C

Structural

Structure
$8,692,000

Indirect costs[1]
$916,000

Structural

Mass timber structure
$13,620,000

Indirect costs[1]
$1,170,000

Interior ceiling finishes
($1,226,000)

Concrete foundation
($700,000)

Exterior envelope
($590,000)

Cost comparison

Major cost drivers and impacts between superstructures of a cast-in-place concrete project and a mass timber project. Does not account for owner costs, such as schedule savings, time to market, etc.

6 Stories
165,340 GSF of residential
130 Residential units

[1] INDIRECT COST: SUM OF SUBCONTRACTOR BONDS, CONSTRUCTION CONTINGENCY, INSURANCE, AND CM FEE; AS A VOLUME PERCENTAGE OF DIRECT PROJECT COST

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Summary
GWP

Minneapolis case study
42%
Total reduction
kgCO2eq

IBC 2021 TYPE III-A ON TYPE IA PODIUM | IBC 2021 TYPE IV-C

Denver case study
22%
Total reduction
kgCO2eq

IBC 2024 TYPE IA | IBC 2024 TYPE IV-B

Atlanta case study
16%
Total reduction
kgCO2eq

IBC 2021 TYPE IA | IBC 2021 TYPE IVA

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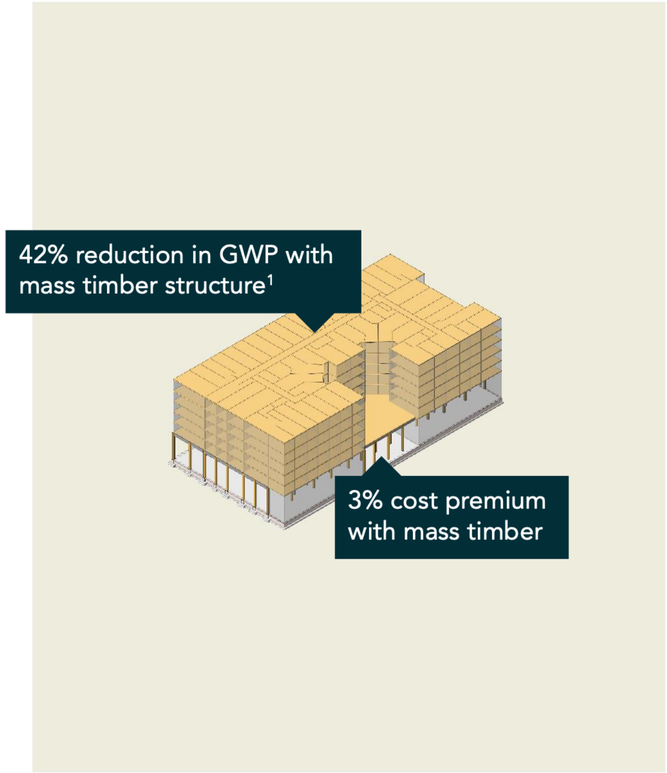
Minneapolis



[1] Mass timber stores more carbon than a stick-built structure

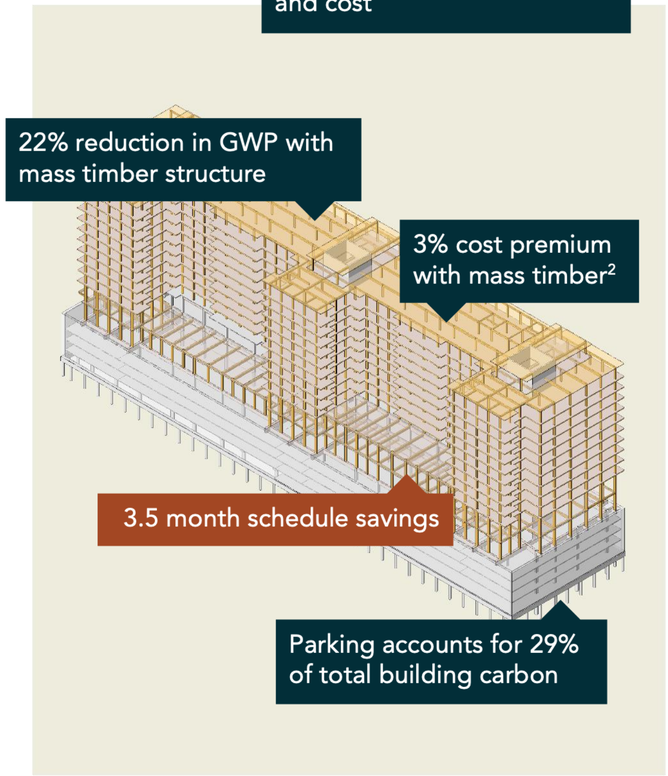
+$16/sf

8.05 kgCO2eq/sf reduction

0 months saved

Denver

Colorado adopted IBC 2024, considerably reducing carbon and cost



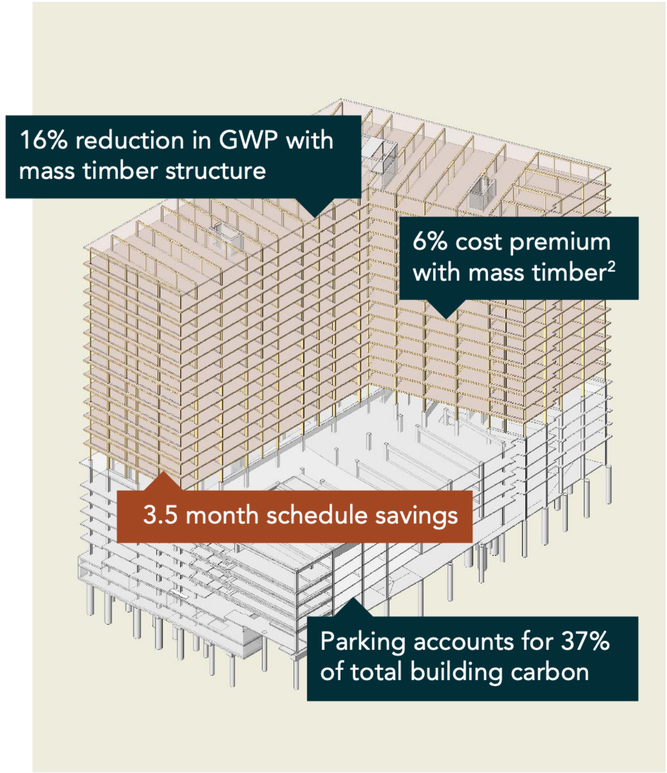
[2] Cost likely to improve if building was originally designed for mass timber

+$19/sf

5.11 kgCO2eq/sf reduction

3.5 months saved

Atlanta



+$37/sf

4.07 kgCO2eq/sf reduction

3.5 months saved

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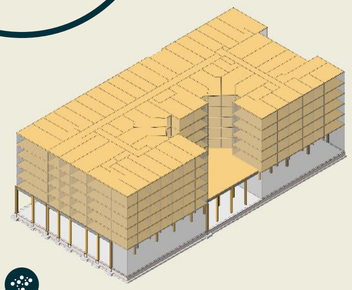
Type IV-C

Potential to replace Type III over Type I construction



42%

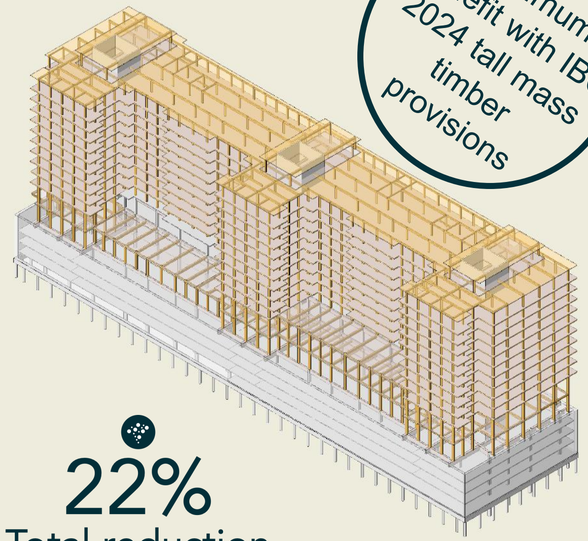
Total reduction

GWP
kgCO2eq

Max # of stories 9 stories

Type IV-B (IBC 2024)

Maximum benefit with IBC 2024 tall mass timber provisions



22%

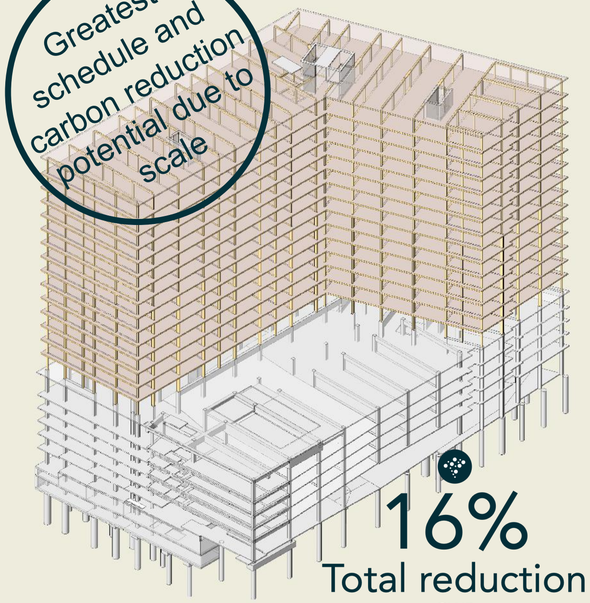
Total reduction

GWP
kgCO2eq

Max # of stories 12 stories

Type IV-A

Greatest schedule and carbon reduction potential due to scale



16%

Total reduction

GWP
kgCO2eq

Max # of stories 18 stories

7-12 story buildings Sweet Spot

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Addressing Roadblocks to Timber

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This concludes The American Institute of Architects Continuing Education Systems Course.