Mass Timber at Apex Headquarters: A New Benchmark for Sustainability

Presented by **Alastair Reilly**, AIA

Design partner

William McDonough + Partners
Architecture and Community Design

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

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

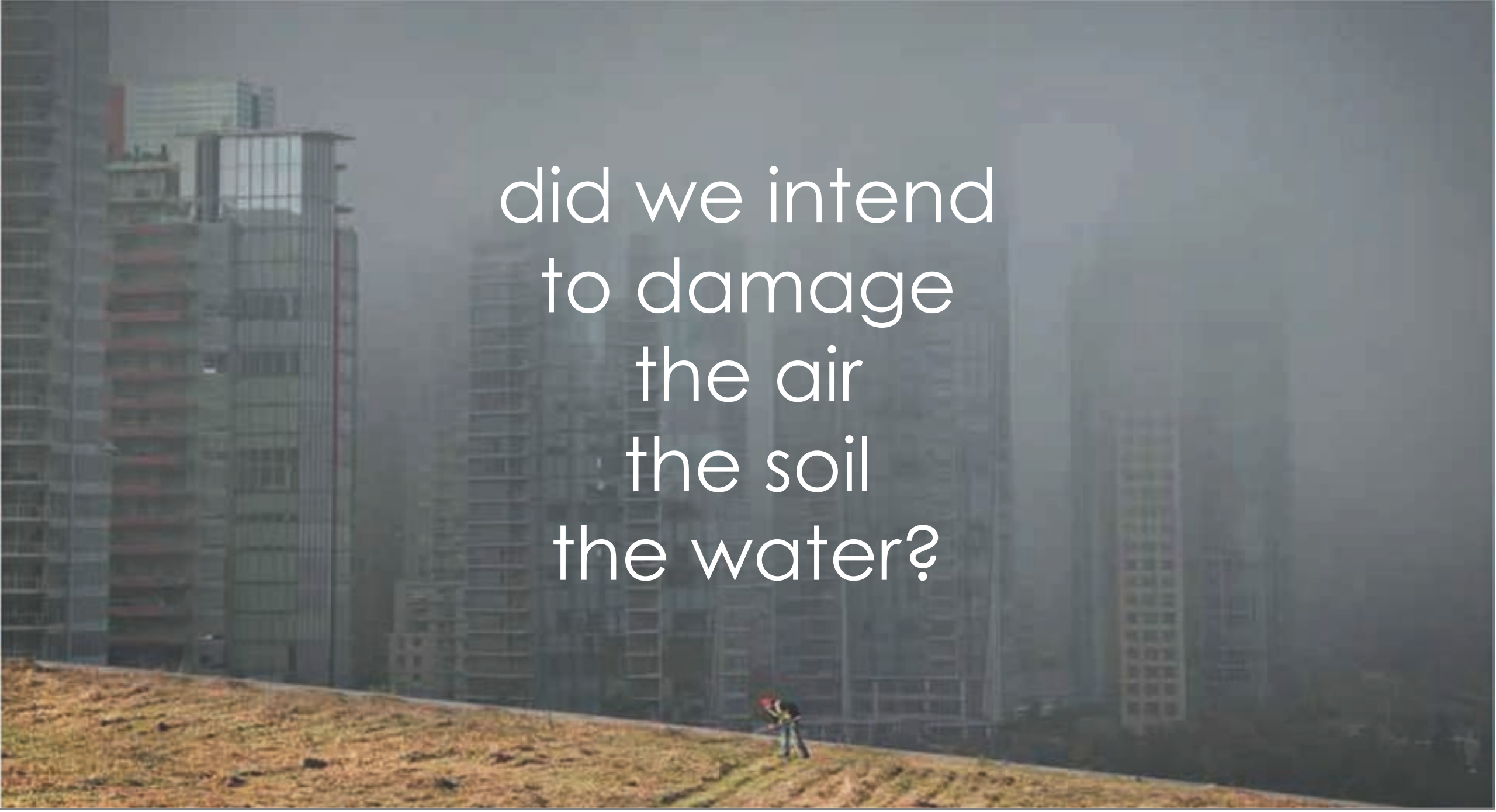
Course Description

When tasked with creating the new headquarters for Apex Clean Energy in Charlottesville, Virginia, William McDonough + Partners sought a solution that could provide healthy materials, prioritize occupant well-being and harvest daylight and solar energy. To meet these needs, a mass timber structure combined with rooftop solar array was chosen. In this session, hear firsthand from WM+P on how they navigated the code approvals for a 100 ft tall mass timber office building, how natural daylighting and a green roof were incorporated to enhance occupant comfort and promote biodiversity and stormwater retention, and how the design incorporated circular economy tactics, such as the ability to dismantle and re-use the mass timber products after the building's end of service life.

Learning Objectives

1. Discuss the role that exposed mass timber framing played in meeting the client's goals of healthy materials and enhanced occupant well-being.
2. Explore the code approvals process for a unique, 100 ft tall mass timber office building.
3. Highlight the use of 875 roof-and canopy-mounted solar panels on this project, which is expected to produce 364 MWh of energy per year, enough to equate to net-positive energy use by the Apex offices.
4. Review how high-value mass timber elements can be dismantled after the building's service life is complete to be re-used in another structure.

design is the first signal
of human intention





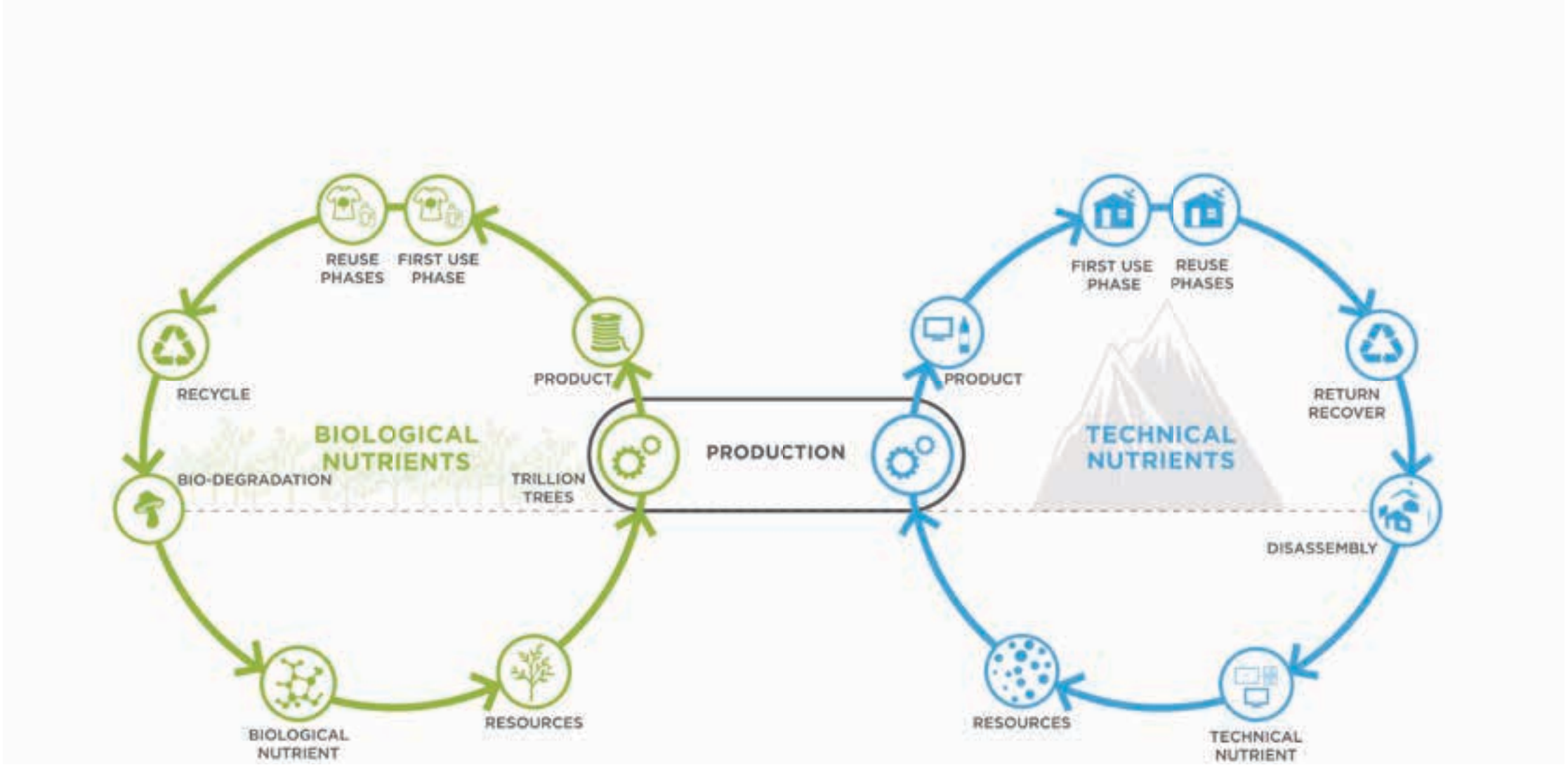



we need a new design

it is more than just closing the loop…

or putting the linear economy in a circle

Image Source: Sustainable Brands



products for consumption **products as a service**

cradle to cradle circular economy

C2C an innovation and validation framework

- **Ensuring materials are safe** for humans and the environment
- **Enabling a circular economy** through product and process design
- **Generating clean energy** and protecting the climate
- **Safeguarding air, water and soil** resources
- **Embracing safe, fair and equitable labor practices** that advance human rights and strong communities

material health

CERTIFIED cradle to cradle PRODUCTS PROGRAM

Chemicals and materials used in the product are selected to **prioritize the protection of human health and the environment**, generating a positive impact on the quality of materials available for future use and cycling.

product circularity

CERTIFIED cradle to cradle PRODUCTS PROGRAM

Products are intentionally **designed for their next use** and are actively cycled in their intended cycling pathways.

Material Health requirements

PLATINUM

- All product-relevant process chemicals are assessed as compatible with human & environmental health
- ≥ 50% of the product by weight is assessed as preferable for human and environmental health
- Toxic emissions in the supply chain are addressed by either:
  Inputs are ≥ 75% MHC or ≥ 50% C3C Certified w/Gold or Platinum level + strategy to increase percentages
  OR
  Environmental & human health impact hotspot **LCA + strategy to address identified hotspots**

GOLD

- All chemicals and materials subject to review in the **product are assessed (100%)**
- Product is optimized for material health (all chemicals are compatible with human & environmental health)
- Product has very low VOC emissions or is inherently non-emitting
- Strategy developed to increase the percentage of preferred materials and chemicals in the product OR optimize the chemistry in the supply chain

SILVER

- **Product is 95% assessed**
- Product does not contain materials with > 1% C-bonded halogen by weight, recognized PBTs, vPvBs, Cat.1&2 CMRs posing risk, or substances causing an equivalent level of concern
- Product has low VOC emissions (for products permanently installed in buildings)
- Product complies with VOC limits (for liquid/aerosol consumer & construction products)

BRONZE

- **Product is in compliance with the Restricted Substances List (RSL)**
- Product does not contain organohalogen substances of special concern (PFAS, HFRs, highly halogenated) or functionally-related, non-halogenated classes of equivalent concern (OPFRs) above relevant thresholds
- Product is 75% assessed and 100% characterized by generic material
- Strategy developed to phase-out or assess/optimize all unassessed and problematic chemicals

Product Circularity requirements

PLATINUM

- At least two intended cycling pathways are defined for the product and its materials
- ≥ 99% materials by weight are compatible with intended cycling pathway(s)
- A minimum amount of product is actively cycled
- Monitoring program to track cycling rates/quality and an increase in cumulative rate/quality is demonstrated

GOLD

- ≥ 90% materials by weight are compatible with intended cycling pathway(s)
- Materials compatible for high value cycling
- **Circular design opportunity implemented**
- Product designed for disassembly (if relevant)
- The product is actively cycled and/or a program is implemented to increase the cycling rate or quality of the product's materials after use (also applies at Platinum)

SILVER

- **Cycling partnership(s) initiated**
- ≥ 70% materials by weight are compatible with intended cycling pathway(s)
- **Strategy for improving product circularity is developed**

BRONZE

- Applicant is involved in a circularity education initiative
- Intended cycling pathway(s) for the product and its materials are defined
- Plan for improving cycling infrastructure; cycling partnerships identified
- Meets level-specific product/material targets for % cycled or renewable content (targets increase through Platinum) Alternative: limitations are publicly reported
- ≥ 50% materials by weight are compatible with intended cycling pathway(s)
- **Circularity data** and cycling instructions are publicly available

Cradle to Cradle® - inspired The Five Goods™

GOOD MATERIALS
Safe biological and technical nutrients

-Prioritize C2C certified materials
-Utilize Mass Timber for the superstructure
-Low embodied carbon materials

GOOD ECONOMY
Circular, sharing, and shared

-Design for adaptability
-Design for disassembly
-Balanced, Intentional, and Repeatable

GOOD ENERGY
100% Renewable Energy

-Net positive for new buildings
-All electric
-Resilient (batteries)

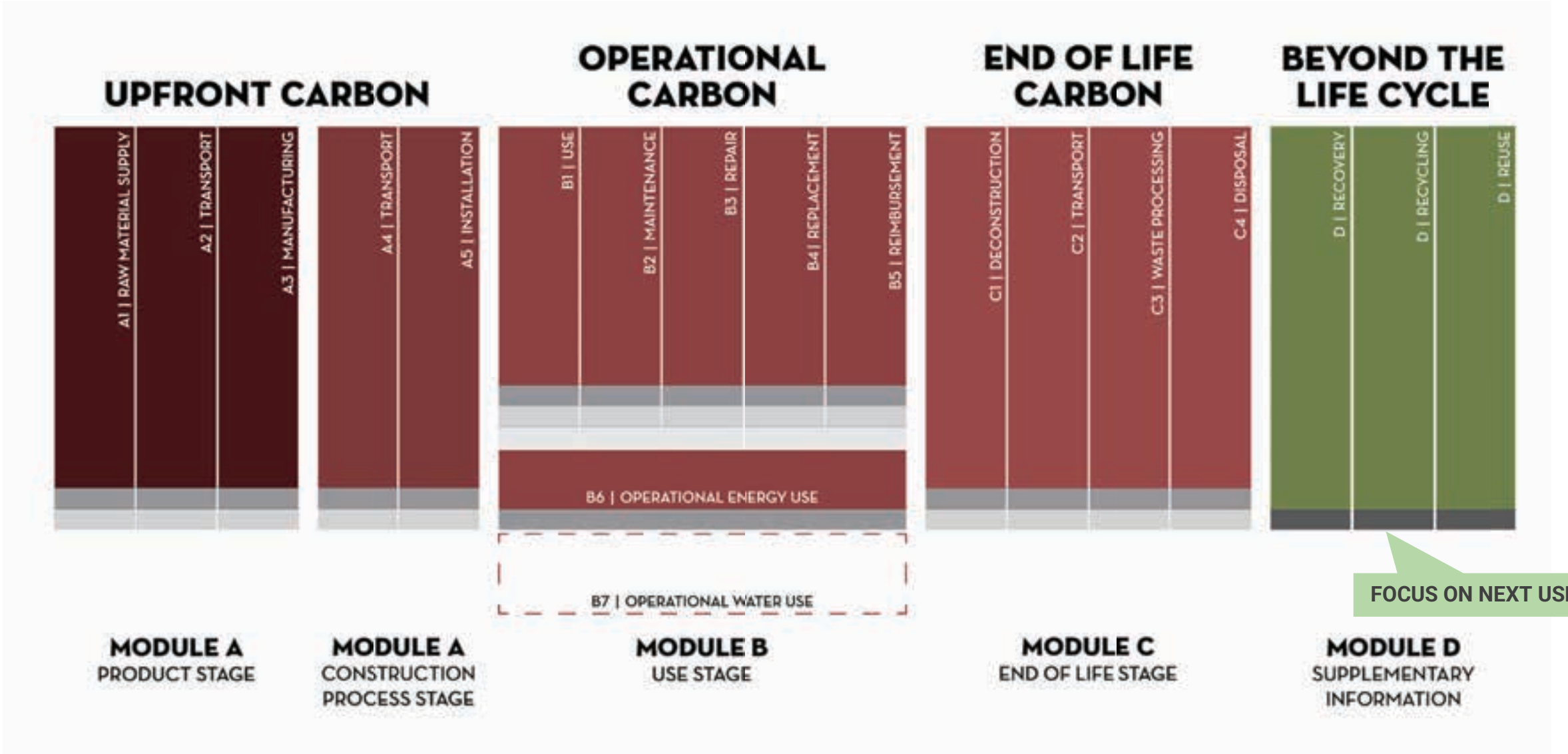
GOOD WATER
Clean and available to all

-Capture stormwater from roofs to reuse in the landscape
-Resilient landscape design.

GOOD LIVES
Safe, meaningful, creative, and dignified.

-Biophilic
-Beauty from Simplicity
-Healthy
-Community

How do our buildings impact the environment | **WBLCA**



emits oxygen

sequesters carbon

fixes nitrogen

accrues solar energy

creates food

creates fuel

distills water

provides habitat

creates microclimate

changes color

self-replicates

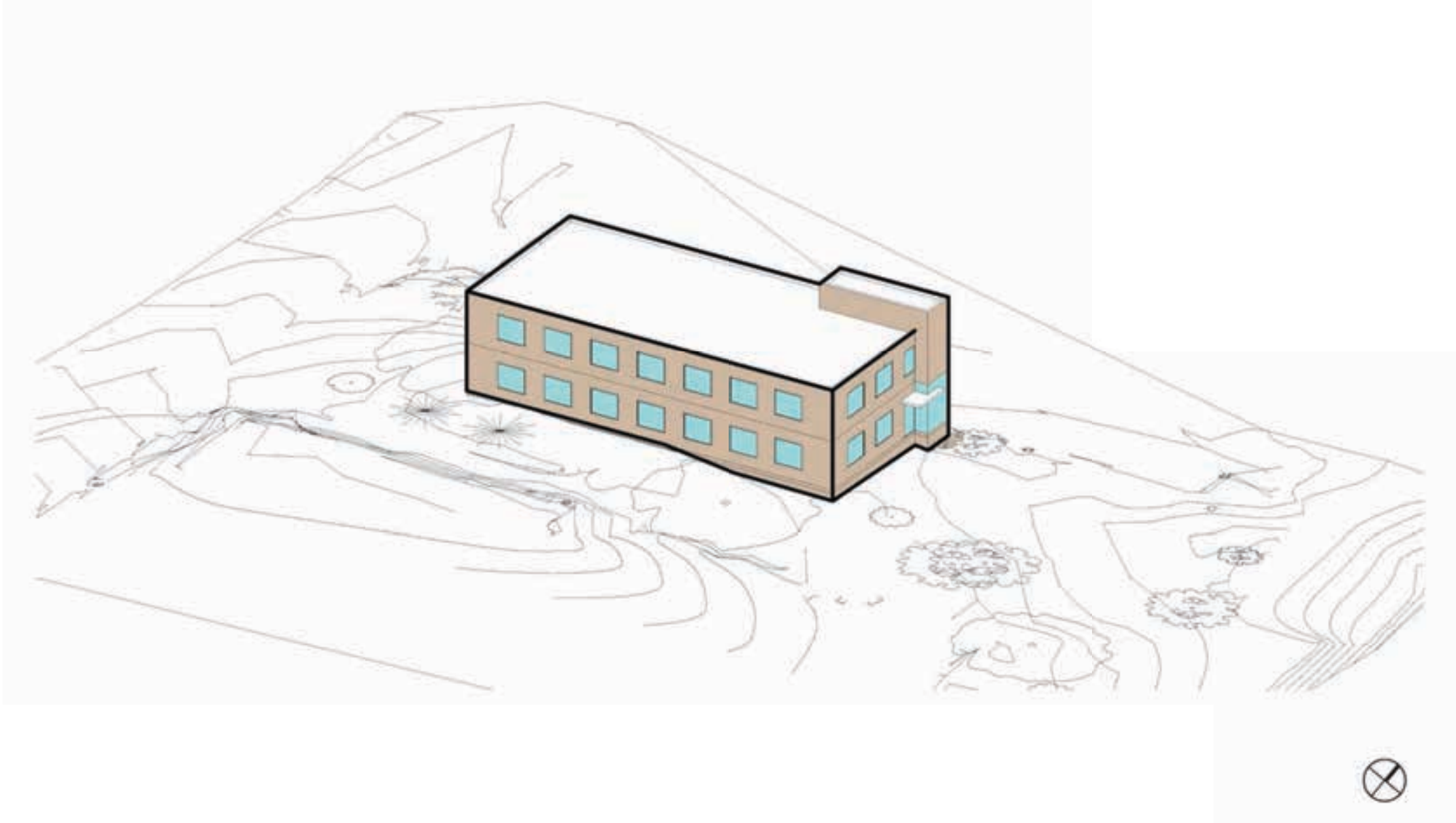
a building like a tree

goal: carbon positive behavior

building case studies

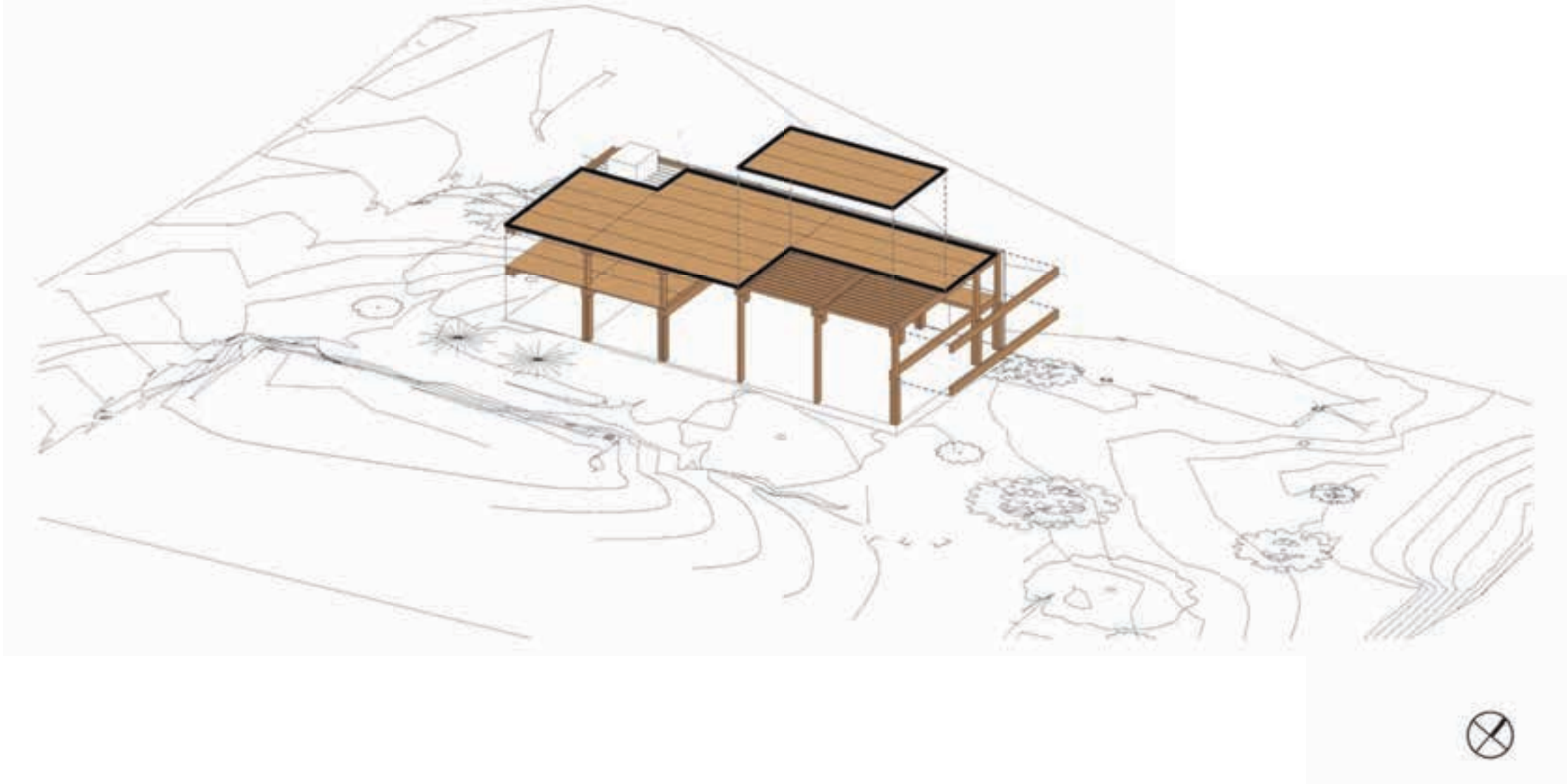
SMALL | MEDIUM | LARGE

CO|LAB a building like a tree

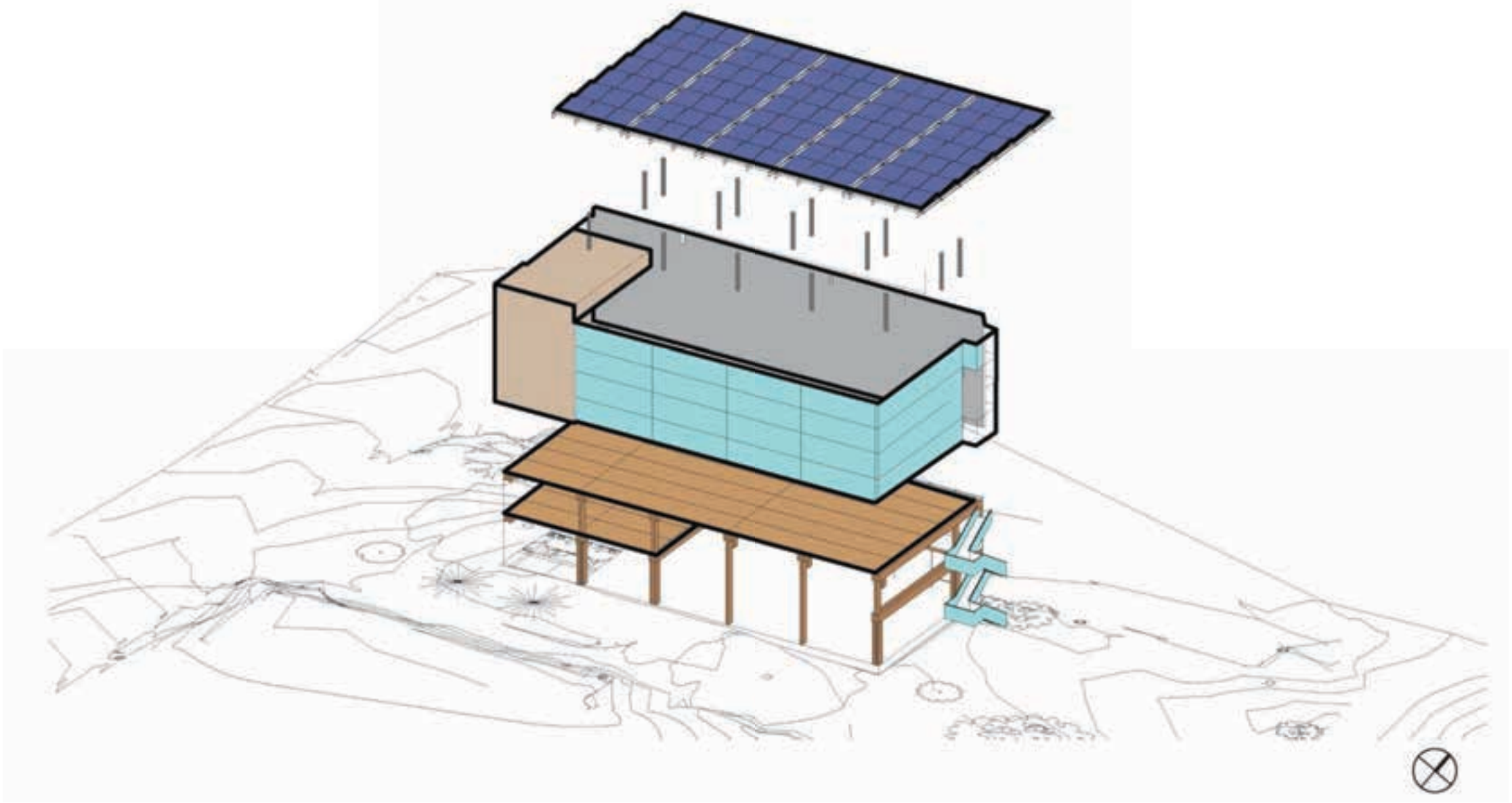


Basecase

70% of GWP related to the building structure



Mass Timber | CLT Structure



High Performance Skin | Integrated PV Array

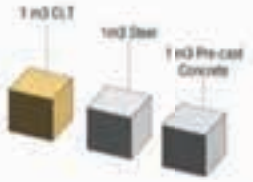
Going beyond zero carbon and toward **carbon positive**

Using Revit and Tally plugin, the team modeled the wood frame and two alternates (one with a steel frame and CLT decks and walls and one with a full steel and concrete structure. **The all wood system was validated as the most environmentally friendly system of the three.**

ALL HOLZ BUILD

'Cradle to Gate' Global Warming potential from Tally*

*Carbon uptake during growth of wood -764.65 kgCO2eq per 1 m³



Wood Mass = 177 t
Total Mass = 177 t

184.5 mtCO2eq + 275.97 mtCO2eq = **+91.47 mtCO2eq**

HYBRID HOLZ + STEEL

Wood Mass = 114 t
Steel Mass = 57 t
Total Mass = 171 t

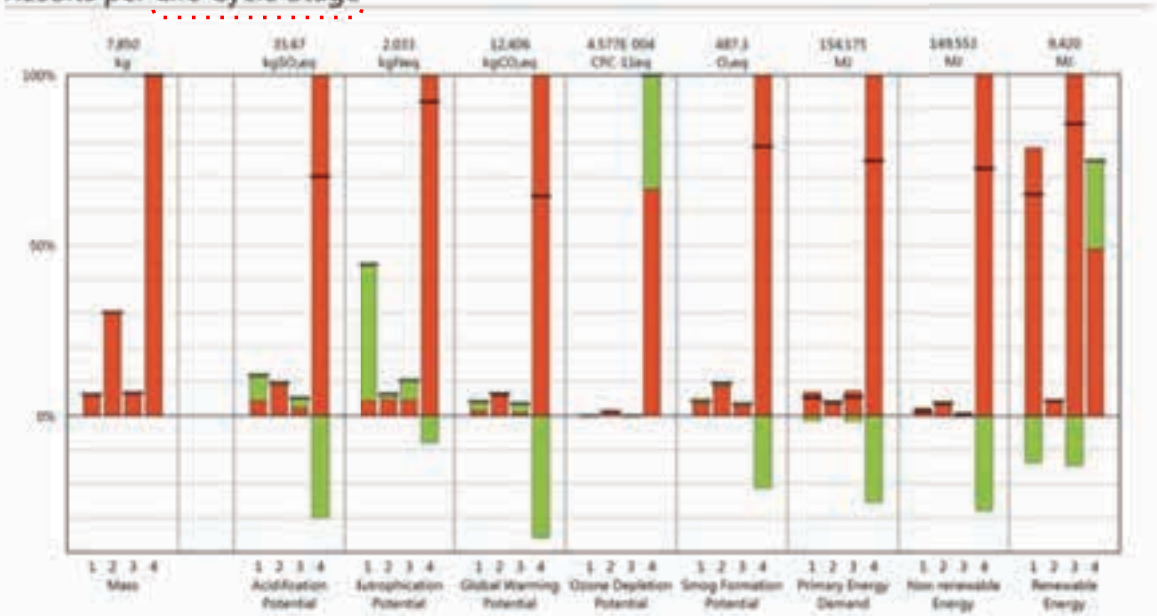
178.7 mtCO2eq + 177.34 mtCO2eq = **+0.95 mtCO2eq**

STEEL + CONCRETE

Wood Mass = 0 t
Steel Mass = 65.9 t
Conc. Mass = 419.2 t
Total Mass = 488 t

184.5 mtCO2eq + 4.5 mtCO2eq = **-179.5 mtCO2eq**

Results per Life Cycle Stage



Whole-building LCA Results

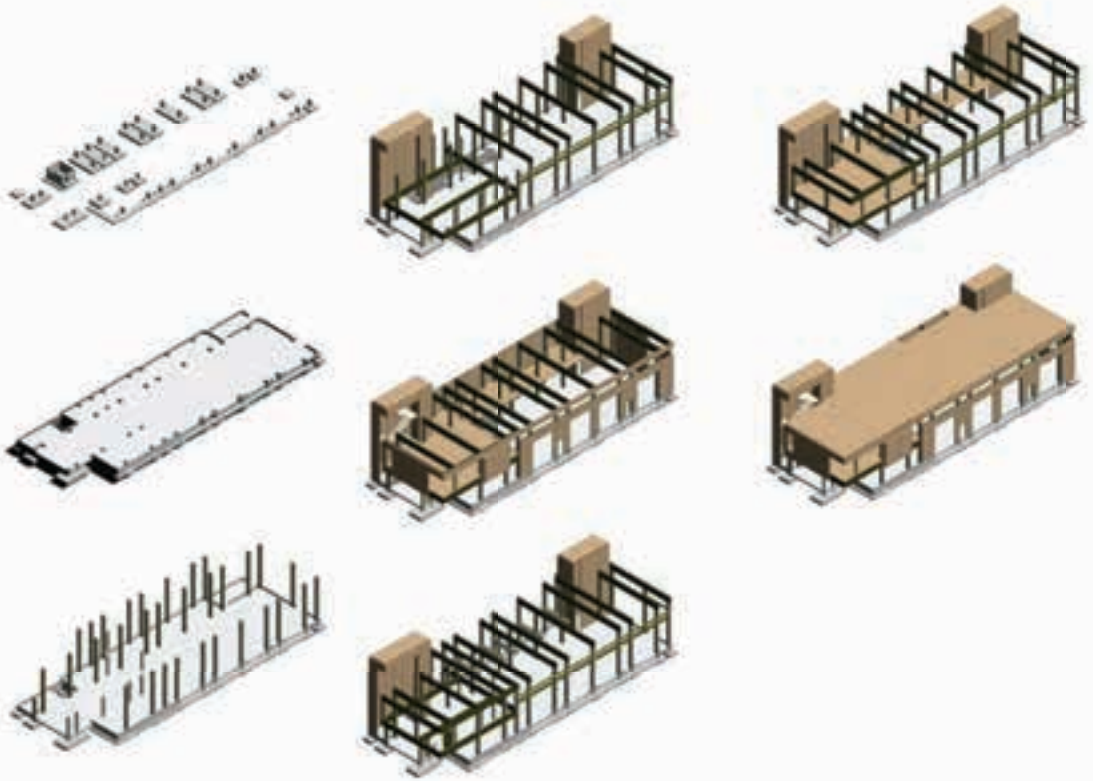
Results System Boundary: Cradle to Grave (Ass C)

Life Cycle Assessment Impact Measures	Baseline Building	Proposed Building	Units	Percent Difference (%)
Global warming potential	319,892.24	224,533.33	kg CO2 eq	-29.83%
Stratospheric ozone depletion	0.00	0.00	kg CFC-11 eq	not applicable
Acidification of land and water	1,033.77	1,028.25	kg SO2 eq	-0.53%
Eutrophication	193.00	155.09	kg N eq	-19.56%
Tropospheric ozone formation	30,911.26	32,243.24	kg O3 eq	4.31%
Depletion of non-renewable energy resources	4,210,510.31	3,363,609.61	MJ	-20.01%
Number of measures with at least 10% reduction (a reduction corresponds to a negative value (positive difference))				3

LCA | Carbon Analysis

Designed for Disassembly in the Circular Economy

By assembling the building using only mechanical fasteners, the high-value MT elements can be disassembled and then reused or recycled to be endlessly recirculated in a safe, then **circular, economy.** The MT structure provides an interior tactile benefit while also allowing rapid installation of the structural frame and envelope and decreasing the building's carbon footprint.



CO|LAB | Designed For Next Use

CO|LAB | R&D Fab Lab

Cost reduction and beauty in using **Cross-Laminated Timber** as a finished product

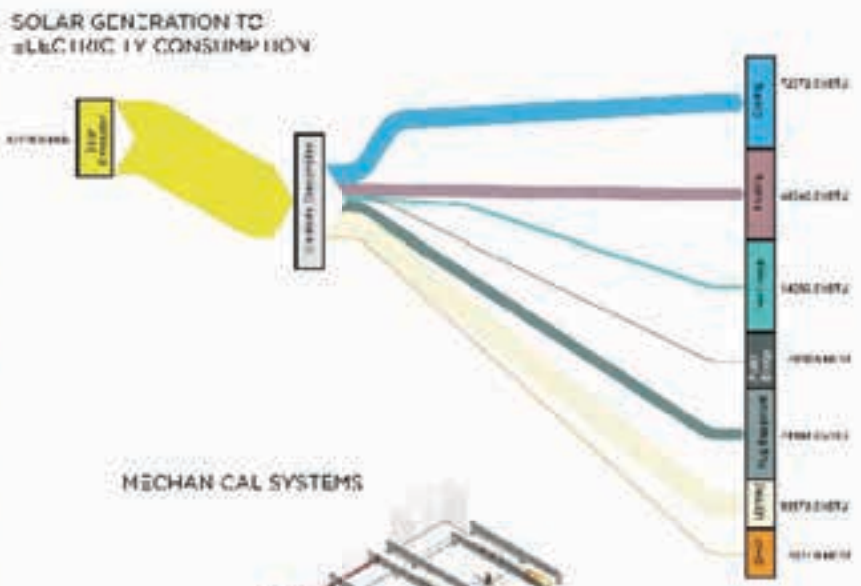
CO|LAB

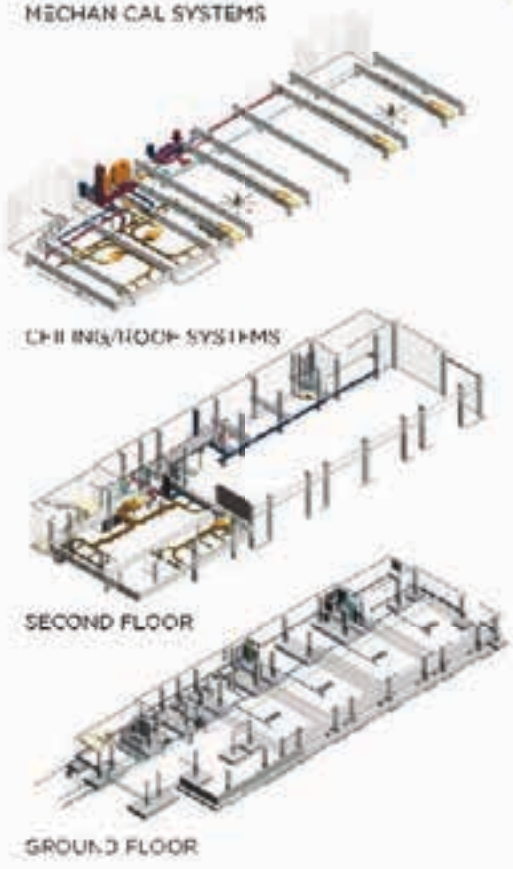
Safe and healthy materials in a collaborative, flexible workplace

LEED Platinum v4 BD+C Certification

Prioritizing material and human health through the specification of **Cradle to Cradle Certified™ Products, Health Product Declaration, Forest Stewardship Council** and **Declare products**

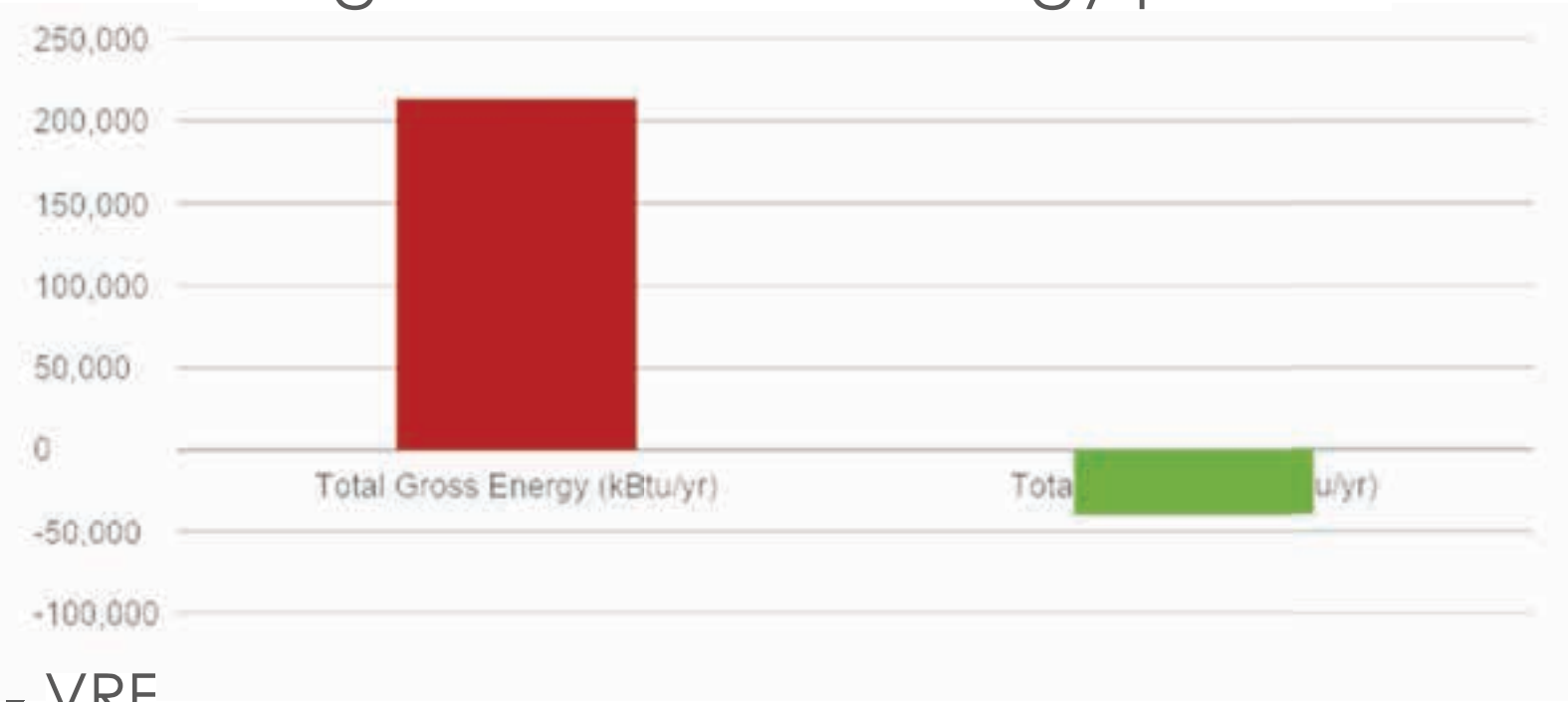
Net-Positive Energy, a model high-performance building





CO|LAB metrics

designed to be net energy positive



- All Electric - VRF
- Predicted Consumed Energy Use Intensity (Site EUI): 25 kBtu/sf/yr
- Predicted Net EUI: -5 kBtu/sf/yr net EUI,
- Carbon emissions: -1.7 lb/sf/yr, net carbon
- **Percent from Renewable Energy: 118% -** integrated for Battery backup & Resiliency

Apex is working to speed and shape the **energy transition**, pioneering new deployment of clean energy technologies and **decarbonizing** the grid

How do we **decarbonize the built environment**

Charlottesville, Virginia

Charlottesville, Downtown Mall

Charlottesville, Downtown Mall

Apex's new offices will bring the company's more than 200 renewable energy experts into one building designed for collaboration, health and wellbeing.

SITE + ROOF PLAN

LEVEL 3 WITH ROOF TERRACE

LEVEL 4 (TYPICAL 5-6)

LEVEL 7 - APEX ATRIUM

LEVEL 8 - APEX OFFICES

Design Positive™

NET ZERO ENERGY

All Electric

No on Site Fossil Fuels

Carbon Free Renewable Energy

No Net New Energy Use for APEX spaces

Optimize Operational Energy Use for GhGs

CLIMATE FRIENDLY MATERIALS

Mass Timber Structure

Low Embodied Carbon Materials

“Cradle to Cradle Material Approach”

RESPONSIBLE WATER USE

Green Roof

Low Flow and High Efficiency Fixtures.

Stormwater BMP

CIRCULAR ECONOMY

Design for Next Use

DfD (Design for Disassembly)

Material Passports

HEALTHY BUILDING

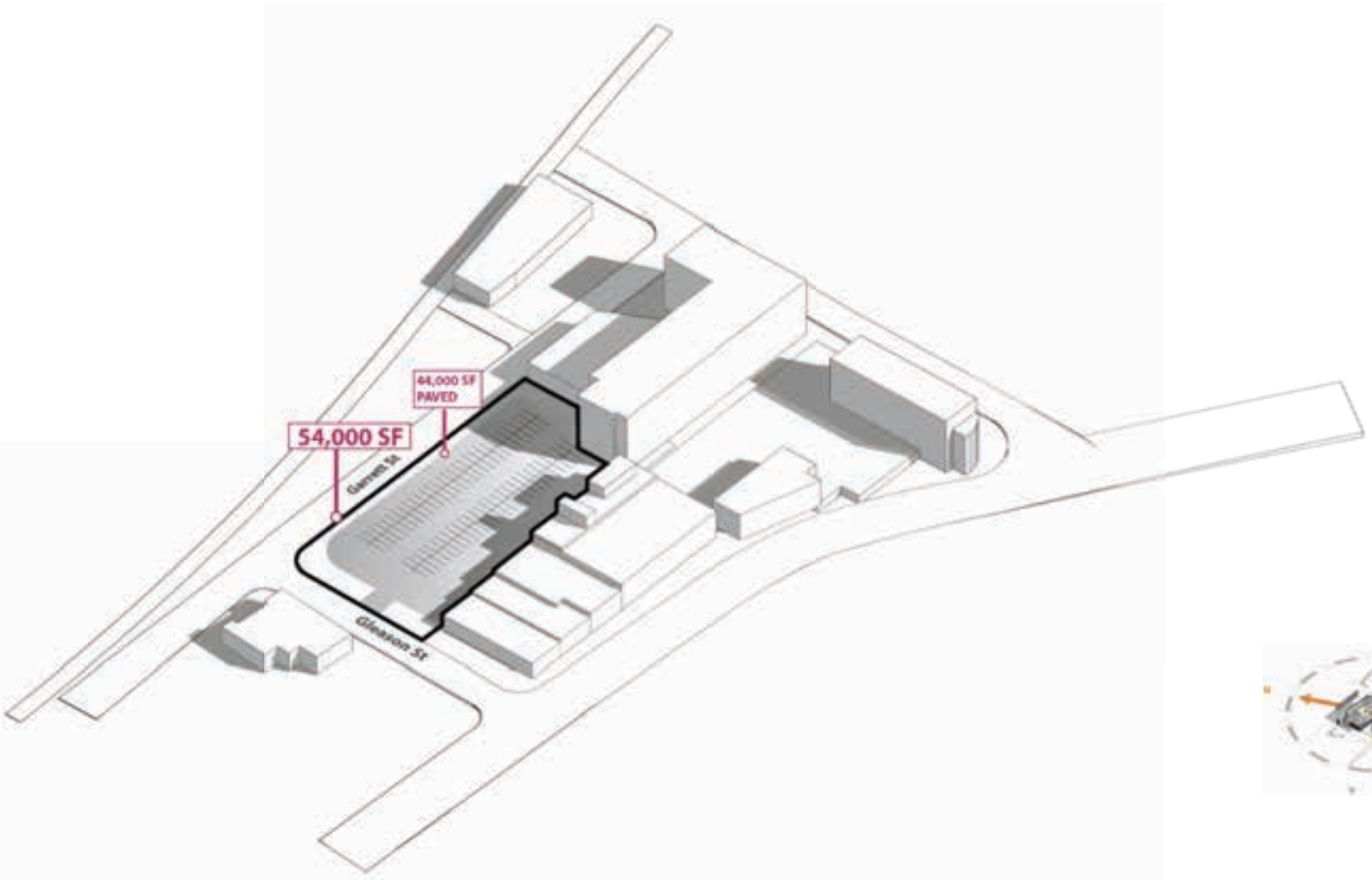
Biophilic

Beauty from Simplicity

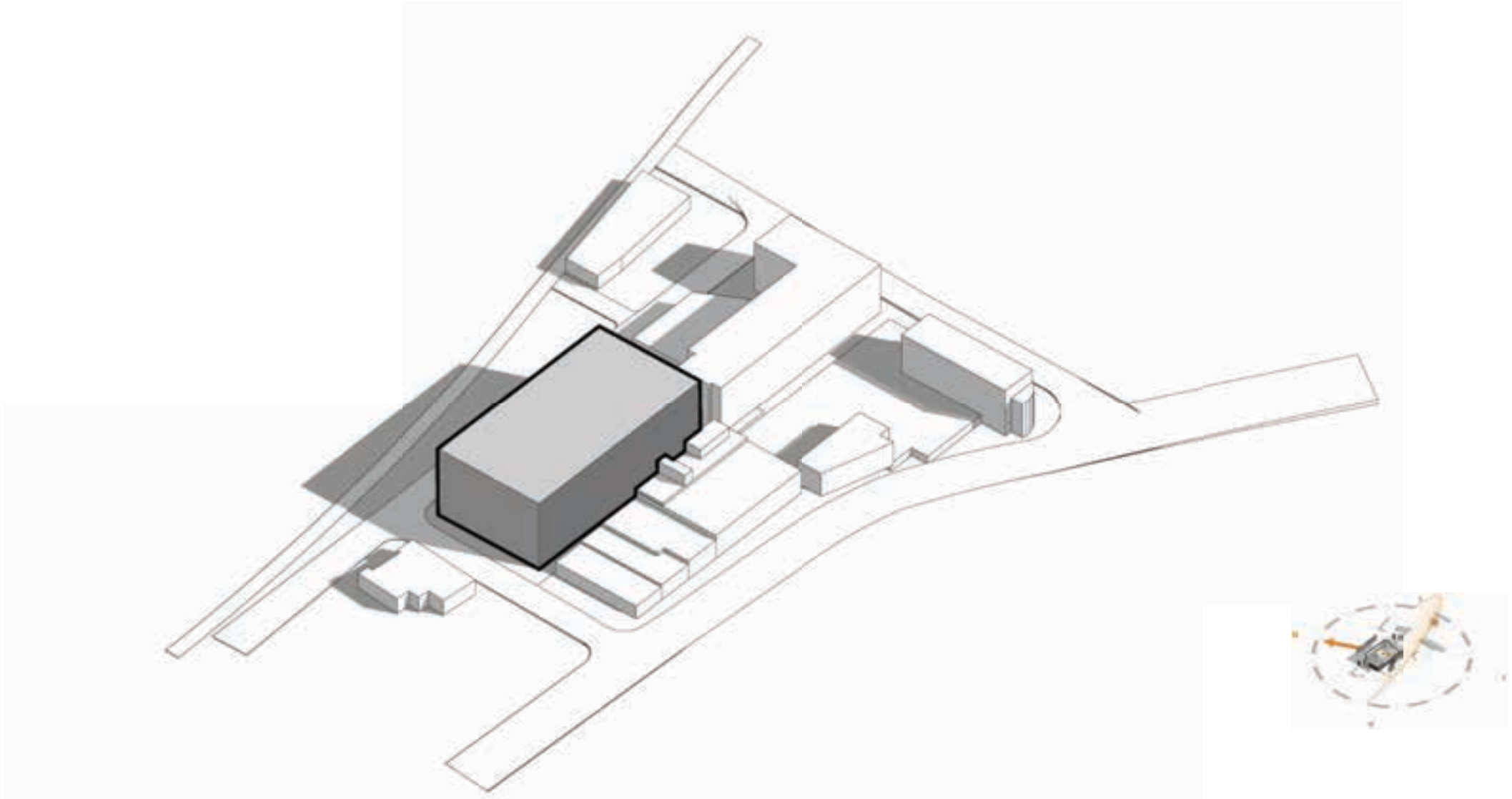
Healthy

Community

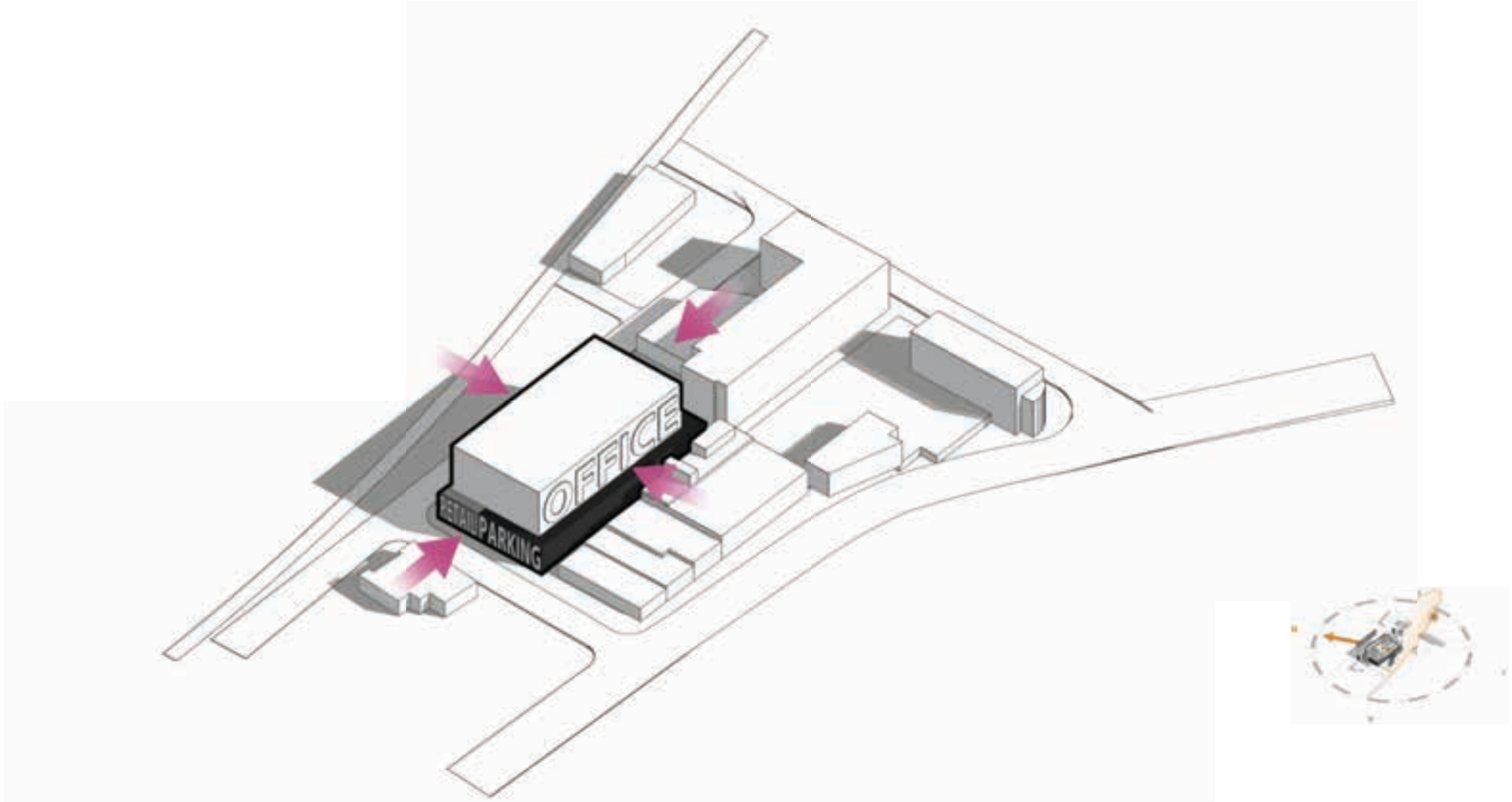
Existing site condition - Downtown Extended corridor ("DE")



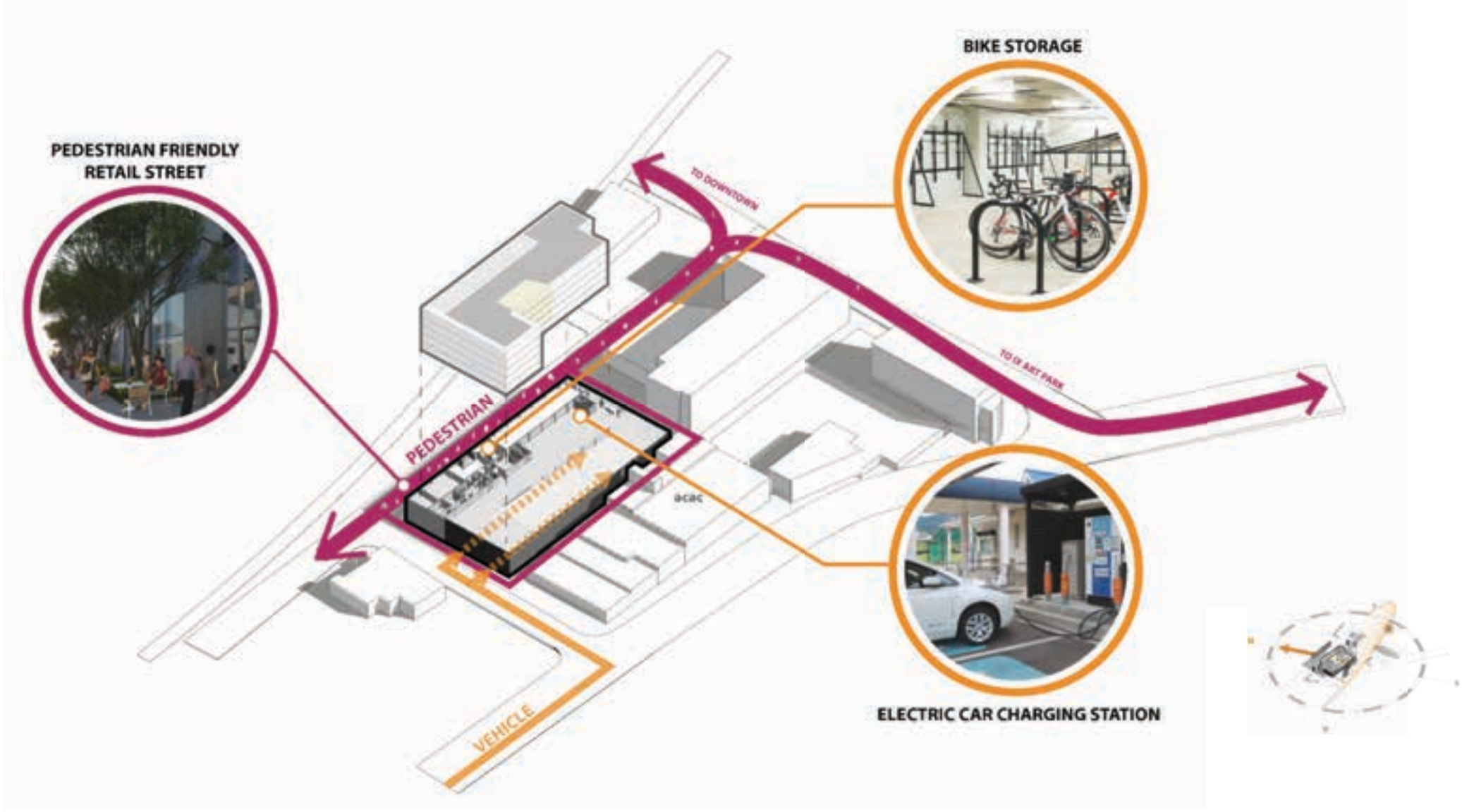
Maximum allowable building envelope - 101’ Max Ht



Split massing by program | Step facade per zoning requirement

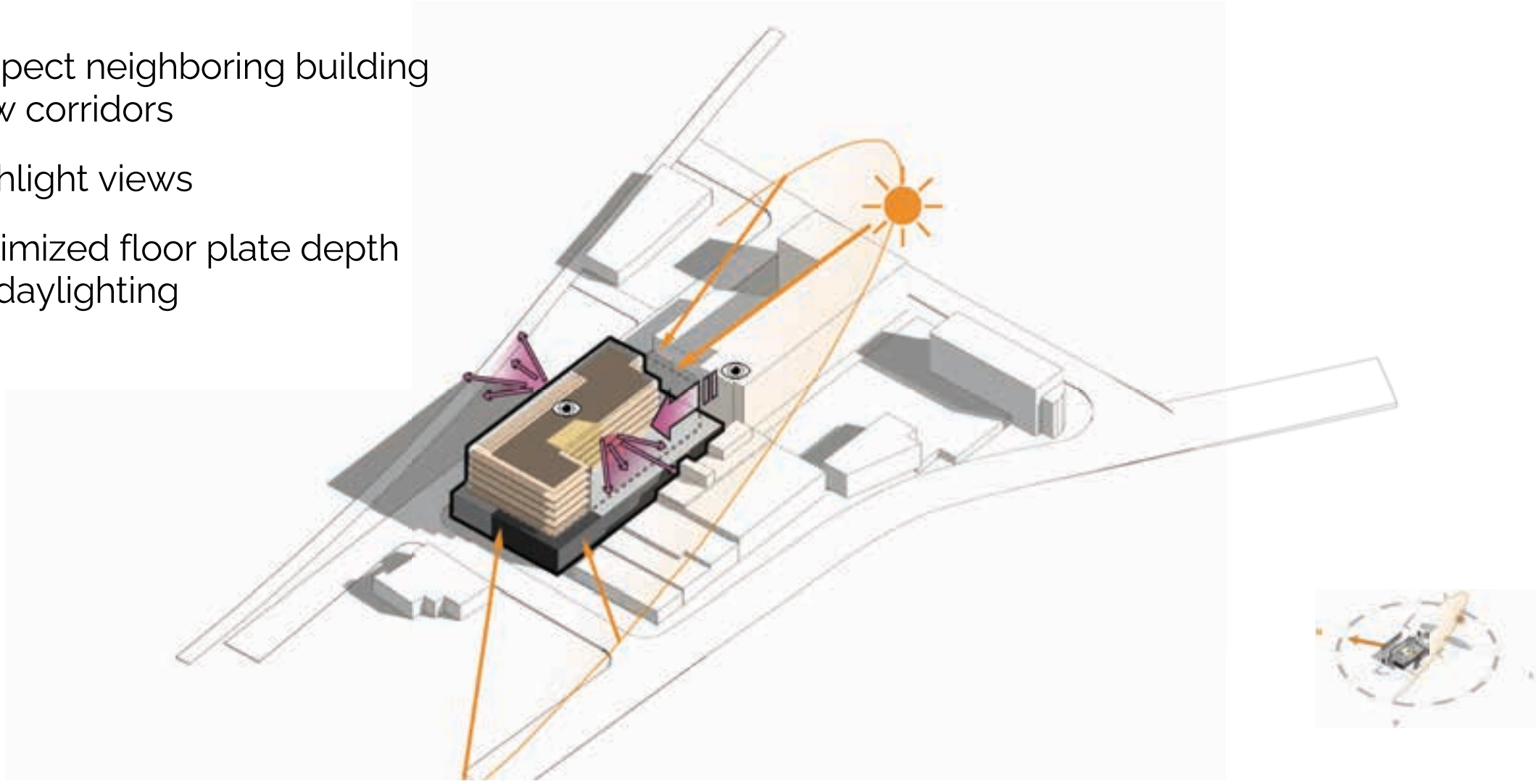


Ground activities + access

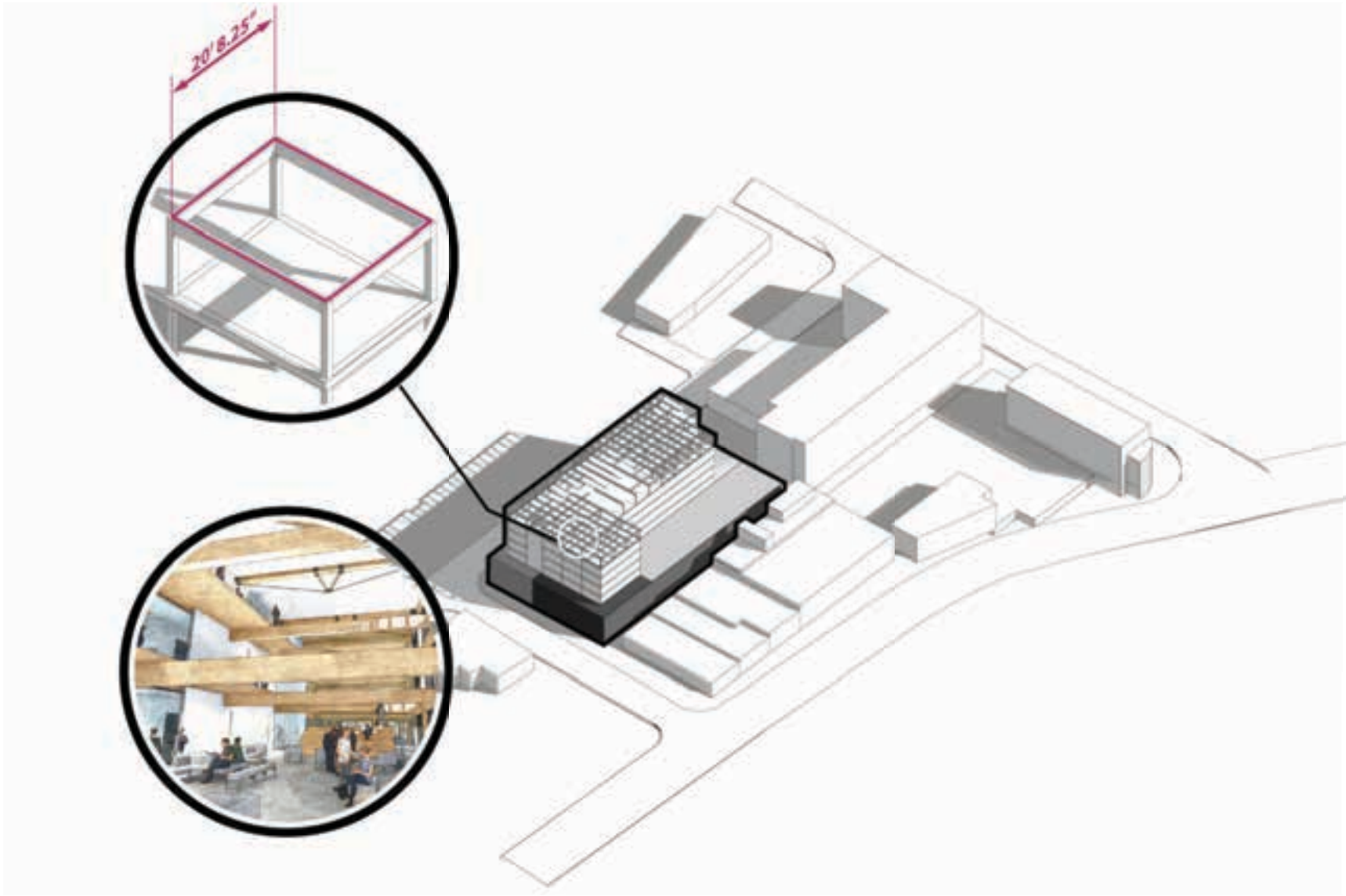


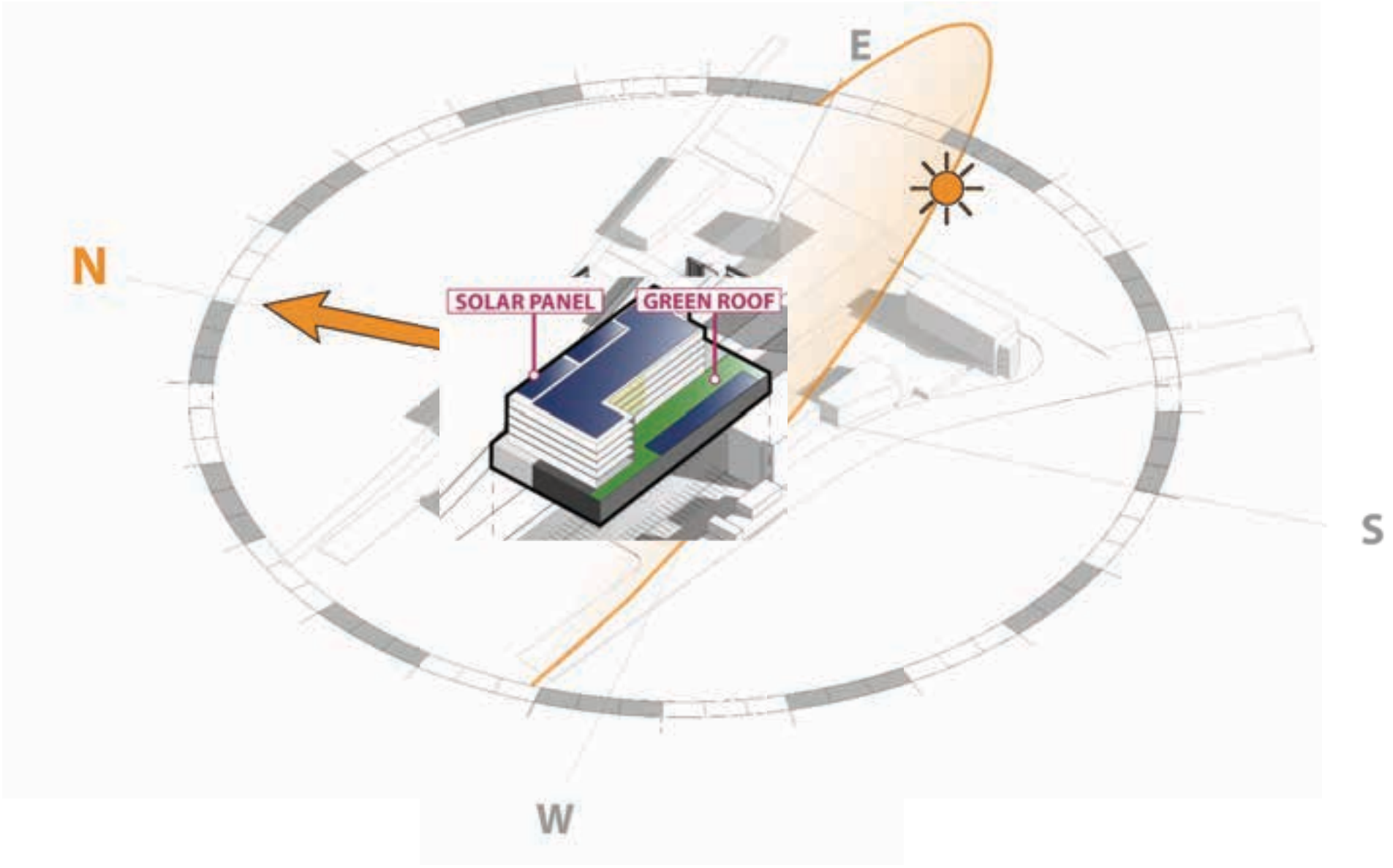
Views and daylighting

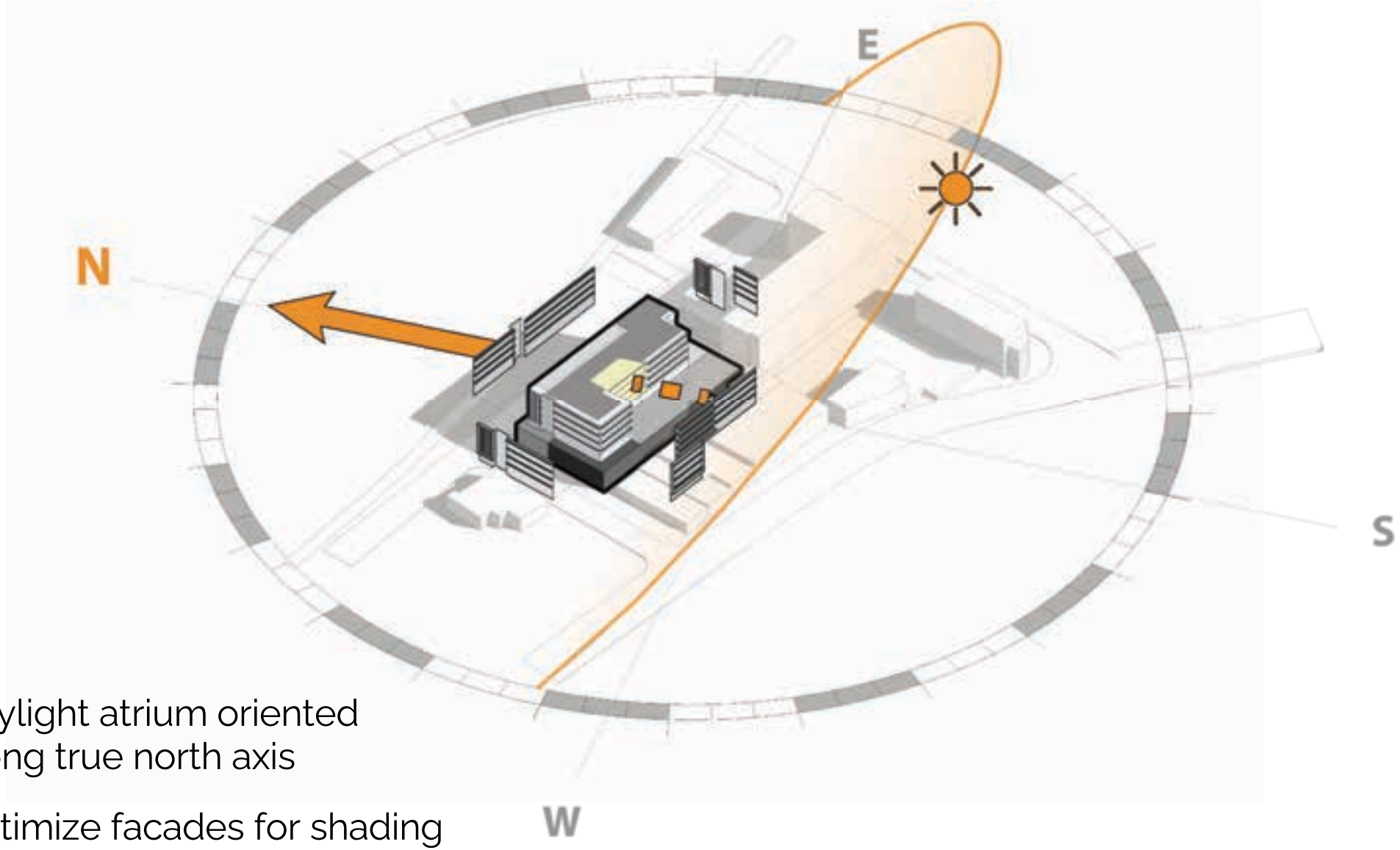
- Respect neighboring building view corridors
- Highlight views
- Optimized floor plate depth for daylighting



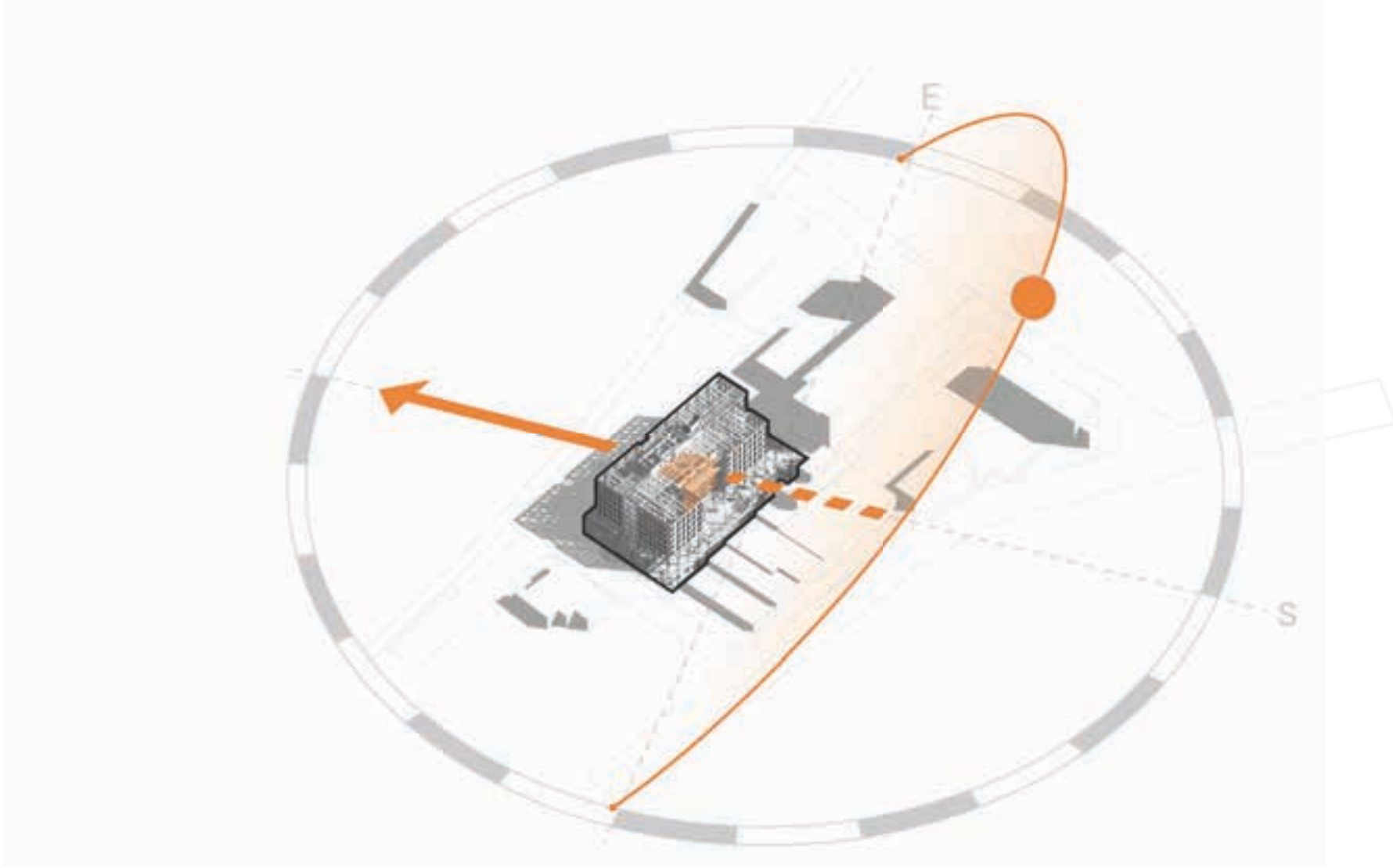
Exposed Mass Timber structure







- Daylight atrium oriented along true north axis
- Optimize facades for shading based on orientation



The Five Goods™

GOOD ENERGY

100% Renewable Energy

GOOD MATERIALS

Safe biological and technical nutrients

GOOD WATER

Clean and available to all

GOOD ECONOMY

Circular, sharing, and shared

GOOD LIVES

Safe, meaningful, creative, and dignified

A Framework for a World Class Workplace

Why Mass Timber? | **Weight Reduction**

LOW CARBON FOOTPRINT | Mass Timber vs. Concrete

Concrete Option

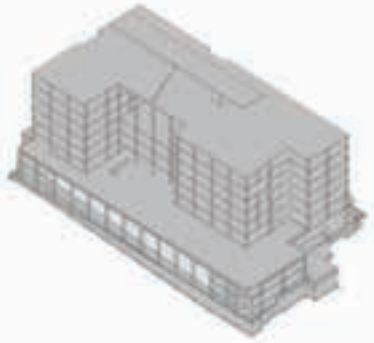
2-way flat slab at office levels:
10" concrete slabs at office levels
18 x 24 concrete perimeter columns
24 x 24 concrete interior columns

Concrete podium:
26x26 concrete interior columns
168x168x36 interior footings

Mass Timber Option

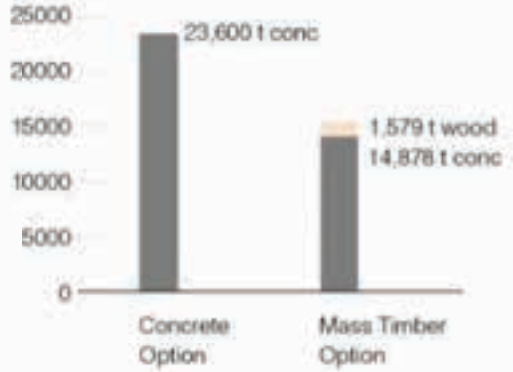
CLT floor slab at office levels:
6 5/8" thick CLT slabs at office levels
12 7/8 x 12 7/8 Glulam perimeter columns
12 7/8 x 18 Glulam interior columns

Concrete podium:
24x24 concrete interior columns
144x144x36 interior footings



'Carbon stored in wood from Woodworks™
'Cradle to Gate' Global Warming potential from Tally®

Mass [metric ton]



7,143 metric ton reduced weight

Why Mass Timber? | **Carbon** | **Weight Reduction**

LOW CARBON FOOTPRINT | Mass Timber vs. Concrete

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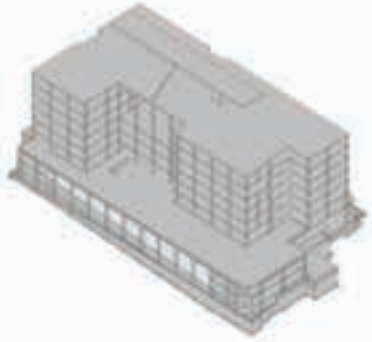
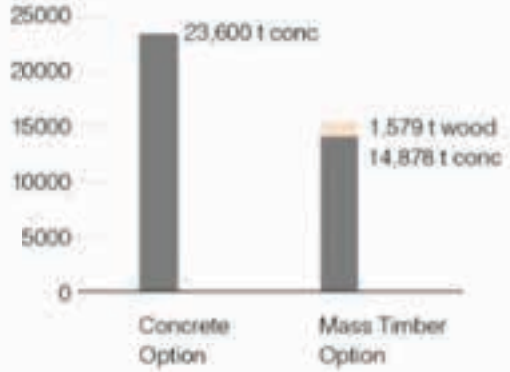
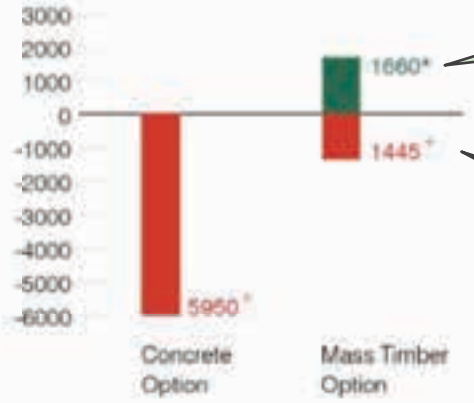


Mass [metric ton]



Global Warming Potential [$mtCO_2eq$]

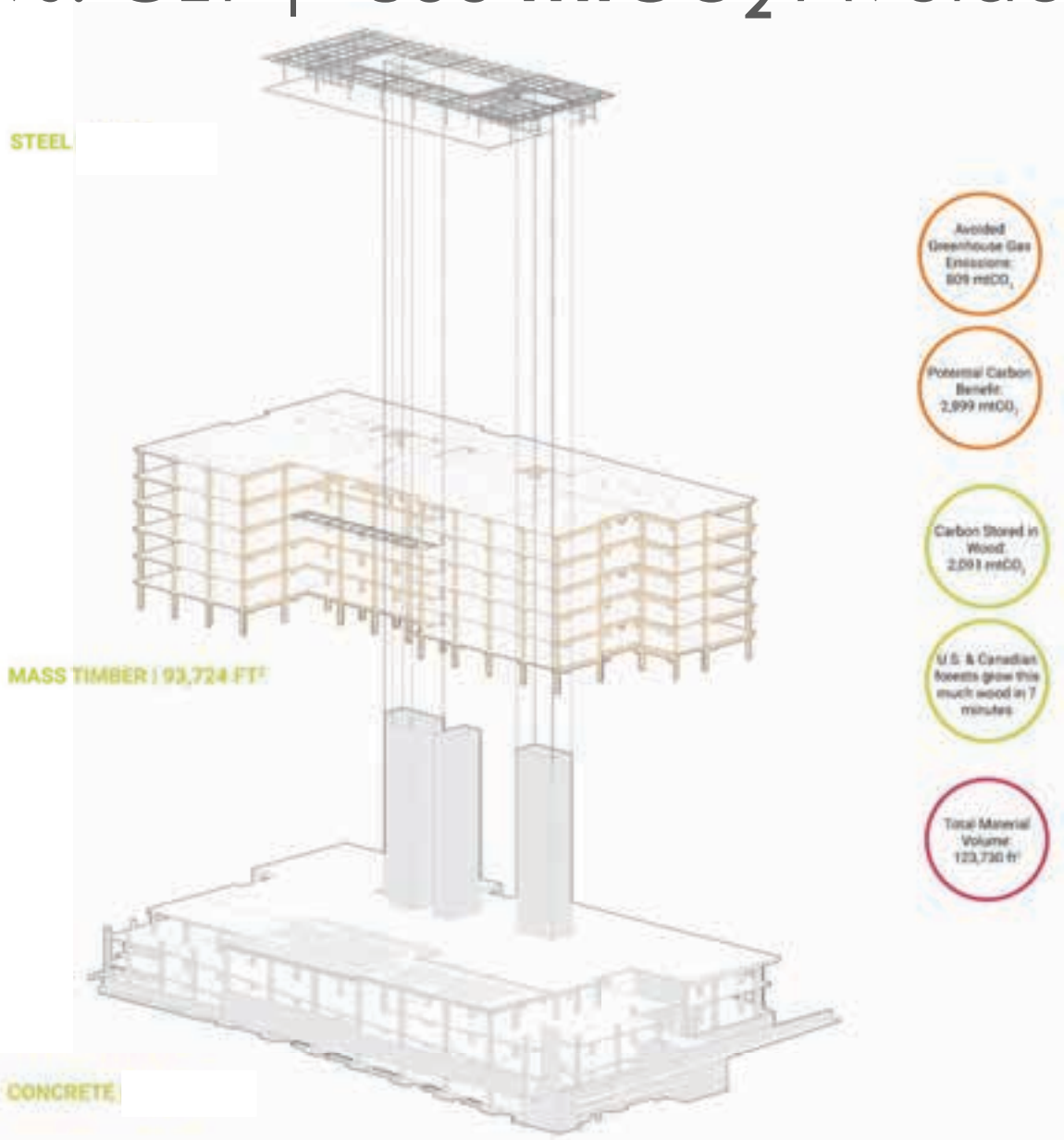


1,660 mt CO_2 biogenic carbon

4,505 mt CO_2 GWP reduction

*Carbon stored in wood from Woodworks®
*Cradle to Gate' Global Warming potential from Tally®

Concrete vs. CLT | **800 mtCO$_2$** Avoided GWP



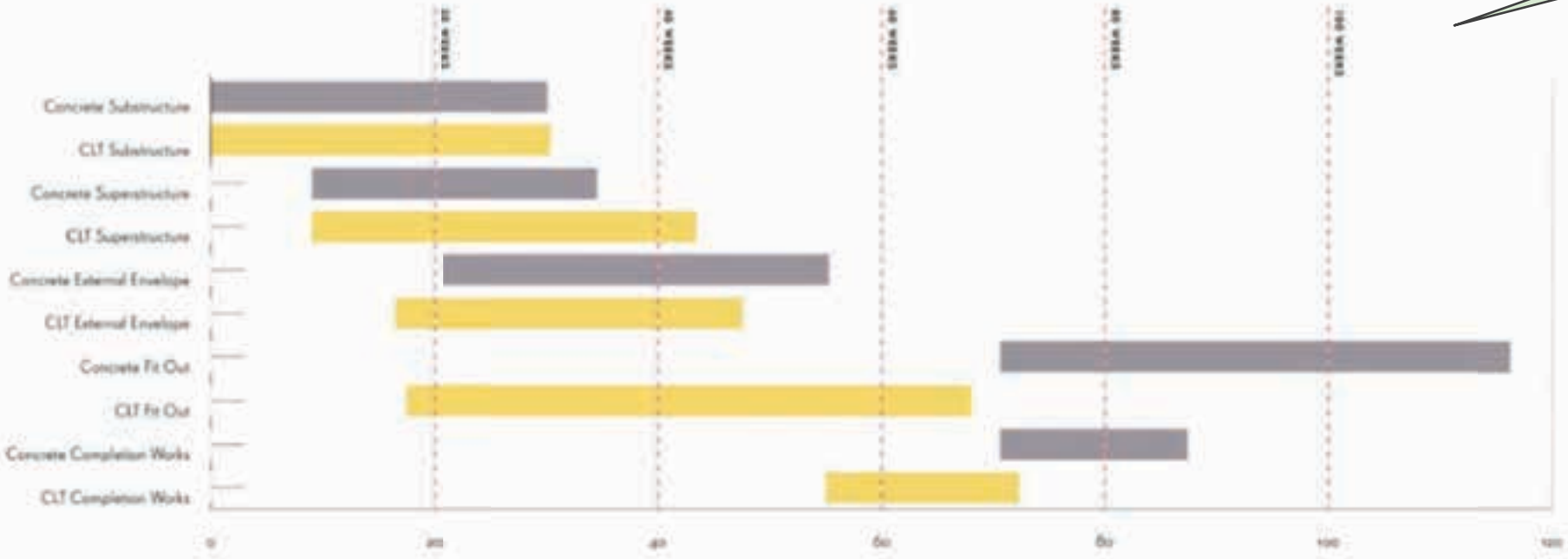
This is equivalent to carbon sequestered by: 5,331 acres of U.S. forests in one year

Why Mass Timber? | **Speed** | **Carbon** | **Weight Reduction**

CONSTRUCTION | Speed

Prefabricated materials designed for disassembly ensure complete coordination between design, manufacturing and on-site construction. Compared to concrete, CLT structures can be installed in a shorter time period. In fact, more than 15,000 square feet of CLT can be installed per day, dramatically cutting construction schedules and costs.

TIMELINE: Approximate program adjustments for CLT versus traditional reinforced concrete build



Nordic Structures: https://www.nordic.ca/en/sustainable-construction/mass-timber
thinkwood: https://www.thinkwood.com, "100 Projects - UK CLT"
greenspec: http://www.greenspec.co.uk/building-design/crosslam-timber-fire-resistance-and-rating/greenspec

20% Schedule reduction

***Earlier start for follow-up trades; no waiting for cure times**

Carbon Positive Design

Going beyond zero carbon and toward **carbon positive**

Carbon sequestration is an important component of building with cross-laminated timber (CLT). Forests act as a carbon "sink," as healthy trees remove carbon dioxide (CO_2) from the atmosphere, release oxygen and sequester/store carbon. Using sustainably harvested FSC mass timber as a building structure reduces the carbon footprint by storing CO_2 in the same way a healthy tree would (one square meter of timber stores approximately one ton of CO_2).

Carbon Stored in Wood
2,091 metric tons of CO_2

+

Greenhouse Gas Emissions Avoided
(use of CLT vs. concrete/steel)
809 metric tons of CO_2

=

2,990 metric tons of CO_2
Potential Carbon Benefit

The Five Goods™

What if our **buildings were designed like trees** as living organisms participating productively in their surroundings?

GOOD ENERGY

1 **Rooftop Solar - PV Array**
Annual production 436 MWh of energy - Zero Net Energy use for Apex offices

2 **Solar Array - PV Canopy**
Provides shade and renewable energy

3 **High-Performance Glazing**
Thermally broken window frames, SOLARBAN 90 insulated glazing unit

4 **High-Performance Opaque Envelope**
Cross-laminated timber (CLT), DensElement™ weather barrier, Thermafiber rigid insulation, thermally broken rainscreen structure, rainscreen cladding

5 **High-Efficiency Mechanical Systems**
Variable refrigerant flow equipment, energy recovery ventilator — low energy consumption and low operating costs

GOOD WATER

6 **Green Roof Terrace**
Provides habitat, biodiversity and stormwater retention

GOOD MATERIALS

7 **Mass Timber Structure - CLT**
Sustainably harvested FSC and Cradle to Cradle Certified® mass timber provides carbon sequestration, low embodied carbon footprint and fast construction

8 **Cradle to Cradle Certified®**
Materials and products assessed for ecological and human health

GOOD LIVES

9 **Daylight and Views + Indoor Environmental Quality**
Excellent access to natural light, rooftop landscape and views, lighting controls, occupancy sensors and operable shades

GOOD ECONOMY

10 **Workplace Performance**
Efficient, large and flexible floor plates — interconnected workplace engages associates and fosters collaboration

11 **CLT Framing - Designed for Disassembly**
Modular, adaptable and cost-effective structure

Tallest MT In the Mid Atlantic | **8 Stories** | **101' tall**

WHAT MAKES APEX PLAZA DIFFERENT?

William McDonough + Partners' building design is the paramount example of applying the Cradle to Cradle Design™ Framework and Circular Economy thinking to a collaborative, multi-tenant office space.

The building is based on a few key **Cradle to Cradle** and **Circular Economy** principles that set it apart from a typical office building:

Building like a Tree

Carbon Positive - Carbon Sequestration

Net-Positive Energy

Designed for Disassembly

Cradle to Cradle Certified™ Products

Health, Wellbeing and Adaptability

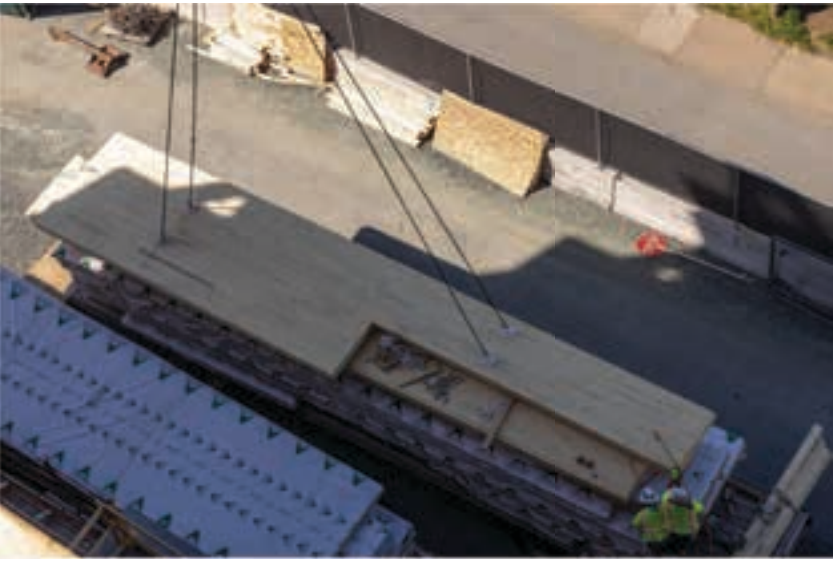
16
WEEK ERECTION VS. 20 WEEKS FOR STEEL

0%
WASTE ON SITE (LITTLE TO NO)

20%
SCHEDULE SAVINGS

50%
LESS CREW NEEDED VS. STEEL

90%
LESS CONSTRUCTION TRAFFIC



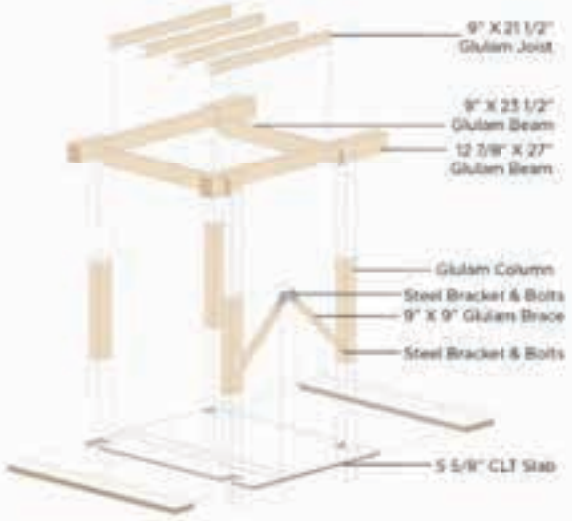



Construction Benefits | **20% SCHEDULE SAVINGS**

Designed for Disassembly in the Circular Economy

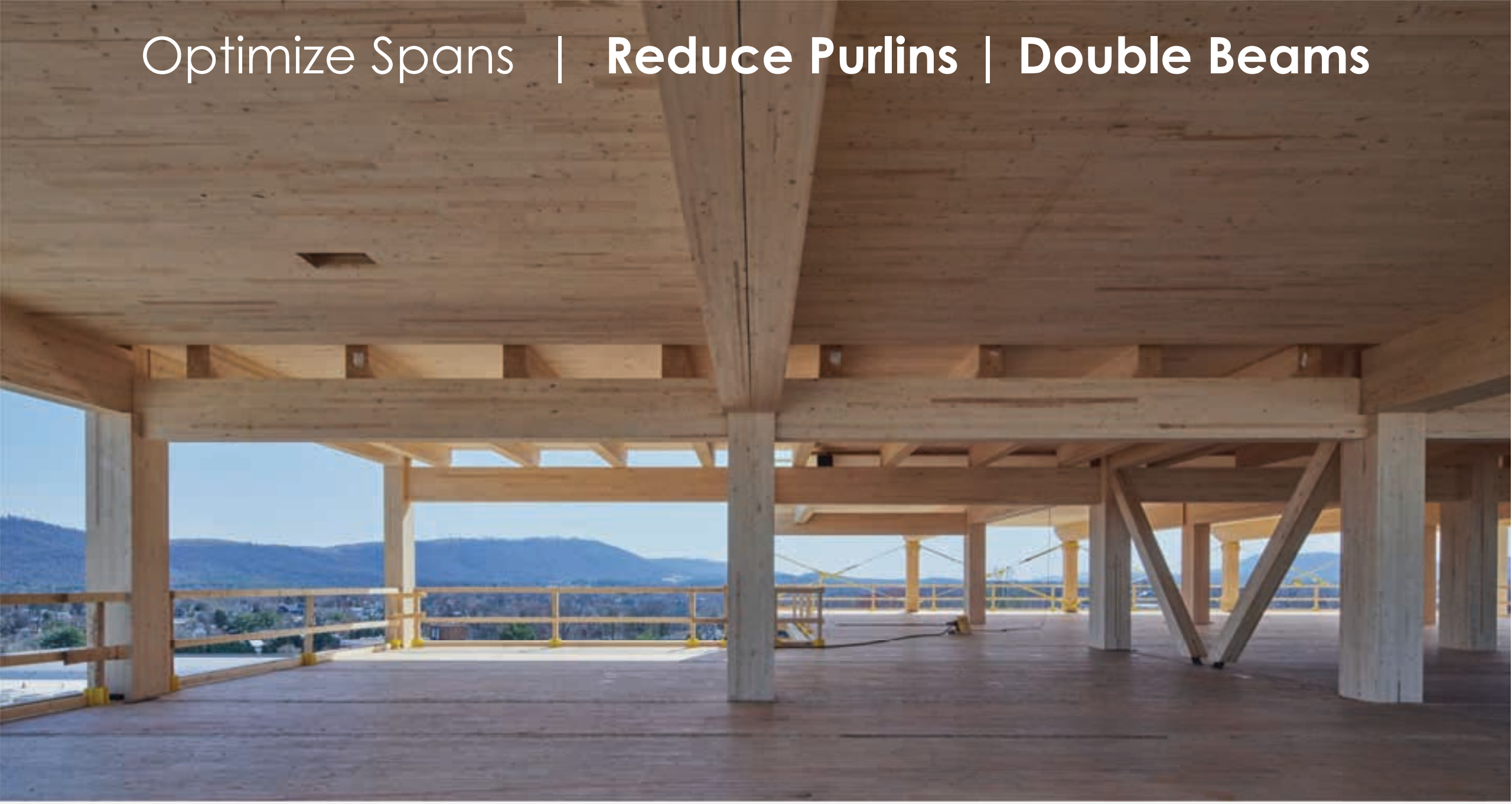
By assembling the building using only mechanical fasteners, the high-value MT elements can be disassembled and then reused or recycled to be endlessly recirculated in a safe, then **circular, economy.** The MT structure provides an interior tactile benefit while also allowing rapid installation of the structural frame and envelope and decreasing the building's carbon footprint.

20' - 8 1/4" X 18' - 4"
Typical Bay with Brace

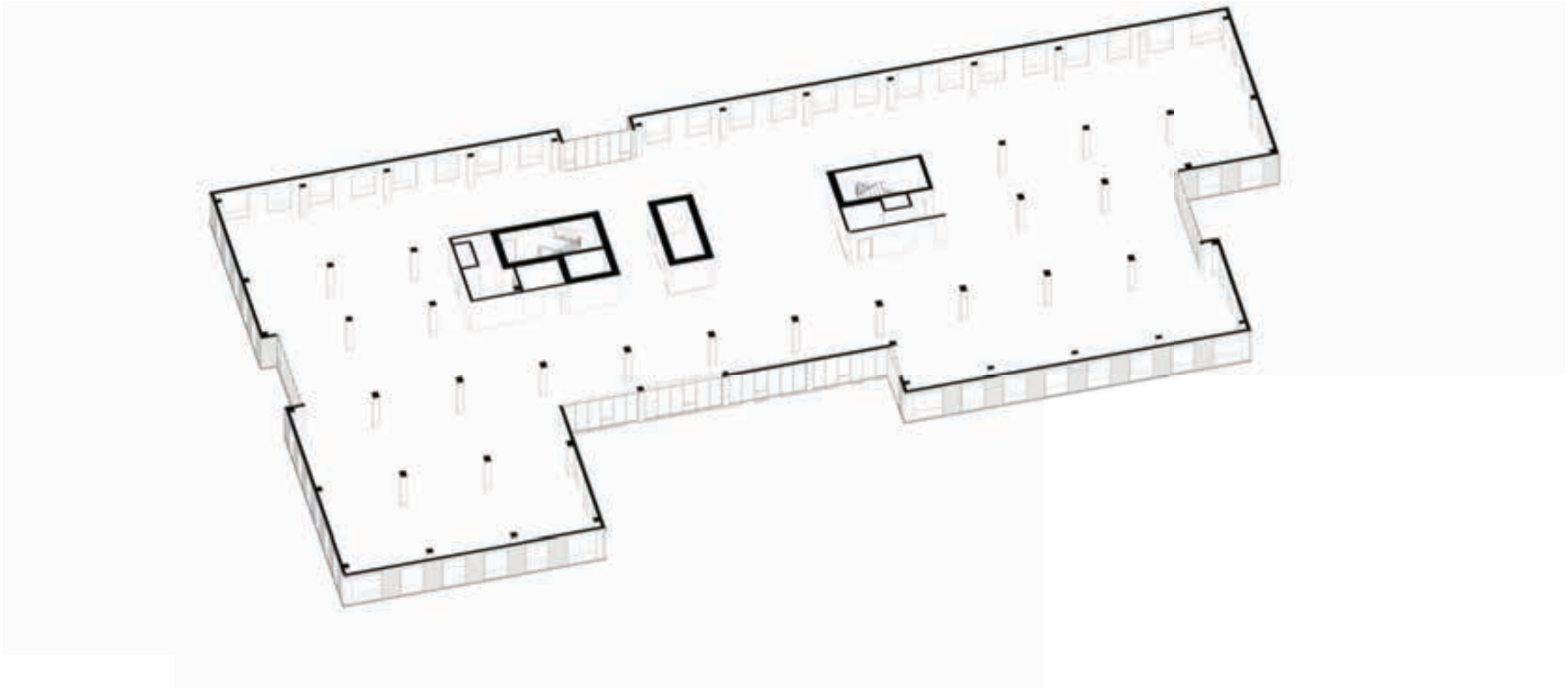


20' - 8 1/4" X 18' - 4"
Exploded Bay

Optimize Spans | **Reduce Purlins** | **Double Beams**



Designed for Next Use | **Flexible Grid**



Designed for Next Use | **Office**

Designed for Next Use | **Apartment Lofts**

Safe and healthy materials in a collaborative, flexible workplace

By prioritizing material and human health, Apex Plaza aims to bring people together in abundantly daylit, flexible spaces. In addition to natural beauty, incorporating Mass Timber from Nordic Structures allows for transparency in material sourcing. Nordic is a vertically integrated company that owns the forest from which Apex's FSC Black Spruce was sourced. They sustainably manage the timber, use all timber in their renewable powered factory and emphasize their employees' experiences. Nordic also achieved Cradle to Cradle Certified™ for several of their products — a first for the North American market.

FSC

CERTIFIED cradle to cradle PRODUCTS PROGRAM

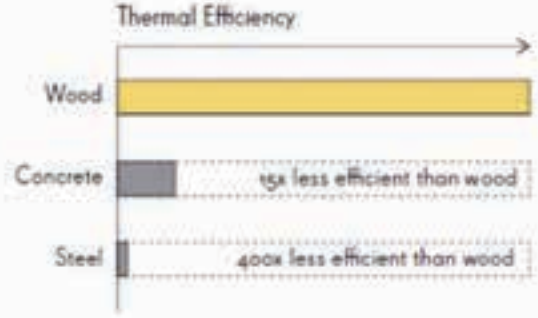
Health, Wellbeing and Adaptability

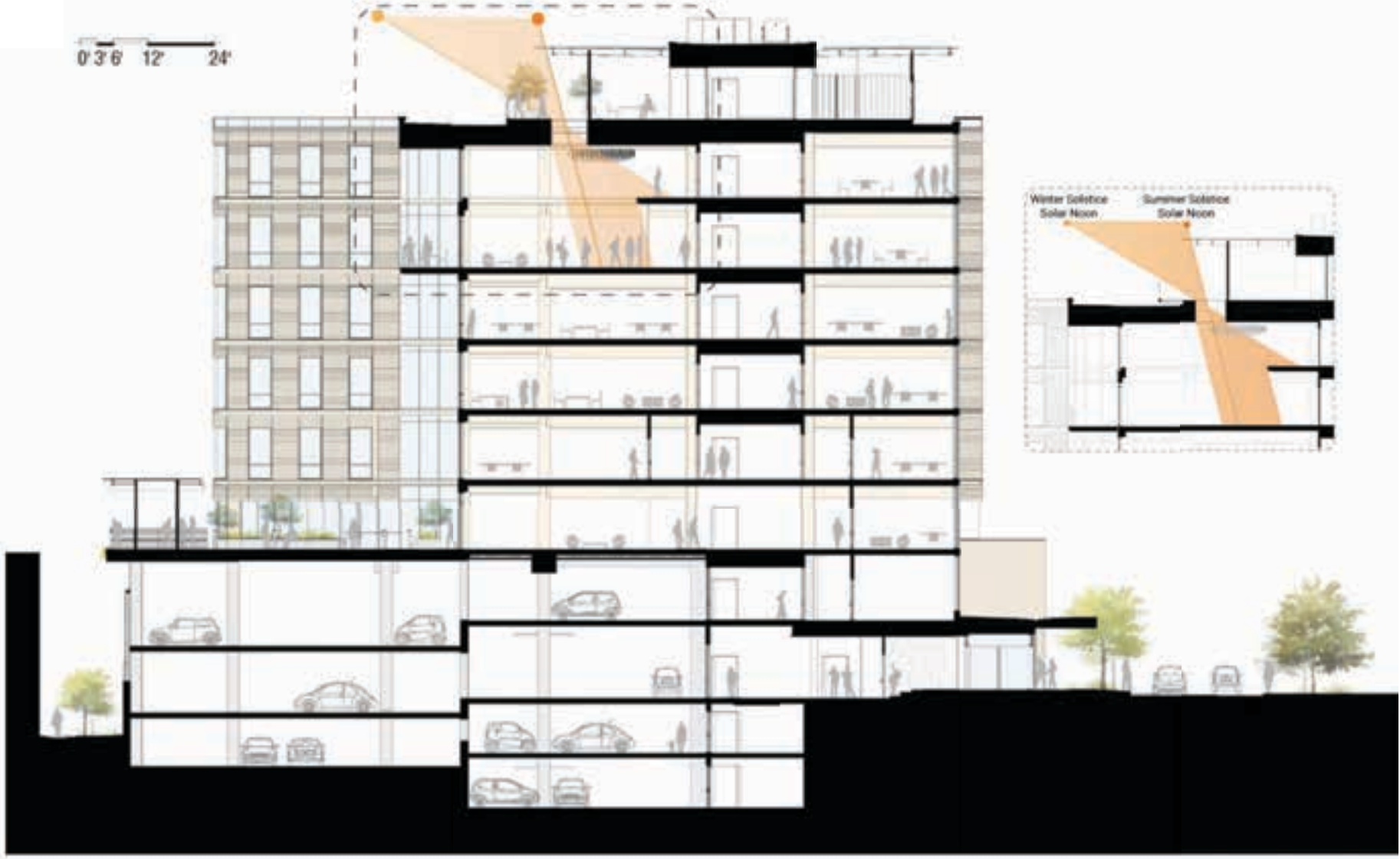
The building offers excellent views to natural light, lighting controls and operable shades. Apex Plaza is also designed for next use as housing of the future with flexible floor plates.

OCCUPANCY

Thermal Comfort

The thermal mass of wood has the ability to compensate for rapid fluctuations in temperature and moderate indoor moisture.






EXIT
EXIT

Net-Positive Energy, a model high-performance building

Based on the load analysis APEX tenant office are projected to consume 331,000 kWh/ year of electricity on an annual basis. The new building mounted solar installations are projected to generate 364,000 kWh/year of electricity representing 110% of APEX's annual energy demand, providing APEX with net-zero electricity use. The project will also provide an on site battery energy storage system.

Apex's Estimated Electrical Energy Consumption
-331,000 kWh per year

+

Solar Panel System Electrical Energy Production
364,000 kWh per year

=

33,000 kWh
Electricity Surplus
(includes 10% consumption buffer)

3rd Floor | Roof Terrace

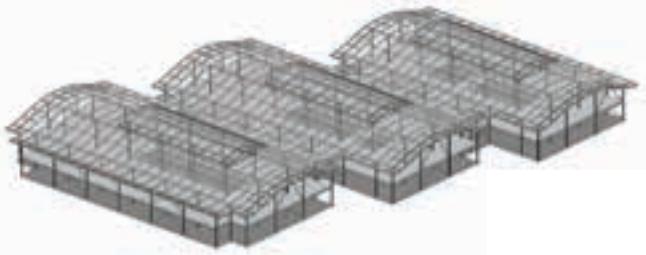
9th Floor | Roof Terrace Solar Canopy

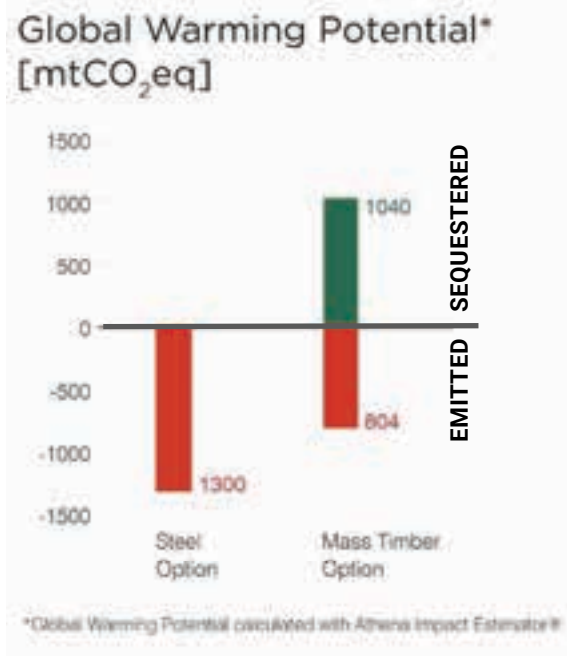
901 Cherry | Master Plan

Embodied Carbon | Mass Timber Carbon Sequestration Potential

MASS TIMBER
CLT Deck with
Glulam Framing
Wood BFRB

STEEL BASE CASE DESIGN
Concrete filled metal deck
Steel frame
Steel BFRB





B2 Mass Timber | CLT

-LARGE FLOOR PLATES
-TEAM CONNECTIVITY
-VOLUMES OF SPACE
-ABUNDANT DAYLIGHT
-ACCESS TO NATURE

Nordic X-Lam CLT | Cradle to Cradle Certified® Silver

B3 Embodied Carbon | Concrete Optimization

-Concrete optimization (Carbon Cure, Orca Aggregate, and increased SCM's
-Use of 'Nucor' rebar

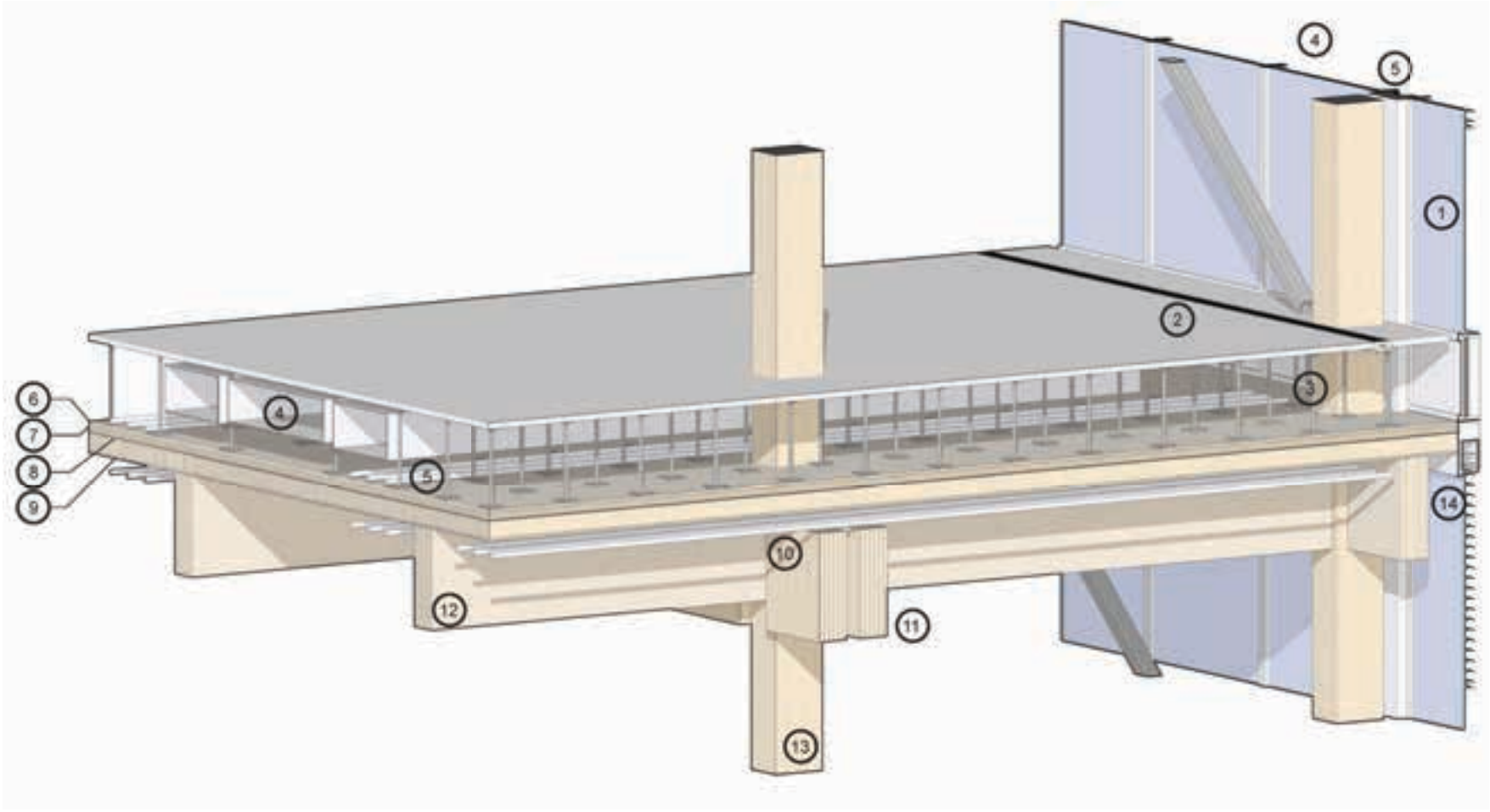
B3 Mass Timber | CLT

Nordic X-Lam CLT | Cradle to Cradle Certified® Silver

Nordic X-Lam CLT | Cradle to Cradle Certified® Silver

Integrated Hvac Systems - RAF and Radiant Ceiling Panels

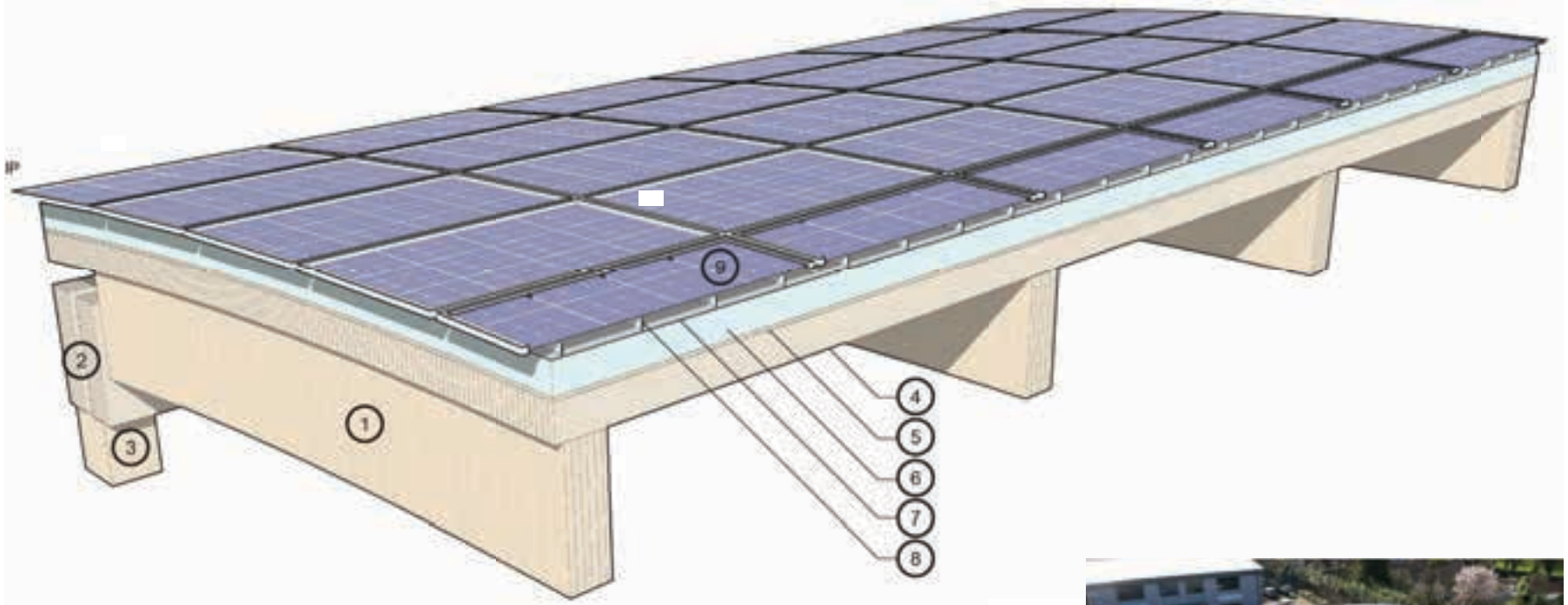
DfD - Dry Acoustic Mat



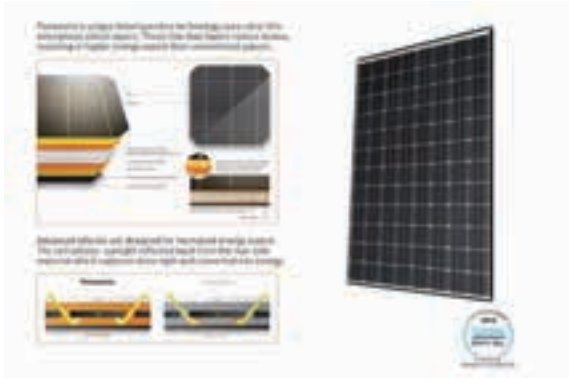
1. UNITIZED CURTAIN WALL SYSTEM
2. IN FLOOR TRENCH CONVECTOR
3. RAISED FLOOR SYSTEM
4. UNDERFLOOR MECHANICAL DUCT
5. UNDERFLOOR CONDUIT & DATA
6. 3/4" PLYWOOD
7. 1-1/2" CEMENT BOARD
8. 31mm RUBBER UNDERLAYMENT
9. DLT SUBFLOOR w/ ACOUSTIC SQUARE PROFILE
10. 6" GAP FOR CONDUIT & FIRE SPRINKLERS
11. DOUBLE 8.75" x 30" GLB GIRDER
12. 8.75" x 27" GLB PURLIN
13. 12.25" X 15" GLB COLUMN
14. INTEGRATED VENETIAN BLIND
15. MECHANICAL DUCT

Integrated Renewable Systems

Mass Timber Structure And Pv's Clipped To Standing Seam Roof



1. 8.75" X 27" GLB PURLIN
2. DOUBLE 8.75" X 30" GLB GIRDER
3. 12.25" X 15" GLB COLUMN
4. 8" DLT ROOF DECK
5. 3/4" PLYWOOD
6. 6" INSULATION
7. VAPOR BARRIER
8. STANDING SEAM METAL ROOF
9. PANASONIC PV MODULES ATTCHED VIA CLIP



Nordic X-Lam CLT | Cradle to Cradle Certified® Silver

Maximize on Site | **Renewable Energy**

The new building mounted solar installations on buildings 2 and 3 are projected to generate 1,900,000 kWh/year of electricity representing 28% of the annual energy demand. The project will also provide an on site battery energy storage system to the south of Building 3 that will contain (2) 1.25MW Tesla Megapacks. The team is exploring a micro grid configuration for the energy system that would allow select critical functions to stay active for the new buildings in the event of power loss.

ENERGY RESILIENCY

Carbon Analysis | Whole Building Life Cycle Analysis (WBLCA)

BUILDINGS 2 AND 3

50%-62%

cumulative gwp reduction

BUILDING 2

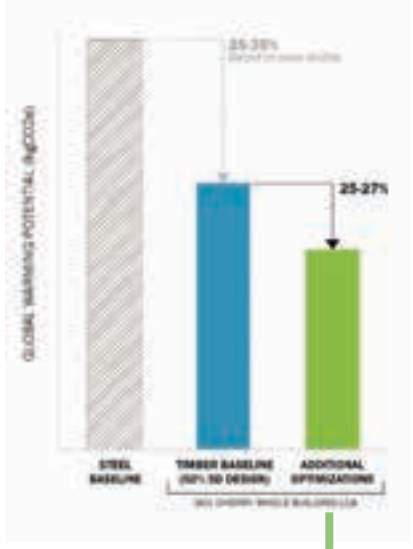
25.5%

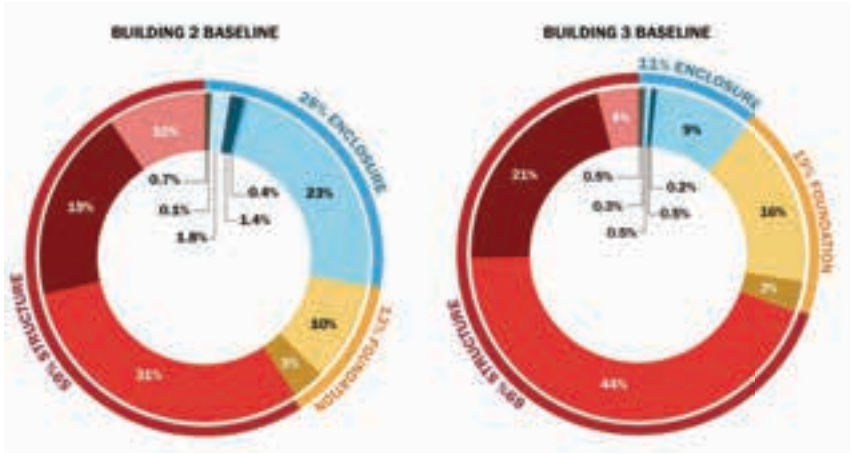
gwp reduction

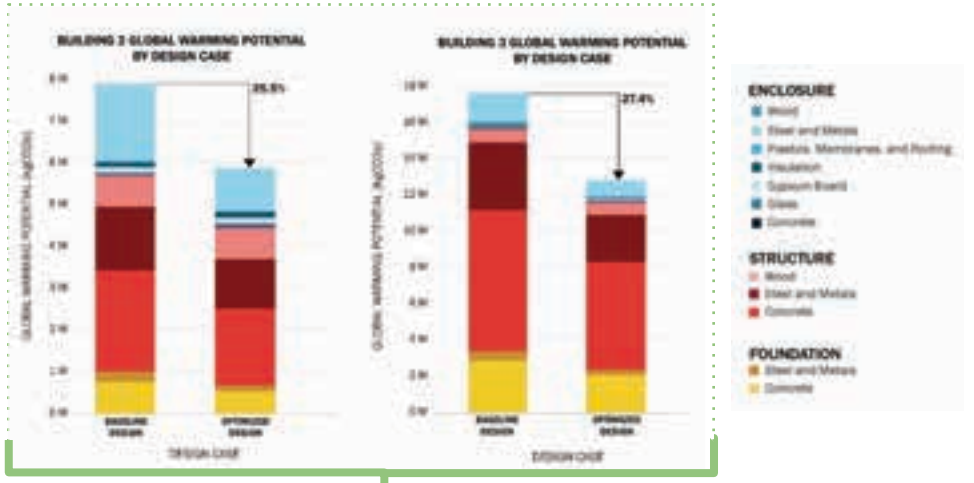
BUILDING 3

27.4%

gwp reduction







Baseline

Measured Against Steel

The 901 Cherry project has the benefit of an existing steel and concrete design that was generated in 1998 before the original project was shelved. The project team will do an in depth analysis of the original design to serve as a one to one benchmark for measuring the GEP reduction benefits that come from the use of Mass Timber.

100% SD

Breakdown Characterization by Physical Scope

The 901 Cherry team targeted Mass Timber as the preferred structure from the outset of the concept design phase which conservatively accounts for an initial 25%-35% reduction in GWP from the outset based on that initial decision. The figure above illustrates the GWP from the WBLCA of the B2 and B3 baselines, broken out by scope and material type. Concrete and steel in the structure and are the dominant drivers for both buildings. Their contribution is more pronounced in B3 due to the four levels of below-grade parking. In the enclosure, most of the impact comes from aluminum used in the curtain wall mullions, which are finished with PVDF. PVDF has a significantly higher embodied carbon-impact compared to an anodized finish.

100% SD

Impact Reduction Measures

Impact Reduction Measures (IRMs) were analyzed for 901 Cherry throughout the SD Phase. Four of these options, those with the highest impact and viability, were included in the WBCLA results. Results from assembly studies which were not included in the WBCLA results are included for reference in the following section. The figure above compares the cradle-to-grave embodied carbon of these IRMs individually in order to quantify the impact of each measure on whole building GWP.

The impact reduction measures accounted for in the figure above include:
-Concrete optimization (Carbon Cure, Orca Aggregate, and increased SCM's
-Use of 'Nucor' rebar
-Use of anodized aluminum for the curtain wall (PVDF coating is still being evaluated)

Nordic Lam | Cradle to Cradle Certified® Bronze

designed for disassembly – perpetual assets

designed for next use

Thank You

www.mcdonoughpartners.com
areilly@mcdonough.com

QUESTIONS?

This concludes The American Institute of Architects Continuing Education Systems Course

Alastair Reilly, AIA

Design Partner, William McDonough + Partners

areilly@mcdonough.com