A SUSTAINABLY RESPONSIBLE MATERIAL

Chris Hellstern
Living Building Challenge Services Director
Goal A: 100% regenerative design by 2030

- **Objective A.1:** Target Net Positive Energy
- **Objective A.2:** Target Net Positive Water (potable gray and black water)
- **Objective A.3:** Contribute to site restoration

Goal B: 100% healthier material choices by 2020

- **Objective B.1:** Design to achieve the LBC Materials Petal

Goal C: Design to enhance occupant health

- **Objective C.1:** Design to optimize indoor air quality
- **Objective C.2:** Design to support natural human biological processes
- **Objective C.3:** Design to promote physical activity

Goal D: Ensure our design thinking supports our core values

- **Objective D.1:** Think smarter, not just bigger
- **Objective D.2:** Drive industry change through transparency
- **Objective D.3:** Address the social and environmental justice impacts of our work
Goal B: 100% Healthy Material Choices by 2020

Objective B.1: Design to achieve the **LBC Materials Petal**

- Vet all specified products for Red List compliance
- Design every project to be embodied carbon neutral
- Specify wood as **FSC certified or 100% salvaged/reclaimed**
- Specify products with disclosed ingredients through a Declare Label, C2C Gold or better rating, or properly disclosed HPD
- Specify products with an Environmental Product Declaration (EPD) that makes 10% improvement of GWP over a forthcoming established baseline
- Every project sends at least 1 advocacy letter to a product manufacturer/industry supporting healthier materials
- Identify recycled content and/or local sourcing for final assembly
“A Living Building”

—Bullitt Center: Celebrating five years as the Greenest Commercial Office Building in the World

Sustainability Commitments

AIA 2030 Commitment

As an early signatory to this AIA program that seeks transformation of the built environment through greenhouse gas emission reductions, Miller Hull has designed many buildings that exceed this standard.

As part of Miller Hull’s ongoing participation in the AIA 2030 Commitment, we collect and report the estimated energy reduction from each of our projects annually. The goal of the challenge is to design buildings that are carbon-neutral by the year 2030. While we are not yet meeting the Challenge, we are steadily improving our performance each year in pursuit of the target reduction.

2017 PROJECTS - ENERGY REDUCTION

[Bar chart showing energy reduction data]
“A Living Building”
— Bullitt Center: Celebrating five years as the Greenest Commercial Office Building in the World

OFFICE OPERATIONS 2016 - OPERATING CARBON

- Energy - Electricity
- Energy - Natural Gas
- Employee Commuting
- Business Travel
- Company Fleet
- Materials & Services
- Paper
- Computers
- Wood Furniture
- Other Furniture
- Office Supplies
- Printing
- Food
- Newspapers
- Shipping
- Laundry

2016 Company Footprint
515 Metric Tons of CO₂e Annually
5.7 Metric Tons of CO₂e Per Employee
OFFICE OPERATIONS 2016 - OPERATING CARBON

- WASTE GENERATION
  - COMPANY FLEET
- MATERIALS & SERVICES
  - PAPER
  - COMPUTERS
  - WOOD FURNITURE
  - OTHER FURNITURE
  - OFFICE SUPPLIES
  - PRINTING
  - FOOD
  - NEWSPAPERS
  - SHIPPING
  - LAUNDRY
- ENERGY - NATURAL GAS
- ENERGY - ELECTRICITY
- EMPLOYEE COMMUTING
- BUSINESS TRAVEL
GLOBAL ISSUES
CONFRONTING
ARCHITECTURE
U.S. CO₂ Emissions by Sector

- Buildings 44.6% (2358 MMT CO₂e)
- Transportation 34.3% (1816 MMT CO₂e)
- Industry 21.1% (1116 MMT CO₂e)

WHY WOOD?
Aesthetics
The manufacture of concrete and steel are responsible for nearly 10% of global CO2 emissions.
STRUCTURAL SYSTEM – EMBODIED CARBON
CARBON IN BUILDINGS

- Concrete slab: 12 Tons CO₂
- Steel sub frame: 10 Tons CO₂
- Timber: 2 Tons CO₂

Source: Treehugger
STRUCTURAL SYSTEMS EMBODIED EFFECTS

The graph compares the embodied effects of different structural systems: Wood Design, Steel Design, and Concrete Design. The effects are normalized to wood value = 0.75. The graph shows the following environmental impacts:
- Fossil Energy
- Resource Use
- O&G
- Acidification
- Eutrophication
- Ozone Depletion
- Smog Potential

The graph indicates that Concrete Design has the highest embodied effects in terms of Ozone Depletion and Smog Potential, followed by Wood Design and Steel Design.
STRUCTURAL SYSTEMS
Cost & Emissions

**Concrete**
- Impact, including foundation
  - 1,180 t
- Tons CO₂

**Steel**
- 605 t
- $35/sf

**Timber**
- 200 t
- $48/sf

**Cost**
- $38/sf

*Source: Eskew Dumez Ripple*
WOOD MUST BE SUSTAINBLY MANAGED
SUSTAINABLE FOREST MANAGEMENT

- Preserves habitat
- Diversity of species and maturity

CLEAR CUT

- Destroys ecosystem
- Monoculture
LIVING BUILDING CHALLENGE℠ 3.1

A Visionary Path to a Regenerative Future

INTERNATIONAL LIVING FUTURE INSTITUTE℠
FOREST STEWARDSHIP COUNCIL (FSC)

- Second largest forest standard
- The most rigorous
- Fastest growing standard
20% of greenhouse gas emissions from deforestation
More emissions than from the transportation sector
The Northwest mixed conifer-hardwood systems have some of the largest soil carbon stocks in the country. — US Forest Service
Clearcutting is Oregon’s single largest source of greenhouse gas emissions

– The Oregonian
Compaction from harvesting equipment can reduce total pore space, which may be beneficial for plant production in poorly-structured soils

— The Wilderness Society
More carbon resides in soil than in the atmosphere and all plant life combined

Large clear cuts result in the release of more biogenic carbon than selective harvests

Effective land restoration could play a major role in sequestering CO2 and slowing climate change
Wood discarded in landfills continues to store carbon for some time.
Portion that decomposes releases significant quantities of methane.
Higher global warming effect than CO2.

- US Forest Service
DANGER
FORMALDEHYDE
IRRITANT & POTENTIAL
CANCER HAZARD
AUTHORIZED PERSONNEL ONLY
“A poison kills you, a chemical like BPA reprograms your cells and ends up causing a disease in your grandchild that kills him.”

-- Frederick vom Saal
Biology Professor
University of Missouri
CASE STUDY #1
The Bullitt Center
Living Building
“Our desire is to open a wedge into the future so that we, and others can see what is possible in a contemporary office building.”

Denis Hayes
Bullitt Foundation, President
250 YEAR STRUCTURE
HEAVY TIMBER, CONCRETE & STEEL

50 YEAR SKIN
HIGH PERFORMANCE ENVELOPE

25 YEAR TECHNOLOGY
ACTIVE SOLAR CONTROL
PHOTOVOLTAICS

RAINFALL COLLECTION
SOILS DEMAND MET ON-SITE
50,000 GAL. BUFFER TANK

GRAYWATER
SOIL TREATMENT ON-SITE
EVAPORATION & INfiltrATION

WASTE COMPOST
SOIL TREATMENT ON-SITE

SOLAR RECIPIRABLE ON-SITE
GRID-USED AS BATTERY

ENERGY

MECHANICAL
GROUND SOURCE HEAT EXCHANGE
RADIANT HEATING/COOLING
HEAT RECOVERY AIR SYSTEM

PROGRAM
OCCUPANCY
PRIVATE USE ABOVE, PUBLIC FOCUS BELOW AT GROUND

INTERNAL, CAP & TRADE
BACK-TO-MAT-HF AN ENERGIE BUDGE
CURRENT ENERGY CAN BE TRANSFERRED

PERMEABLE STAIR
ELEVATOR ALTERNATIVE, HEALTHIER
OCCUPANTS, ENGAGEMENT WITH STREET
GLU-LAMINATED TIMBER

The Bullitt Center, The Miller Hull Partnership
FIRE PROTECTION

- Residual cross-section for load capacity calculations
- Assumed zero-strength layer for load calculations
- Char layer
- Original section
CONNECTIONS—CONCEALED OR HIDDEN?
BUCKET CONNECTION
BUCKET CONNECTION
CASE STUDY #2
The Kendeda Center Living Building
• 262 Wood processing mills, 1400 forest product manufacturers
• 108,112 Jobs in Georgia
• 24 Million acres timberland available for commercial use—more than any other state
• Georgia’s forest industry is 2nd largest in the state
6 STORIES—SEATTLE

Bullitt Center, The Miller Hull Partnership

COMPLETE

7 STORIES—CANADA

Wood Innovation Center, Michael Green Associates

COMPLETE
WSU Spokane student housing proposal, The Miller Hull Partnership

CONCEPT DESIGN

14 STORIES—USDA TALL WOOD COMPETITION
Paris Tower proposal, Michael Green Associates

DESIGN PROPOSAL

35 STORIES—PARIS

Timber Tower Research Project, SOM

RESEARCH PROPOSAL

42 STORIES—?
THANK YOU

CHRIS HELLSTERN
AIA | LFA | LEED AP | CDT

sustainability@millerhull.com