Hybrid Timber Tower, Toronto: Achieving 105 Stories and Long Spans via Steel Cables and Cages

Craig Applegath
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HYBRID TIMBER SUPERTALL: SCALING UP THE AMBITION OF MASS TIMBER

CTBUH HYBRID WORKSHOP CONFERENCE
MAY 24th, 2022

Presented by: Craig Applegath
Thomas Wu
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100+ STOREY HYBRID-WOOD MIXED-USE ZERO-CARBON HIGH-RISE PROTOTYPE
100+ STOREY HYBRID-WOOD MIXED-USE ZERO CARBON HIGH-RISE PROTOTYPE

“How can we design a mixed-use high-rise building using wood, steel, concrete and other advanced materials that maximizes the overall use of sustainably harvested wood by volume in high-rise construction in the most cost efficient, energy efficient, low carbon, and elegant manner, that is also conducive to human wellbeing, and the wellbeing of the environment?”

JANUARY 10, 2018
HYBRID STRUCTURAL DESIGN
Structural Concept
Hybrid Timber Panel System

A - OUTRIGGER FLOORS
B - PARTIAL OPENING THROUGH OUTRIGGER FLOORS TO MINIMIZE WIND IMPACT
C - TOWER CROWN
D - MASS TUNED DAMPERS
E - TYPICAL HYBRID TIMBER FLOOR SYSTEM (HTFS)
F - FRAMING FOR OPEN LOBBY
Structural Concept
Hybrid Timber Panel System

HTFS Panel Arrangement
Structural Concept
Hybrid Timber Panel System

CLT arrive at plant
CNC’d in advance
Procured from domestic supplier
Structural Concept
Hybrid Timber Panel System

Screws, cages installed
Structural Concept
Hybrid Timber Panel System

PT ducts installed
Structural Concept
Hybrid Timber Panel System

Concrete cast in plant
Structural Concept
Hybrid Timber Panel System

Panels flipped
Structural Concept
Hybrid Timber Panel System

Panels flipped
Structural Concept
Hybrid Timber Panel System

Kerf Plates installed
Installed on site
~20,000lbs / panel
Structural Concept
Hybrid Timber Panel System

Topping poured
Manufacturing Concept
Hybrid Timber Panel System

Plant Scope

- Kerf Plates
- 7-Ply CLT
- Self Tapping Screws
- Post Tensioned Tendons + Reinforcement

Field Scope

- Topping Reinforcement
- 4” Concrete Topping

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RESEARCH PROGRAM

1. Small-Scale Structural Testing

2. Small-Scale Fire Testing

3. Full-Scale Structural Testing

4. Standard Fire Testing
THE FUTURE OF MASS TIMBER DESIGN AND CONSTRUCTION?
Patent Applications (November 2021)
Hybrid Timber Panel System
SEVEN KEY TAKE-AWAYS

1. LONG SPAN = COMMERCIAL FLOOR PLATE SPAN (CLASS A)
2. REDUCE STRUCTURAL DEPTH = ENVELOPE COST SAVINGS
3. ADDRESSES FIRE SAFETY
4. EXPOSED WOOD CEILING
5. HIGH DEGREE OF PREFABRICATION = REDUCED ON SITE CONSTRUCTION TIME
6. COST COMPETITIVE TO TRADITIONAL CONSTRUCTION
7. IS A HIGHLY EFFECTIVE CARBON STRATEGY!
THANKS!

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