Office Overbuild: Building a Vertical Mass Timber Addition in Washington, DC

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Disclaimer: This presentation was developed by a third party and is not funded by WoodWorks or the Softwood Lumber Board.
80 M STREET
Washington, DC

FIRM
Hickok Cole

CLIENT
Columbia Property Trust

SIZE
100,000 SF

DETAILS
Vertical addition/extension to an existing seven-story building
Adds two full floors of trophy class office space with 17’-0” ceiling heights
An occupied penthouse level will add additional office density as well as a roof top terrace and social space
EXISTING CONDITIONS
MASSING CONCEPTS

**EXISTING**
Maintain existing roof
Move mechanical equipment up

- **2 LEVELS**
  - 20,000 SF habitable penthouse
  - 80,000 SF GFA
  - 10,000 SF rooftop terrace

- **2.5 LEVELS**
  - Mechanical penthouse
  - 108,000 SF GFA
  - 14,000 SF terrace on level 10

**EXISTING**
Maintain existing roof
Move mechanical equipment up

- **3 LEVELS**
  - Mechanical penthouse
  - 120,000 SF GFA

- **3 LEVELS**
  - 20,000 SF habitable penthouse
  - 120,000 SF GFA
  - 10,000 SF rooftop terrace
CONCEPTUAL SECTION

80 M STREET: E/W SECTION DIAGRAM

TYPICAL FLOOR 8'-6" WINDOW HGT = 15'-8" PRIMARY DL
NEW FLRs - 15'-0" & 12'-0" WINDOW
IBC 2021 NEW CONSTRUCTION TYPES

Primary Structural Frame:

**TYPE IV-A**
- 3HR Fire Rated

Required Noncombustible Protection:
- Ceilings: 100% Protection
- 0% Exposed Timber
- 1” Minimum Coverage
- 2/3 of FRR, 80 mins min
- Redundant water main feed at Fire Pump
- Fire Safety Procedures During Construction
- Other High Rise Requirements

**TYPE IV-B**
- 2HR Fire Rated

Required Noncombustible Protection:
- Ceilings: 80% Protection
- 20% Exposed Timber
- 1” Minimum Coverage
- 2/3 of FRR, 80 mins min
- Redundant water main feed at Fire Pump
- Fire Safety Procedures During Construction
- Other High Rise Requirements

**TYPE IV-C**
- 2HR Fire Rated

Required Noncombustible Protection:
- Ceilings: Not Required
- Floors: Not Required
- Interior Surfaces: Not Required
- Fire Safety Procedures (Over 4 Stories)
- Other High Rise Requirements (Over 75 FT)

Building Heights and Allowable Building Areas:

- **18 Stories**
  - Building Height: 270 FT
  - Allowable Building Area: 972,000 SF
  - Average Area per Story: 54,000 SF

- **12 Stories**
  - Building Height: 180 FT
  - Allowable Building Area: 648,000 SF
  - Average Area per Story: 54,000 SF

- **9 Stories**
  - Building Height: 85 FT
  - Allowable Building Area: 405,000 SF
  - Average Area per Story: 45,000 SF
NEW CONSTRUCTION TYPES

OUR DESIGN:

<table>
<thead>
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10 STORIES (9 STORIES + PENTHOUSE) BUILDING HEIGHT 130 FT
7 EXISTING STORIES, TYPE 1B
3 STORIES OF MASS TIMBER
ADDITION OF 100,000 SF AVERAGE AREA PER STORY 33,000 SF
To incorporate mass timber construction, we proposed a code modification to the DC Building Code under the Alternative Materials, Design and Methods permitted in Chapter 1 of DCMAR 12A:

**Over height Type IV-C, at a building height of 130ft, with 3 floors mass timber, over 7 floors of concrete construction with additional fire protection.**

In support of the proposed code modification, we offer the following information:

- All Four sides of the building allow fire department access.
- The existing seven story building is Type 1B construction, non-combustible concrete.
- The existing non-combustible egress stairs are 48” wide. (wider than the Code Min. 44” width)
- The proposed three story addition would incorporate 2 hour fire rated, exposed mass timber.
  - Glulam meeting Chapter 23 of 2018 IBC
  - CLT meeting Chapter 23 of 2018 IBC and PRG-320 (using non-heat delaminating adhesives)
- With the Mass Timber Addition, the building core and egress stairs would be constructed of non-combustible steel and concrete.
- Three Hour Fire Separation between Type IB and Type IV-C.
FIRE DEPARTMENT ACCESS ON ALL FOUR SIDES OF THE BUILDING

100% of the building's facades are accessible to fire trucks.
PROPOSED ADDITION:
3 Stories of Mass Timber Construction. Type IV-C

BUILDING CORE AND EGRESS STAIRS:
Steel Framing with Composite Decks, 2HR FR

EXISTING BUILDING:
7 Stories of Concrete Construction. Type 1B
PROPOSED 8TH FLOOR PLAN

*All floor plans are illustrative & final layout is subject to adjustment prior to permit review
TYPICAL STRUCTURAL BAY

- 3'-1" WOOD COLUMN
- 3" CONCRETE TOPPING SLAB
- 5 PLY CLT PANEL
- SECONDARY BEAM
- PRIMARY BEAM

Dimensions:
- 30'-0" overall length
- 10'-0" height
- 30'-0" height

Beams:
- SECONDARY BEAMS, 28"
- PRIMARY BEAMS, 37"

Panel:
- 5 PLY CLT PANEL
INTERIOR VIEW
**CONNECTION CONCEPTS**

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CONNECTION CONCEPT DIAGRAM

- (2) 12" x 24" glulam column
- Stl column to column support
- Topping slab
- 5 ply clt deck
- Primary girder
- (2) 12" x 24" glulam column
- Secondary beam
- 2hr concealed hanger
VIBRATION ANALYSIS

*Images provided by Arup and subject to copyright

Expectations

Synchronization

1.6-2.2Hz

Structural Transmission

Mass
Stiffness
Damping
VIBRATION ANALYSIS

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TARGET MAXIMUM RESPONSE FACTOR OF 8

11.4

7.79

13.5

12.3

Z-dr support
around facade line
INTERIOR VIEW – CONCEPT
THANK YOU!

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