The AISC Design Guide to Hybrid Steel Frames with Wood Floors

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CTBUH 2022
Steel-Timber Conference

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AISC Design Guide to Hybrid Steel Frames with Wood Floors

CTBUH Steel-Timber Hybrid Buildings Conference

Michelle Roelofs + Jordan Woodson

May 24, 2022 - Chicago

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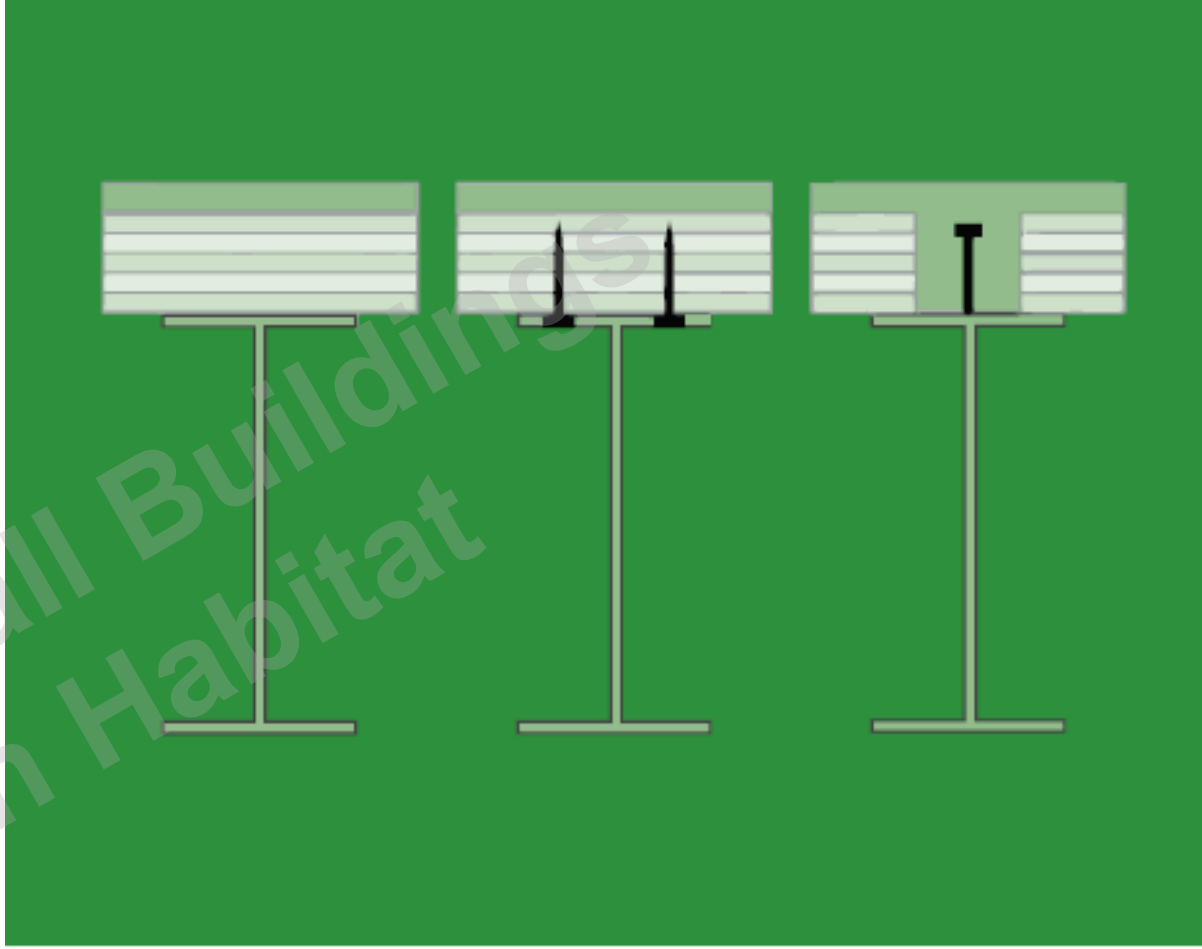
- Published in late April
- Available for pdf download now:

https://www.aisc.org/products/publication/design-guide/design-guide-37-hybrid-steel-frames-with-wood-floors/



Design Guide 37

Hybrid Steel Frames with Wood Floors

Smarter. Stronger. Steel.

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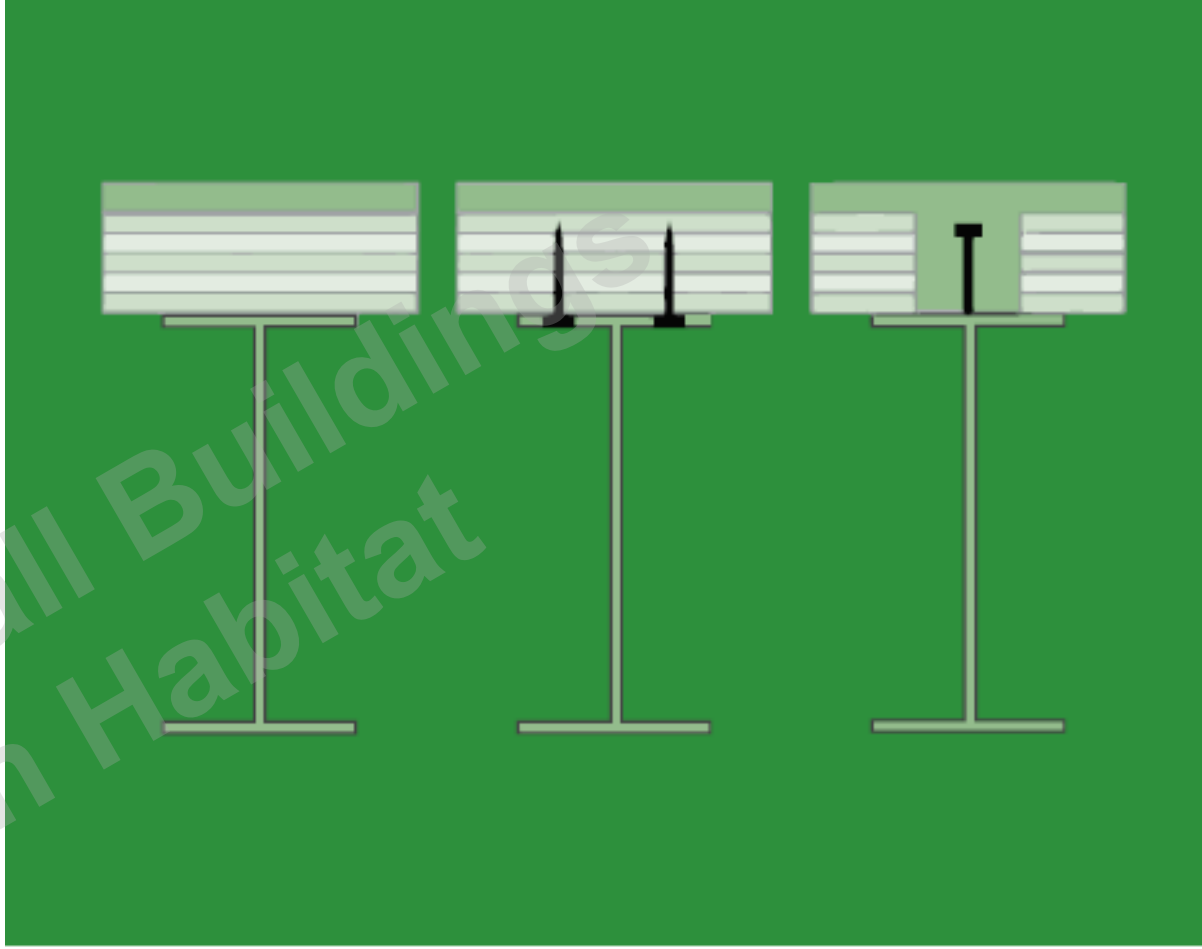

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Purpose of the Design Guide

- Intended for engineers who are *not familiar with mass timber construction*
- Also appropriate for architects and owners looking for in-depth technical information about this typology
- Provides *multi-disciplinary guidance* including fire, sustainability, acoustics, and structural considerations
- *Collates information* and best practices from many other codes and industry guidelines

Scope of the Guide

Steel Frames with Mass Timber Floors

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Structure of the Design Guide

- Chapter 1: Mass Timber Basics
- Chapter 2: Introduction to Hybrid Steel-Timber Systems
  - Case Studies
- Chapter 3: Fire Design
- Chapter 4: Acoustics
- Chapter 5: Sustainability
- Chapter 6: Structural Design
- Chapter 7: Constructability

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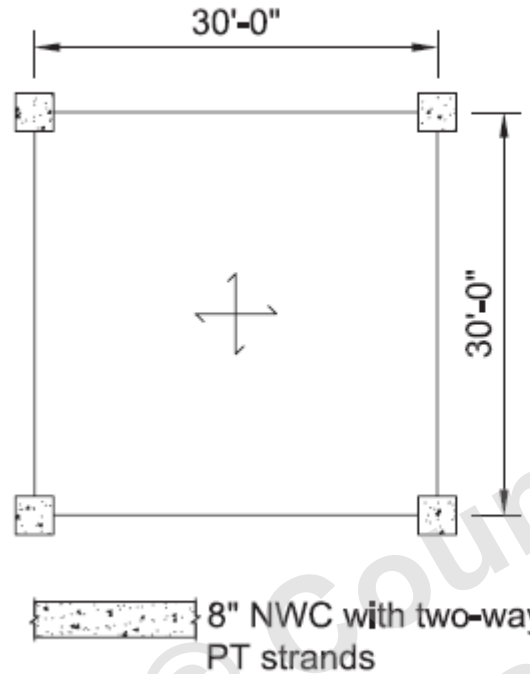
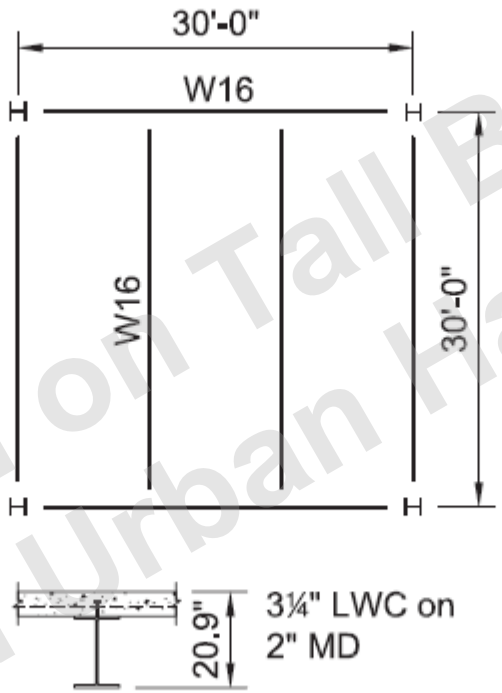
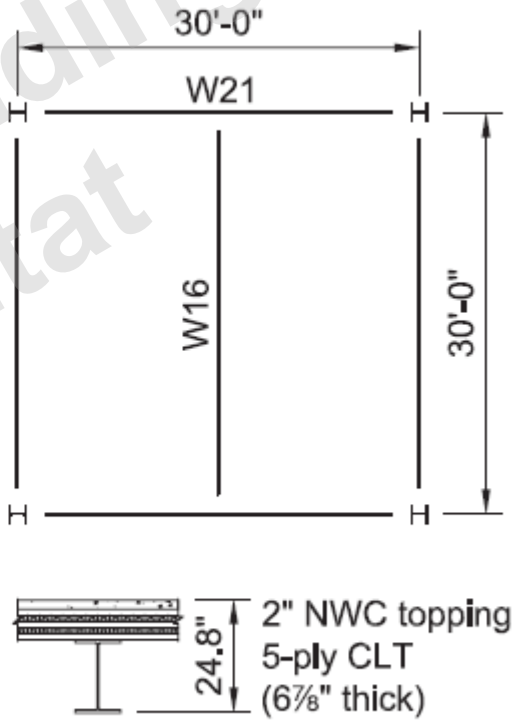


(a) Post-tensioned concrete



(b) Composite deck plus steel



(c) CLT deck plus steel

Description		PT Concrete	Composite Steel	Hybrid CLT + Steel
8 in. NW Concrete Benchmark US, 6000 psi	cyd	22.2	--	--
Prestressing tendons	lbs	990	--	--
2 in. NW Concrete Benchmark US, 3000 psi	cyd	--	--	5.60
3.25 in. over 2 in. LWC Benchmark US, 3000 psi	cyd	--	11.8	--
Cross Laminated Timber	cf	--	--	516
2 in. 18 ga Metal Deck	lbs	--	3220	--
Reinforcement	lbs	1170	565	227
Structural Steel	lbs	--	4080	4750
Connections	lbs	--	611	475
Spray Fire Resistive Material	sf	--	562	--
Intumescent Paint	gal	--	--	10.0
Acoustic Mat	sf	--	--	900

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vs.

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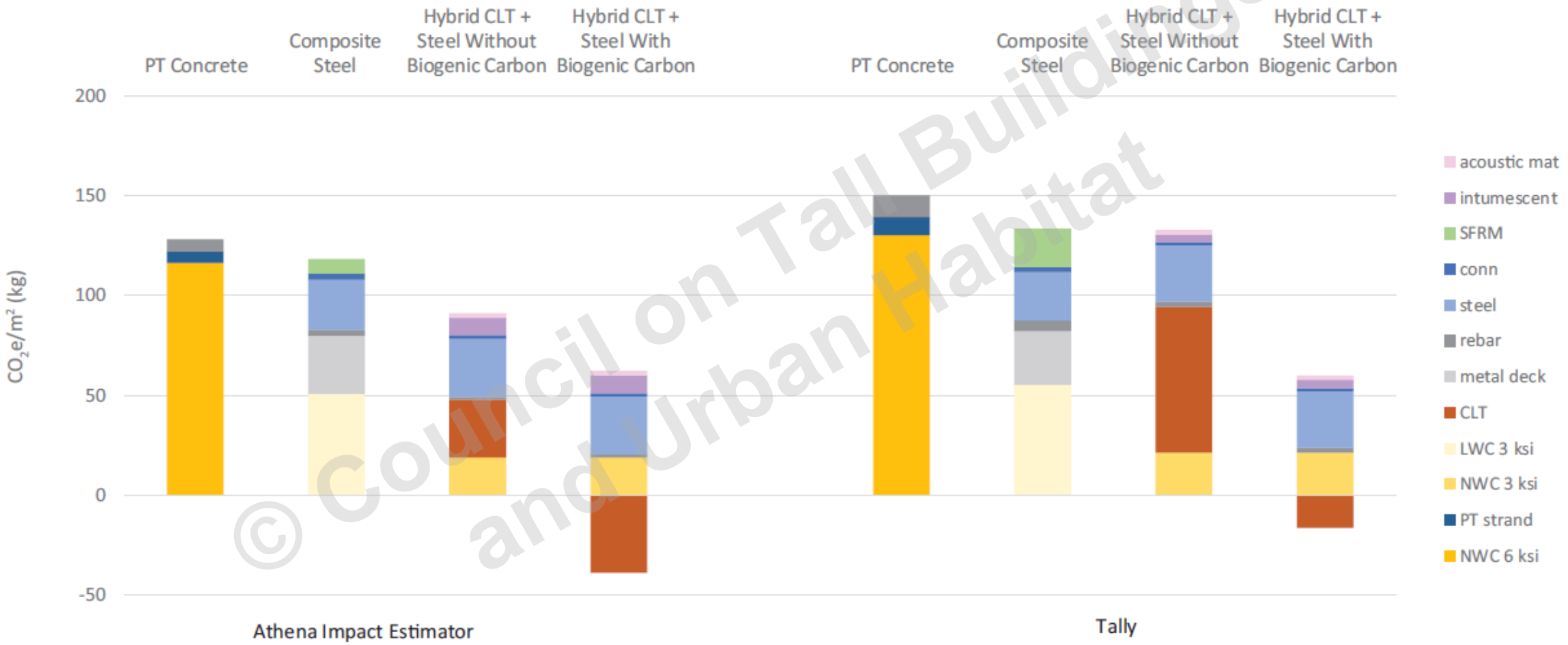

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Houston Endowment

Credit: Kevin Daly Architects with Productora

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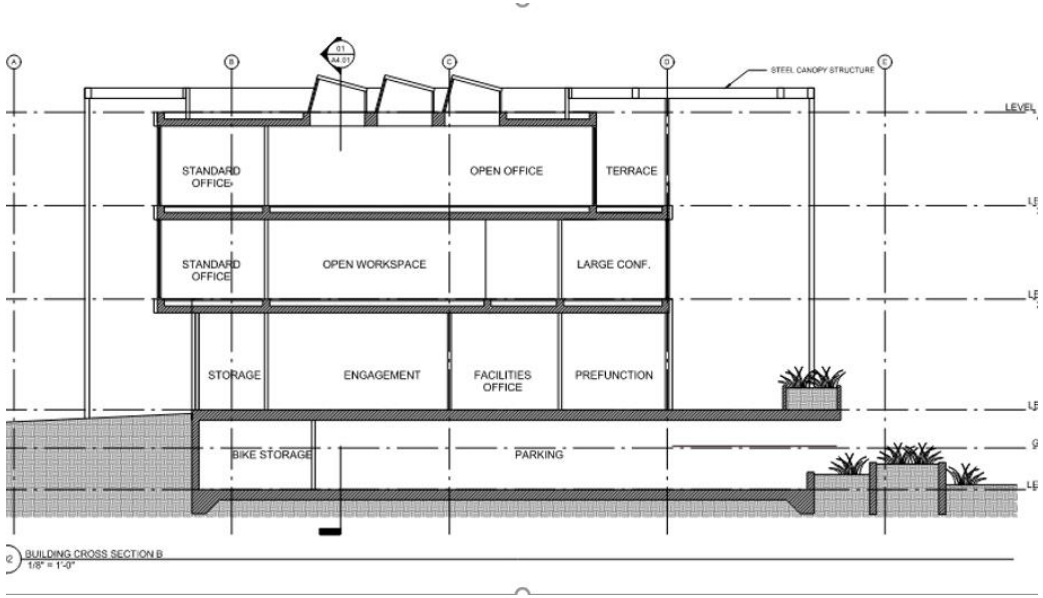
SD Scheme – Concrete

- All concrete scheme with radiant cooling was 2x budget
- Cost Drivers
  - Mobilization of large crane for small project
  - Custom formwork at each level
  - Poor soil and site obstructions



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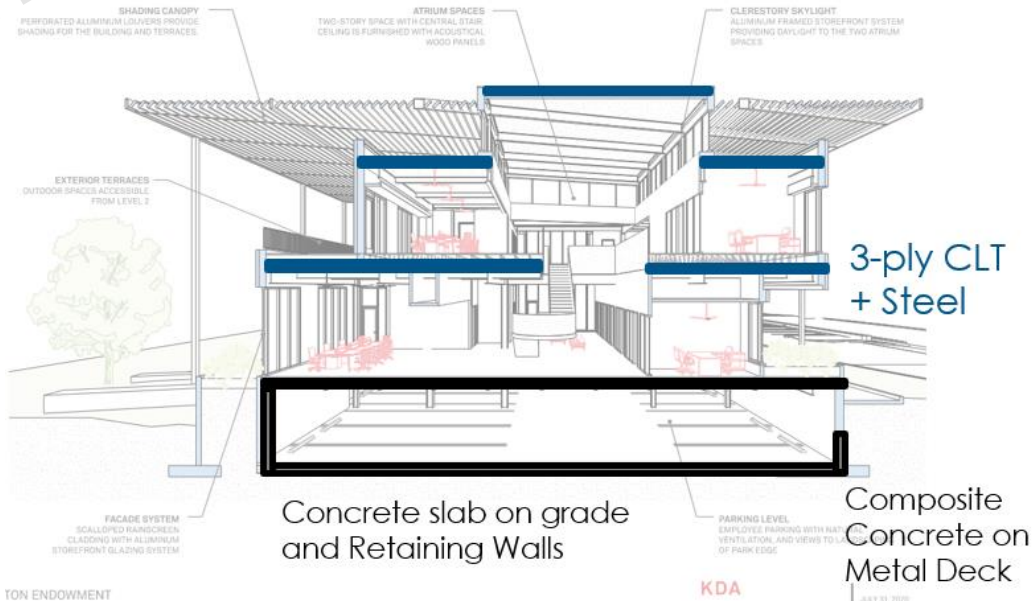
CLT + Steel Alternate

- ~½ cost of concrete scheme
- ~½ weight of concrete scheme
- ~½ carbon of concrete scheme
- Faster installation
- Steel allowed for longer spans
- Raised floor hid MEP systems



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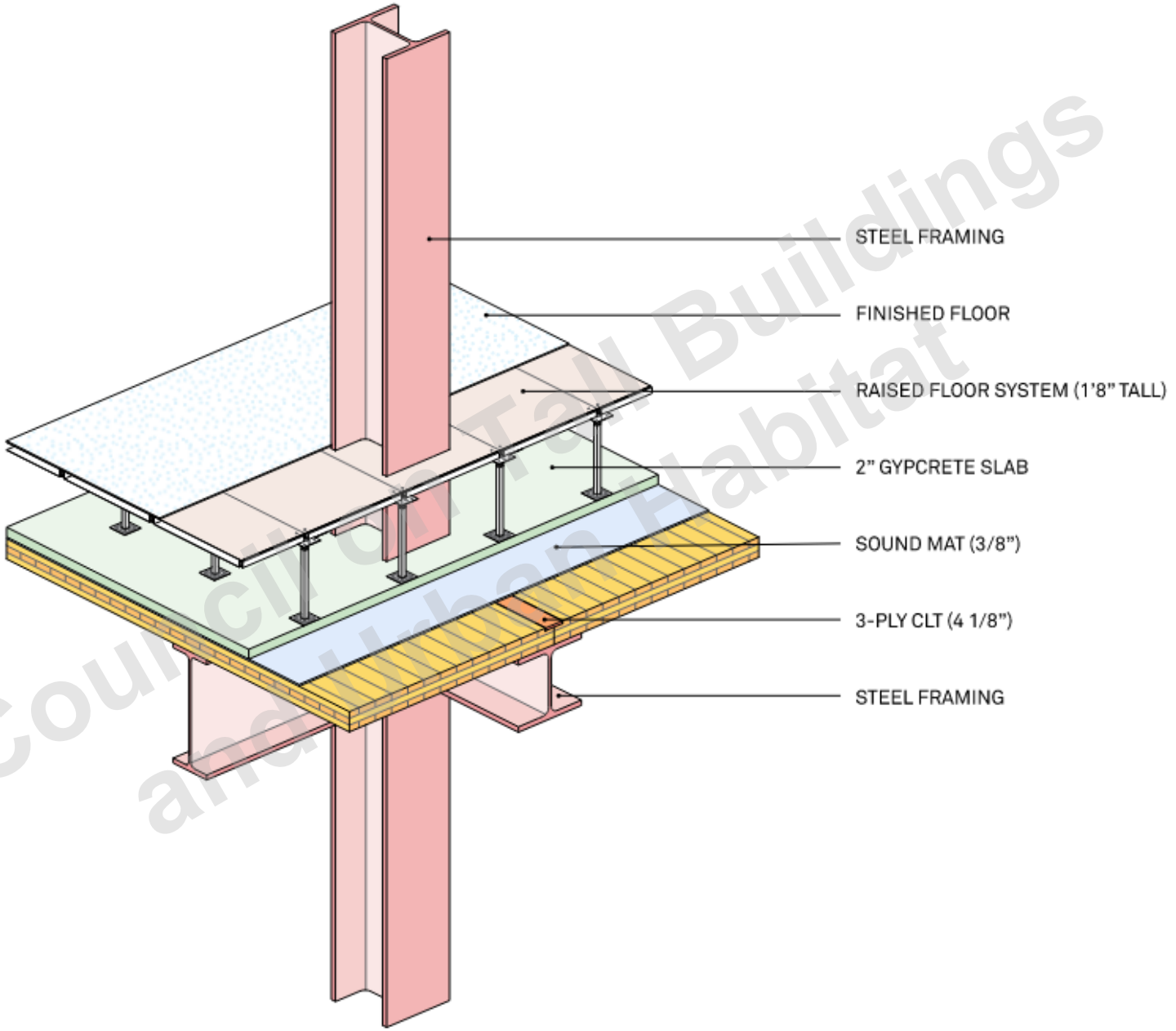

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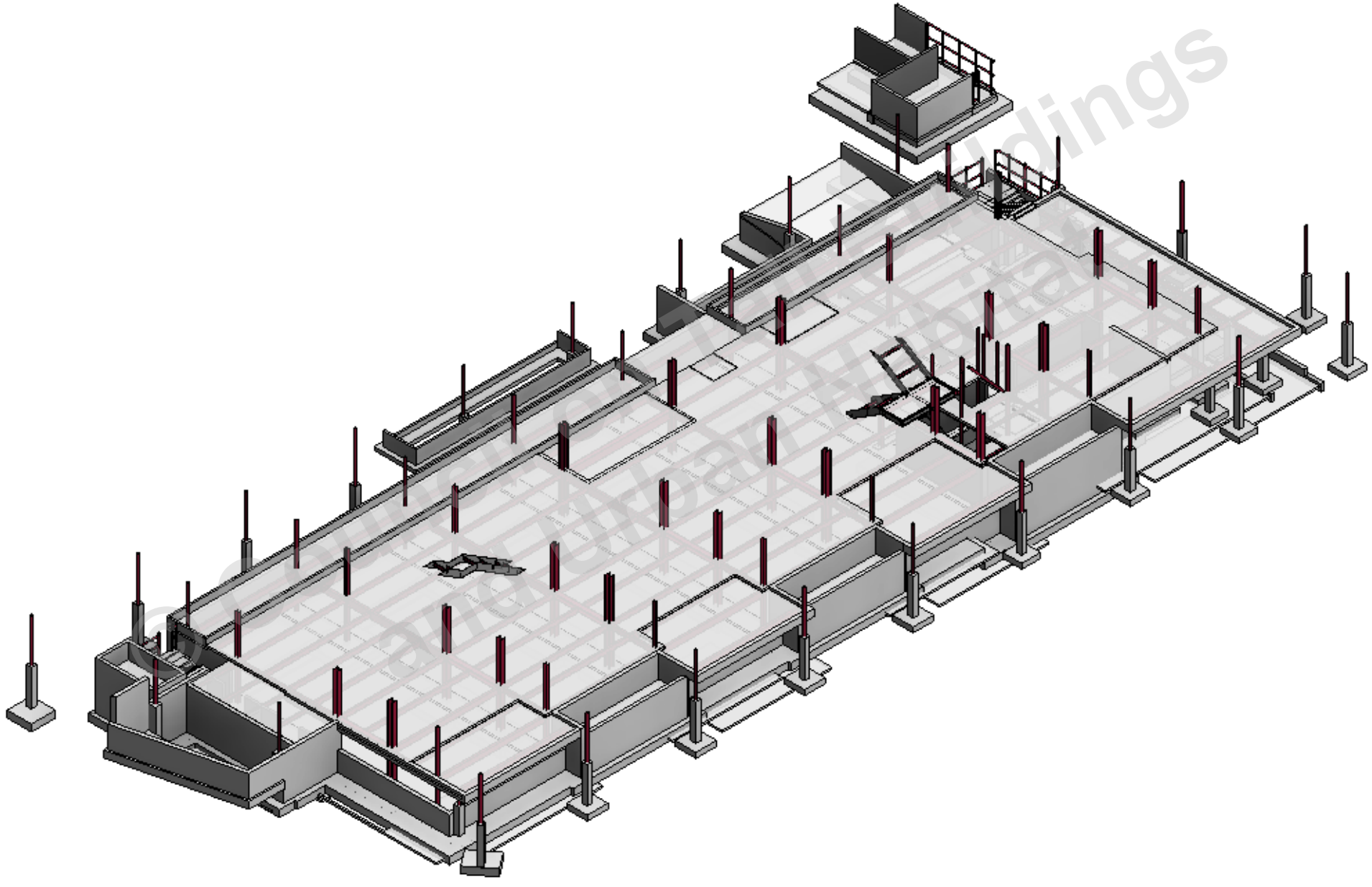

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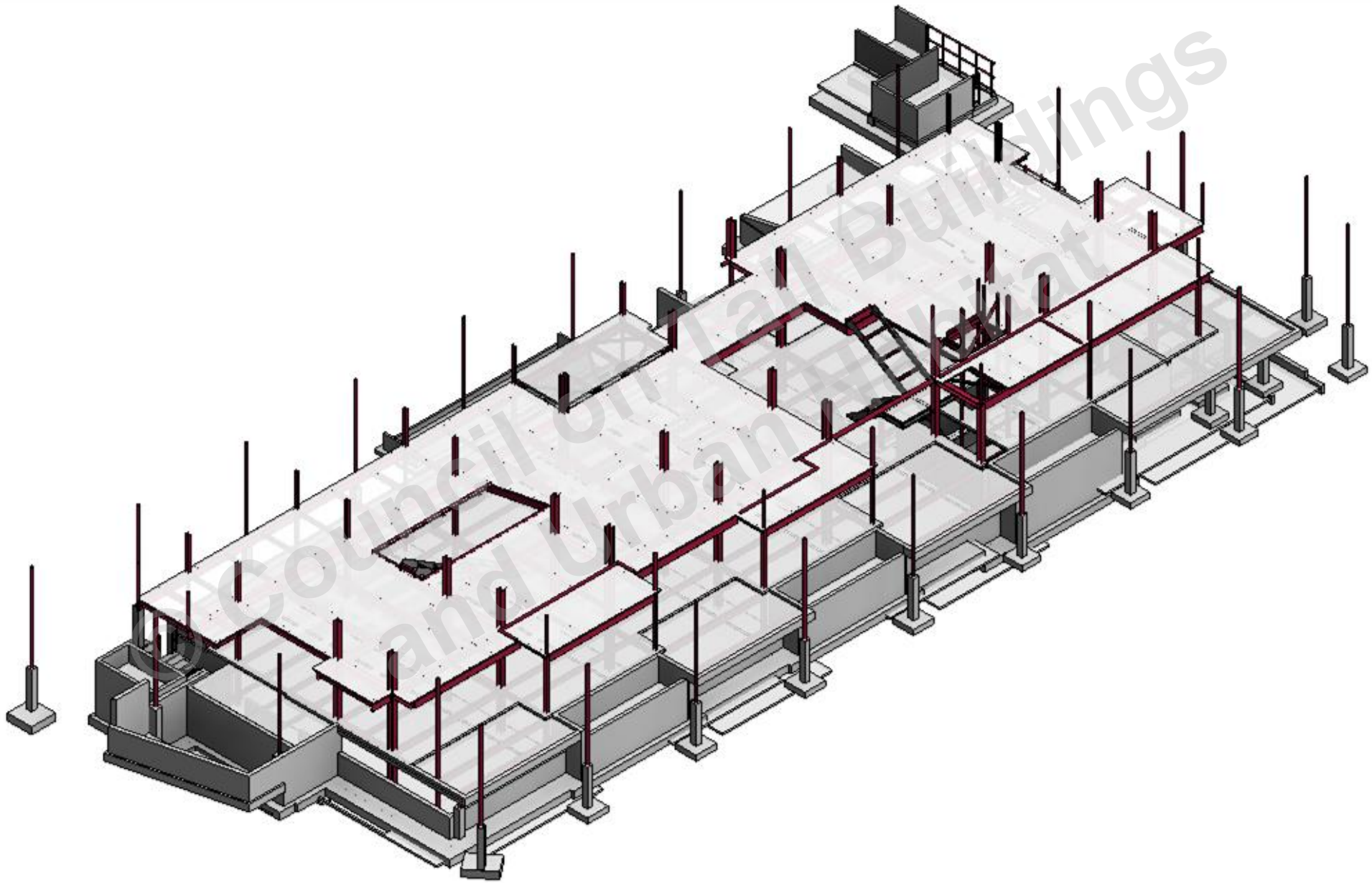

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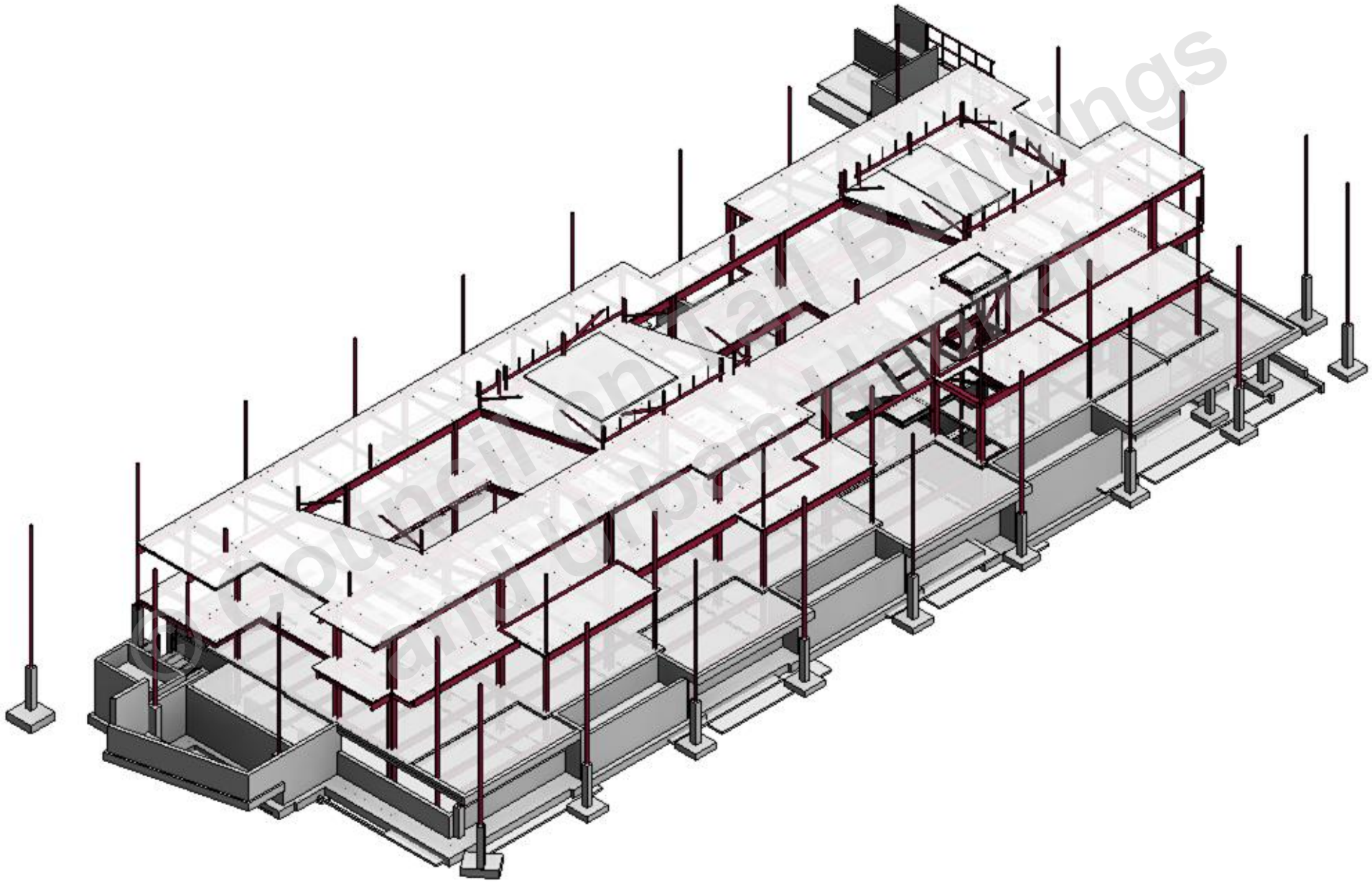

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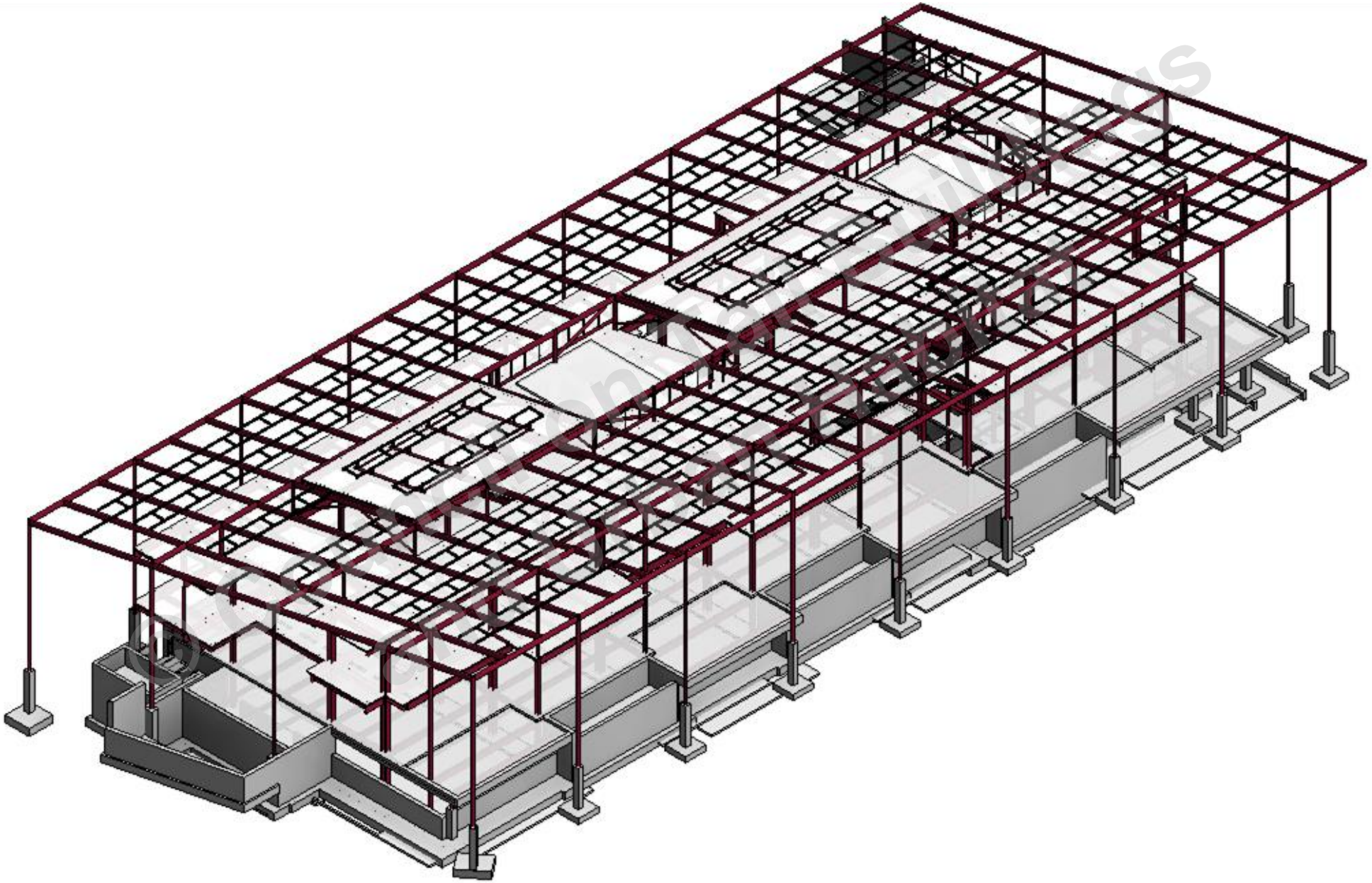

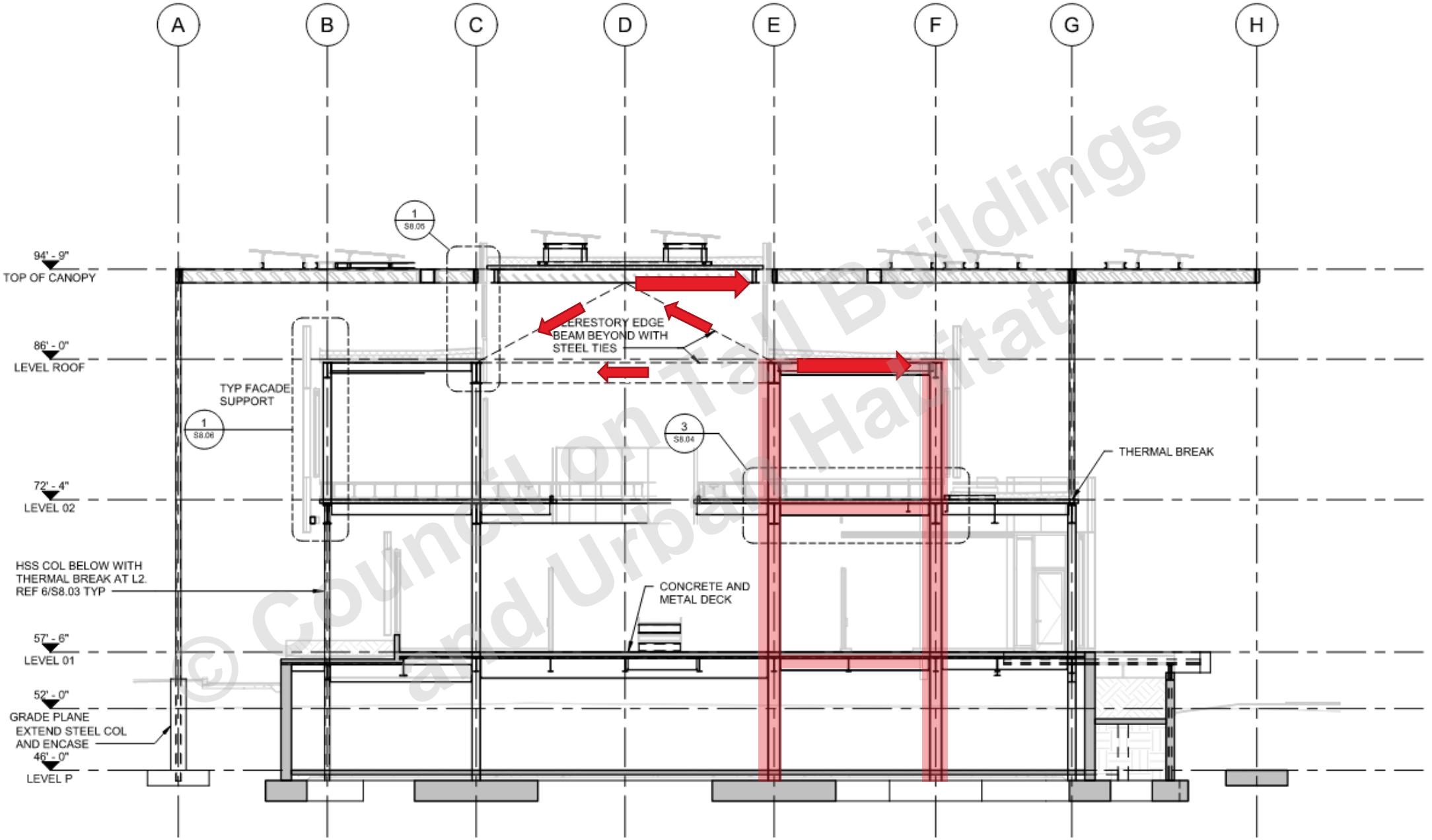

3 MF SECTION 3

1/8" = 1'-0"

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Buildings

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