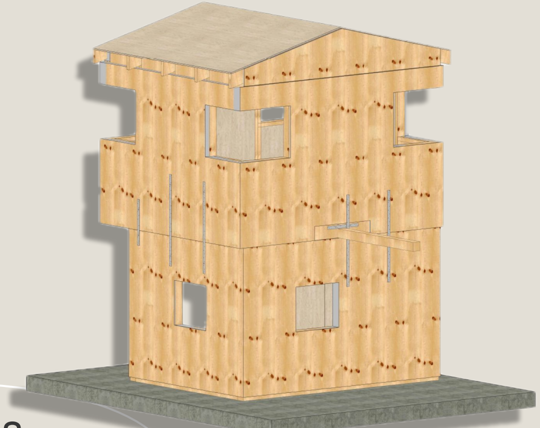
SKY HIGH STRUCTURES

Timber-Strong Design Build Competition Team [2025-2026]



CENE 486C | May 1, 2026

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Project Overview

Project: Timber-Strong Design Build Competition

Competition Location: University of Utah

Competition Date: April 16-18, 2026

Client: Mark Lamer

Purpose:

- Design & construct a two-story, light-frame wooden structure
- Sustainability, aesthetics, material efficiency, structural creativity & complexity

Sponsors: Simpson Strong-Tie, HomCo

Figure 1: Timber-Strong 2026 Winners

Design Criteria and Constraints

- High wind loads
  - Lateral System
    - Walls - 43 pounds per square foot (psf)
    - Roof - 33 psf
  - Components and Cladding
    - Walls - 38 psf
    - Roof - 75 psf (uplift)
- Lateral system Factors of Safety (FS)
  - 1.35 to 1.65 for max points
  - Not less than 1.2
- Maximum and minimum dimensions

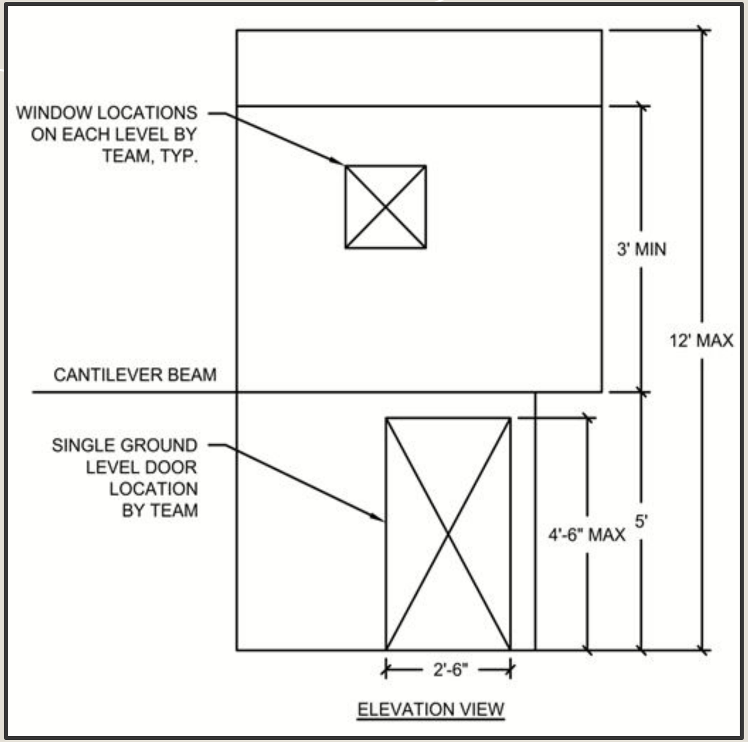

Figure 2: Geometric Constraints [3]

Construction Constraints

- 90 minute build limit
- Team estimated time: 55 min
- 18 ft × 18 ft site
- Stable and self supporting
- Build bottom up; Panelized approach
- Roof built on site
- Prefab ≤ 30 lb size limited
- No saws or air-powered tools
- Cantilever tested after build

Figure 3: Competition Construction

Research

- Past Competition Teams (2023-2025)
- 2026 ASCE Timber-Strong Competition Rules
- Material Availability
- Specification Manuals:
  - National Design Specification for Wood Construction
  - Special Design Provision for Wind & Seismic
  - The Engineered Wood Association
  - Simpson-Tie Resources

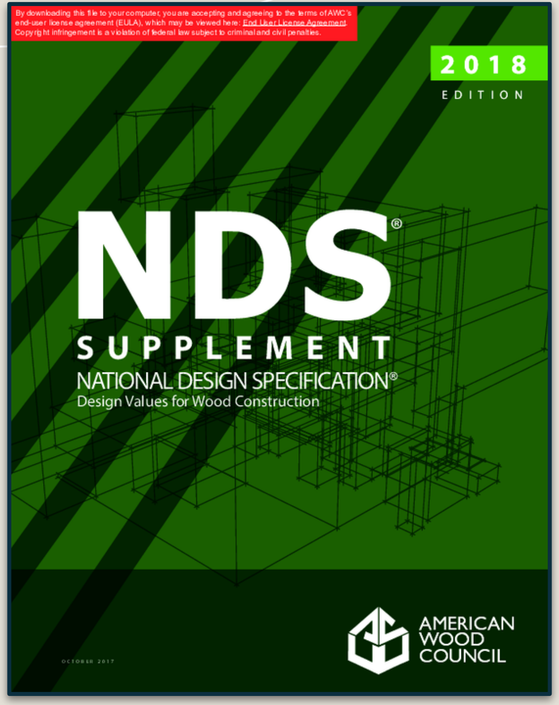

Figure 4: NDS Supplement [6]

Design Selection

- Selected design using weighted decision matrix
- Selected design had prefabricated gable trusses and open corner windows
- Best balance of creativity & structural design challenge
- Roof trusses have never been done before & open corner windows were only done once

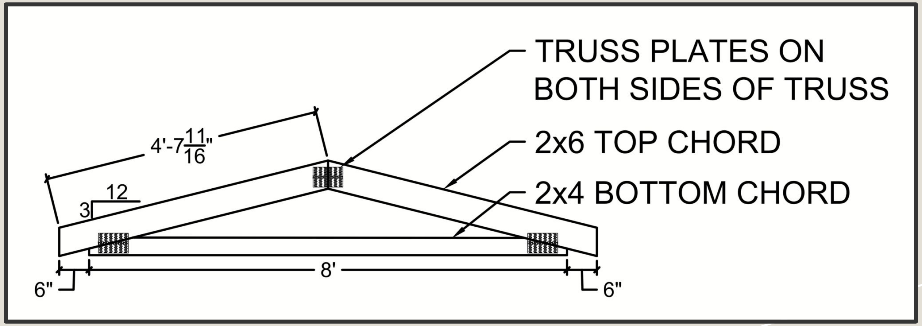

Figure 5: Roof Truss [1]

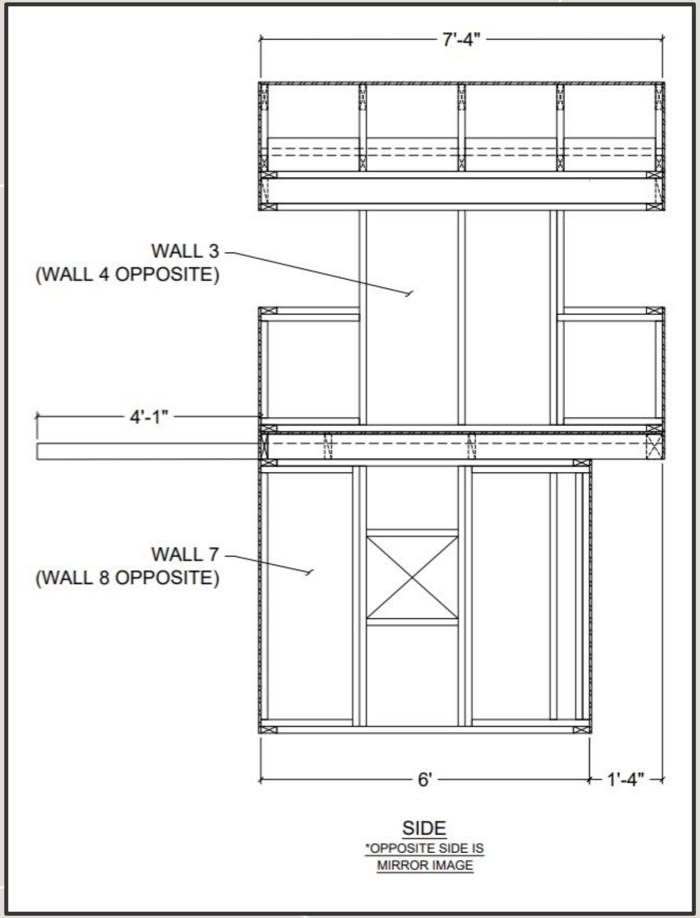

Figure 6: Selected Design [1]

Gravity Design

Design Challenges:

Open Corner Windows

- Cantilevered Window Headers
- Designed as an Indeterminate Beam

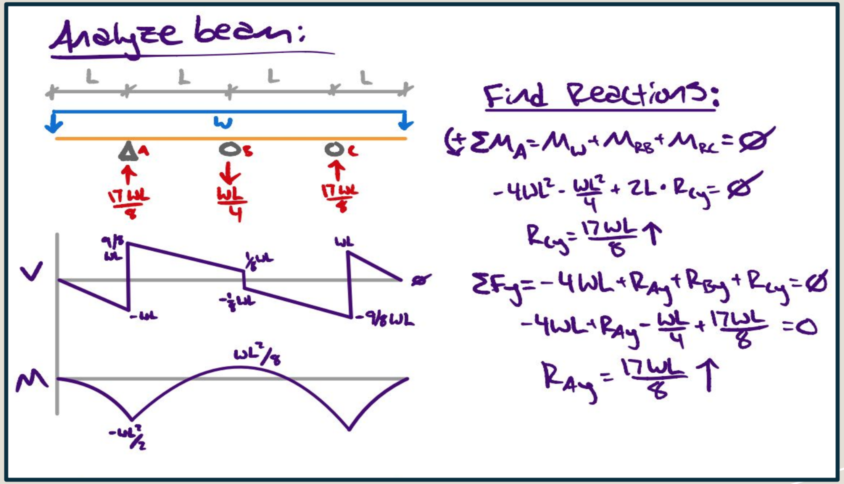

Figure 7: Window Header Calcs [5]

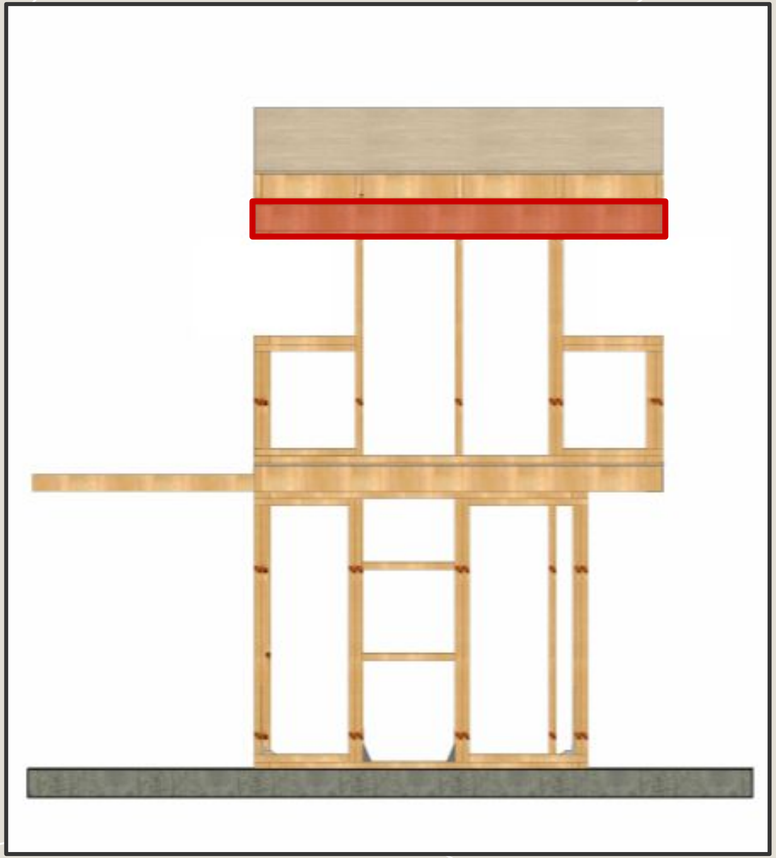

Figure 8: BIM 3D Model Side View [5]

Gravity Design

Design Challenges:

Second Level Floor Cantilever

- Joists were cantilevered
- Upward & Downward point loads applied to end
- Distributed Loads along the floor
- Uplift distributed load on cantilever
- Resulted in numerous load combinations

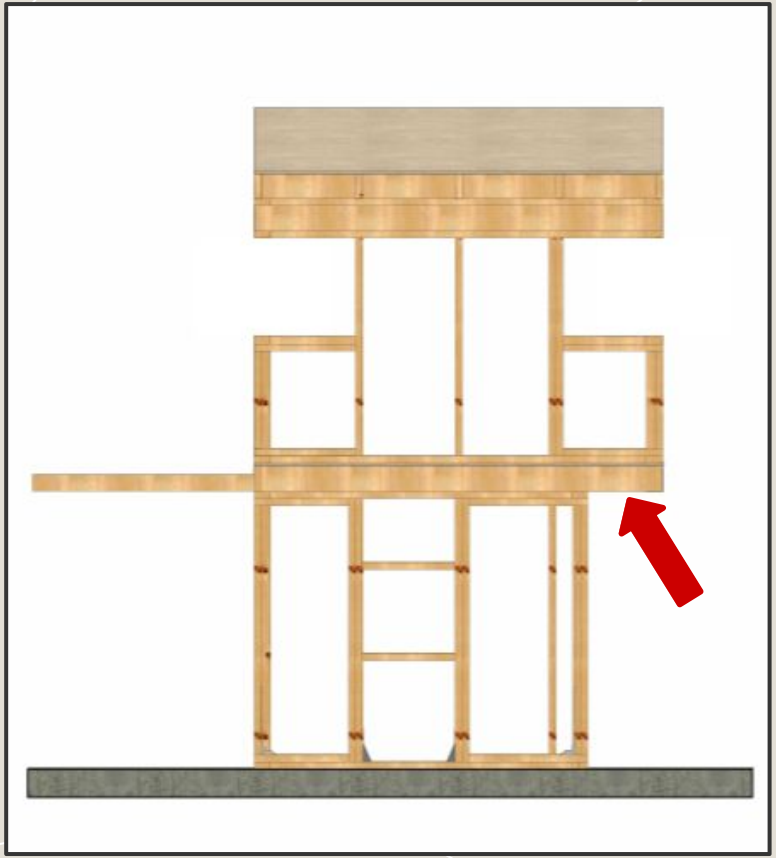

Figure 8: BIM 3D Model Side View [5]

Uplift Design

Load Path:

1. Roof Sheathing
2. Trusses
3. Uplift Screws
4. Sheathing*
5. 2nd Level Studs
6. Tension Straps*
7. 1st Level Studs
8. Hold Downs*

*Uplift+Lateral

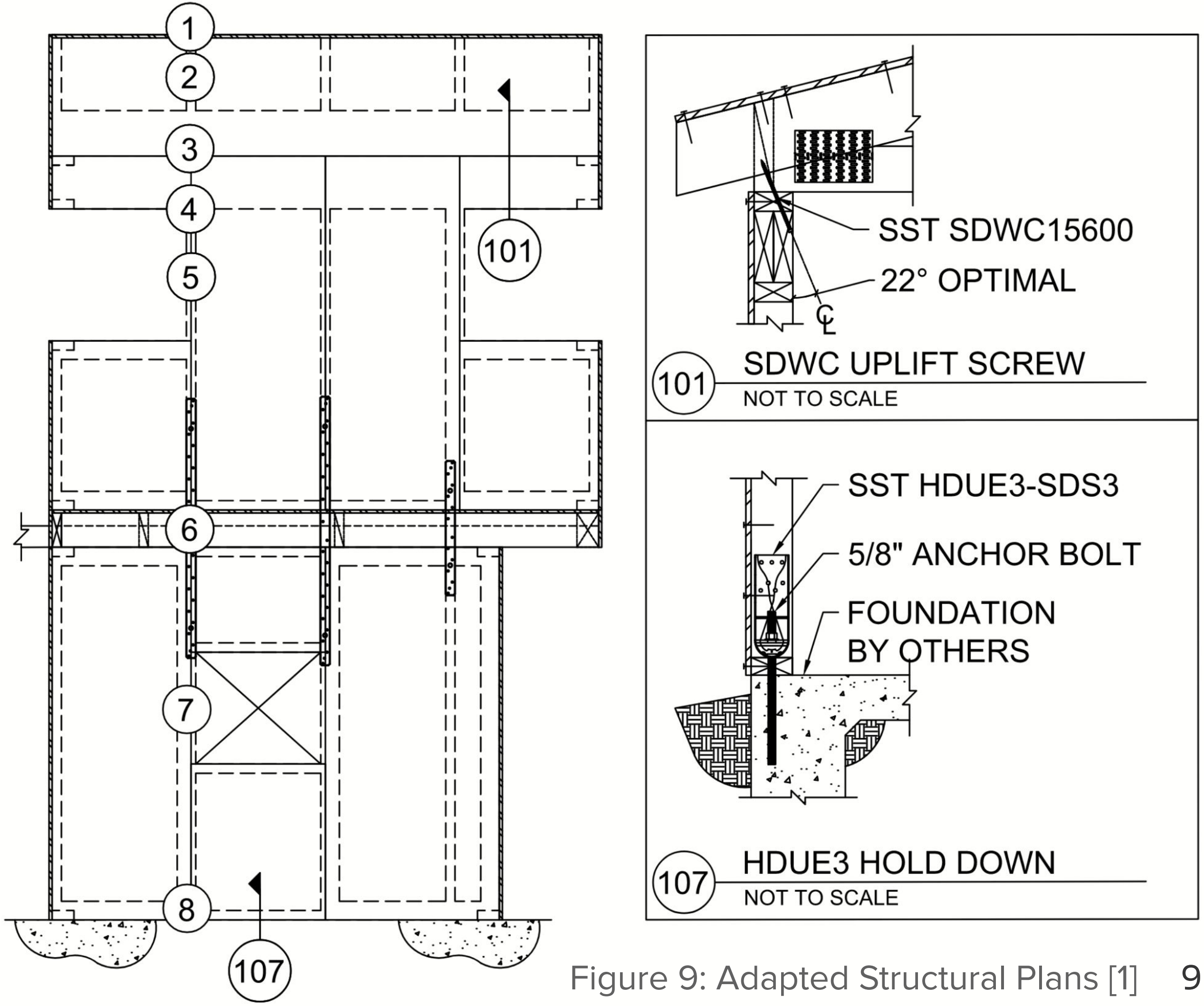

Figure 9: Adapted Structural Plans [1]

Lateral Design

- Shear walls prevent overturning
- Shear walls held down by uplift connections
- Diaphragms connect walls

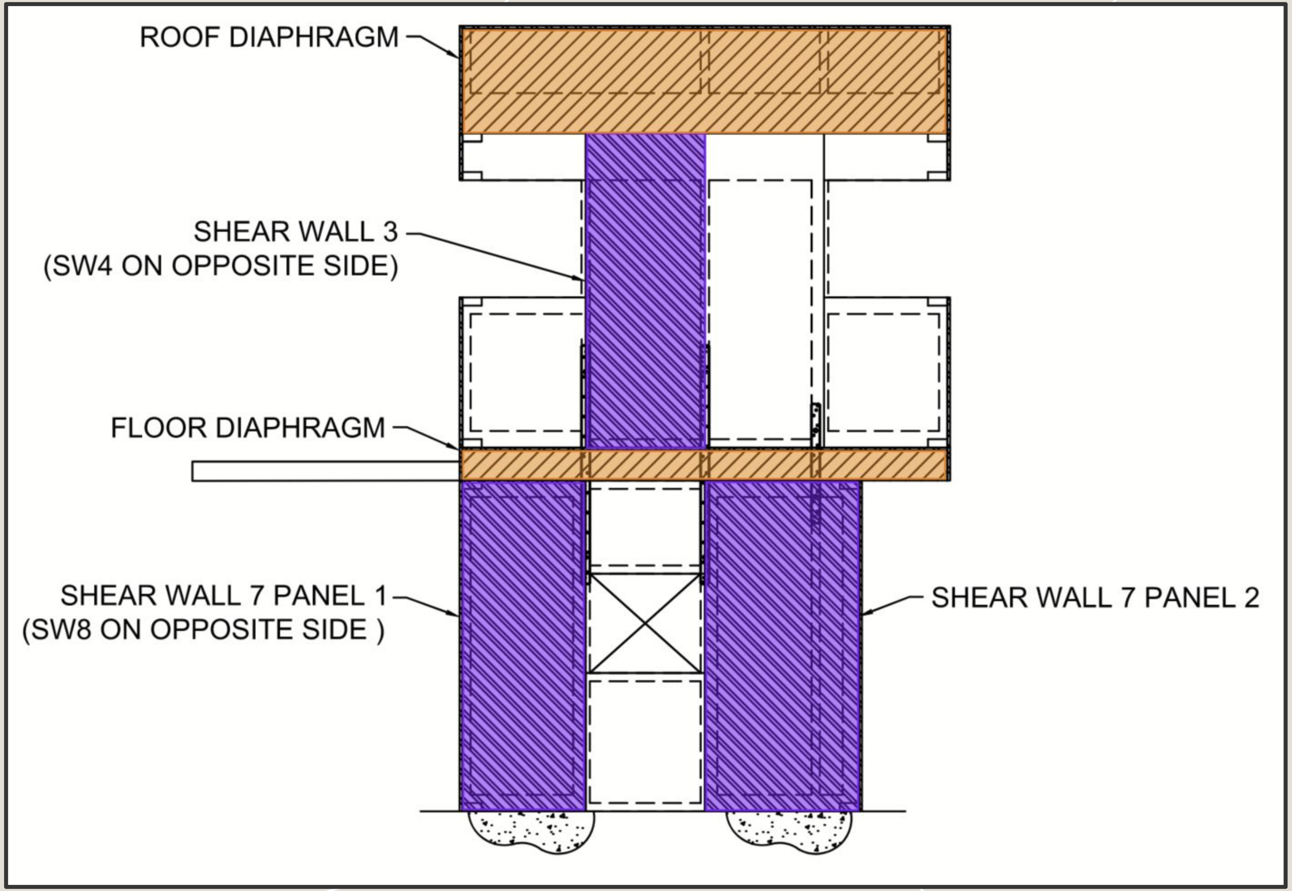

Figure 10: Shear Wall and Diaphragm Diagram [1]

Lateral Design

- Nearly perfect Factor of Safety score
- 1/2” sheathing (not ideal)
- Also designed:
  - Chords & collectors
  - Overturning
    - Tension straps & hold downs

Lateral System Factors of Safety			
Component ID	**Adjusted Capacity (plf)**	**Demand (plf)**	**FS**
SW 1&2	365	211	1.59
SW 3&4	490	304	1.61
SW 5&6	490	332	1.60
SW 7&8	533	352	1.51
		SW Average	**1.58**
Roof Dia.	252	73	3.45
Floor Dia.	252	185	1.37
		Diaphragm Average	**2.41**

Table 1: Lateral System Factors of Safety [5]

Structural characteristics: Cantilever Deflection

- 4’ 1” cantilever extending from back of structure
- 150lb point load at 3 possible locations
- Predicted deflection for each cantilever loading point
- L2 is required to have member deflection between 0.5” and 1.0”
- Ensure the 4x4 cantilever can resist loads within allowable limits

Table 2: Predicted cantilever deflections.

Load Location	Predicted Deflection
3’-0”	0.40”
3’-6”	0.57”
4’-0”	0.70”

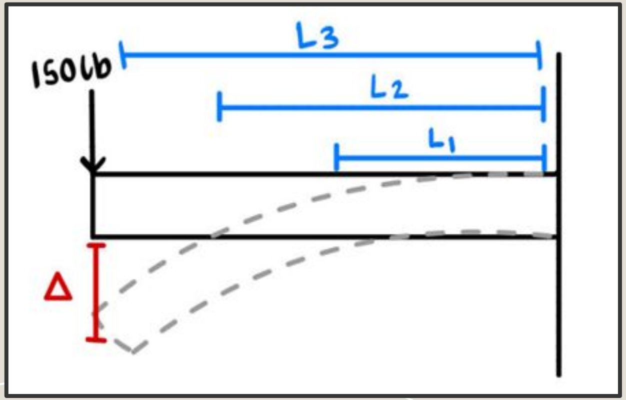

Figure 11: Cantilever loading points.

BIM Model

Architectural View

Figure 12: Exterior Sheathing 3D View [5]

Structural View

Figure 13: Structural 3D View [5]

Pre-Competition Construction

Material Procurement

- Takeoffs and ordering

Construction

- Prefabricate all 8 wall panels and the 2nd floor
- Prefabricated trusses

Practice Assembly Roles & Timing

- Roles based on experience and efficiency
- Developed detailed staging plan
- 3 practice builds to finish in exactly 55 minutes

Figure 14: Lumber Delivered

Figure 15: Truss plate installation

Competition & Outcome

Competition Summary

- Built in the 55 minute estimated time, within 90 minute limit
- Cantilever deflection 0.60” (0.57” predicted)
- Deductions for out of bounds and missing high-vis marker
- Won 1st place due to accuracy of design calculations and design submittals

Figure 16: Timber-Strong 2026 Winners

Cost of Materials

Cost Summary Table	
HomCo Lumber Subtotal	$422
HomCo Sheathing Subtotal	$677
Simpson Strong-Tie Hardware Subtotal	$868
Total Before Sponsorship	$1967
Total After Sponsorship	$1099

Table 3: Total Project Cost Summary [5]

Recycling Plan

- Structure disassembled and transported back to Flagstaff
- Structure installed on Zac's property
- Community playhouse for Zac's child and other neighbors
- Install foundation, railings, plexiglass windows, and roofing

Figure 17: Completed structure.

Lessons Learned & Conclusion

1. Working with sponsors
2. QA/QC for deliverables & construction
3. Importance of checklists on complex projects
4. Importance of adaptability

Figure 18: Timber-**STRONG.**

References

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[2] J. Cipollini, "Timber-Strong Design Build Competition — Utah Winners," SE Blog, Jun. 2022. [Online]. Available: https://seblog.strongtie.com/2022/06/timber-strong-design-build-competition-utah-winners/. [Accessed: Feb. 5, 2026].
[3] ASCE, Timber-Strong Design Build Rules. American Society of Civil Engineers, Washington, DC. [Online]. Available: https://www.asce.org/-/media/asce-images-and-files/communities/students-and-younger-members/documents/asce-timber-strong-design-build-rules.pdf. [Accessed: Feb. 5, 2026].
[4] H., Seria, Viable Design Option Sketches,2026.
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[6] American Wood Council, ANSI/AWC NDS-2018: National Design Specification for Wood Construction, Leesburg, VA: American Wood Council, 2017.

Thank you!
Questions?