2025-2026 ASCE

TIMBER-STRONG DESIGN BUILD COMPETITION PROPOSAL

Sky High Structures

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Abbreviations

ASCE	American Society of Civil Engineers
ASD	Allowable Stress Design
BIM	Building Information Model
C&C	Component & Cladding Pressure
DL	Dead Load
EIT	Engineer in Training
FE	Fundamentals of Engineering
FS	Factor of Safety
GSNs	General Structural Notes
HSS	Health & Safety Specialist
INCL	Including
INT	Construction Intern
ISWSS	International Southwest Student Symposium
LL	Live Load
LRFS	Lateral Force Resisting System
MWRFS	Main Wind Force Resisting Systems
NAU	Northern Arizona University
NDS	National Design Specification for Wood Construction, 2018
PE	Professional Engineer (Professional Engineering License)
PrE	Project Engineer
SDPWS	Special Design Provisions for Wind and Seismic, 2021
SPM	Senior Project Manager
SST	Simpson Strong-Tie Company
SUP	Superintendent
WL	Wind Load

1.0 Project Understanding

1.1 Project Purpose

The purpose of this project is to design and construct a two-story, small-scale, light-framed wooden structure for the Timber-Strong Design Build Competition for the annual Intermountain Southwest Student Symposium (ISWSS) hosted by the American Society of Civil Engineers (ASCE). This project serves as a comprehensive learning experience, allowing students to use their course knowledge in real life design and construction.

Sky High Structures will apply knowledge and skills in structural analysis, project management, design modeling, communication, and collaboration over the course of this design-build competition. Sky High Structures will also be sourcing materials from sponsoring companies.

The design will follow requirements outlined in the *Timber-Strong Design Build 2026 Rules* (the "Competition Rules"). These requirements will guide the final design and will require Sky High Structures to exhibit excellent engineering judgement and showcase high-level problem-solving skills. At the end of the competition, the design will be judged and scored based on compliance with the constraints and project requirements. Sky High Structures proposes to deliver a project that is scored highly by the judging panel, and, in so doing, win the competition and exceed client expectations

1.2 Project Background

1.2.1 Overview

The 2026 ISWSS Competition will take place at the University of Utah, located in Salt Lake City, UT. NAU student teams have participated in the Timber-Strong Design Build competition at the ASCE ISWSS for the last eight years, and Capstone teams for Civil Engineering students have participated in this competition for the last three years. Since the inception of this competition, rules and guidelines have been updated each year to introduce novel challenges to the design team.

The phases of the project, including framing plan design, structural calculations, Building Information Model (BIM) creation, and construction drawing preparation will take place within the Engineering Building at Northern Arizona University (NAU). The 2018 National Design Specification for Wood (NDS) and the 2021 Special Design Provisions for Wind and Seismic (SDPWS) will be the primary standards guiding the design process. Building design requires an understanding of the load path, competition loading requirements, geometric criteria, sustainable design, and the prefabrication and construction processes.

1.2.2 Loading and Load Paths

Per the Competition Rules, analysis and design will be performed using the NDS Allowable Stress Design (ASD) methods in conjunction with loading prescribed by the competition rules and load combinations specified in the ASCE 7-22, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*. The basic gravity loading requirements for the competition are shown in Table 1 below.

Table 1: Competition Gravity Load Requirements [1].

Load Type	Load
Roof Dead Load	self-weight
Roof Live Load	20 psf
Floor Dead Load	self-weight
Floor Live Load	50 psf
Cantilever Beam Point Load	150 lb

This includes load requirements for the roof, floor, and cantilevered beam. The cantilevered beam will extend from the second floor of the structure, with deflections predicted for the 150-lb point load applied on build day. Points will be awarded based on the accuracy of these predictions. Table 2 and

Table 3 below present the Main Wind Force Resisting System Pressures (MWFRS) and Component & Cladding (C&C) wind loading requirements.

Table 2: Wind Requirements for Entire System [1].

MAIN WIND FORCE RESISTING SYSTEM PRESSURES ASD (entire system)		
Surface	External with (+ Internal Pressure)	External with (- Internal Pressure)
Windward Wall	+17 psf	+29 psf
Leeward Wall	-20 psf	-14 psf
Sidewall	-26 psf	-14 psf
Windward Roof (+ external)	-12 psf	+2 psf
Windward Roof (- external) and Leeward Roof	-42 psf	-30 psf
For a MONOSLOPE Roof, the entire roof surface is either a windward or leeward roof surface. For a FLAT Roof, the entire roof surface is a windward (- external pressure) roof surface		

Table 3: Wind Requirements for Individual Members [1].

COMPONENT & CLADDING PRESSURES (individual member)		
Surface	External with (+ Internal Pressure)	External with (- Internal Pressure)
Roof (C&C Zone 3) Negative Pressure	-3 psf	-75 psf
Roof (C&C Zone 3) Positive Pressure	1 psf	13 psf
Wall (C&C Zone 5) Negative Pressure	-2 psf	-38 psf
Wall (C&C Zone 5) Positive Pressure	1 psf	30 psf

Load paths must be considered during the design process. A load path is the route that a load follows through a structure, beginning at the point of application and ending at the foundation. A load path includes every structural member, connection, and other component which transfers applied loads from the point of application down to the foundation. Gravity, uplift, and lateral load paths must be accounted for in the final design and illustrated using 3D modeling software. Figure 1 below demonstrates a typical gravity load path.

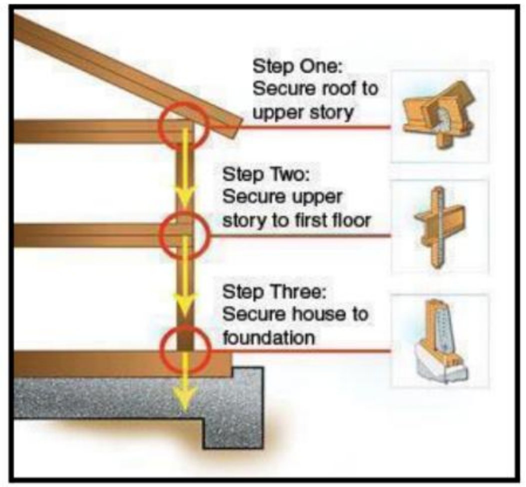

Figure 1: Typical Gravity Load Path [1].

Figure 2 below demonstrates the sequence of an uplift load path and locations which typically require uplift connections.

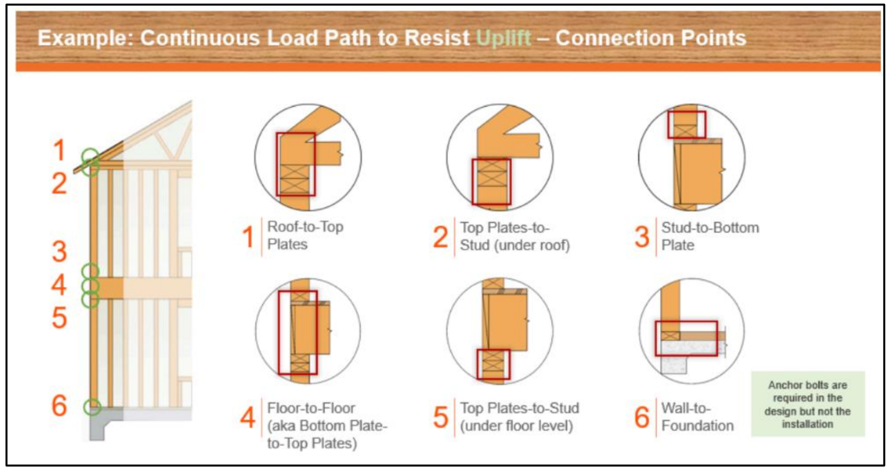

Figure 2: Uplift Load Path [1].

Figure 3 below shows the sequence of an in-plane lateral load path and its effects on connection points throughout a structure.

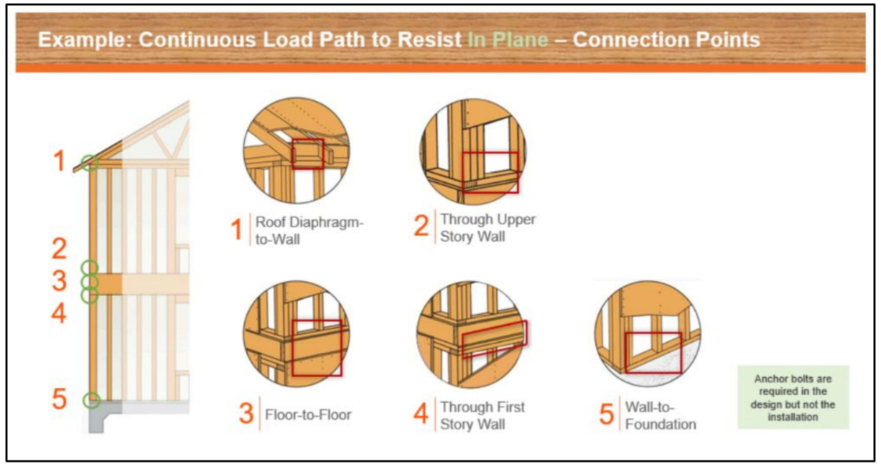

Figure 3: Lateral Load Path [1].

1.2.3 Geometric Requirements

The structure is required to have two stories, with a total of four walls for each story. The first floor dimensions must be 6'-0" x 8'-0", and the second floor dimensions must be 7'-4" x 8'-0". The second floor is to cantilever over one of the first floor walls, and the cantilever beam is to extend from the rear of the structure. These dimensions are shown in Figure 4, below.

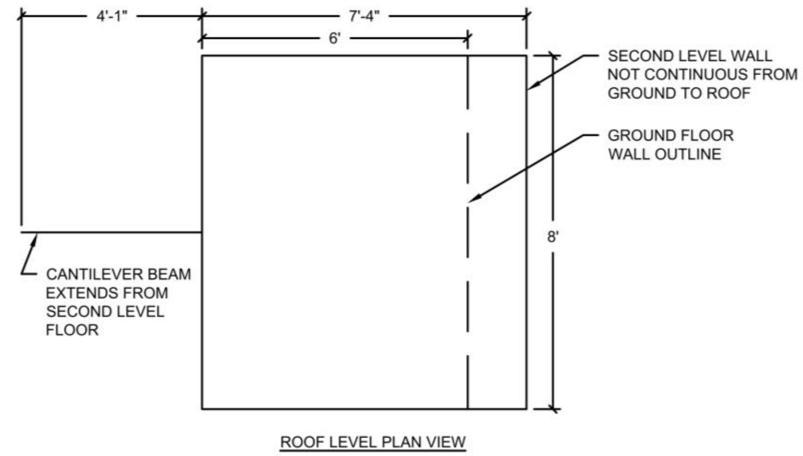

Figure 4: Roof level plan view with dimensional requirements [1]

Figure 5, below, depicts the structure's side elevation. The first level must be 5' tall from bottom plate to top plate, while the second level must be no less than 3' from bottom plate to top plate. The structure may be no more than 12' tall in total. There must be one window on each wall, except for the wall which has the door. The door must have a minimum width of 2'-6" and a maximum height of 4'-6". The windows are not limited to specific dimensions.

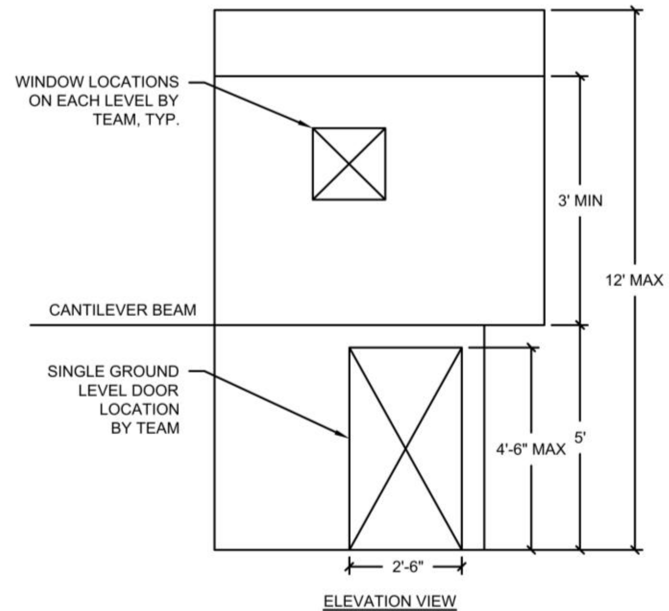

Figure 5: Side elevation view with dimensional requirements [1].

1.2.4 Sustainability

The sustainability of the design is another important factor in the competition. Points are awarded based on the efficient use of wood, minimized waste, and accuracy of carbon footprint calculations. Calculations will be performed using the Woodworks Carbon Calculator.

1.2.5 Prefabrication and Construction

The project construction will be carried out in two phases: prefabrication and onsite construction. Following the design and analysis process, structural components will be prefabricated at the NAU field station, also known as "the Farm." Designing and prefabricating the structure in Flagstaff will have an impact on what materials can be obtained, with the primary consideration being available species of wood members. Material availability may vary for each competition team based on their prefabrication location. Sky High Structures will be accountable for transporting prefabricated elements and other construction materials to the competition site.

The construction phase involves building the design using prefabricated elements and other construction materials. This will take place during the ISWSS competition at the University of Utah in April of 2026. The structure will be constructed within a 90-minute time limit at the competition and will be evaluated by judges for the requirements and constraints outlined in the competition rules.

1.3 Technical Considerations

Framing members, sheathing, and connections must be designed to create a continuous load path to transfer all design loads to the foundation using methods outlined in Section 1.2 above). Framing members must be designed for axial, bending, shear, crushing, and buckling stresses, while shear walls and diaphragms must be designed for shear and bending. Additional calculations must be performed for uplift connections, shear connections, tiedowns, anchorage, and to predict the deflection of the cantilever beam. All calculations must be performed by hand; no software calculations are permitted in project deliverables.

The final design for the structure will be documented both in AutoCAD and in Revit. AutoCAD will be used to create a complete set of structural plans for the structure; Revit will be used to create a BIM of the structure which must demonstrate continuous load paths in three dimensions.

Points are awarded in the competition for structures which consider and demonstrate sustainability in material selection and construction. Calculations must be performed to estimate the carbon impact of the structure. Carbon impact of the project is to be presented in units of tons of carbon dioxide released by the amount of wood and metal fasteners/connectors used for construction.

The designed structure needs to be assembled and disassembled multiple times, transported to the competition, and reassembled during the competition in a 90-minute timeframe. Structural drawings and the BIM will need to be detailed to enable modular construction and rapid assembly/disassembly.

The structure will also need to be assessed on its sustainable impact, which will be calculated using WoodWorks Carbon Calculator. This calculator will determine the amount of carbon emissions the teams build will emit. The Embodied Carbon Estimator will also be used to estimate the amount of carbon emissions a potential full sized building will emit.

1.4 Constraints

1.4.1 Geometric Constraints

The Rules require that the structure meet the geometric criteria outlined in Section 1.2 above), including overall dimensions, presence and sizing of fenestrations in each wall, and incorporation of a type-4 structural irregularity on the second floor. Each of these criteria constrains and complicates the lateral design by creating irregularities and discontinuities in the shear walls of the structure. Allowable shear wall ratios must be maintained when designing the placement and sizing of fenestrations.

1.4.2 Time Constraints

The entire structure must be assembled during the competition in 90 minutes or less, and points are awarded for speed of construction. While the walls and floor may be pre-built panels, the roof must be assembled during the competition from structural units weighing no more than 30 lbs. each and no more than 12” in width, and sheathing must be fastened on site. It is likely that the roof will be the most time-consuming element of the competition assembly, thus an efficient roof design could be the difference between taking home a win or not.

1.4.3 Loading Constraints

Loads are prescribed by the Competition Rules (see Section 1.2 above) for details) and include substantial wind uplift forces (75 psf for Components & Cladding). Such high uplift forces will constrain the roof member tributary area, roof overhang, and uplift connection options.

1.4.4 Transportation

A box trailer is available to transport the structure to the competition. Structural modules must not exceed the trailer width or height and must stack efficiently to enable transportation of other Capstone teams’ equipment. In addition, structural modules must be durable enough to withstand the packing/unpacking process, as well as any vibration or impact which they may endure during transportation.

1.5 Stakeholders

The Timber-Strong Design Build competition involves four main stakeholder groups. That being the student teams, the NAU Civil Engineering Department, the Client, and the Team Sponsors. The student teams are the most directly impacted, since their design, construction performance, and learning outcomes determine their scores, and can influence their professional growth. The NAU Civil Engineering department and its faculty are also direct stakeholders, responsible for evaluating performance and ensuring academic standards. The department also has a stake, as the team's performance reflects the quality of education it provides. The Client has limited influence on the project because most constraints are dictated by the Timber-Strong 2026 competition rules; however, the Client still has significant stake, as they are funding the effort and want the team to produce a winning project. While the client may not directly impact the project, the project's outcome has a clear impact on the client. Lastly, the sponsors, including the technical advisor, are indirect stakeholders who provide resources, guidance, and industry expertise that influence the project's success. Project outcomes directly reflect their support, making sponsorship a central part of their stake.

2.0 Scope of Services / Research Plan

2.1 Task 1: Research

2.1.1 Task 1.1: Research Past Competition Teams

The purpose of this task is to obtain a better understanding of the competition by evaluating choices made by previous competition teams. This will be accomplished by reviewing submittals from past teams and analyzing how winning teams have designed their structures. This will also involve evaluating their design choices and gaining an idea of how they have gained an edge in previous competitions.

2.1.2 Task 1.2: Research Competition Rules

The purpose of this task is to review the ASCE Timber-Strong Design Build 2026 Rules and become familiar with all aspects of the competition. This will be accomplished by identifying and listing the criteria and constraints outlined in the Competition Rules.

2.1.3 Task 1.3: Research Structural Systems

The purpose of this task is to gain familiarity with typical residential light-wood framing methods for gravity loads and lateral loads. This will be accomplished by using the resources provided in the competition rules to gain a deeper understanding of common structural systems.

2.1.4 Task 1.4: Research Material Availability

The purpose of this task is to identify readily available wood construction materials and lumber suppliers in Flagstaff, Arizona. This will be accomplished by researching local wood suppliers and researching the process for requesting sponsored connections from Simpson Strong-Tie.

2.2 Task 2: Design Selection

2.2.1 Task 2.1: Brainstorm Structural Systems

The purpose of this task is to come up with a list of potentially viable structural systems. This will be accomplished by identifying the pros, cons, and prospective compatibility of each of the previously identified structural systems within the context and constraints of the competition structure, then listing potentially viable structural systems and combination of systems which merit further consideration.

2.2.2 Task 2.2: Identify Viable Design Options

The purpose of this task is to narrow down the list generated in the previous task. This will be accomplished by performing initial structural calculations for any brainstormed structural systems identified in Task 2.1 which require analysis to determine if they may meet project constraints and criteria. For example, if a roof truss is proposed, perform initial calculations to determine if the proposed truss can withstand competition design loads while remaining under 30 lbs. This task involves taking a close look at each of the most viable options identified in Task 2.1 to eliminate any non-viable design options.

2.2.3 Task 2.3: Select Design

The purpose of this task is to select a final design. This will be accomplished according to the following steps. First, sketch at least three unique structures for consideration based on combinations of the viable design options identified in Task 2.2.2. Next, create a decision matrix to evaluate each proposed design. Matrix criteria will be based on criteria from the Competition Rules (e.g. sustainability, material efficiency, durability). Matrix weights for various criteria shall be approximately proportional to the points allocated for each criterion in the Competition Rules. Finally, use the decision matrix to rate each proposed structure. The highest-rated proposed design will be selected for the competition.

2.3 Task 3: Final Structural Analysis and Design

2.3.1 Task 3.1: Draft Framing Plan

The purpose of this task is to draft a detailed framing plan of the selected design based on the sketch developed in Task 2.2.3. This will be accomplished using AutoCAD. The geometry and connection details on this draft framing plan will be used for structural calculations, and the framing plan will be updated as necessary to reflect any changes which occur over the course of the iterative design process.

2.3.2 Task 3.2: Gravity Design

2.3.2.1 Task 3.2.1: Roof Design

The purpose of this task is to calculate required roof member size based tributary area, member geometry, proposed spacing, species design values, and combined loading (incl. self-weight and applied loads). This will be accomplished by applying applicable NDS formulas and engineering principles. Truss top chords with distributed loading must be checked for combined compression and bending forces. Minimum roof decking thickness and span rating will be designed as part of this task but increased as necessary during the lateral design process.

2.3.2.2 Task 3.2.2: Second Level Bearing Wall Design

The purpose of this task is to calculate required stud size based on stud geometry, proposed spacing, species design values, and combined loading (incl. roof member reactions and out-of-plane wind loading). This will be accomplished by applying applicable NDS formulas and engineering principles. Studs must be checked for combined compression and bending forces.

2.3.2.3 Task 3.2.3: Second Level Design

The purpose of this task is to calculate required floor joist size based on tributary area, joist geometry, proposed spacing, species design values, and combined loading (incl. second floor stud wall reactions, where applicable). This will be accomplished by applying applicable NDS formulas and engineering principles. Minimum floor decking thickness and span rating will be designed as part of this task but increased as necessary during the lateral design process.

2.3.2.4 Task 3.2.4: First Level Bearing Wall Design

The purpose of this task is to calculate required stud size based on stud geometry, proposed spacing, species design values, and combined loading (incl. floor joist reactions and out-of-plane wind loading). This will be accomplished by applying applicable NDS formulas and engineering principles. Studs must be checked for combined compression and bending forces.

2.3.3 Task 3.3: Diaphragm Design

2.3.3.1 Task 3.3.1: Calculate Diaphragm Forces

The purpose of this task is to calculate in-plane loading of roof and floor diaphragm chords based on out-of-plane wind loading of exterior walls. This will be accomplished by applying applicable SPDWS formulas and engineering principles. This step includes calculating any diaphragm forces which may be required to transfer around openings, where applicable. For design and load calculation purposes, wood diaphragms are to be idealized as “flexible.”

2.3.3.2 Task 3.3.2: Select Diaphragm Parameters

The purpose of this task is to select diaphragm parameters from SDPWS tables based on applied load, support member spacing, presence or absence of blocking, geometry, and local availability of structural panels. This will be accomplished by applying applicable SPDWS formulas and engineering principles. Parameters to be selected include structural panel grade, rating, and nailing pattern.

2.3.3.3 Task 3.3.3: Diaphragm Connection Design

The purpose of this task is to, where applicable, select suitable SST connectors for shear transfer, chord splicing, etc., based on the diaphragm forces calculated in Task 2.3.3.1. This will be accomplished by comparing calculated loads to SST load tables for various connectors.

2.3.4 Task 3.4: Shear Wall Design

2.3.4.1 Task 3.4.1: Shear Wall Forces

The purpose of this task is to calculate in-plane loading of shear wall collector/strut members. This will be accomplished by applying the reactions from the diaphragm loading calculated in Task 2.3.3.1. This task includes calculating any shear wall forces which may be required to transfer around openings, where applicable. For design and load calculation purposes, wood sheathed shear walls are to be idealized as "flexible."

2.3.4.2 Task 3.4.2: Select Shear Wall Parameters

The purpose of this task is to select shear parameters from SDPWS tables based on applied load, support member spacing, presence or absence of blocking, geometry, and local availability of structural panels. This will be accomplished by applying applicable SPDWS formulas and engineering principles. Parameters to be selected include structural panel grade, rating, and nailing pattern.

2.3.4.3 Task 3.4.3: Shear Wall Connection Design

The purpose of this task is to, where applicable, select suitable SST connectors for shear transfer based on the shear wall forces calculated in Task 2.3.4.1. This will be accomplished by comparing calculated loads to SST load tables for various connectors.

2.3.5 Task 3.5: Uplift Connection Design

The purpose of this task is to ensure uplift connections are strong enough for the applied loads. This will be accomplished first by hand sketching the structure and identifying and labeling each connection which must be designed for uplift. Next, the team must determine uplift loading of each identified uplift connection by following the load path from the roof down, then select suitable uplift connectors from SST catalog load tables based on the uplift loading calculated in the previous task and the framing geometry drafted in Task 2.3.1. Note: Per the Competition Rules, structure DL may not be used to counteract uplift forces.

2.3.6 Task 3.6: Tiedown and Anchor Design

The purpose of this task is to ensure tiedown and anchor connections are strong enough for the applied loads. This will be accomplished by calculating combined loading at tiedown and anchor locations identified in Task 2.3.1 and selecting appropriate tiedown connectors from the SST catalog load tables. Anchor bolt size is prescribed by the Competition Rules, but anchor bolt quantities and locations must still be designed to handle the applied loads.

2.3.7 Task 3.7: Cantilever Beam Design

2.3.7.1 Task 3.7.1: Beam Member Selection

The purpose of this task is to calculate the required member size. This will be accomplished by applying engineering principles and by considering the beam loading, material, and geometry.

2.3.7.2 Task 3.7.2: Overturning Stability Check

The purpose of this task is to prepare calculations for competition submittal which prove the structure's ability to resist overturning when the competition load is applied to the cantilever beam. This will be accomplished by applying engineering principles and mechanics to a model of the loaded structure.

2.3.8 Task 3.8: Final Calculation Packet

The purpose of this task is to organize structural hand calculations into a neat calculation packet for presentation to the competition board. This will be accomplished by reviewing all calculations, making any necessary edits, and assembling them into a single PDF document. This packet will be included in electronic submissions which are outlined in a later task.

2.3.9 Task 3.9: Final Structural Drawings

The purpose of this task is to finalize the draft of the structural plan set developed in Task 2.3.1. This will be accomplished using AutoCAD and will incorporate any changes made during the iterative design process. Plan sheets shall include, but are not limited to, the following: General Structural Note (GSNs); roof framing plan; floor framing plan; stud wall framing plans; diaphragm and shear wall diagrams, and connection details.

2.3.10 Task 3.10: Building Information Model

The purpose of this task is to generate a BIM demonstrating the continuous load paths identified in Task 3 and associated subtasks. This will be accomplished using Revit 3D software.

2.4 Task 4: Pre-Competition Construction Phase

2.4.1 Task 4.1: Material Procurement Phase

The purpose of this task is to secure lumber, sheathing, connectors, and hardware through HomeCo, sponsors, and existing suppliers. This will be accomplished by contacting sponsors and suppliers, placing orders, sending payment via NAU's ASCE chapter, retrieving materials, and, finally, verify that all materials meet species/grade and rule requirements.

2.4.2 Task 4.2: Prefabrication Phase

2.4.2.1 Task 4.2.1: Wall Panel Prefabrication

The purpose of this task is to frame and sheath wall panels before competition. This will be accomplished by cutting and fastening members together, cutting and nailing sheathing, and pre-installing any hardware permitted by the Competition Rules. For efficiency, panels will be labeled for quick identification and assembly.

2.4.2.2 Task 4.2.2: Floor Panel Prefabrication

The purpose of this task is to frame and sheath the floor panel before competition. This will be accomplished by cutting and fastening members together, cutting and nailing sheathing, and pre-installing any hardware permitted by the Competition Rules. This task includes construction of a temporary shoring method.

2.4.2.3 Task 4.2.3: Roof Assembly Prefabrication

The purpose of this task is to prepare the roof members and sheathing for competition assembly. This will be accomplished by pre-cutting all roof members to specified length and end geometry and pre-assembling small roof components (<30 pounds, ≤12" narrow dimension).

2.4.3 Task 4.3: Mock Assembly & Practice

The purpose of this task is to prepare for rapid and repeatable competition assembly. This will be accomplished by repeatedly assembling and disassembling the structure following the 90-minute competition construction process listed below in Task 2.5.1.

2.4.4 Task 4.4: Transportation Preparation

The purpose of this task is to prepare structural panels, tools, fasteners, ladders, and safety gear for competition. This will be accomplished by loading materials into the transportation trailed and by creating an organized staging plan so components enter the build site in correct order.

2.5 Task 5: Competition Construction Process

2.5.1 Task 5.1: 90-Minute Competition Construction Process

The purpose of this task is to maximize the chances of winning the competition. This will be accomplished by following the step-by-step process of the 90-Minute competition and construction of the structure, below. This process will be completed at the competition in Salt Lake City, on competition day.

- **Pre-Build Setup** – Stage all tools, prefabricated panels, and materials inside the 18'x18' build site; ensure all builders wear required PPE; begin when the Team Captain signals readiness, and the team raises hands.

- **First-Floor and Second-Floor Framing** – Assemble first-floor walls and second-floor framing; temporary shoring must be in place for the cantilevered floor system until the upper story is complete; judges may pause construction to verify stability or safety.

- **Cantilever Beam Installation** – Install the cantilever beam with required high-visibility marking; this element will later undergo deflection testing.

- **Second-Floor Walls & Roof Framing** – Erect second-floor walls and build roof framing piece-by-piece on site; maintain visible sheathing fastener patterns for inspection.

• **Mid-Build Structural Inspection** – Before finishes or siding are added, notify judges; timer pauses while they inspect fasteners, connections, and load path.

• **Cantilever Beam Deflection Test** – Once the cantilever system is complete, judges pause the timer, roll a die to select a test point, and measure deflection before and after applying a 150-lb load; builders may assist with weights.

• **Safety Oversight During Build** – Judges or safety officials may halt construction at any point if unsafe practices occur; work resumes only after corrections are made.

2.5.2 Task 5.2: Deconstruction Phase

The purpose of this task is to deconstruct the competition structure and determine appropriate reuse per the competition rules. This will be accomplished by following the list below.

• **Panel-by-Panel Deconstruction** – After the competition, the structure must be taken apart in panels (walls, floors) and stacked on pallets; the roof cannot be disassembled as one large unit for safety reasons.

• **Donation or Recycling Plan** – Design for disassembly and reusability of the structure to ensure the life cycle of the building's materials has been circulated efficiently after the competition. The deconstructed structure must be transported back to NAU before the donation/recycling plan can be implemented.

• **Team Responsibility** – Teams must remove all pallets, panels, and scrap from the competition build site, including lumber, fasteners, and debris. Failure to fully clean up results in point deductions.

• **Liability Waiver for Reuse** – If the team donates the structure itself (not just materials), they must request a liability waiver from ASCE's Legal Department.

• **Stability Oversight** – A designated team member must oversee structural stability during both construction and deconstruction.

2.6 Task 6: Impact Assessment

2.6.1 Task 6.1: Carbon Footprint Calculation

The purpose of this task is to calculate the carbon footprint of the competition structure. This will be accomplished by using the WoodWorks Carbon Calculator tool. Next, determine the theoretical carbon footprint of the competition structure at the scale of a full-sized building using the Embodied Carbon Estimator. This carbon calculation will be taken from the amount of wood and metal fasteners/connectors used in the structure for competition.

2.6.2 Task 6.2: Triple Bottom Line Assessment

The purpose of this task is to determine the triple bottom line such as societal, environmental, and economic impacts of the project. This will be accomplished by analyzing community involvement, use of sustainable materials and the long-term benefit of this build. The global impact of green construction can help shift toward acceptance of strong and sustainable wood construction.

2.7 Task 7: Deliverables

2.7.1 Task 7.1: Competition Deliverables

2.7.1.1 Task 7.1.1: Intent and Eligibility Acknowledgement Form

The purpose of this task is to complete and submit the Intent and Eligibility form by November 3, 2025.

2.7.1.2 Task 7.1.2: Ladder Safety Training Certificate

The purpose of this task is to have all members obtain a ladder safety training certificate and complete the waiver form prior to any construction and prefabrication.

2.7.1.3 Task 7.1.3: Phase 1A Electronic Files

The purpose of this task is to upload the Phase 1A Files to the ASCE Cerberus ftp server by February 20, 2026. This will be accomplished by team members completing the official scoring spreadsheet provided by ASCE for the competition. Members must also ensure that these documents have been reviewed and completed with accuracy before submission.

2.7.1.4 Task 7.1.4: Phase 1B Electronic Files

The purpose of this task is to upload the final responses and other Phase 1B Files to the ASCE Cerberus ftp server by February 20, 2026. This will be accomplished by ensuring that these documents have been reviewed and completed with accuracy before submission.

2.7.1.5 Task 7.1.5: Electronic File Phase 2 Presentation

The purpose of this task is to prepare and record a presentation with visual aid to submit it to ASCE's Cerberus server by March 6, 2026. This will be accomplished by practicing the presentation to ensure that all the required information is included and accurate prior to the final recording.

2.7.1.6 Task 7.1.6: Change Orders and Final Submittals

The purpose of this task is to submit any necessary change orders to the final design. This will be accomplished by uploading all change orders and final submittals to ASCE's Cerberus server 7 calendar days prior to the competition build day.

2.7.1.7 Task 7.1.7: Phase 3 Electronic File

The purpose of this task is to upload the visual aid, construction drawings, and final report before the build day of the student symposium competition. This will be accomplished by uploading these documents to the ASCE Cerberus server.

2.7.2 Task 7.2: Capstone Deliverables

2.7.2.1 Task 7.2.1: 30% Deliverable

The purpose of this task is to generate a draft of the final design and report for feedback from instructors. This will be accomplished by compiling all work completed up to the 30% stage, submitting it to the grading instructor (GI), and using feedback to improve future deliverables. This deliverable will include work from all tasks up to Task 3.4: Shear Wall Design.

2.7.2.2 Task 7.2.2: 60% Deliverable

The purpose of this task is to generate an improved draft of the final design and report for feedback from instructors. This will be accomplished by using feedback from the 30% deliverable to improve the 60% report and by including additional work completed up to the 60% point. This deliverable will include work from all tasks up to Task 3.5: Uplift Connection Design.

2.7.2.3 Task 7.2.3: 90% Deliverable

The purpose of this task is to generate an improved draft of the final design and report for feedback from instructors. This will be accomplished by using feedback from the 60% deliverable to improve the 90% report and by including additional work completed up to the 90% point. This deliverable will include work from all tasks up to Task 4.4: Transportation Preparation, as well as work from Task 6.2: Triple Bottom Line Assessment.

2.7.2.4 Task 7.2.4: Final Presentation

The purpose of this task is to present the entire project clearly and concisely to an audience of capstone instructors and NAU students. This will be accomplished by compiling information from the competition report and results into a PowerPoint for delivery to the department. Topics shall include the general process of project completion and the results.

2.7.2.5 Task 7.2.5: Final Report and Website

The purpose of this task is to finalize the capstone report. This will be accomplished by incorporating all new work, competition results, and GI feedback. This task also includes finalizing the website which shows the project process from the final proposal to the final report and results.

2.8 Task 8: Project Management

2.8.1 Task 8.1: Team Coordination

The purpose of this task is to ensure efficient and professional teamwork. This will be accomplished by following the list below. The items listed below make up the foundation of the team's project management responsibilities. These represent the five largest tasks associated with project management, though the team's duties are not limited to these alone.

- **Meetings** – Set weekly meetings for design/prefabrication updates and biweekly progress checks with advisors. At least four meetings need to occur with the Technical Advisor. The Grading instructor and client require a minimum of one meeting each.

• **Roles & Responsibilities** – Assign clear duties (e.g. Team Captain, Safety Officer, Logistics Lead, Documentation Lead, Structural Lead, Project Manager, etc.).

• **Communication Tools** – Plan and implement the use of shared drives, group chats, shared calendars, and task trackers to organize project file and document communications.

• **Funding Management** – Track use of the budget, and sponsorship contributions. Teams must track resources even if not analyzing costs in the report.

• **Space & Equipment** – Reserve time at the Farm, ensure transport, and allocate tools to specific phases. Phases are listed out in Task 2.5.

2.8.2 Task 8.2: Outreach & Volunteers

The purpose of this task is to recruit help for the project and provide opportunities to gain experience to aspiring engineers. This will be accomplished by following the list below.

• **Sponsor Coordination** – Maintain regular contact with partners to keep them updated and engaged; sponsors are also a valuable source for feedback and expertise.

• **Volunteer Recruitment** – Recruit at least one freshman or sophomore student volunteer for assistance with logistics, pre-competition construction, documentation, or transportation. Recruit underclassmen through NAU Civil Engineering classes or NAU's ASCE Student Chapter.

2.8.3 Task 8.3: Safety Oversight & Training

The purpose of this task is to ensure safety during all construction activities. This will be accomplished by following the list below.

• **Required Certifications** – Ensure all builders complete ladder safety training and upload certificates.

• **PPE & Site Rules** – Monitor use of hard hats, glasses, gloves, and boundary compliance during all construction activities. In addition, the team will be required to submit a lab safety form to a faculty advisor for approval. This will allow the team to begin construction and the prefabrication process.

• **Plan for Emergency** – Establish an emergency plan for construction accidents or other injuries which may occur at the Farm. A designated Safety Officer must always be present.

2.8.4 Task 8.4: Quality Control & Compliance

2.8.4.1 Task 8.4.1: Mock Inspections

The purpose of this task is to prepare for competition. This will be accomplished by inspecting the practice build structures to verify dimensional accuracy, structural stability, and rule compliance. The team will make changes to the build process to maximize scoring during mock inspections and later competition.

2.8.4.2 Task 8.4.2: Drawings & Rules Review

The purpose of this task is to ensure excellent quality submittals. This will be accomplished by double-checking construction documents against Timber-Strong rules before submission, as well as standard QC procedures such as spell check and checking calculations.

2.8.4.3 Task 8.4.3: Pre-Competition Structural Audit

The purpose of this task is to ensure competition readiness. This will be accomplished by inspecting prefabricated components and fastener patterns to ensure ease of inspection and compliance with Competition Rules. In competition, connections and fasteners must be visible for the judges to proceed with inspections and grading.

2.9 Exclusions

Per the Competition Rules, snow and seismic design are excluded from this scope. Anchor bolt selection and installation is also excluded from this scope; see Task 3.6 for scope regarding anchor bolts.

Sky High Structures is not responsible for any construction activities beyond what is required by the Competition Rules. Sky High Structures is not responsible or liable for installation of the structure during the repurposing phase.

3.0 Schedule

As scheduled, the project will have a total duration of 176 days, beginning on September 02, 2025, with an end date of May 05, 2026. A Gantt Chart was created in Microsoft Project to graphically depict the project timeline (see Appendix A: Gantt Chart). Each major task identified in the above Scope was assigned a duration and dependencies to automatically generate a project schedule and critical path. The critical path is comprised primarily of Task 2, Task 3, and Task 4, which are the design and prefabrication tasks; the final major portion of the critical path is comprised of Capstone deliverables. In the Gantt Chart, deliverables have been formatted as milestones, and these include a mix of Timber-Strong Competition deliverables and CENE486 Capstone deliverables. Task 8: Project Management is an ongoing task which runs from the project start date to the project finish date. All major tasks and deliverables are outlined in the bulleted lists below.

Major Tasks

- **Task 1: Research**
    - 11 Days: 9/02/2025 – 9/16/2025
- **Task 2: Design Selection**
    - 24 Days: 9/2/2025 – 10/3/2025
- **Task 3: Final Structural Analysis & Design**
    - 85 Days: 10/6/2025 – 1/30/2025
- **Task 4: Pre-Competition Construction**
    - 52 Days: 2/2/2025 – 4/14/2026
- **Task 5: Competition Construction**
    - 2 Day: 4/16/2026 – 4/17/2025
- **Task 6: Impact Assessment**
    - 14 Days: 2/2/2025 – 2/19/2025
- **Task 7: Deliverables**
    - 133 Days: 11/03/2025 – 5/06/2026
- **Task 8: Project Management**
    - 176 Days: 9/02/2025 – 5/05/2026

Deliverables

- **Competition Deliverables**
    - Intent & Eligibility: 11/03/2025
    - Ladder Safety: 2/01/2025
    - Phase 1A: 2/20/2026
    - Phase 1B: 2/20/2026
    - Phase 2 Presentation: 3/06/2026
    - Change Orders & Submittals: 4/09/2026
    - Phase 3: 4/15/2026

- **Capstone Deliverables**
    - 30% Report: 2/10/2026
    - 60% Report: 3/17/2026
    - 90% Report: 4/16/2026
    - Final Presentation: 4/24/2026
    - Final Report & Website: 5/06/2026

Critical Path

The critical path in the schedule shows the longest sequence of finish-to-start tasks which must be completed on time to ensure that the project is finished within the 177-day timeline. It is evident that final design selection and analysis should be completed according to schedule to ensure that competition calculations and mock assembly and practice are completed in time before the competition. Sky High Structures intends to maintain the timing and duration of all critical path items by communicating frequently regarding deadlines and by meeting at least once per week to update members on individual and group progress regarding project tasks. These meetings will also be used to delegate tasks to team members or sub-groups depending on individual strengths and interests. The team will regularly check the schedule and set internal due dates to ensure that tasks are being completed on time and will make updates to the schedule as necessary.

4.0 Staffing Plan

The following list provides all staff positions of Sky High Structures and their associated abbreviations. The qualifications for each staff position are listed within each bullet point below. An abstract of each position's completed hours for project tasks is displayed below in Table 4: Sky High Structures Staffing Matrix, with a full record of completed hours included in

Appendix B: Sky High Structures Staffing Matrix.

- **SUP: Superintendent**

  The Superintendent has an extensive background in framing, contracting, site management, and construction processes. The Superintendent also has strong skills in plan reading and interpretation, as well as personnel management. They oversee and coordinate all construction activities and directly oversee the Construction Intern.

- **SPM: Senior Project Manager**

  The Senior Project Manager has a PE License (Professional Engineering License), 5 years of experience as a PE and 13 total years of combined experience and education in the engineering field. The Senior Project Manager performs little design work; instead, they supervise the design team, conduct tasks related to QC (Quality Control) and plan review, and mentor the Project Engineer.

- **PrE: Project Engineer**

  The Project Engineer has a PE license and 8 total years of combined experience or education in the engineering field. This person performs a majority of the design work and delegates tasks to the Engineer in Training with supervision. They have a high degree of experience with the design of all components and systems of typical light-frame wood structures.

- **EIT: Engineer in Training**

  The Engineer in Training has obtained their EIT certification. The EIT also has a bachelor's degree from an ABET accredited university. They have 4 years of engineering experience. The EIT also has basic knowledge of structural principles from university or previous internship experience.

- **HSS: Health & Safety Specialist**

  The Health & Safety Specialist ensures that all applicable safety codes and procedures are followed on the jobsite. The HSS oversees scheduling and supervising the Ladder Safety Training for all employees and enforces guidelines that were provided in this training. The HSS also ensures that proper PPE (Personal Protective Equipment) is worn at all times on the job site. The HSS also supervises all prefabrication and competition construction activities.

- **INT: Construction Intern**

  The Construction Intern has a basic understanding of the construction process, as well as typical tools and terminology used on the job site. They can lift at least 80 lbs to their chest and have fulfilled all safety trainings provided by the Health & Safety Specialist.

Table 4: Sky High Structures Staffing Matrix

Task /Subtasks	Job Position / Title						Total Hours
	SPM	SUP	PrE	HSS	EIT	INT	
Task 1: Research	2	0	4	3	8	0	17
Task 2: Design Selection	2	3	6	0	8	0	19
Task 3: Final Structural Analysis & Design	5	0	54	0	76	0	135
Task 4: Pre-Competition Construction Phase	0	39	12	33	36	36	156
Task 5: Competition Construction Process	0	5	5	5	5	5	25
Task 6: Impact Assessment	2	0	4	0	6	0	12
Task 7: Deliverables	11	10	32	6	30	3	92
Task 8: Project Management	34	26	52	26	42	42	222
Total Hours	56	83	169	73	211	86	678

5.0 Cost of Engineering Services

Sky High Structures has prepared an estimate for the total cost of engineering services for the proposed project shown in Table 5: Cost of Services, below. The table summarizes estimated billable hours for each staff member, billable rates, and total cost. Additional detail regarding personnel hours by task is provided in the Staffing Matrix in

Appendix B: Sky High Structures Staffing Matrix. Table 5: Cost of Services also includes other line items and associated cost, including travel, lab use, and materials. Travel costs cover vehicle rental, mileage, hotel, and per diem. Lab use includes the use of the field station as well as wear and tear on equipment and tools. Materials focus on the components needed to build the two-story wood light framed building. Donated materials such as tie connectors are estimated to be around $250 with contribution of sponsors such as Simpson Strong-Tie.

Table 5: Cost of Services

Category	Description	Quantity	Unit	Price Per	Cost
Personnel	Senior Project Manager	56	Hr	$220	$12,320
	Project Engineer	169	Hr	$165	$27,885
	Superintendent	83	Hr	$200	$16,600
	Safety Officer	73	Hr	$80	$5,840
	Engineer in Training	211	Hr	$85	$17,935
	Construction Intern	86	Hr	$60	$5,160
	Subtotal Personnel				**$85,740**
Travel	Rental Van	5	Days	$74	$368
	Driving Mileage	500	Miles	$0.41	$205
	Per Diem	20	People-Day	$60	$1,200
	Hotel Room	16	Room-Night	$300	$4,800
	Subtotal Travel				**$6,573**
Lab Use	"The Farm" Field Station	14	Days	$100	$1,400
	Subtotal Lab Use				**$1,400**
Materials	Lumber	400	Linear Feet	$0.75	$300
	4x8 OSB Sheet	30	EA	$15	$460
	Fasteners and Hardware	1	Lump Sum	$300	$300
	Paint	10	Gal	$10	$100
	Primer	10	Gal	$20	$200
	Subtotal Material Cost				**$1,360**
				Total Cost of Engineering Services	**$95,072**

6.0 References

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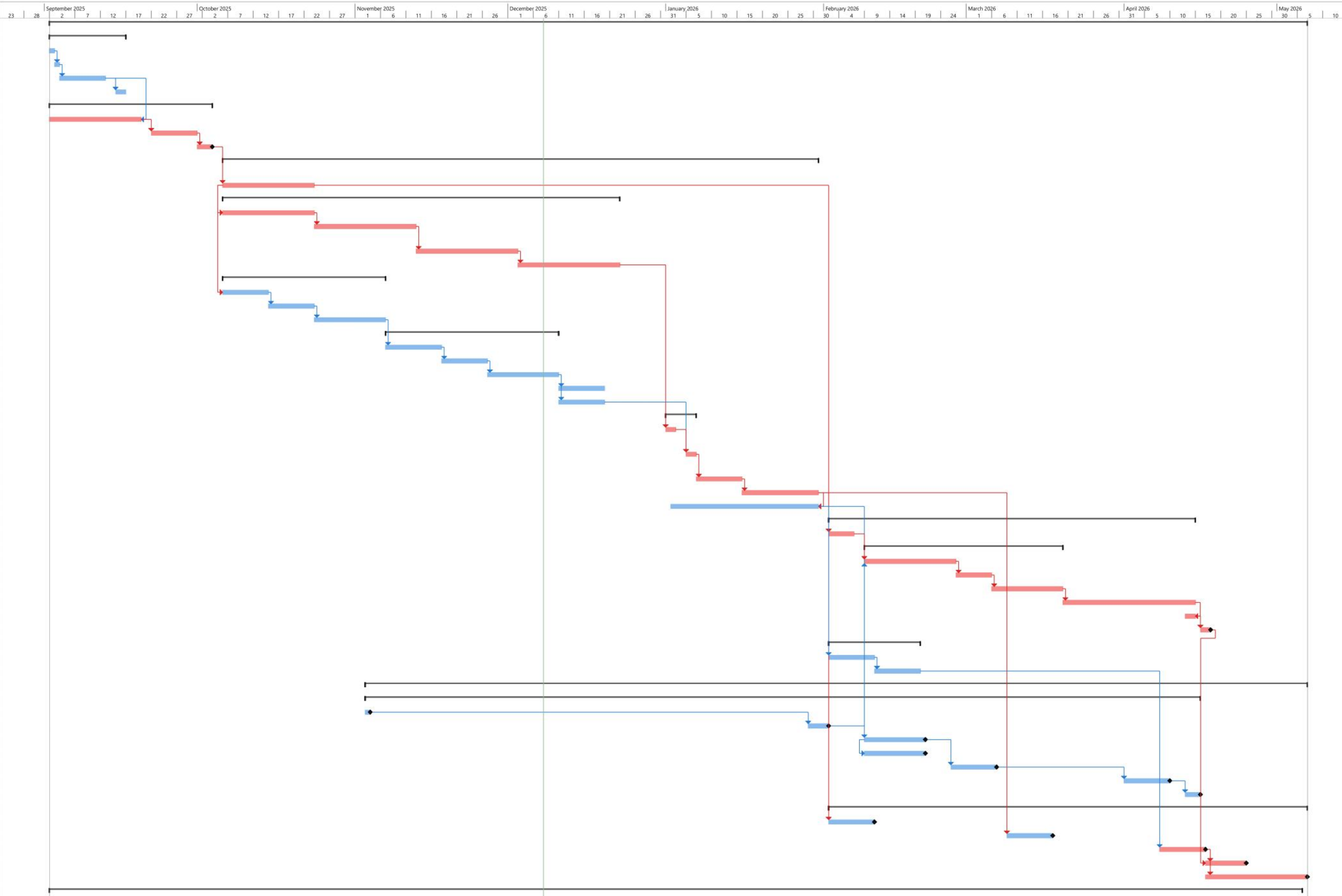
Appendices

Appendix A: Gantt Chart

Displayed fully on the following page

ID	Task Name	Duration	Predece	Scheduled Start	Scheduled Finish
1	**Timber Strong Design-Build**	**177 day**		**Tue 9/2/25**	**Wed 5/6/26**
2	**Task 1: Research**	**11 days**		**Tue 9/2/25**	**Tue 9/16/25**
3	1.1 Past Comp. Teams	1 day		Tue 9/2/25	Tue 9/2/25
4	1.2 Comp. Rules	1 day	3	Wed 9/3/25	Wed 9/3/25
5	1.3 Structural Systems	7 days	4	Thu 9/4/25	Fri 9/12/25
6	1.4 Material Availability	2 days	5	Mon 9/15/25	Tue 9/16/25
7	**Task 2: Design Selection**	**24 days**		**Tue 9/2/25**	**Fri 10/3/25**
8	2.1 Structural Systems	14 days	5FF	Tue 9/2/25	Fri 9/19/25
9	2.2 Viable Design Options	7 days	8	Mon 9/22/25	Tue 9/30/25
10	2.3 Select Design	3 days	9	Wed 10/1/25	Fri 10/3/25
11	**Task 3: Final Struct. Analysis & Design**	**85 days**		**Mon 10/6/25**	**Fri 1/30/26**
12	**3.1 Framing Plan**	14 days	10	Mon 10/6/25	Thu 10/23/25
13	**3.2 Gravity Design**	**56 days**		**Mon 10/6/25**	**Mon 12/22/25**
14	3.2.1 Roof Design	14 days	12SS	Mon 10/6/25	Thu 10/23/25
15	3.2.2 2nd Floor Bearing Wall	14 days	14	Fri 10/24/25	Wed 11/12/25
16	3.2.3 2nd Floor Design	14 days	15	Thu 11/13/25	Tue 12/2/25
17	3.2.4 1st Floor Bearing Wall	14 days	16	Wed 12/3/25	Mon 12/22/25
18	**3.3 Diaphragm Design**	**24 days**		**Mon 10/6/25**	**Thu 11/6/25**
19	3.3.1 Diaphragm Forces	7 days	12SS	Mon 10/6/25	Tue 10/14/25
20	3.3.2 Diaphragm Parameters	7 days	19	Wed 10/15/25	Thu 10/23/25
21	3.3.3 Connection Design	10 days	20	Fri 10/24/25	Thu 11/6/25
22	**3.4 Shear Wall Design**	**24 days**		**Fri 11/7/25**	**Wed 12/10/25**
23	3.4.1 Shear Wall Forces	7 days	21	Fri 11/7/25	Mon 11/17/25
24	3.4.2 Shear Wall Paramaters	7 days	23	Tue 11/18/25	Wed 11/26/25
25	3.4.3 Connection Design	10 days	24	Thu 11/27/25	Wed 12/10/25
26	**3.5 Uplift Connection Design**	7 days	25	Thu 12/11/25	Fri 12/19/25
27	**3.6 Tiedown & Anchor Design**	7 days	25	Thu 12/11/25	Fri 12/19/25
28	**3.7 Cantilever Beam Design**	**4 days**		**Thu 1/1/26**	**Tue 1/6/26**
29	3.7.1 Beam Member Selection	2 days	17FS+7 days	Thu 1/1/26	Fri 1/2/26
30	3.7.2 Overturning Stability Check	2 days	29,27	Mon 1/5/26	Tue 1/6/26
31	**3.8 Final Calculation Packet**	7 days	30	Wed 1/7/26	Thu 1/15/26
32	**3.9 Final Structural Drawings**	11 days	31	Fri 1/16/26	Fri 1/30/26
33	**3.10 BIM Model**	21 days	32FF	Fri 1/2/26	Fri 1/30/26
34	**Task 4: Pre-Comp. Construction**	**52 days**		**Mon 2/2/26**	**Tue 4/14/26**
35	**4.1 Material Procurement**	5 days	32	Mon 2/2/26	Fri 2/6/26
36	**4.2 Prefabrication**	**29 days**		**Mon 2/9/26**	**Thu 3/19/26**
37	4.2.1 Wall Panel	14 days	35,49	Mon 2/9/26	Thu 2/26/26
38	4.2.2 Floor Panel	5 days	37	Fri 2/27/26	Thu 3/5/26
39	4.2.3 Roof Assembly	10 days	38	Fri 3/6/26	Thu 3/19/26
40	**4.3 Mock Assembly & Practice**	18 days	39	Fri 3/20/26	Tue 4/14/26
41	**4.4 Transportation Prep**	2 days	40FF	Mon 4/13/26	Tue 4/14/26
42	**Task 5: Competition**	2 days	41	Thu 4/16/26	Fri 4/17/26
43	**Task 6: Impact Assessment**	**14 days**		**Mon 2/2/26**	**Thu 2/19/26**
44	**6.1 Carbon Footprint**	7 days	33	Mon 2/2/26	Tue 2/10/26
45	**6.2 Triple Bottom Line**	7 days	44	Wed 2/11/26	Thu 2/19/26
46	**Task 7: Deliverables**	**133 day**		**Mon 11/3/25**	**Wed 5/6/26**
47	**7.1 Competition Deliverables**	**118 day**		**Mon 11/3/25**	**Wed 4/15/26**
48	7.1.1 Intent & Eligibility	1 day		Mon 11/3/25	Mon 11/3/25
49	7.1.2 Ladder Safety	2 days	48	Thu 1/29/26	Sun 2/1/26
50	7.1.3 Phase 1A	10 days	33	Mon 2/9/26	Fri 2/20/26
51	7.1.4 Phase 1B	10 days	50SS	Mon 2/9/26	Fri 2/20/26
52	7.1.5 Phase 2 Presentation	7 days	50	Thu 2/26/26	Fri 3/6/26
53	7.1.6 Change Orders & Final Su	7 days	52	Wed 4/1/26	Thu 4/9/26
54	7.1.7 Phase 3	3 days	53	Mon 4/13/26	Wed 4/15/26
55	**7.2 Capstone Deliverables**	**68 days**		**Mon 2/2/26**	**Wed 5/6/26**
56	7.2.1 30%	7 days	12	Mon 2/2/26	Tue 2/10/26
57	7.2.2 60%	7 days	32	Mon 3/9/26	Tue 3/17/26
58	7.2.3 90%	7 days	45	Wed 4/8/26	Thu 4/16/26
59	7.2.4 Final Presentation	6 days	58,42	Fri 4/17/26	Fri 4/24/26
60	7.2.5 Final Report & Website	14 days	58	Fri 4/17/26	Wed 5/6/26
61	**Task 8: Project Management**	**176 day**		**Tue 9/2/25**	**Tue 5/5/26**



Project: Timber-Strong Scope S
Date: Mon 12/8/25

Task, Split, Milestone, Summary, Project Summary, Inactive Task, Inactive Milestone, Inactive Summary, Manual Task, Duration-only, Manual Summary Rollup, Manual Summary, Start-only, Finish-only, External Tasks, External Milestone, Deadline, Critical, Critical Split, Progress, Manual Progress

Appendix B: Sky High Structures Staffing Matrix

Task /Subtasks	Job Position / Title						Total Hours
	SPM	SUP	PrE	HSS	EIT	INT	
Task 1: Research	**2**	**0**	**4**	**3**	**8**	**0**	**17**
1.1: Past Competition Teams	1	0	1	0	1	0	3
1.2: Competition Rules	1	0	3	3	1	0	8
1.3: Structural Systems	0	0	0	0	5	0	5
1.4: Material Availability	0	0	0	0	1	0	1
Task 2: Design Selection	**2**	**3**	**6**	**0**	**8**	**0**	**19**
2.1: Brainstorm Structural Systems	0	1	2	0	3	0	6
2.2: Viable Design Options	1	1	2	0	2	0	6
2.3: Select Design	1	1	2	0	3	0	7
Task 3: Final Structural Analysis & Design	**5**	**0**	**54**	**0**	**76**	**0**	**135**
3.1: Draft Framing Plan	0	0	2	0	2	0	4
3.2: Gravity Design	0	0	8	0	21	0	29
3.2.1: Roof Design	0	0	2	0	4	0	6
3.2.1: Second Floor Bearing Wall Design	0	0	2	0	6	0	8
3.2.3: Second Floor Design	0	0	2	0	6	0	8
3.2.4: First Floor Bearing Wall Design	0	0	2	0	5	0	7
3.3: Diaphragm Design	0	0	10	0	5	0	15
3.3.1: Calculate Diaphragm Forces	0	0	4	0	2	0	6
3.3.2: Select Diaphragm	0	0	2	0	1	0	3
3.3.3: Diaphragm Connection Design	0	0	4	0	2	0	6
3.4: Shear Wall Design	0	0	12	0	10	0	22
3.4.1: Shear Wall Forces	0	0	4	0	4	0	8
3.4.2: Shear Wall Parameters	0	0	4	0	4	0	8
3.4.3: Shear Wall Connection Design	0	0	4	0	2	0	6
3.5: Uplift Connection Design	1	0	3	0	6	0	10
3.6: Tiedown and Anchor Deisgn	1	0	3	0	6	0	10
3.7: Cantilever Beam Design	0	0	2	0	4	0	6
3.7.1: Beam Member Selection	0	0	1	0	2	0	3
3.7.2: Overturning Stability Check	0	0	1	0	2	0	3
3.8: Final Calculation Packet	1	0	6	0	8	0	15
3.9: Final Structural Drawings	1	0	4	0	6	0	11
3.10: Building Information Model	1	0	4	0	8	0	13
Task 4: Pre-Competition Construction Phase	**0**	**39**	**12**	**33**	**36**	**36**	**156**
4.1: Material Procurment Phase	0	6	3	0	3	3	15
4.2: Prefabrication Phase	0	24	0	24	24	24	96

4.2.1: Wall Panel Prefab	0	15	0	15	15	15	60
4.2.2: Floor Panel Prefab	0	3	0	3	3	3	12
4.2.3: Roof Assembly Prefab	0	6	0	6	6	6	24
4.3: Mock Assembly & Practice	0	7	7	7	7	7	35
4.4: Transporation Preparation	0	2	2	2	2	2	10
Task 5: Competition Construction Process	**0**	**5**	**5**	**5**	**5**	**5**	**25**
5.1: 90-Minute Competition Construction	0	3	3	3	3	3	15
5.2: Deconstruction Phase	0	2	2	2	2	2	10
Task 6: Impact Assessment	**2**	**0**	**4**	**0**	**6**	**0**	**12**
6.1: Carbon Footprint Calculation	1	0	2	0	3	0	6
6.2: Triple Bottom Line Assessment	1	0	2	0	3	0	6
Task 7: Deliverables	**11**	**10**	**32**	**6**	**30**	**3**	**92**
7.1: Competition Deliverables	6	6	17	1	10	1	41
7.1.1: Intent & Eligibility Form	0	0	0	0	1	0	1
7.1.2: Ladder Safety Training	1	1	1	1	1	1	6
7.1.3: Phase 1A	1	0	4	0	4	0	9
7.1.4: Phase 1B	1	0	4	0	4	0	9
7.1.5: Phase 2 Presentation	1	2	2	0	0	0	5
7.1.6: Change Orders & Final Submittals	1	2	5	0	0	0	8
7.1.7: Phase 3 Electronic File	1	1	1	0	0	0	3
7.2: Capstone Deliverables	5	4	15	5	20	2	51
7.2.1: 30% Deliverable	1	0	3	1	4	0	9
7.2.2: 60% Deliverable	1	0	3	1	4	0	9
7.2.3: 90% Deliverable	1	0	3	1	4	0	9
7.2.4: Final Presentation	1	2	3	1	4	1	12
7.2.5: Final Report & Website	1	2	3	1	4	1	12
Task 8: Project Management	**34**	**26**	**52**	**26**	**42**	**42**	**222**
8.1: Team Coordination	10	10	36	10	36	36	138
8.2: Outreach & Volunteers	3	3	3	0	0	0	9
8.3: Safety Oversight & Training	3	3	3	10	3	3	25
8.4: Quality Control & Compliance	18	10	10	6	3	3	50
8.4.1: Mock Inspections	3	3	3	3	3	3	18
8.4.2: Drawings & Rules Review	12	4	4	2	0	0	22
8.4.3: Pre-Competition Structural Audit	3	3	3	1	0	0	10
Total Hours	**SPM**	**SUP**	**PrE**	**HSS**	**EIT**	**INT**	**TOTAL**
	56	**83**	**169**	**73**	**211**	**86**	**678**