University of New Hampshire
Precision Racing Team

UNH Precision Racing Team 2025

SAE INTERNATIONAL

Abstract

UNH PRECISION RACING IS A STUDENT-PROJECT ORGANIZATION DEDICATED TO FOSTERING THE DEVELOPMENT OF YOUNG ENGINEERS THROUGH THE FORMULA SAE (FSAE) COMPETITION SERIES. THE FSAE PROGRAM EXPOSES STUDENTS TO ENGINEERING OUTSIDE THE CLASSROOM, INCLUDING DESIGNING, MANUFACTURING, PROJECT MANAGING, AND COMMUNICATING WITH THE WIDER COMMUNITY

College of Engineering and Physical Sciences

Mechanical Engineering Department

Team Members
Frame: Colin Gates, Matt McMahon, Matt Pelletier
Suspension: Robin Cottrill, Kristian Lane, Anthony Marchioni
Underclassmen: Matt McCoy, Jonathan Dean, Sam Harms
Faculty Advisors: Juan Carlos Cuevas Bautista, Elvis Marin

Future Outlook

As UNH Precision Racing continues its development of this two-year Formula SAE race car, our focus will shift towards refining key performance systems in preparation for the 2026 competition. Having established a strong foundation through frame and suspension improvements this year, the next phase will concentrate on control systems, powertrain optimization, electrical integration, and aerodynamic advancements.

Frame

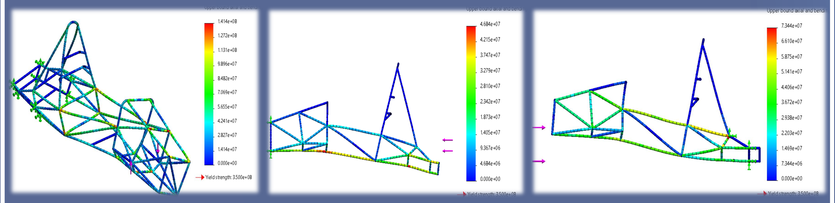
Design Goals

- Meet all structural qualifications outlined by the SAE structural equivalency sheet
- Minimize total frame weight under 35kg
- Reconfigure the frame to mount the suspension to the front roll hoop
- Create sufficient space in the engine bay to allow improved mounting positions

Iteration Process

- Made changes based off weak spots and other sub teams needs

Iteration Number	Weight (kg)	Torsional Stress (MPa)	Torsional FOS	Front Impact Stress (MPa)	Front Impact FOS	Rear Impact Stress (MPa)	Rear Impact FOS
1	36.7	154	2.27	369	0.95	192	1.82
2	37.7	146	2.39	389	0.89	202	1.73
3	37.9	206	1.69	98	3.57	57	6.06
4	34.3	158	2.22	99	3.51	66	5.31
5	33.6	155	2.26	98	3.57	64	5.43
6	33.8	159	2.19	130	2.68	64	5.45
7	33.7	147	2.38	63	5.56	244	1.43
FINAL	32.4	141	2.48	73	4.77	47	7.5

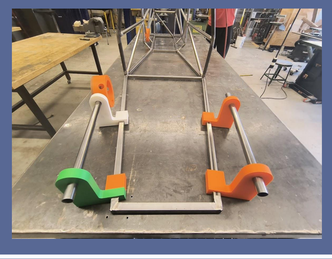


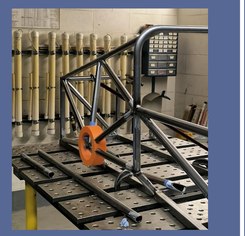
New Design

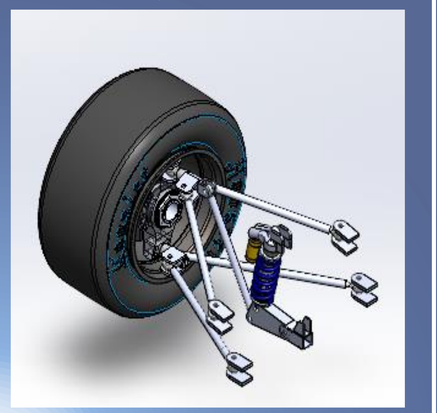
- Final Weight = 32.4 kg (previous design weight = 39.5kg)
- Final Length = 105.5 inches (previous design length = 92.2 inches)
- Final Width = 26.6 inches (previous design width = 26.5 inches)
- One central node in the front instead of two in the current design
- Extended engine box in back to accommodate new, bigger engine
- Allows room for rear exit exhaust, as opposed to forward-facing side exit on current car

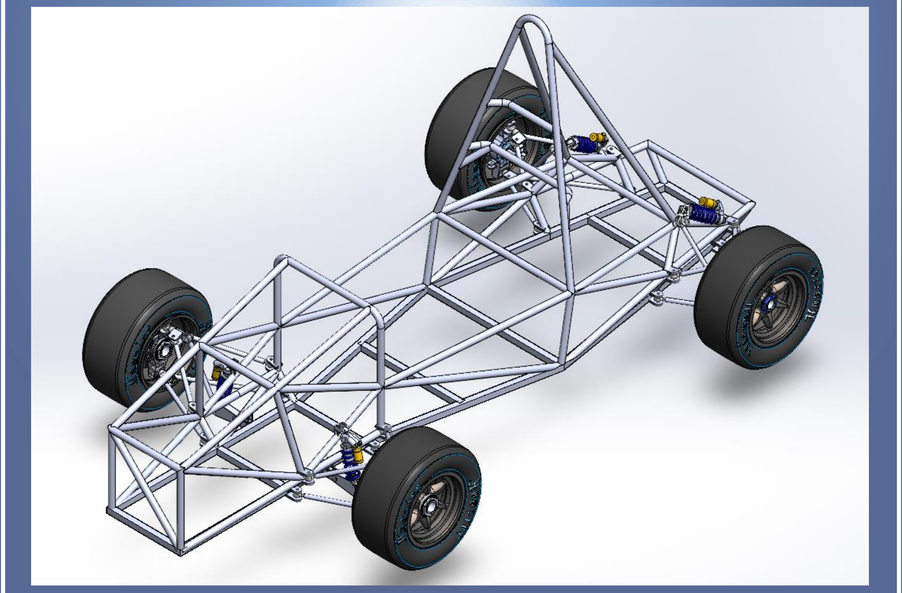
Manufacturing

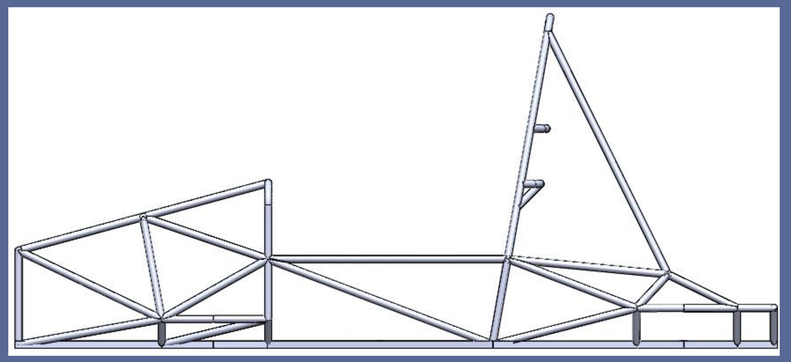
- Cut list made for each tube
- Tube end cutting guides made for better cutting accuracy
- Each tube is manufactured and welded in Kingsbury S171
- 3D modeled jigging equipment made to ensure efficient fitting in large node junctions











Suspension

Design Criteria and Goals

- Minimum wheel travel of 50mm in either direction
- All mounting points must be visible
- Rod ends must be mounted in double sheer or are captured by screw/bolt head or washer with and outside diameter larger than the bearing housing
- Feet
- A polished design that can be easily adjusted

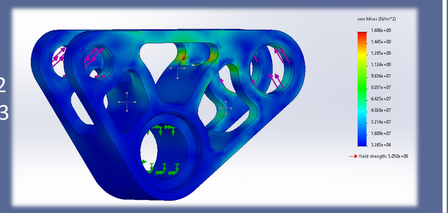
Geometry

- Used parameterized models to design, test, and optimize suspension geometry

Final Suspension Geometry	Front	Rear
Wheelbase (mm)	1640	----------
Trackwidth (mm)	1260	1260
Static Toe (deg)	0.3	-0.3
Static Camber(deg)	-3	0
Caster (deg)	5.7	6.3
KPI (deg)	9.5	9.5
Scrub Radius (mm)	25	25
Steering Ratio	6	----------
Roll Center Height (mm)	75	100
Avg. Toe Gain in Heave (deg/mm)	0.003	0.07

Modeling and Testing

- SolidWorks, Optimum Kinematics
- Bell Crank Motion Ratio (rear) = 1.12
- Bell Crank Motion Ratio (front) = 1.03
- Bell Crank Factor of Safety = 3.1
- Upright Factor of Safety = 23



Manufacturing

- Conducted in the Olsen Center, student shops, and machine shop
- Cut list and tube ending cutting guides made for each tube to ensure accuracy
- Water Jet used to cut out all attachments
- Uprights made with 5 Axis CNC Machine