



Company Information

Company Name	<i>Caterpillar, Inc</i>	Date Submitted	<i>10/28/2024</i>
Project Title	<i>Design of a SWL Adjustable Shipping Brace (CAT_BRACE)</i>	Planned Starting Semester	<i>Spring 2025</i>

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	5	Electrical	
Computer		Systems	0-1

Company and Project Overview:

Caterpillar is the world's leading manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines and diesel-electric locomotives. We are a leader and proudly have the largest global presence in the industries we serve. For more than 90 years, Caterpillar Inc. has been making sustainable progress possible and driving positive change on every continent. Customers turn to Caterpillar to help them develop infrastructure, energy and natural resource assets.



This project will be with the Clayton (NC) Machine Development Center (CMDC), where more than 200 engineers, prototype technicians and expert operators work to design, build and test machines in one location. The CMDC has dedicated 150 acres for machine development and features a half-mile, high-speed machine track, 10 test and demonstration areas and seven machine operation areas to prove machine reliability and durability. The Clayton facility manufactures small wheel loaders and serves as a product distribution center for backhoe loaders. This project will be associated with inertial measurement units that are used on Caterpillar products.

Project Requirements:

Design a method to allow Model 93X small wheel loader machines to ship safely and without damage by flat rack method in two different height configurations (flat rack = 1x tall, super rack = 1.5X tall). The design must meet the following requirements.

Requirements:

- Two machines must fit on a single flat rack, one with linkage on the ground and one linkage in the air
- The raised linkage must be supported – withstand [provided by Cat] force (weight of linkage and commanded lower)
- Solution must be flexible to keep lift arms at current height and 4 inches lower (super rack)
- Must be able to be installed/removed at a port (35 lb limit for one person)
- Can be disposable if lower cost but strongly prefer a reusable design
- Cost target - TBD
- Machines need to be free of damage from installation and removal
- Solution must travel with the machine from the factory (in the cab, attached to the machine, etc)
- Solution must include a safety measure to ensure the linkage does not lower accidentally
- Tool-free installation and removal preferred, simple tools will be allowed
- Youtube video of a crane unloading flat rack SWLs:



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- <https://www.youtube.com/watch?v=PfoHosalaa0>





Expected Deliverables/Results:

- Listed in Requirements, above

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- Project is Mechanical Engineering intense, but an automated solution could be considered if the team desires, so ME's with some electrical or controls background would be useful for this project.