

# Team 14: Nucraft Racking System

Team members: Tyler Stassines, Dugan O'Donnell, Brooke Becker, and Daniel Johnston

## Objective

Nucraft Furniture has requested help to redesign its outdated racking system used for handling conference tabletops during sanding, painting, and inspection. The design must improve operator safety, enhance mobility, reduce setup time, and allow full surface access during finishing processes.

## Background

Nucraft uses the racking system to hold and orient large conference table tops as the final sanding, painting, and inspection is completed. The previous system presented several challenges, including safety hazards, inefficient setup and breakdown procedures, overspray buildup, and poor ergonomics.

## Key Specifications

- Support a static load of 300 lbs without structural failure.
- Maximum 50 lb force required to transport the rack.
- Accommodate all table sizes ranging from 60-120 in long and 20-60 in wide.
- Allow racked tables to rotate at least 70 degrees along longitudinal axis.
- Withstand ambient temperature of up to 114°F while maintaining functionality.

## Function Structure Diagram

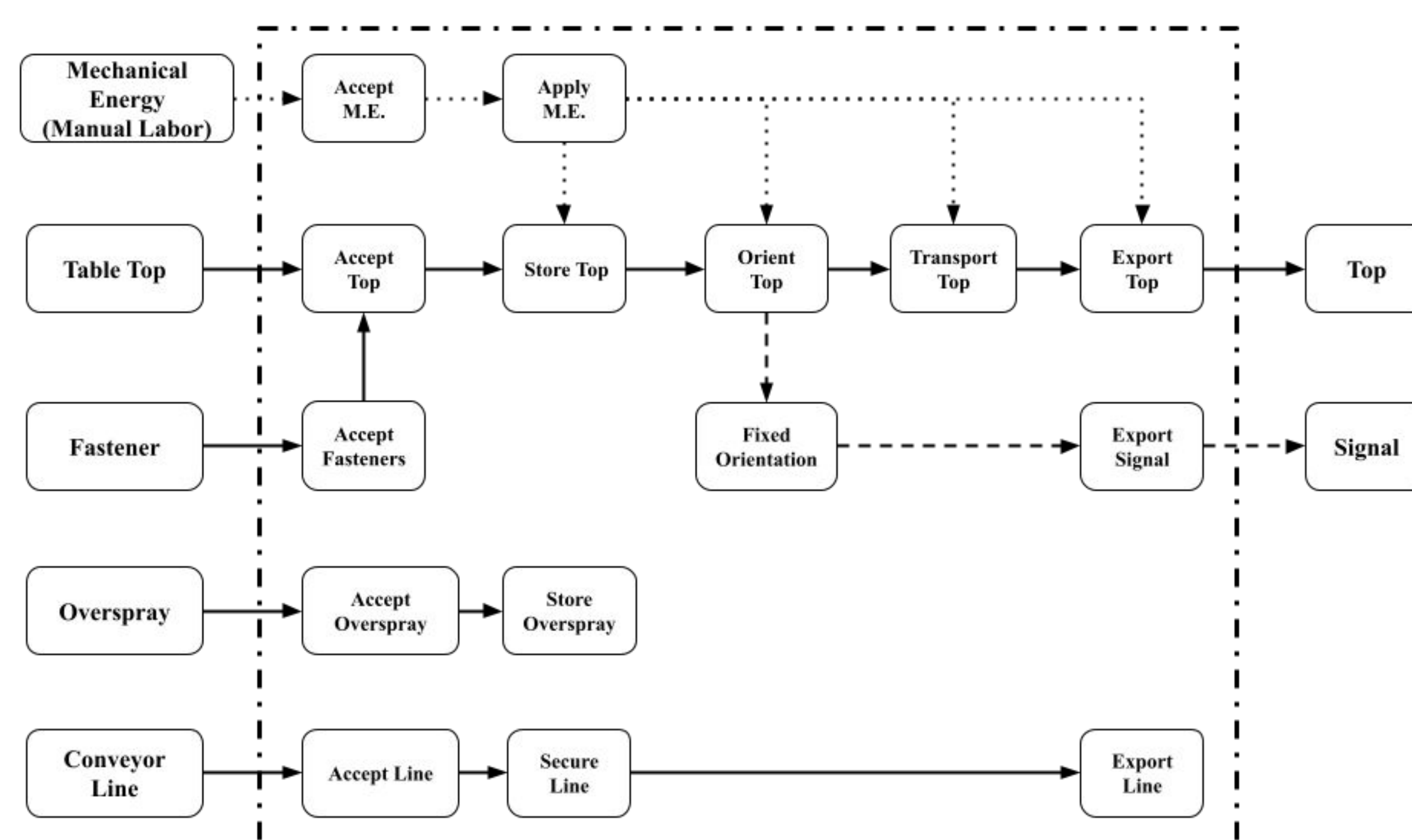


Figure 1. Conference table rack function structure diagram.

## FINAL DESIGN

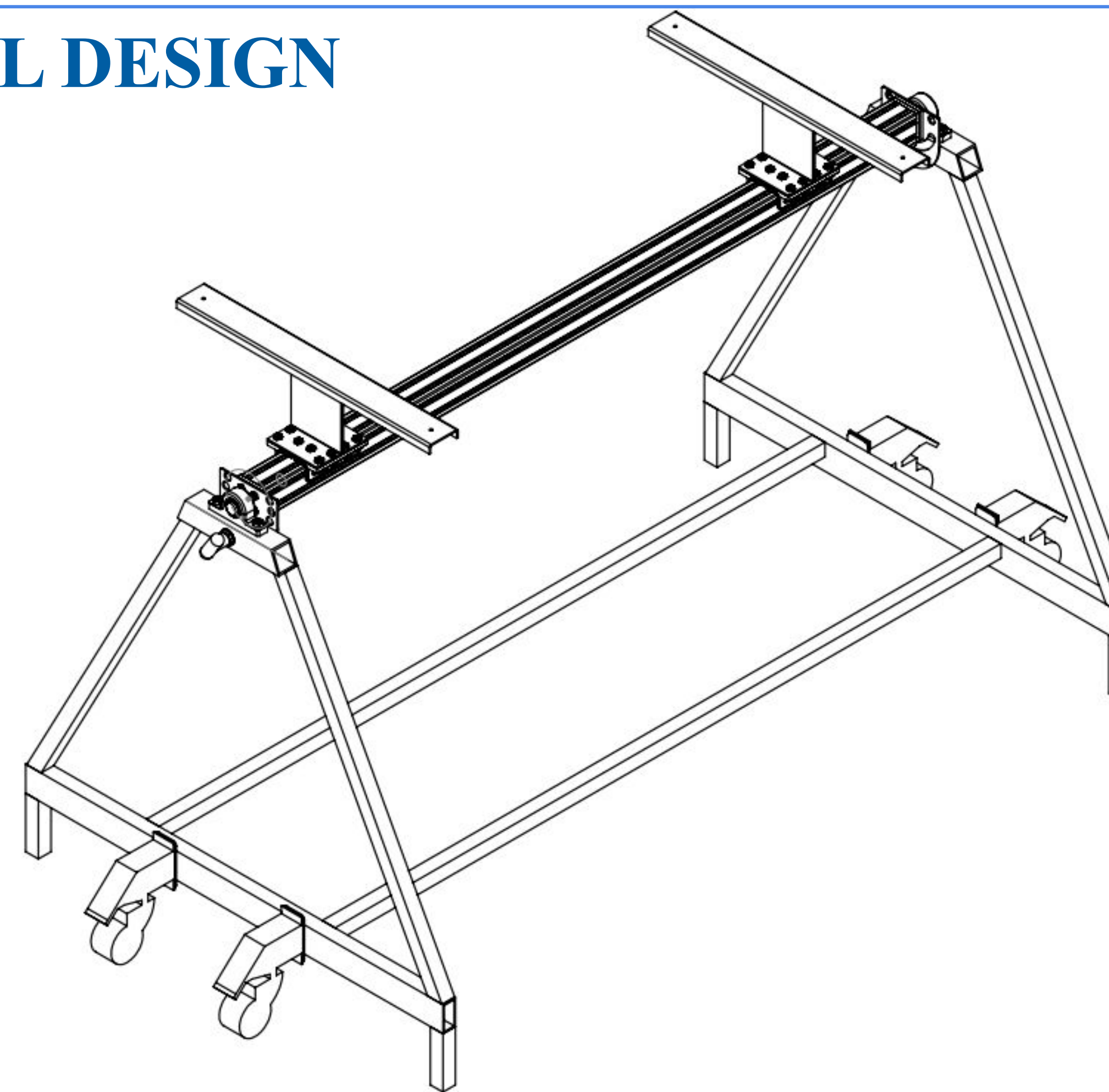


Figure 2: Final design CAD model.

## FEA RESULTS

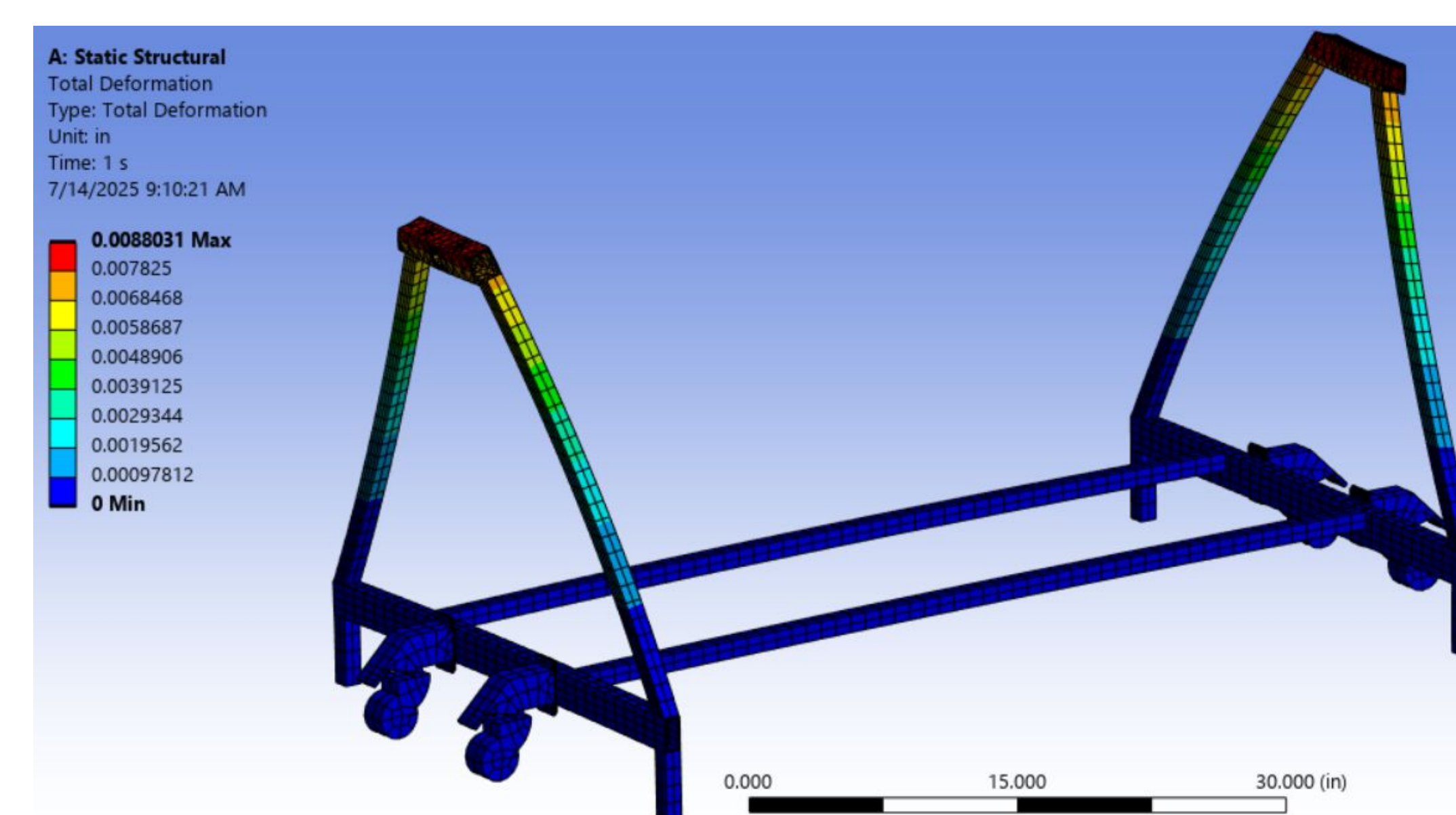


Figure 3. Base frame FEA analysis.

- At max load, deflection = 0.0088 in.
- Max deflection allowable: 0.25in.

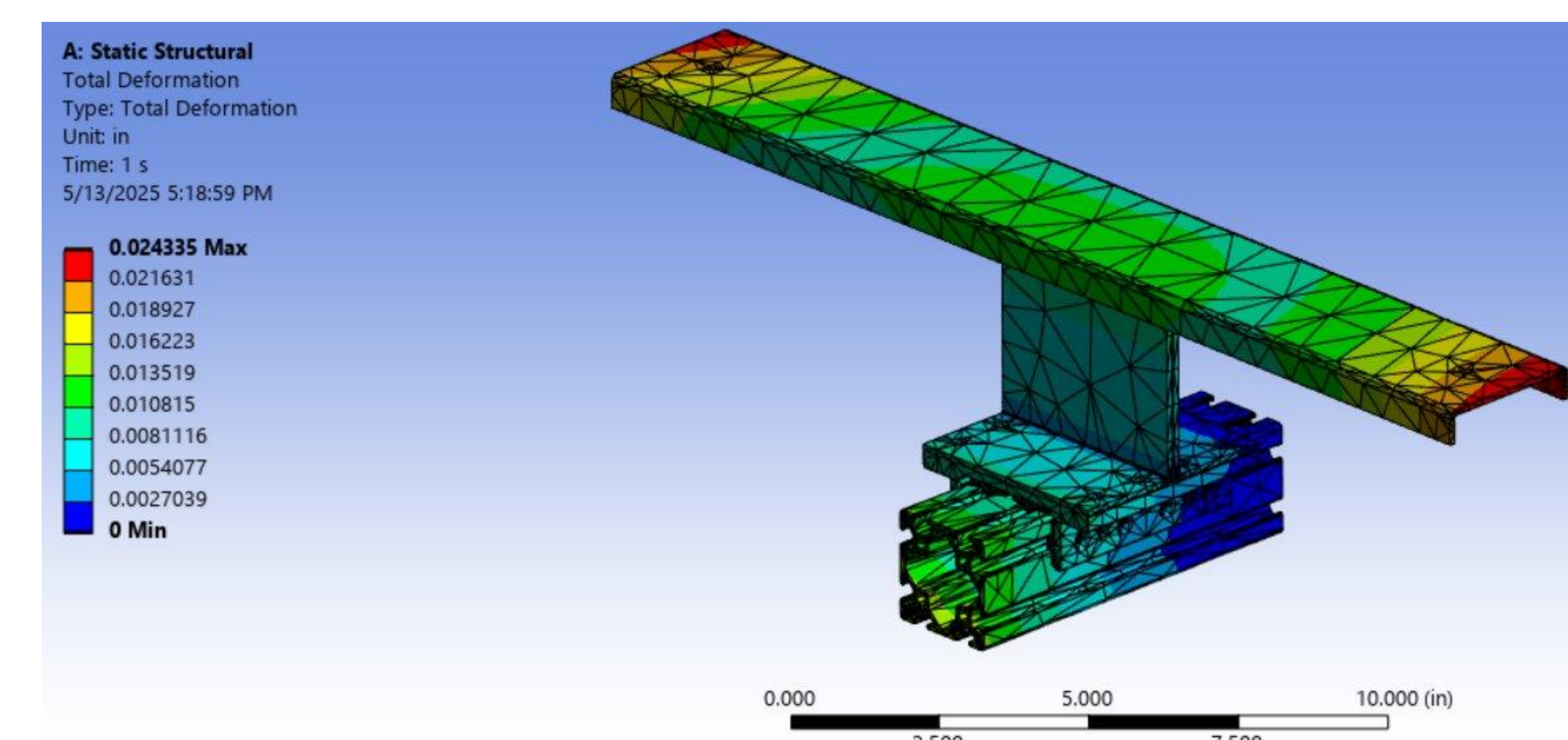


Figure 4. Mounting assembly FEA analysis:

- At max load, deflection = 0.02434 in.
- Max deflection allowable: 0.25in.

## Design Challenges

## 1. Safe Rotation

While tables are being sanded, painted, sealed, and finished, the rack ensures operators safe and easy access to all faces of the table. Therefore, the rack must allow tables to rotate and lock in place at various angles using minimal force to initiate rotation.

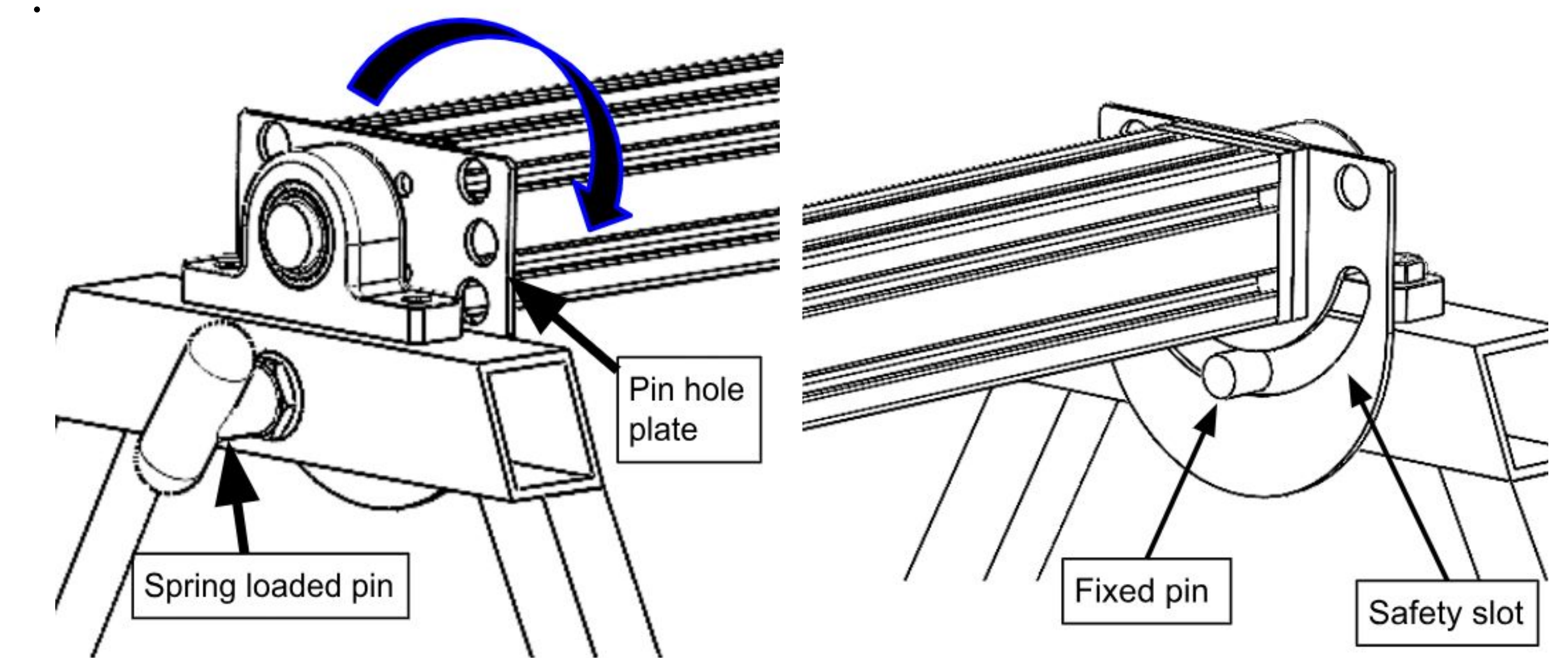


Figure 5/6. Rotation locking mechanism

## 2. Safe Transportation

Racked tables are often transported from one cell to another on the production floor. The current design requires operators to manually push racked tables causing unnecessary wear on racks and opportunity to cause serious safety and quality incidents. The challenge is that racks should allow movement requiring little force while traveling on the production floor but allow no movement when traveling on the pallet.

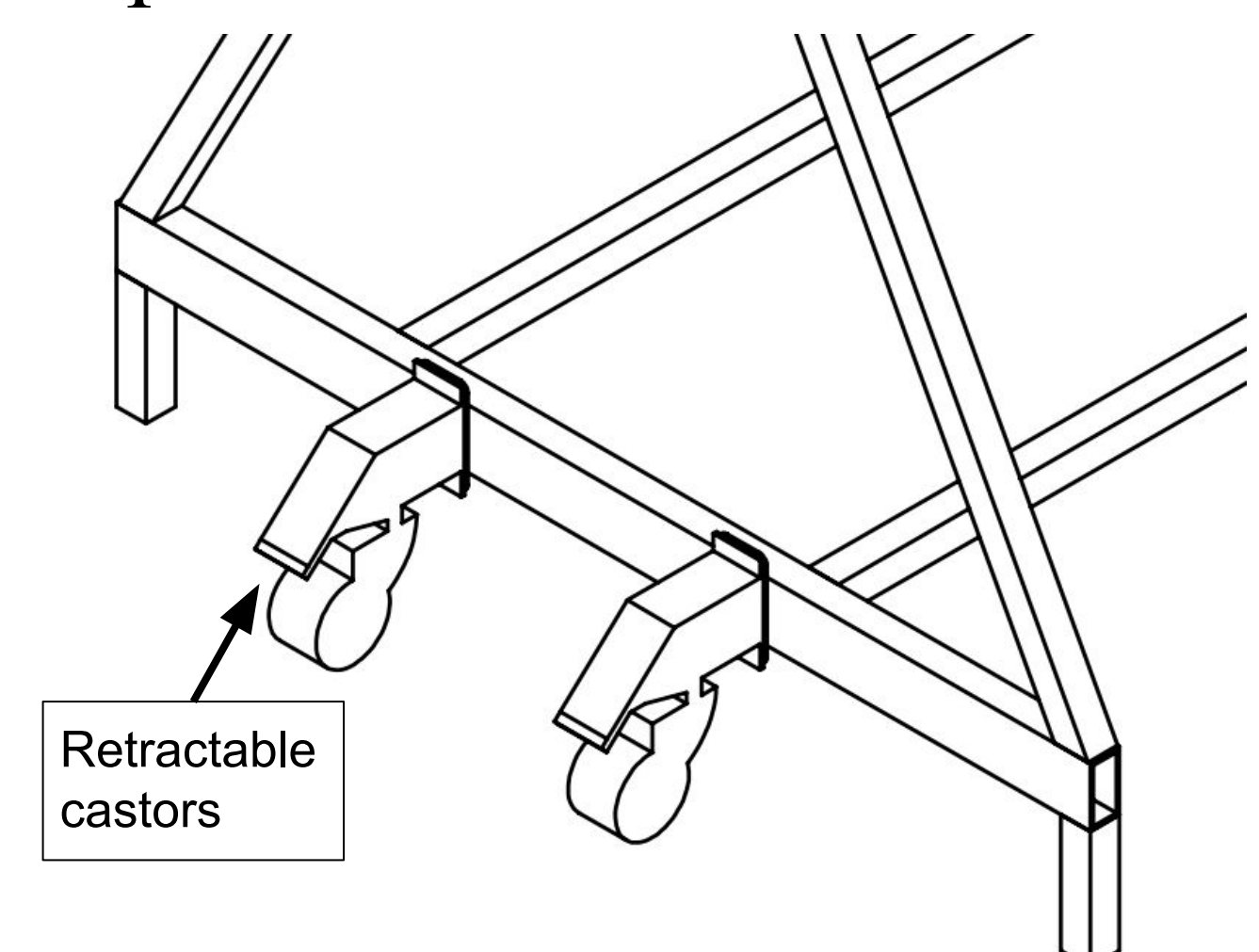


Figure 7. Transportation mechanism

### 3. Handling Overspray

While in use, the rack naturally blocks operators from spraying the underside of tables. The rack must limit the area blocked while also protecting key components from being coated in overspray.