

# Wheelchair Accessible Driving Position

## Introduction

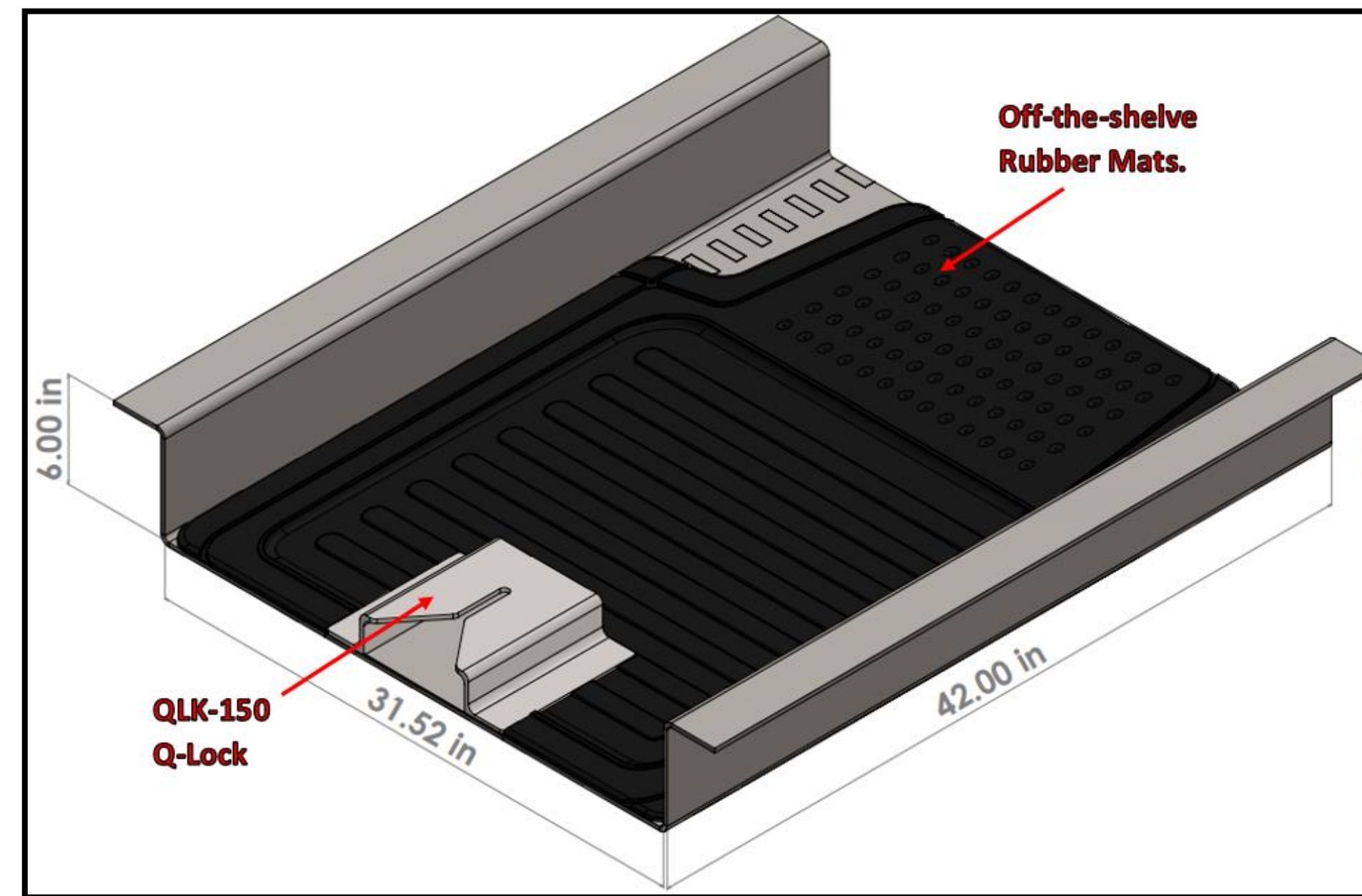
- Our Task**
  - Develop a modified driver area of a RAM ProMaster 2500 to accommodate a wheelchair user.
  - Overcome the 6-in ramp
- Why choose the Ram ProMaster 2500?**
  - Option for extended roof clearance
  - Ideal large rear access to passenger area
- Project Scope**
  - Modifying the driver seat area
  - Electrical and mechanical components beneath the platform are out of scope



## Final Design

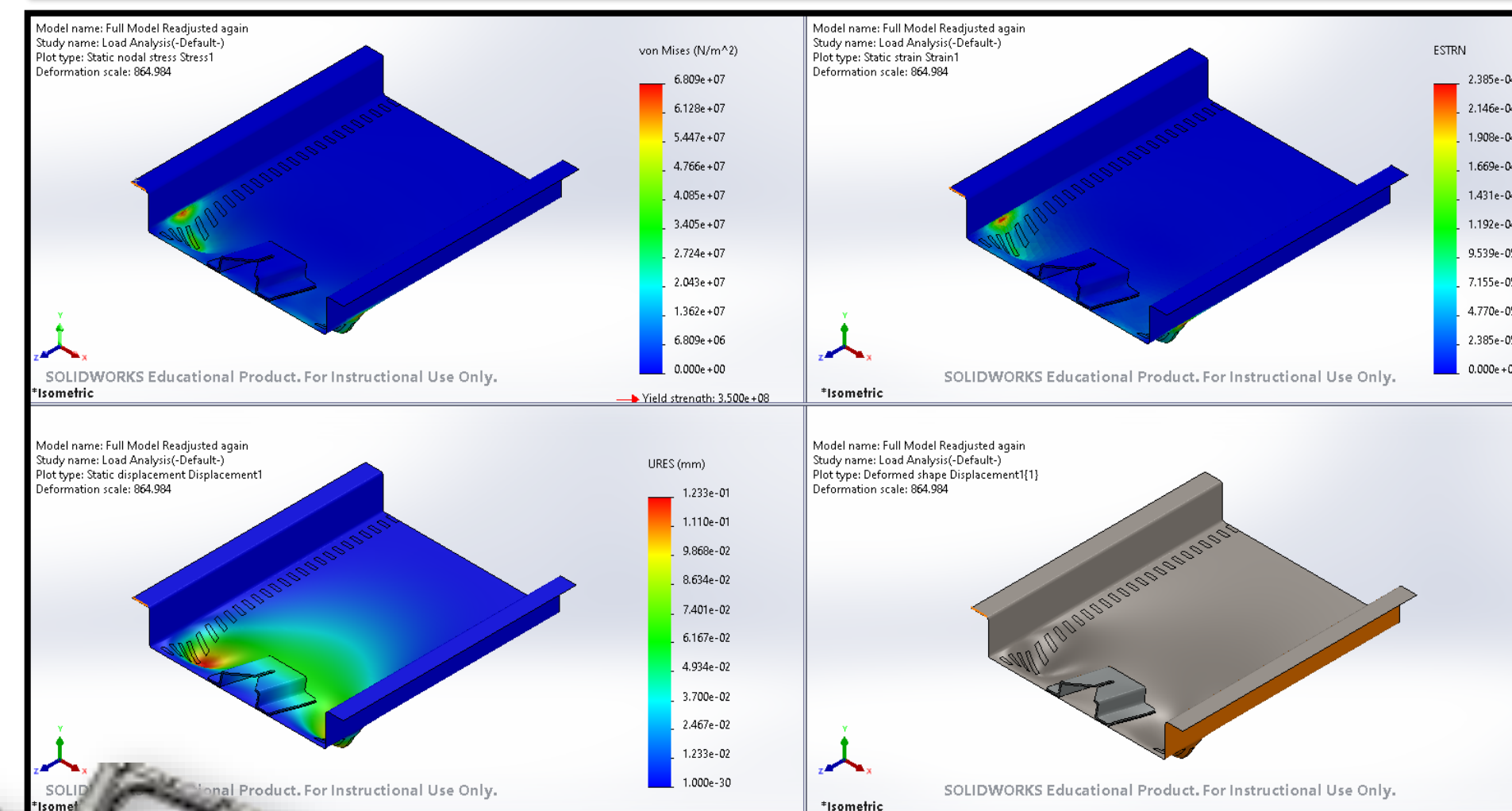
### Details of Design

- Material: **3-Gage Sheet Metal, 1020 Cold Rolled Steel**
- Accessories:
  - Locking System, Q-Lock QLK-150
  - Off-the-shelve Rubber Mats

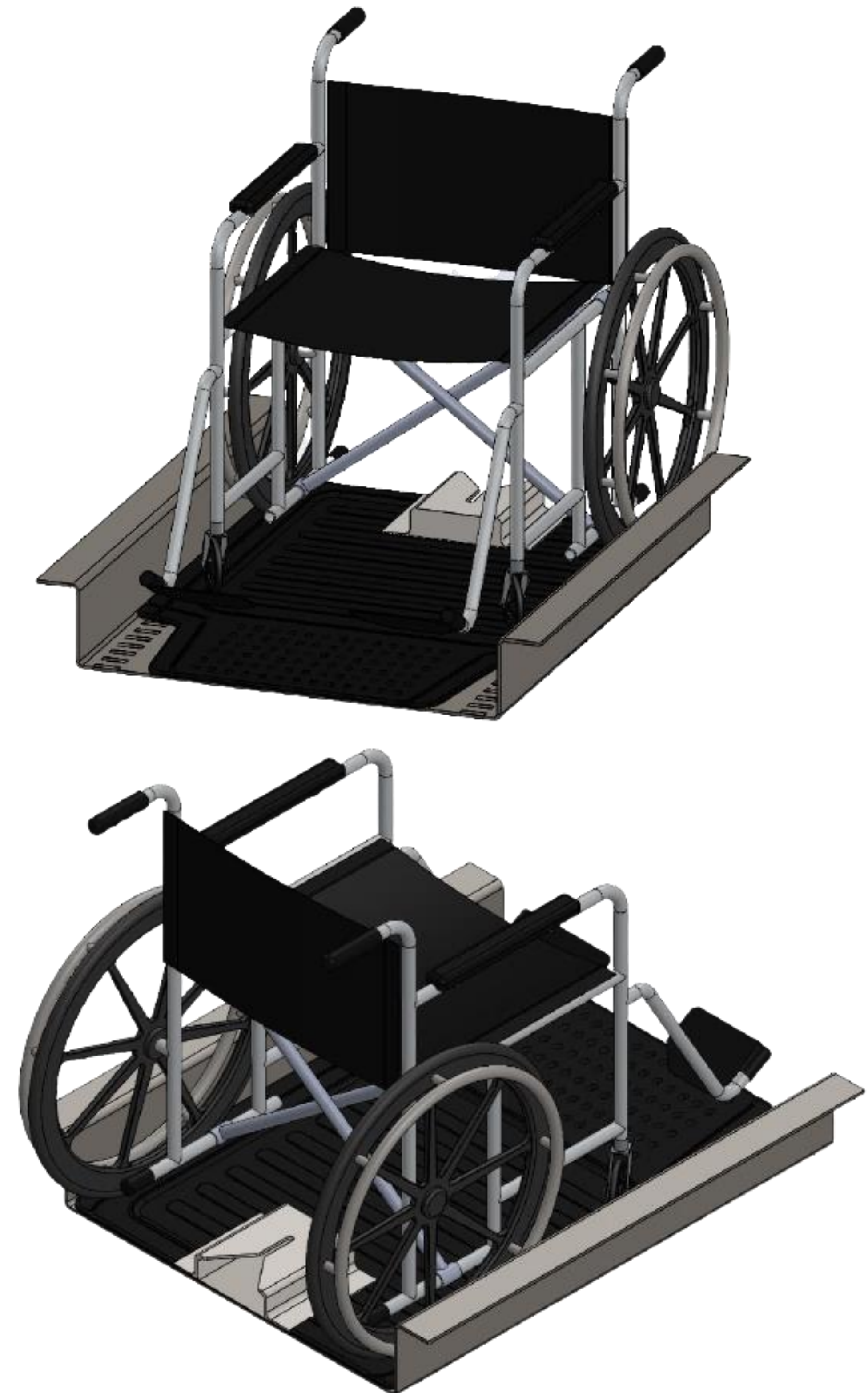


### Load Analysis

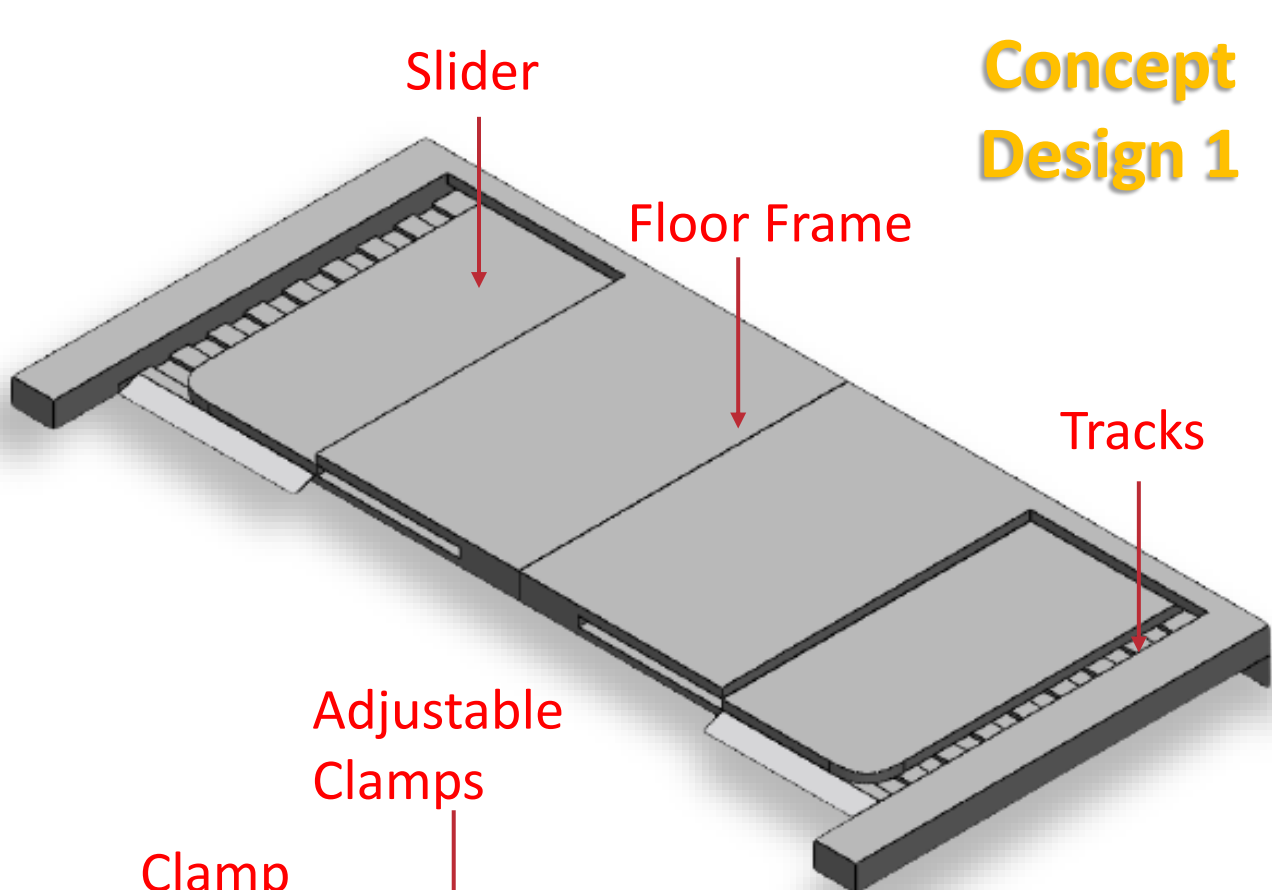
- Von Mises Stress:  $6.809 \times 10^7$  [Pa]
- Yield Stress:  $3.5 \times 10^8$  [Pa]
- Safety Factor: **5.1402**
- Max Displacement: **0.1233** [mm]



## Previsualization

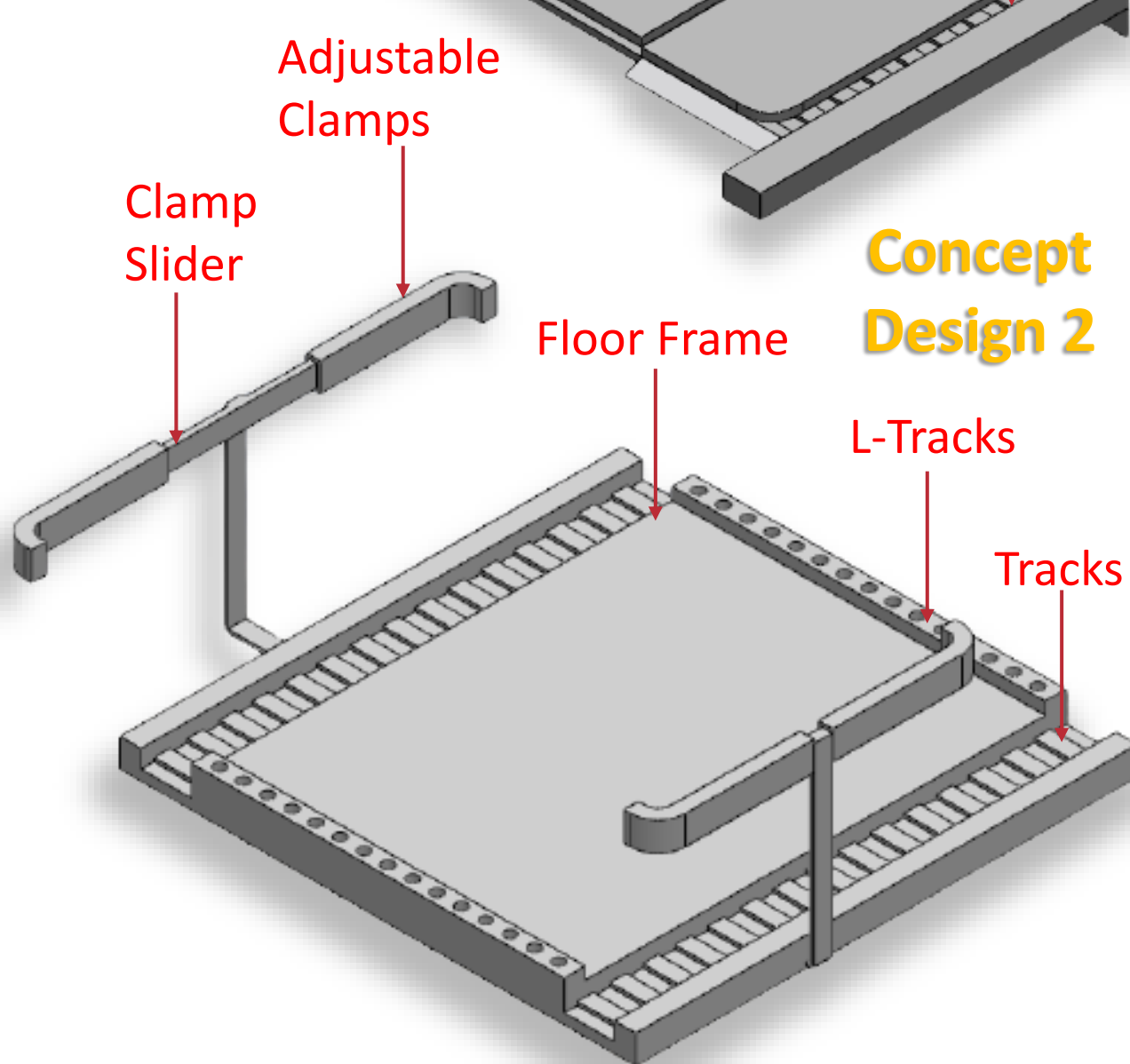


## Design Process



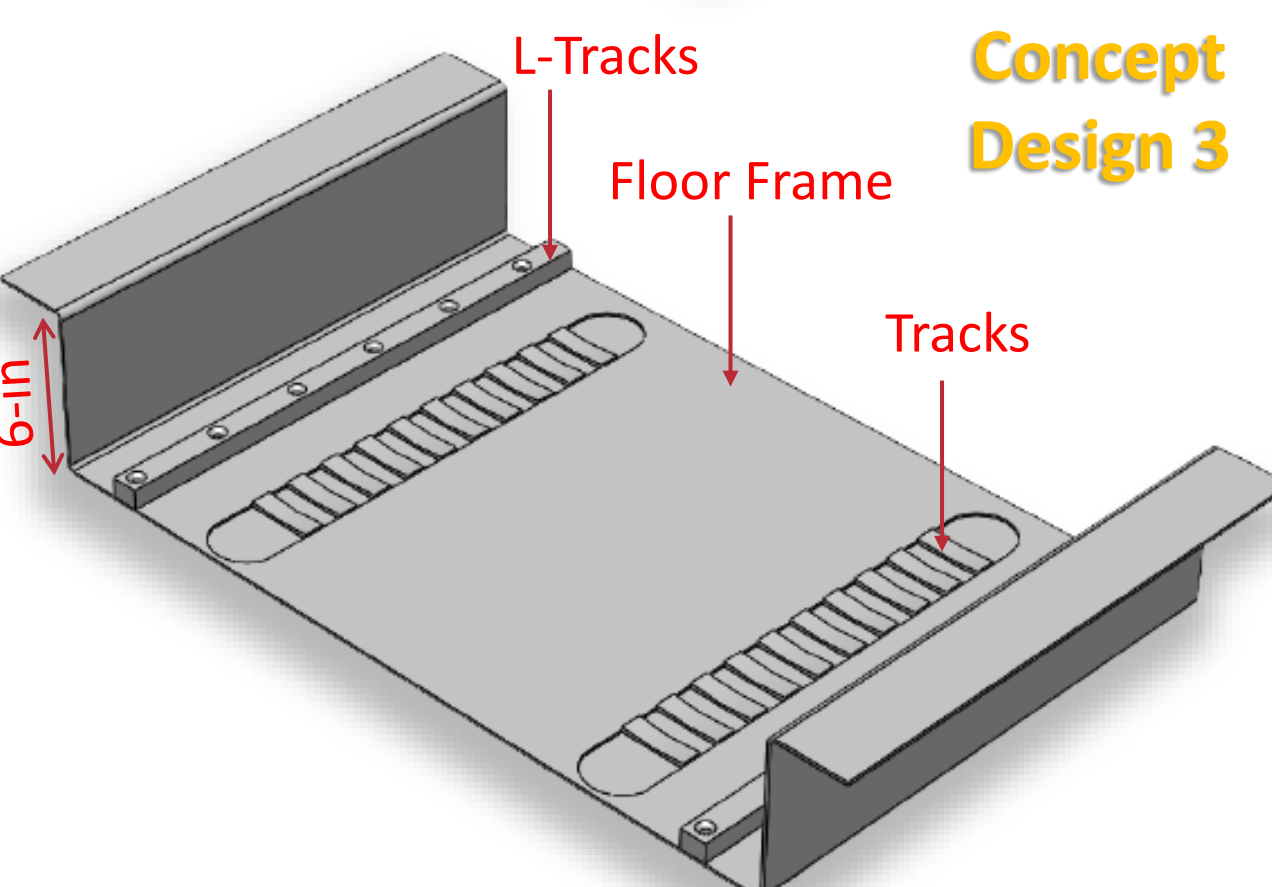
**Concept Design 1**

Pros
<ul style="list-style-type: none"> <li>Compatible with various sizes</li> <li>Compact</li> </ul>
Cons
<ul style="list-style-type: none"> <li>Limited space</li> <li>Hollow interior</li> <li>Costly to manufacture</li> </ul>



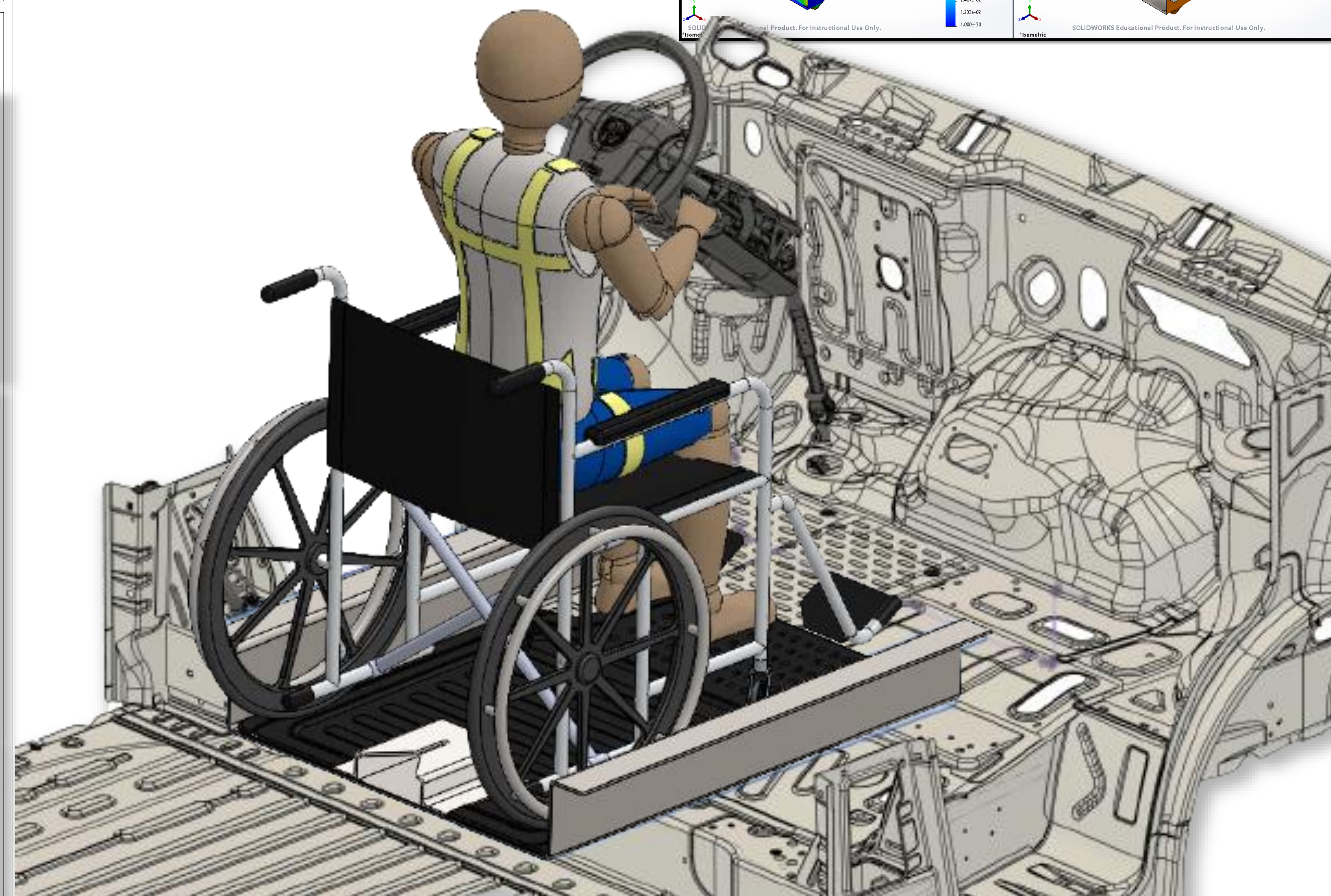
**Concept Design 2**

Pros
<ul style="list-style-type: none"> <li>Secure locking mechanism</li> <li>Clamps can adjust to various wheel sizes</li> </ul>
Cons
<ul style="list-style-type: none"> <li>Limited width for wheelchair</li> <li>Requires physical input from operator</li> <li>Complex design</li> <li>Costly to manufacture</li> </ul>



**Concept Design 3**

Pros
<ul style="list-style-type: none"> <li>Cheap to manufacture</li> <li>Simple design</li> <li>Secure locking mechanism</li> </ul>
Cons
<ul style="list-style-type: none"> <li>Limited width for wheelchair</li> <li>Tracks are difficult to manufacture</li> <li>Low structural integrity</li> </ul>



## References

- FCA Canada Inc. (2015). *RAM ProMaster*. Retrieved November 6, 2020
- FCA Canada Inc. (2020). *2020 RAM PROMASTER® 1500*. Retrieved 12 07, 2020

## Conclusion and Recommendations

### Conclusion

- Project Deliverables:
  - Document with detailed CAD of vehicle modification
  - Work Instructions on the build of the modified floor
- Design overcomes the 6-in hurdle
- Model has high structural integrity
- Client has capabilities to bend, weld and assemble the design

### Recommendations

- Crash testing is recommended
- Verify provided CAD against FCA CAD
- Reevaluate the dimensions once the floor is cut