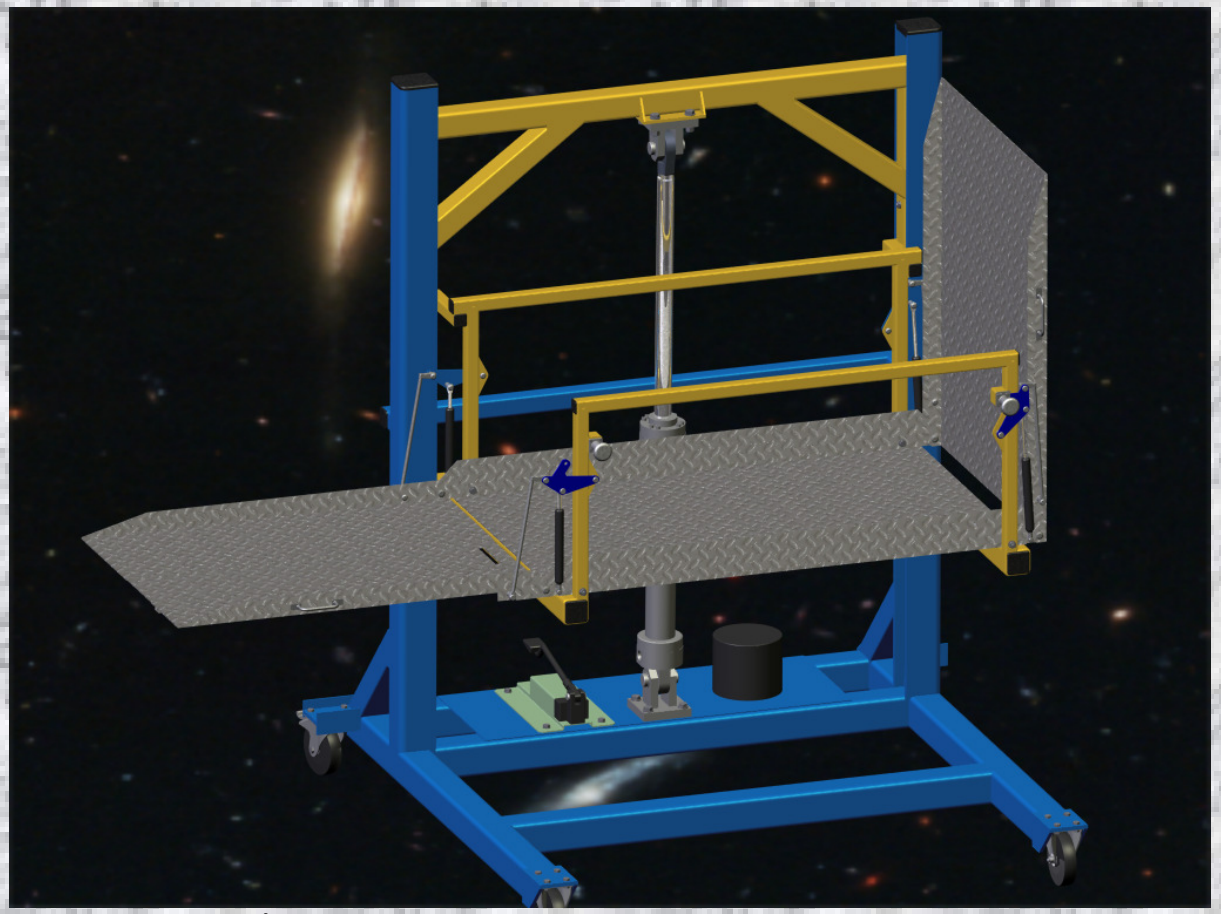
LIFTING MODUL FOR WHEEL CHAIRS



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Besenyi Norbert

Supervised: Dr. Váradi Károly

List of Requirements

- Max. lifting weight: 250 kg
- Size of the lifting surface: 820x1220
- Max lifting height: 1000 mm
- Safe and reliable operation, comfortable usage
- Max lifting time: 120 sec
- Applying standard components
- Light and economical design solution

Wheel Chair Types

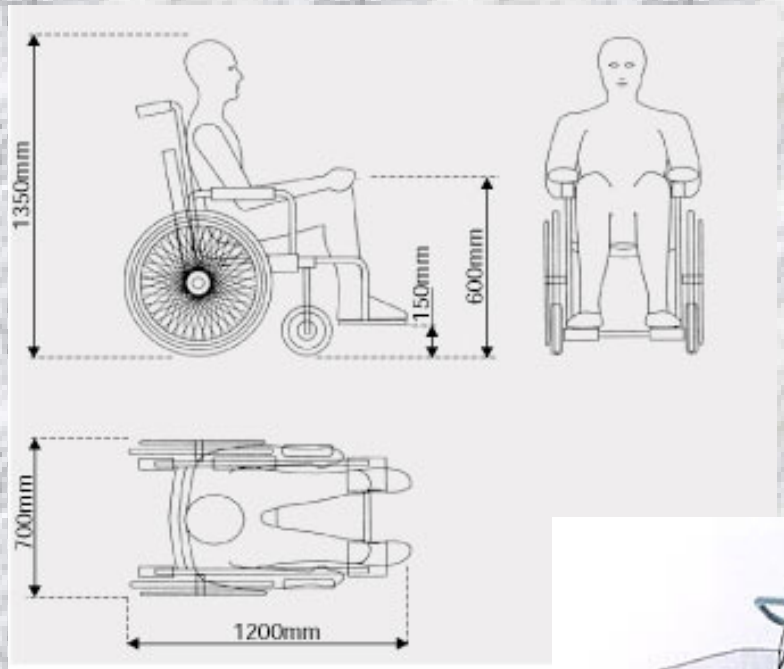
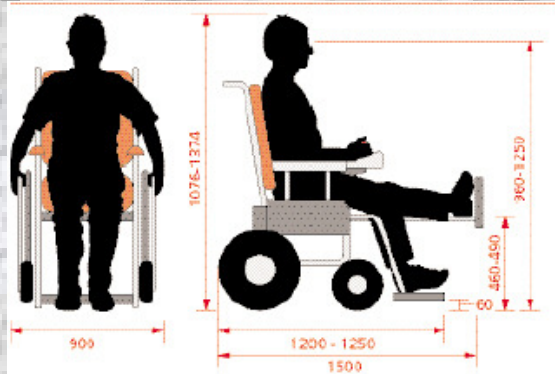


Diagram Wheelchair dimension - reference



Note:

Requirements in transport regulations introduced under the Disability Discrimination Act 1995 are based on an occupied wheelchair 1200 x 700mm.

Wheelchairs that are larger than this can and should be catered for in the built environment, but it's not feasible to provide for larger wheelchairs on public transport.

Length of wheelchair and user (excluding children)

Chair type	Mean (mm)	Min (mm)	Max (mm)	Percentiles (mm)	
				5th	95th
Attendant propelled	1080	742	1318	928	1197
Electric wheelchair	1107	758	1549	949	1328
New style manual chair	1033	707	1256	846	1183
Older style manual chair	1108	862	1357	919	1267
Electric scooter	1187	971	1500	1000	1402
All chairs	**1085**	**707**	**1549**	**894**	**1273**

Width of wheelchair (excluding children)

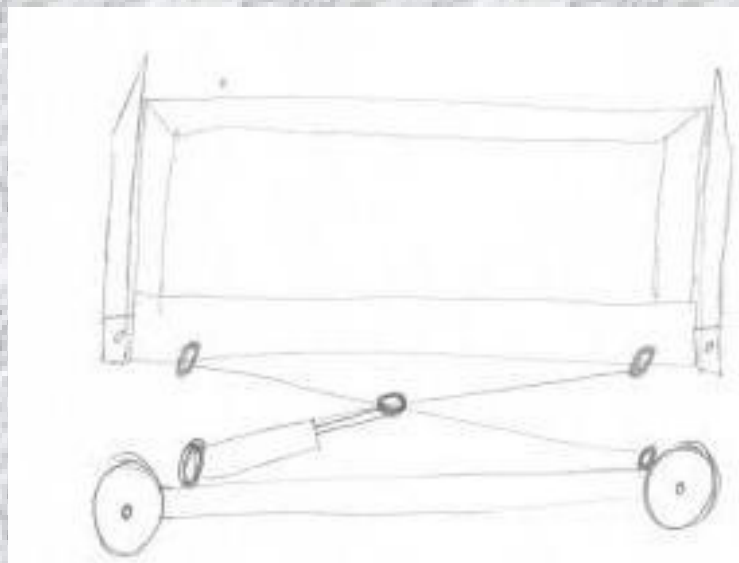
Chair type	Mean (mm)	Min (mm)	Max (mm)	Percentiles (mm)	
				5th	95th
Attendant propelled	596	520	674	528	658
Electric wheelchair	635	521	755	552	706
New style manual chair	638	511	741	579	702
Older style manual chair	616	511	722	560	686
Electric scooter	607	501	695	529	685
All chairs	**627**	**501**	**755**	**558**	**695**

Source: A survey of occupied wheelchairs to determine their overall dimensions and weight: 1999 Survey by R E Stait, J Stone and T A Savill. Unpublished Project Report, Transport Research Laboratory.

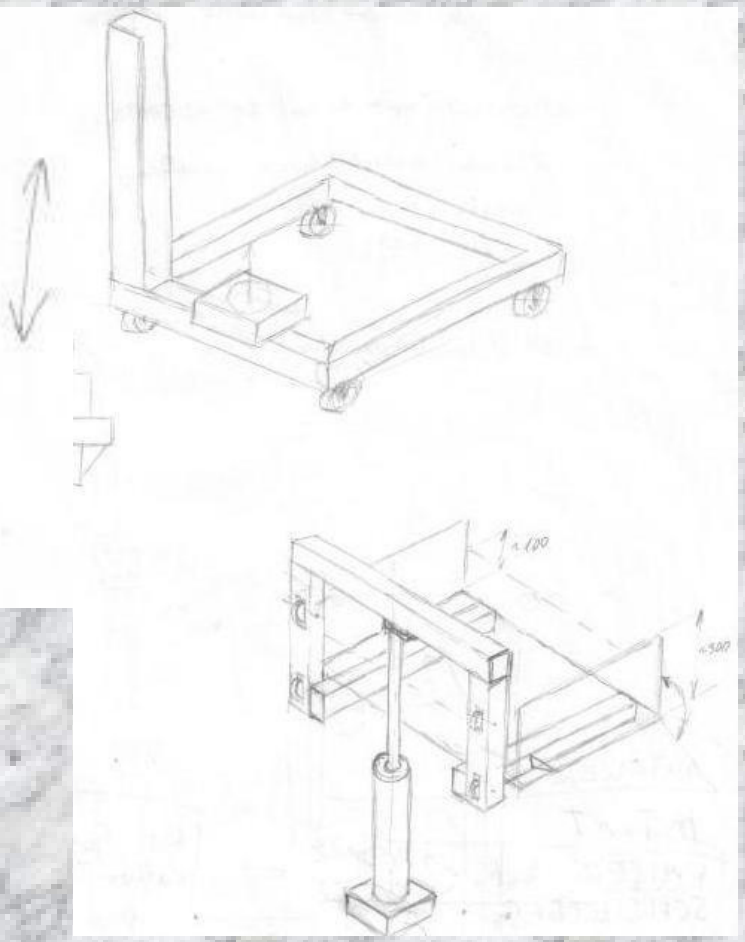
Wheel Chair Lift Variations

Design Alternatives

Solution 1:



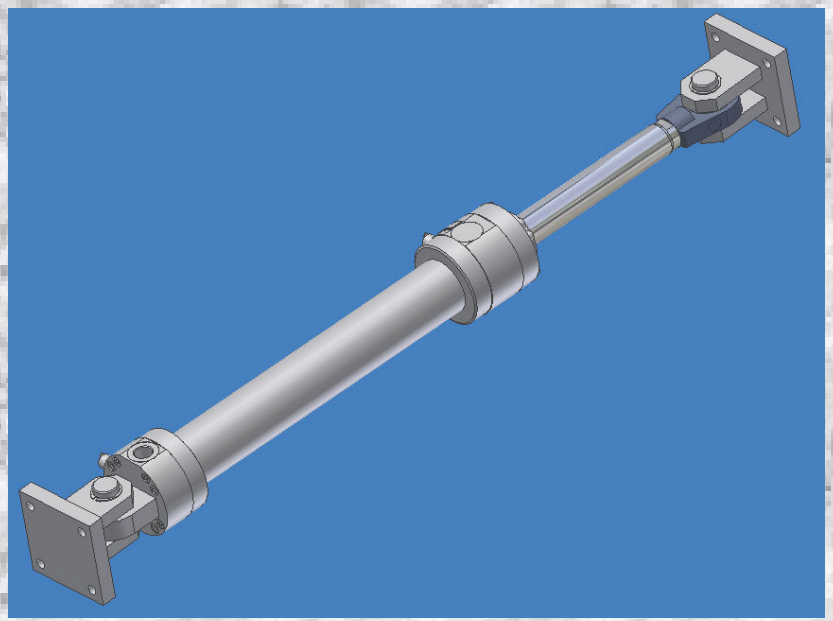
Solution 2:



Standard Components

Hydraulic Cylinder: Bosch-Rexroth (www.bosch-rexroth.com)

(CDH1MP3_63_45_800A1X_B2CLDA_XAE_A_K450_VAll_Emm)



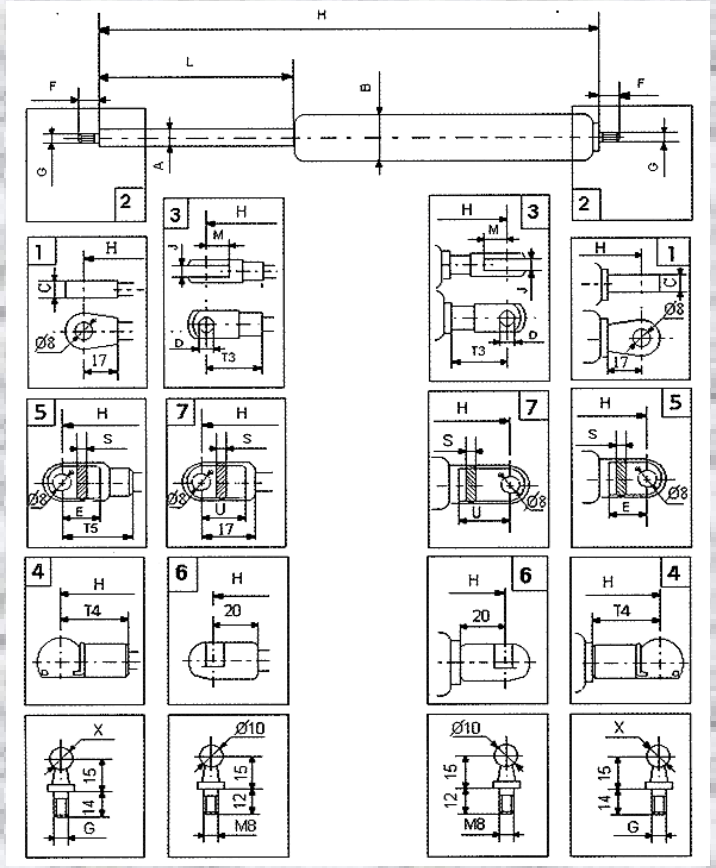
Wheel: Blickle wheel (www.blickle.hu)

Front wheel: Bockrolle B-VPP 140G

Rear wheel: Lenkrolle L-VPP 140G-FI

Standard Components

Pneumatic unit: FORMAX Járműalkatrészgyártó Kft (www.formax.mdo.hu)

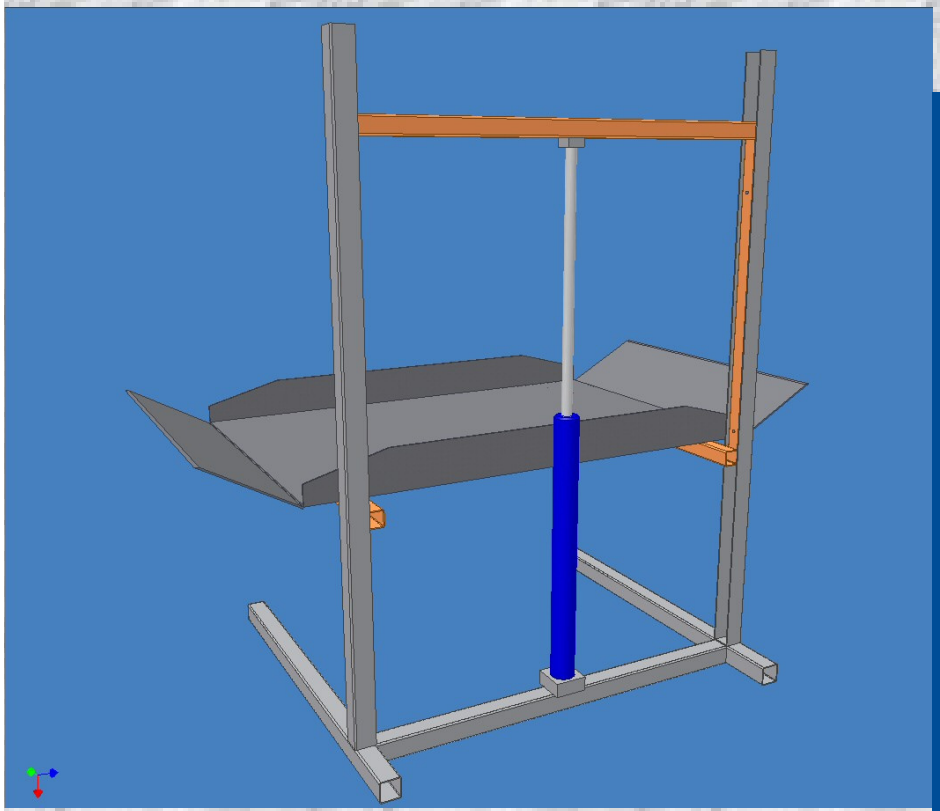


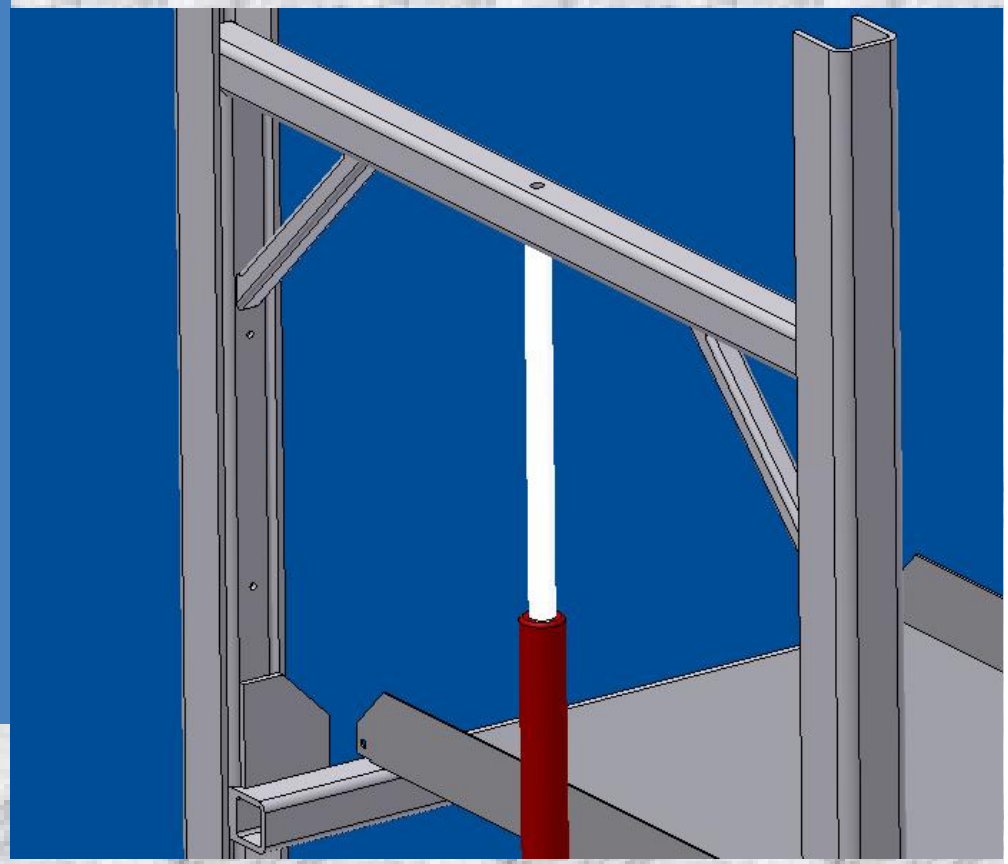
Hydraulic unit: Hidra-mix Kft (www.hidramix.hu)

BFP14/22

3D Solid Model of the Frame

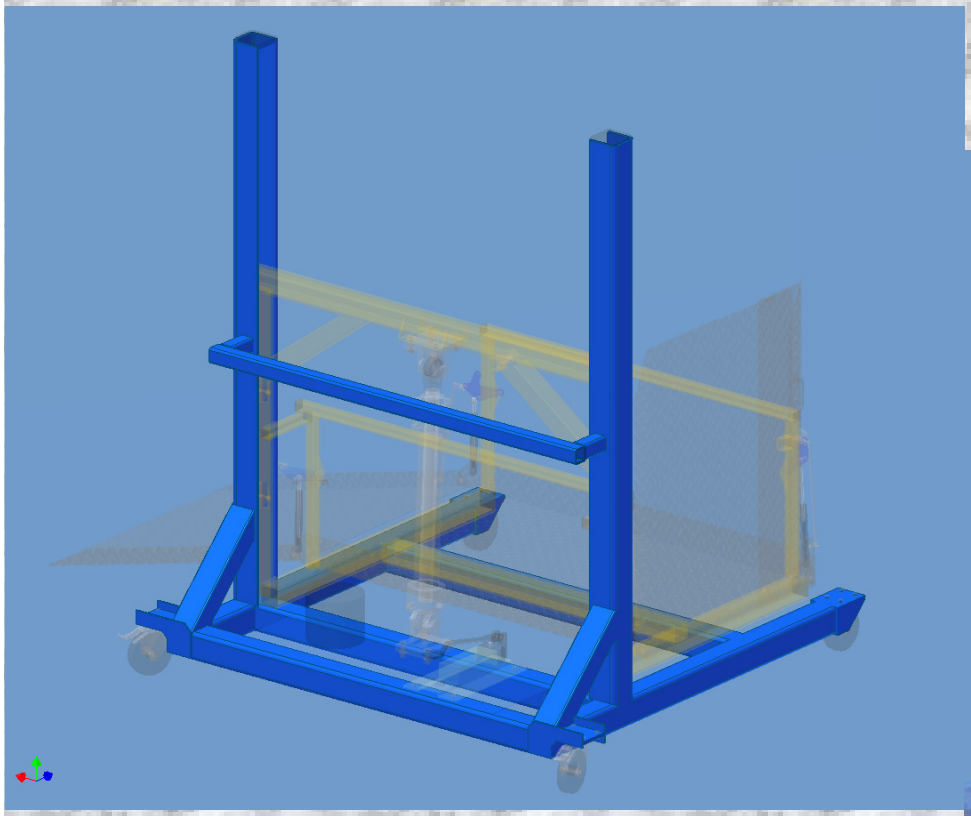
Solution 1:

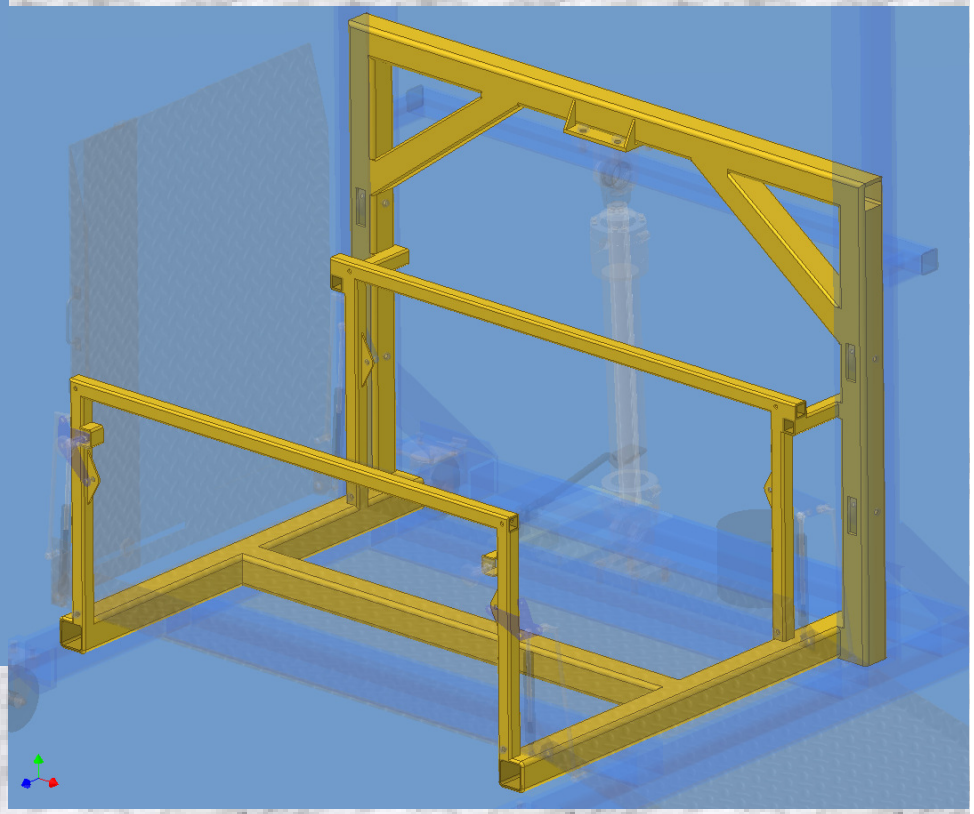




3D Model of the Frame

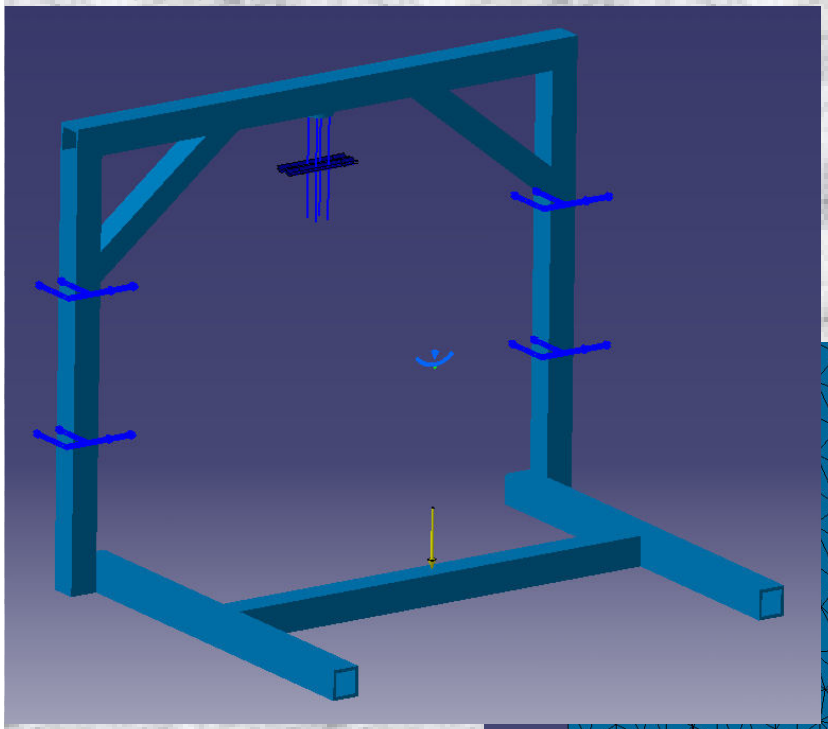
Solution 2:

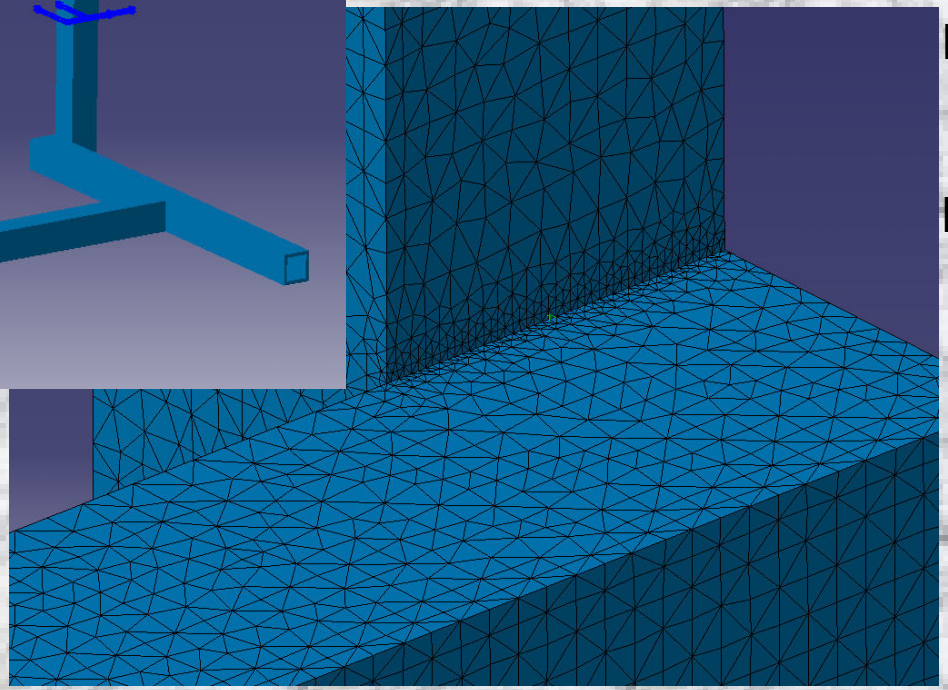




Fe Analysis of the Lifting Unit

Solution 1:





Average element size:

6 mm

Element density:

2 mm

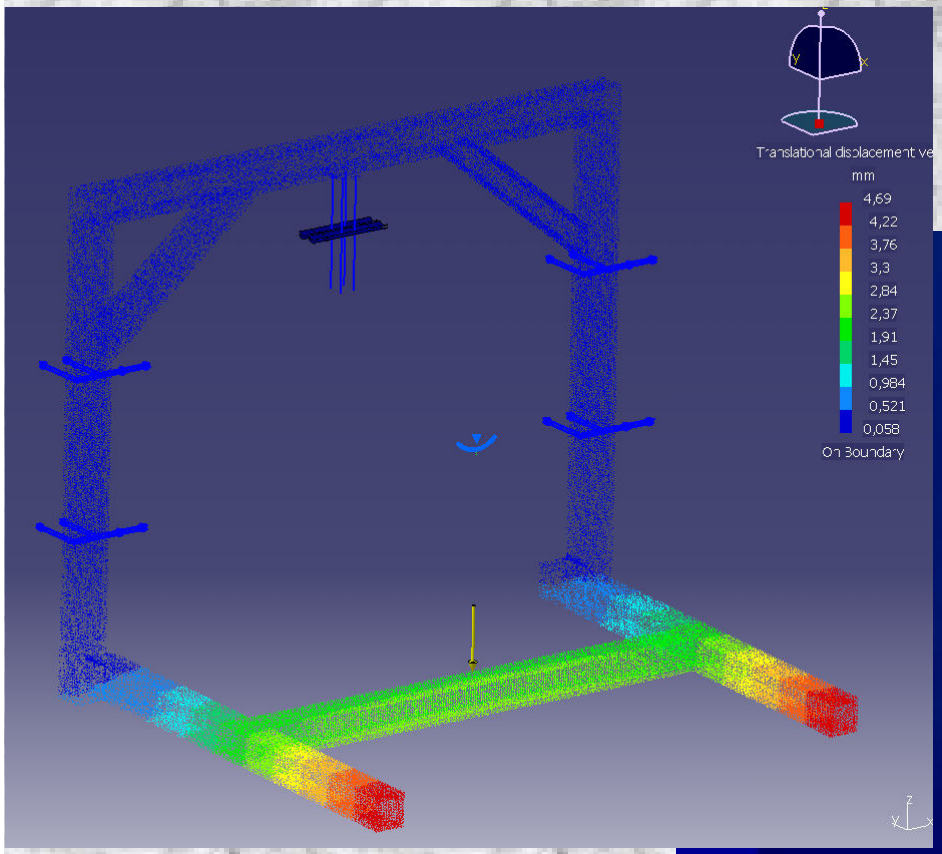
Element type:

solid

Load:

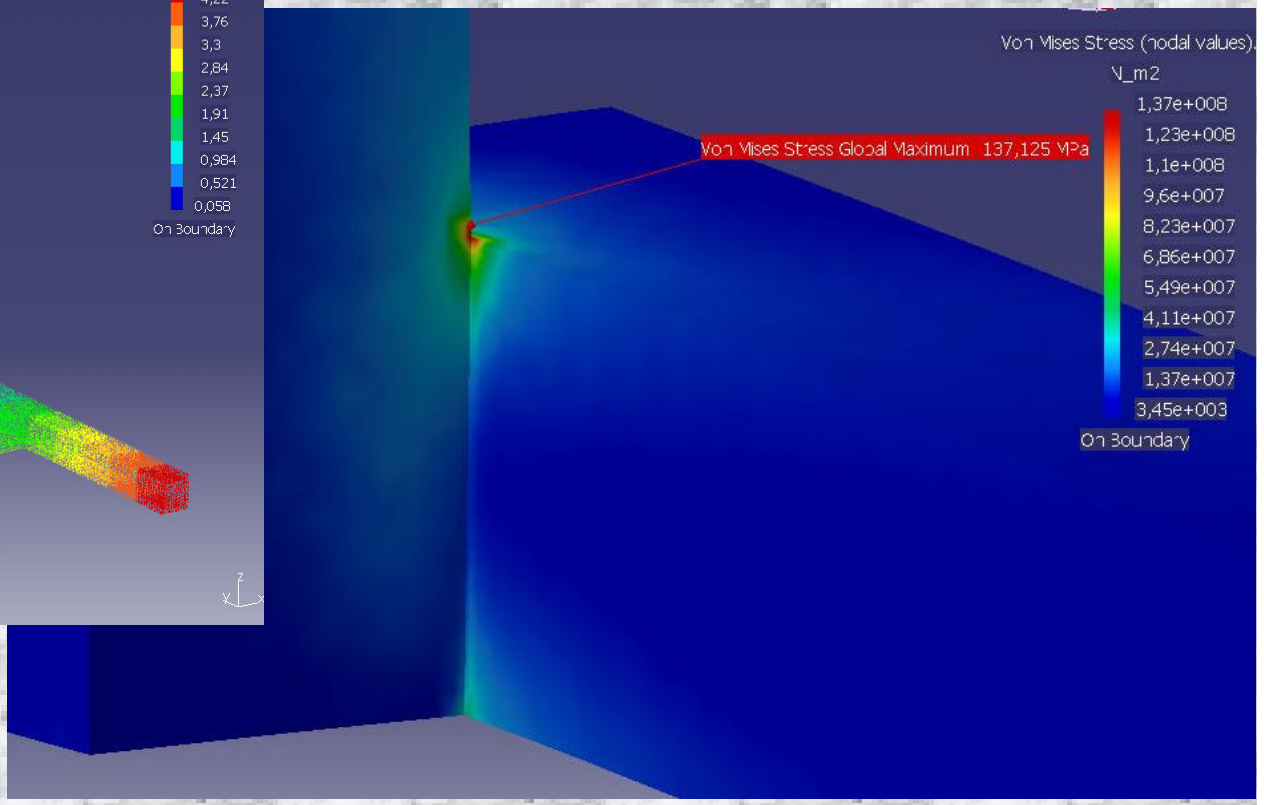
F=2500N

Fe Results



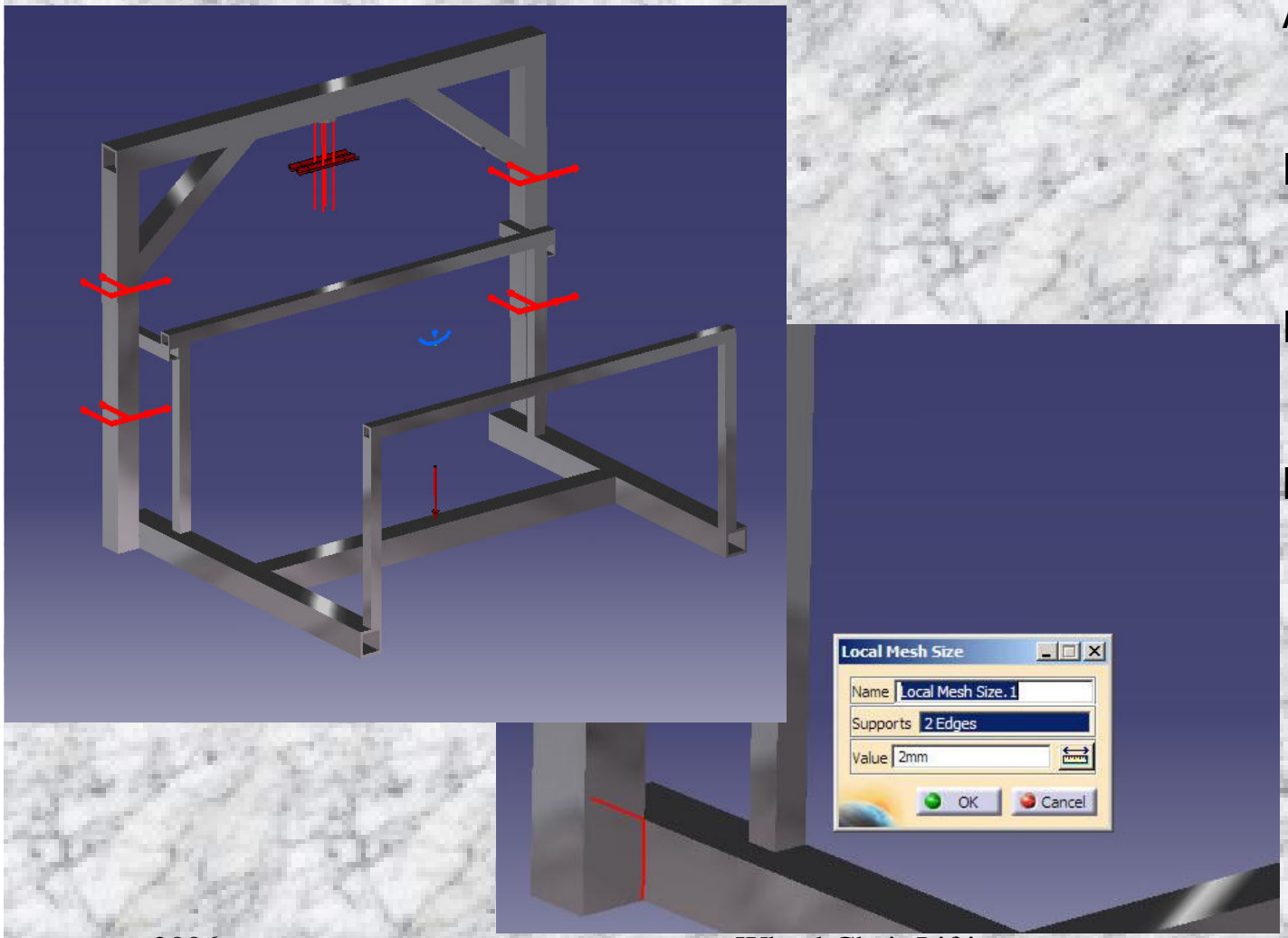
Max Displacement:
4.7mm

Max Stress: 137MPa



FE Analysis of the Frame

Solution 2:



Average element size:

6 mm

Element density:

2 mm

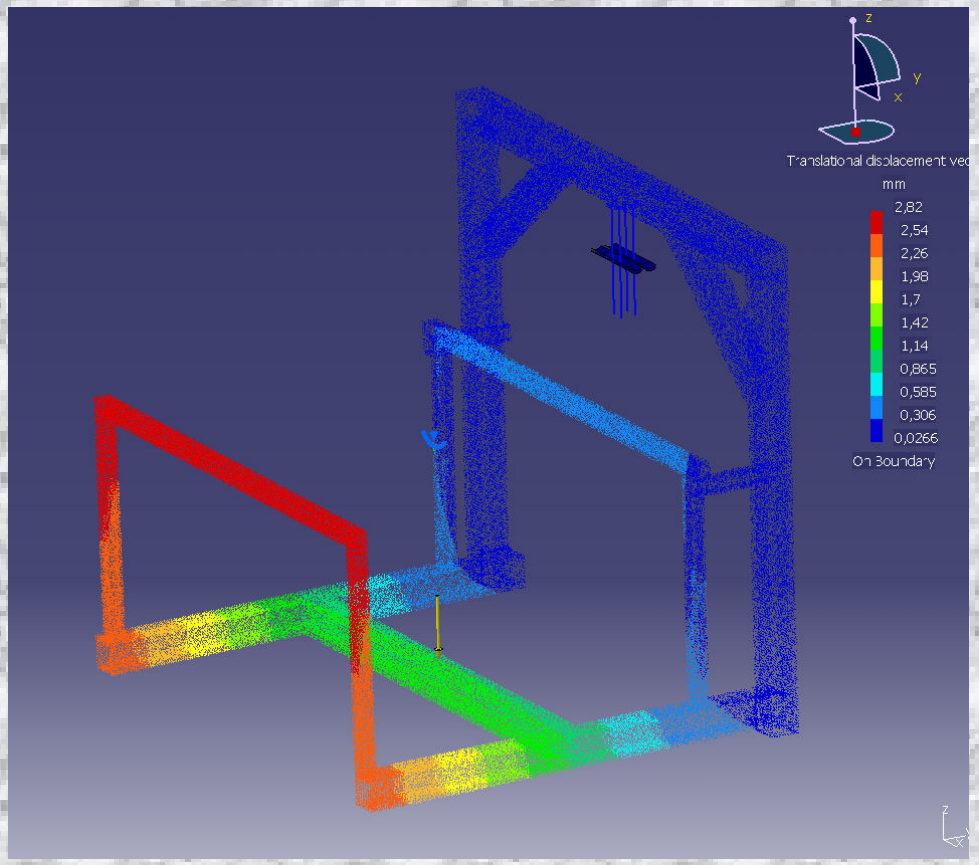
Element type:

solid

Load:

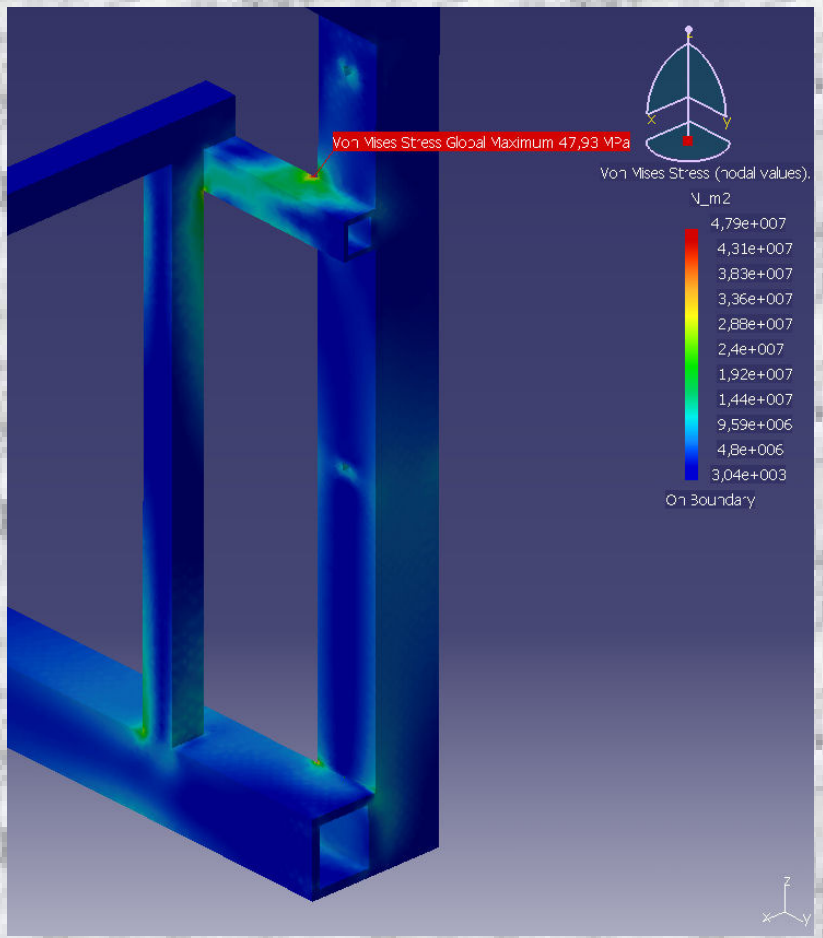
F=2500N

FE Results



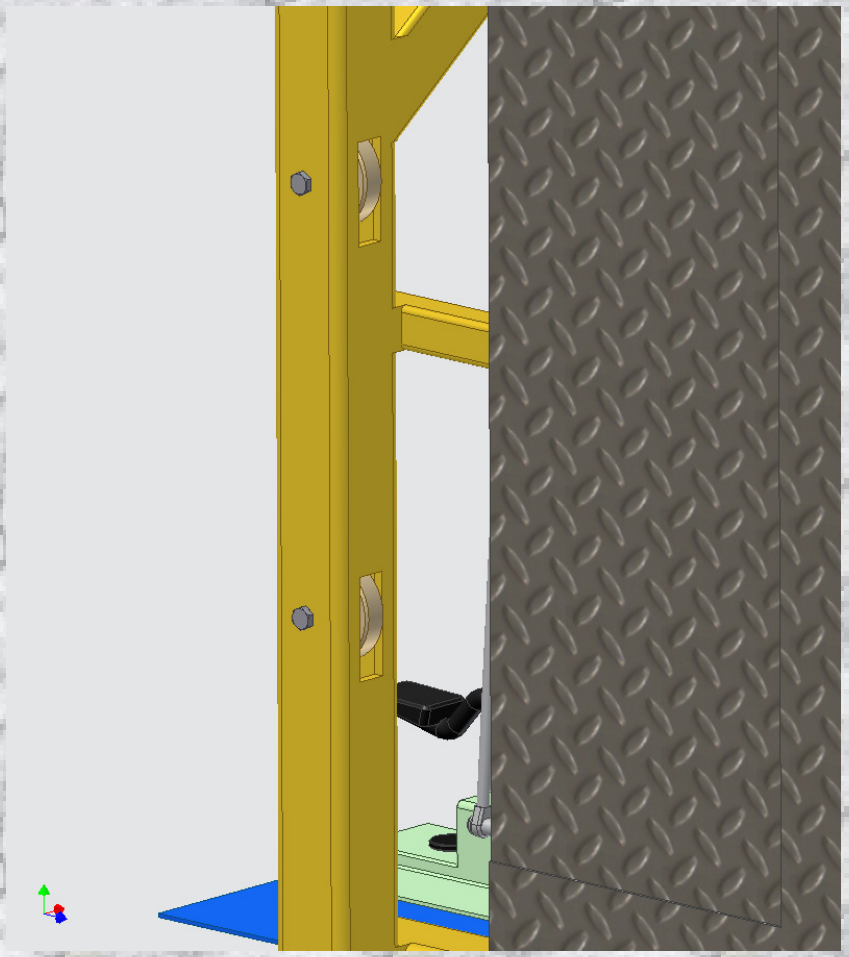
Max Displacement:
2.8mm

Max Stress: 48MPa

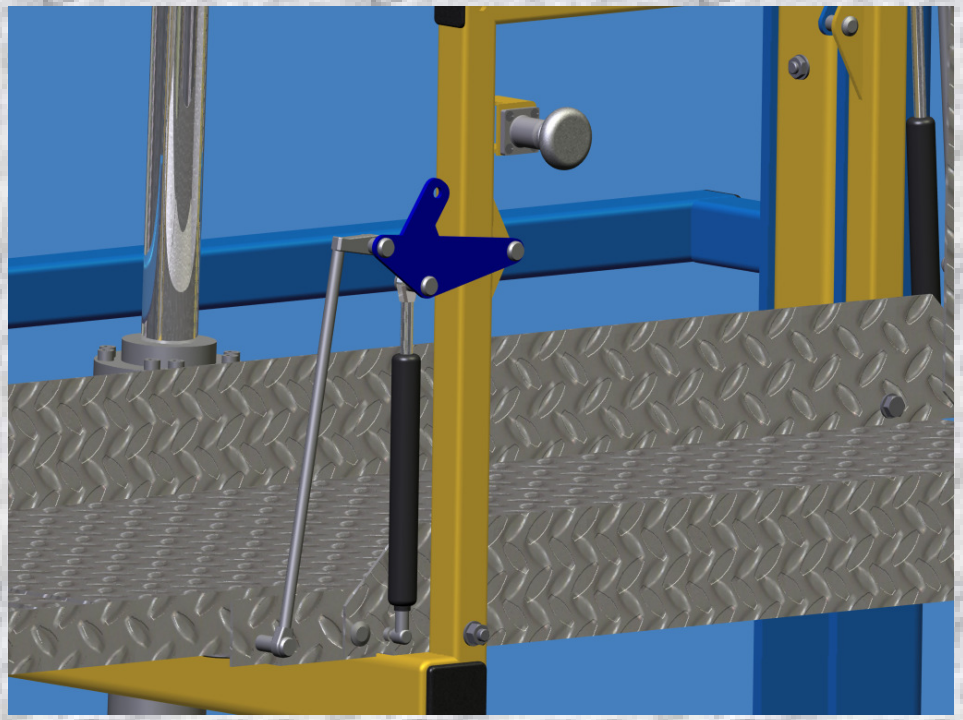


Components of the Structure

Guiding rollers:

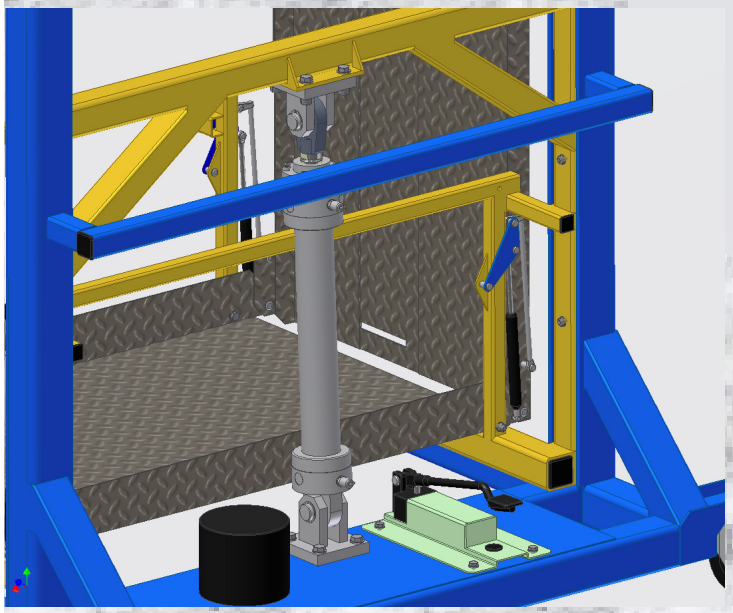


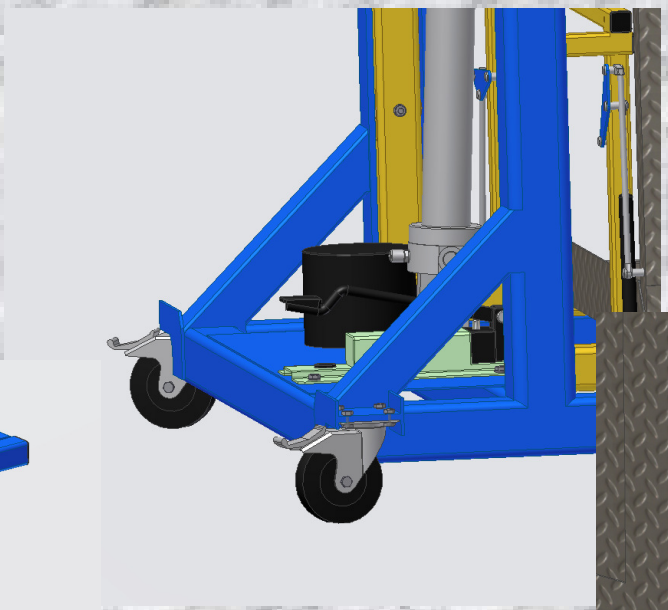
Ramp moving mechanism:



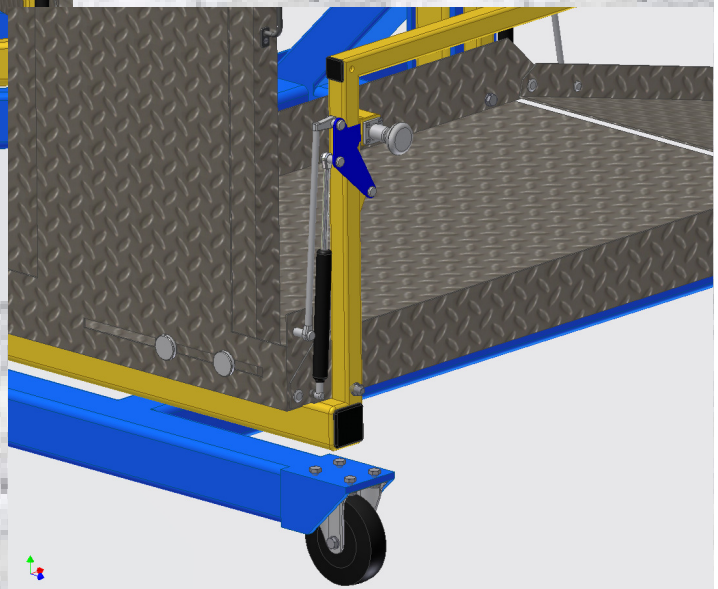
Components of the Structure

Hydraulic System:



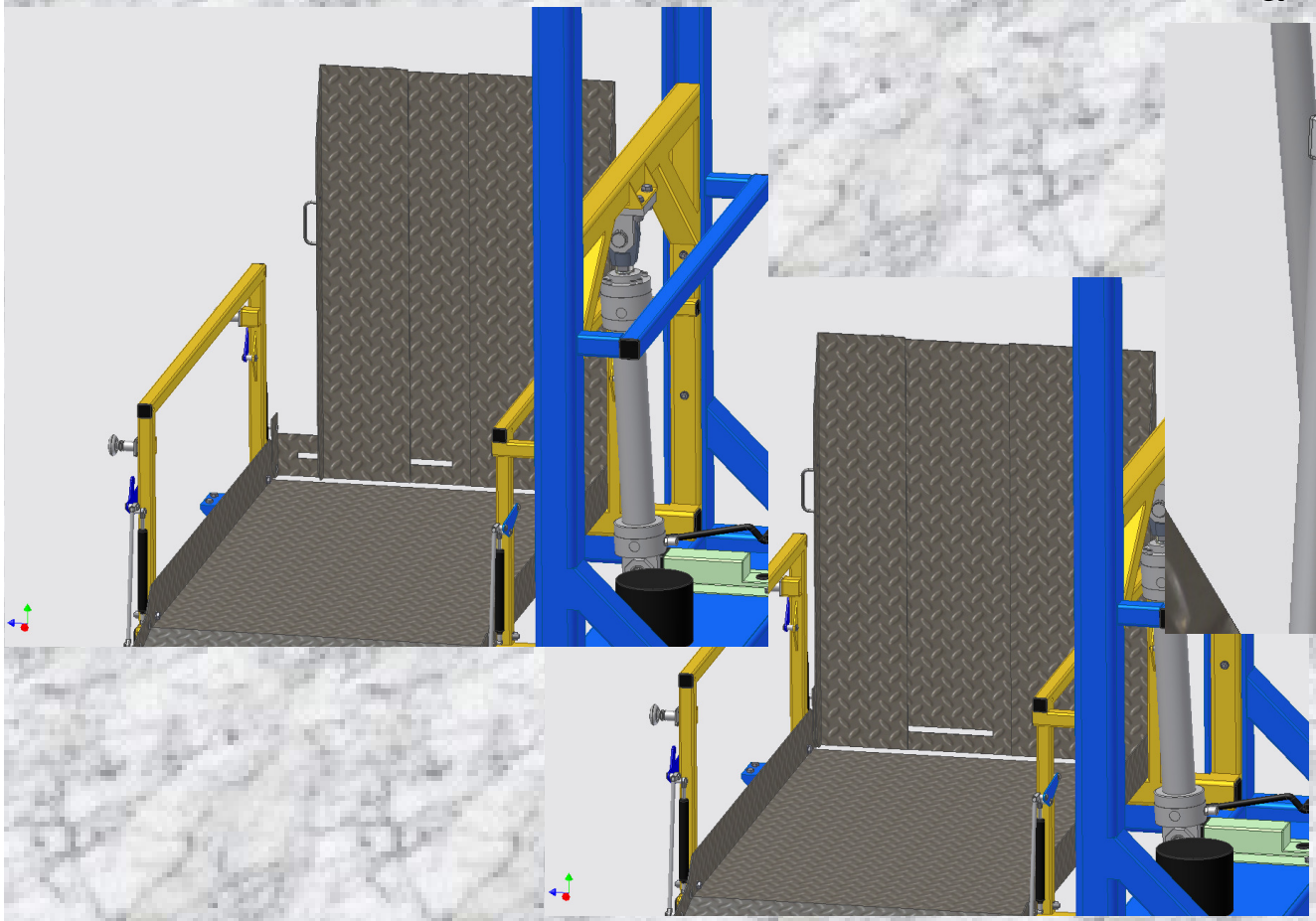


Wheels:

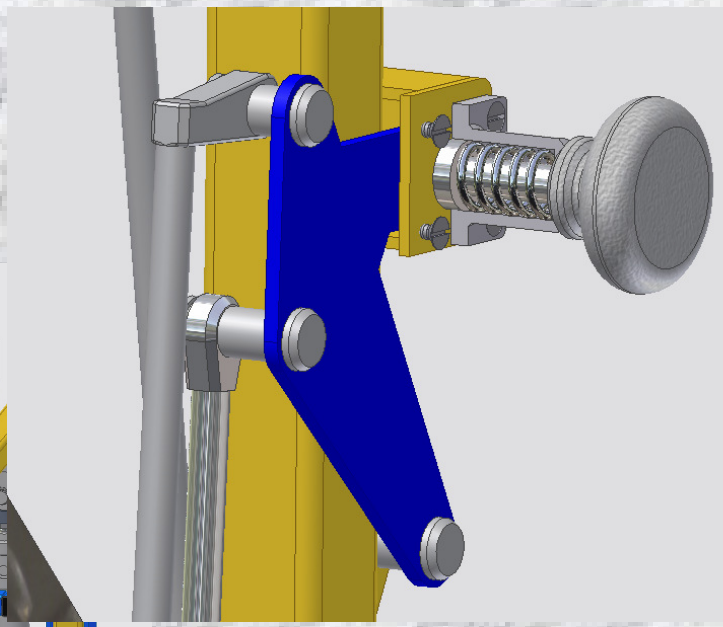


Components of the Structure

Ramp width setting:

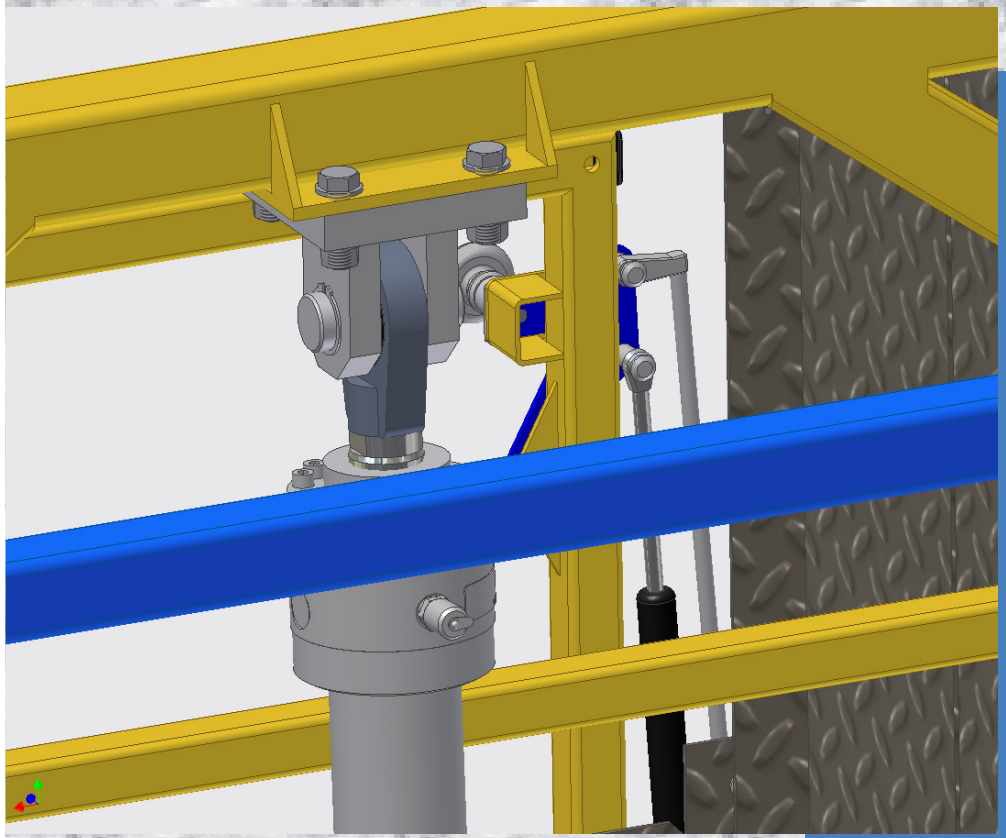


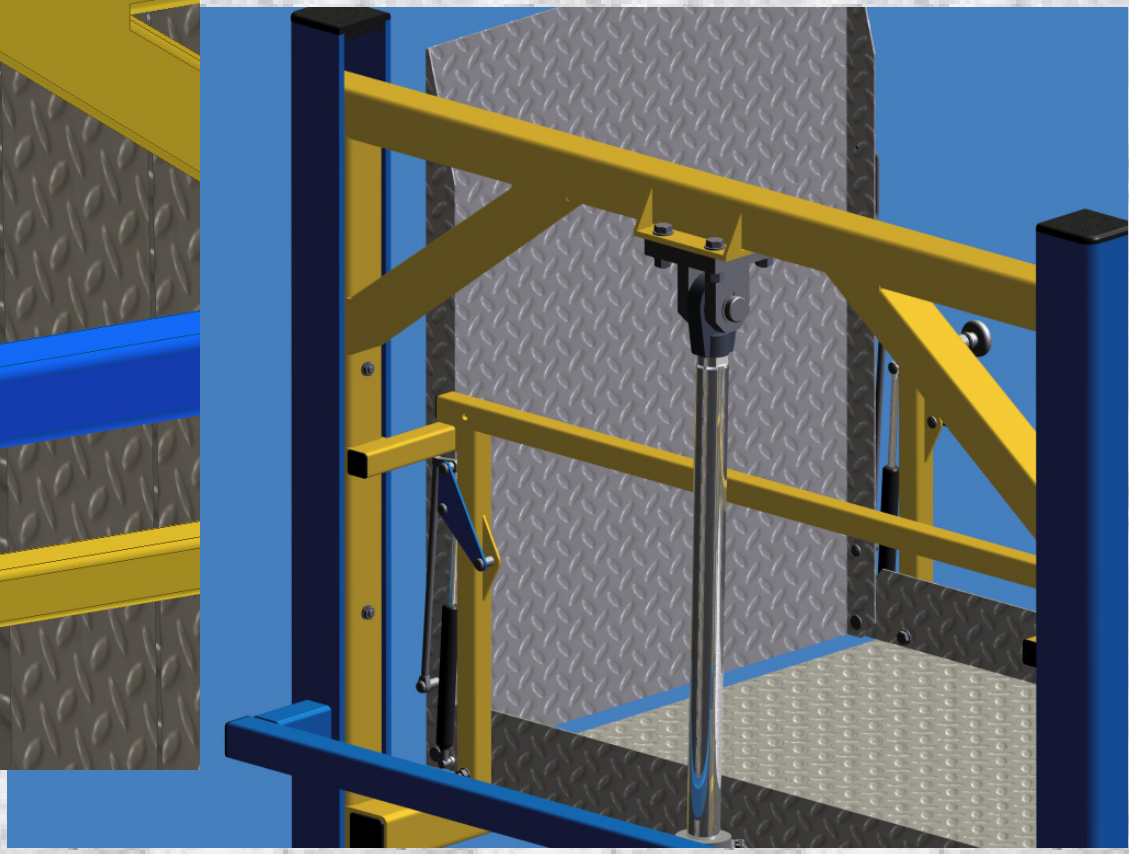
Ramp fixing:



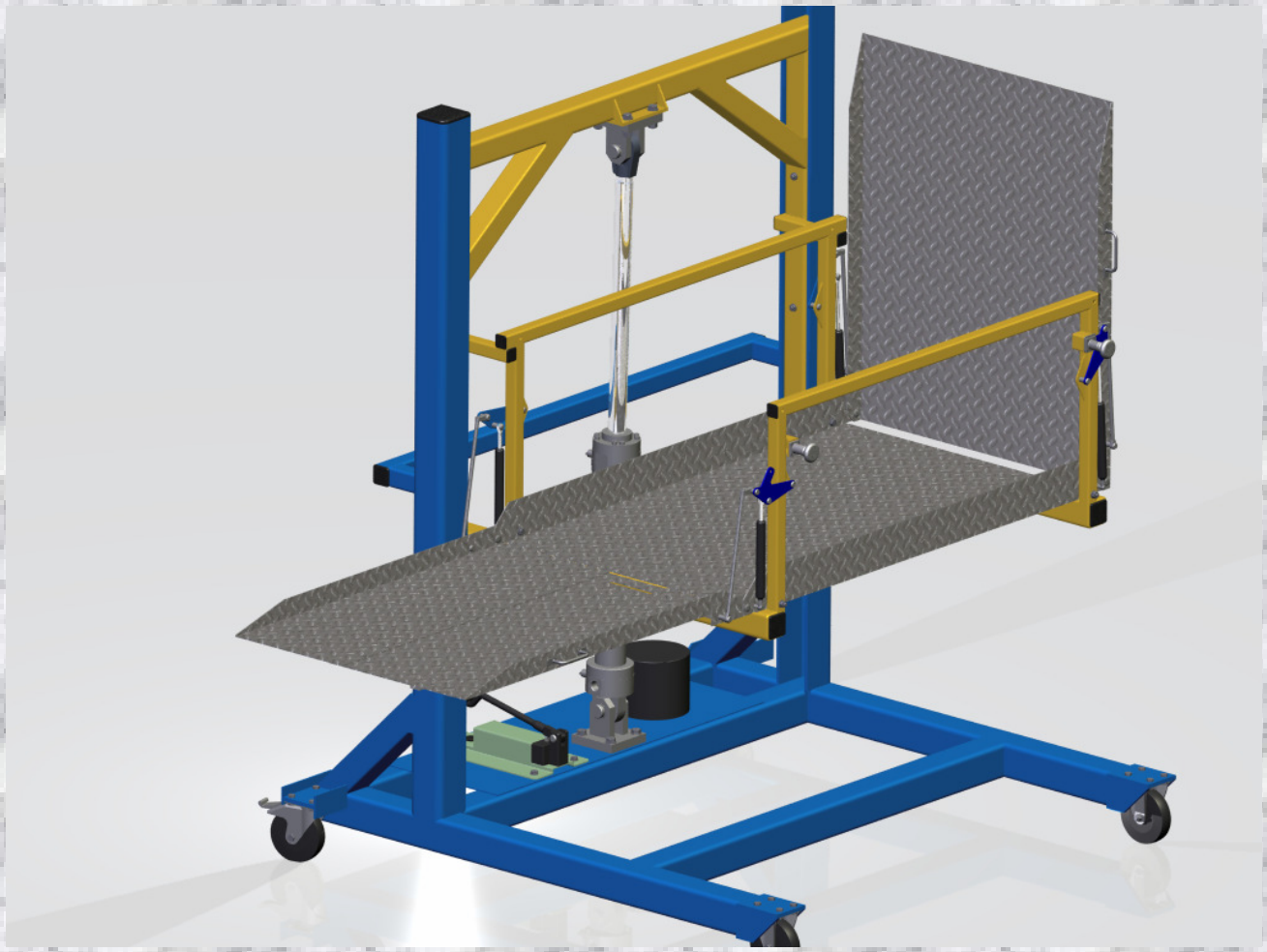
Components of the Structure

Connection of the Hydraulic Cylinder:

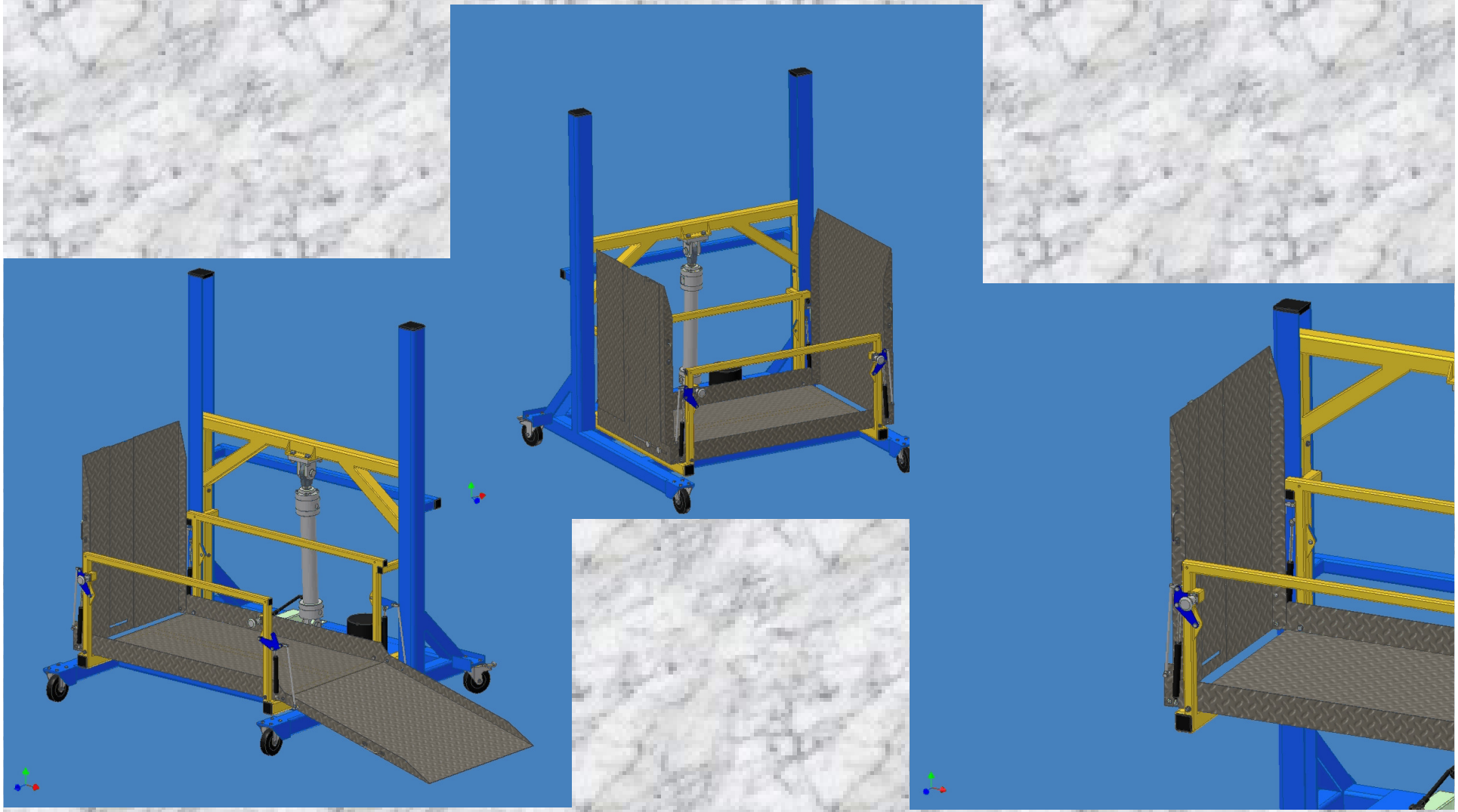




3D Model of the Lifting Device



Motion Simulation



Further Recommendations

- Selecting the optimal solution (size, weight)
- Designing a stationary version
- Applying electronic-hydraulic units
- Shape design for the covering components

Cost evaluation:

Weight cca:

150-160 kg