

WCTE

Detector Moving System

*From Tertiary to Secondary beam
Inside T9*

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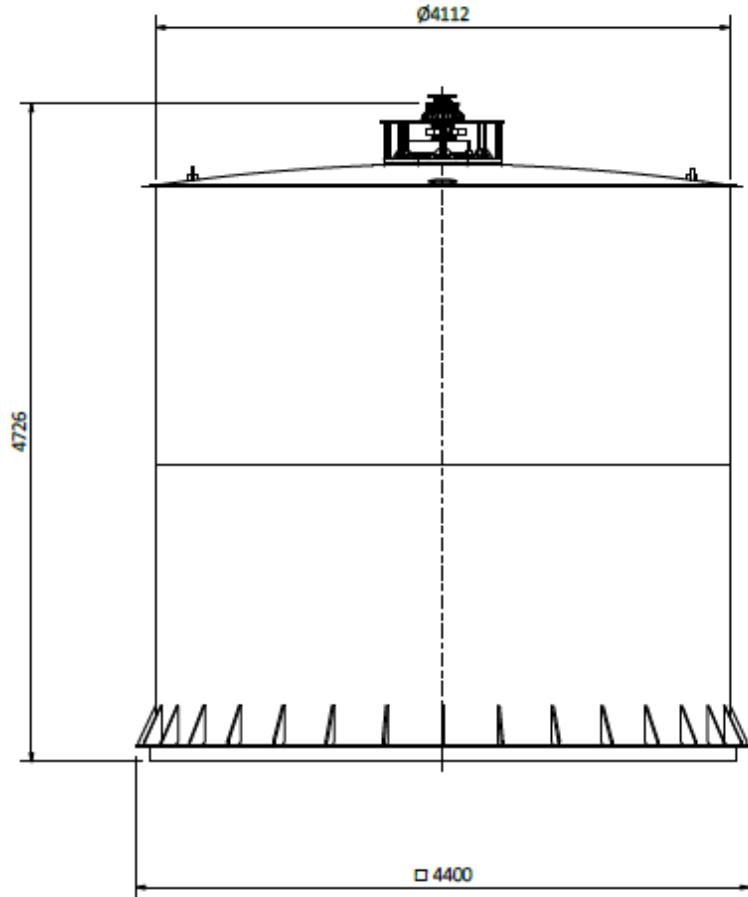
Outline:

- What is being moved?
- Where is this taking place?
- Possible Moving Systems – Initial Concepts
- FEA
- What's Next?



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The WCTE Detector Dimensions:



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The Main Components:

Component	Mass Kg
Tank	2400
Base	3100
Lid	750
Water	52,500
mPMT Array	10,000
CDS	120
<i>Total</i>	68,870

Calibration System
*More on this by Lauren
Anthony on Wed*

Tank Lid

Tank

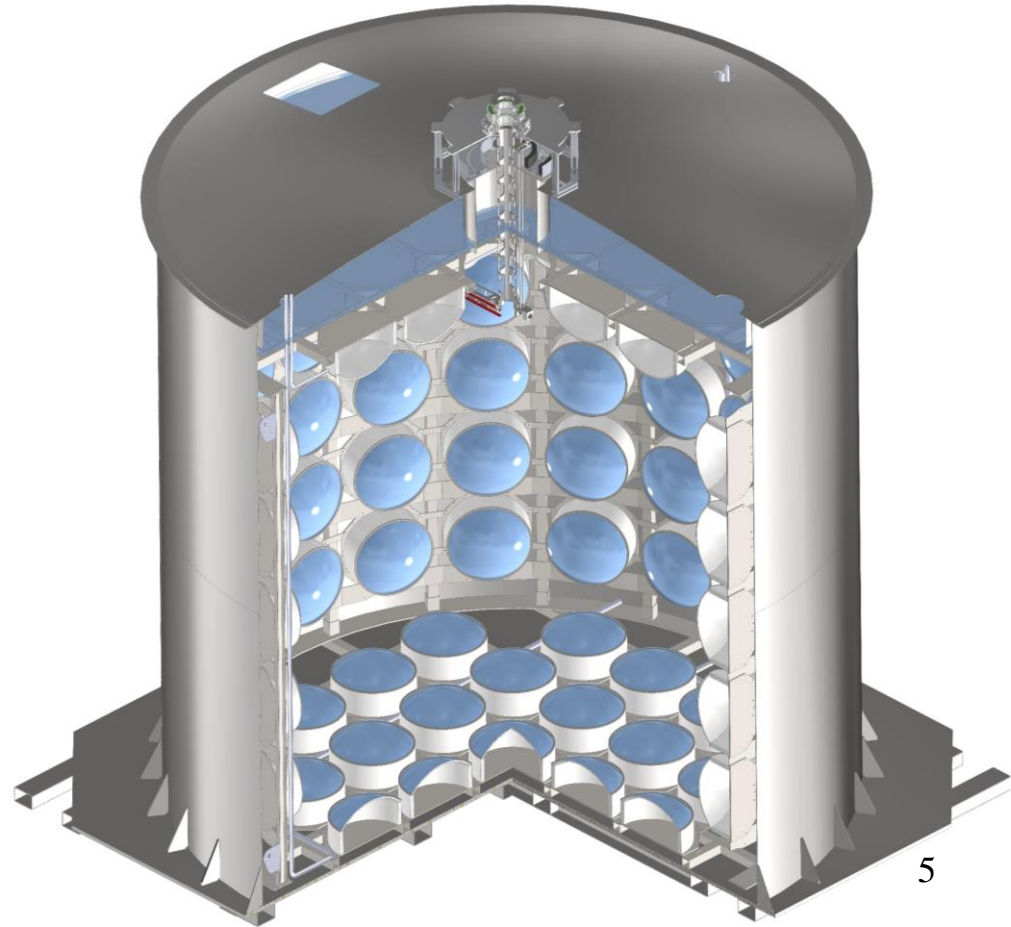
**mPMT Array /
Structure**

Base Plate



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Segmented View



- CERN East Area

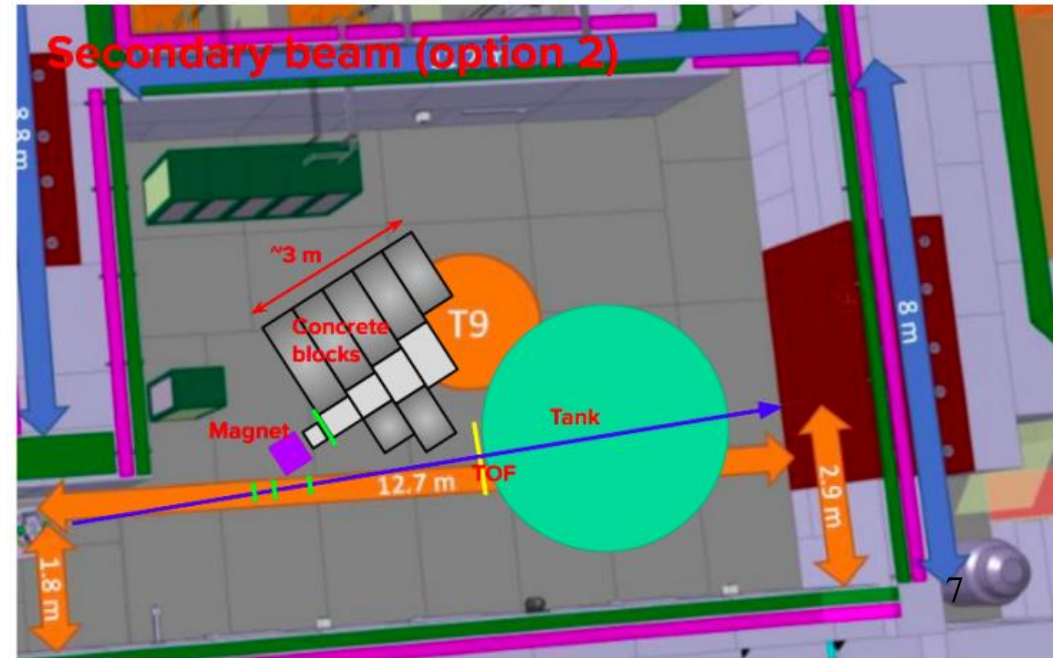
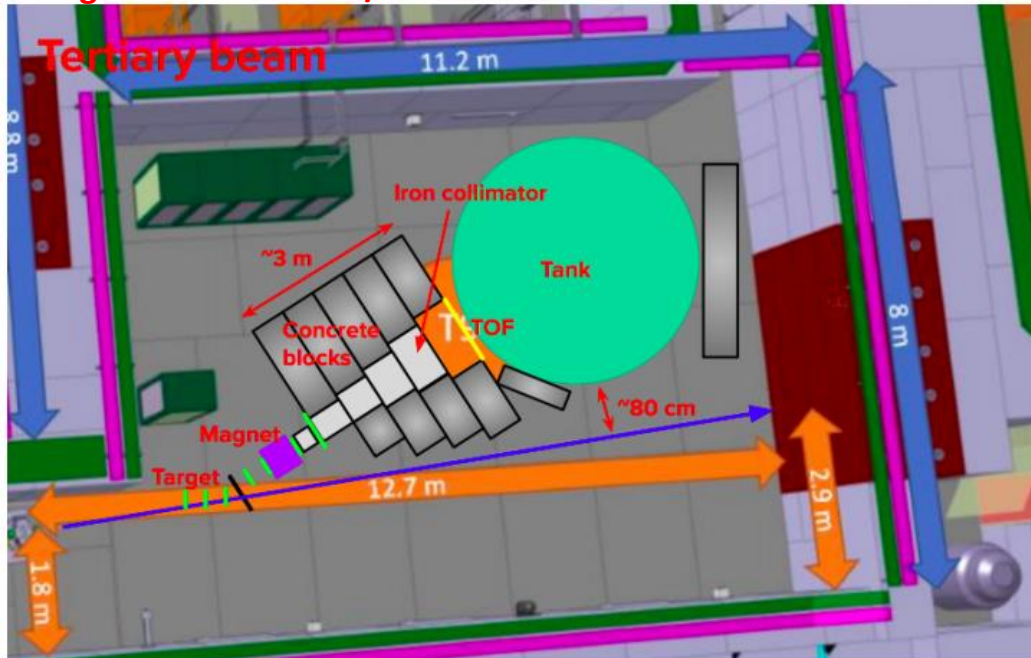
Experimental Area

Image from M. Hartz / M. Pavin



- Inside T9

Images from M. Hartz / M. Pavin

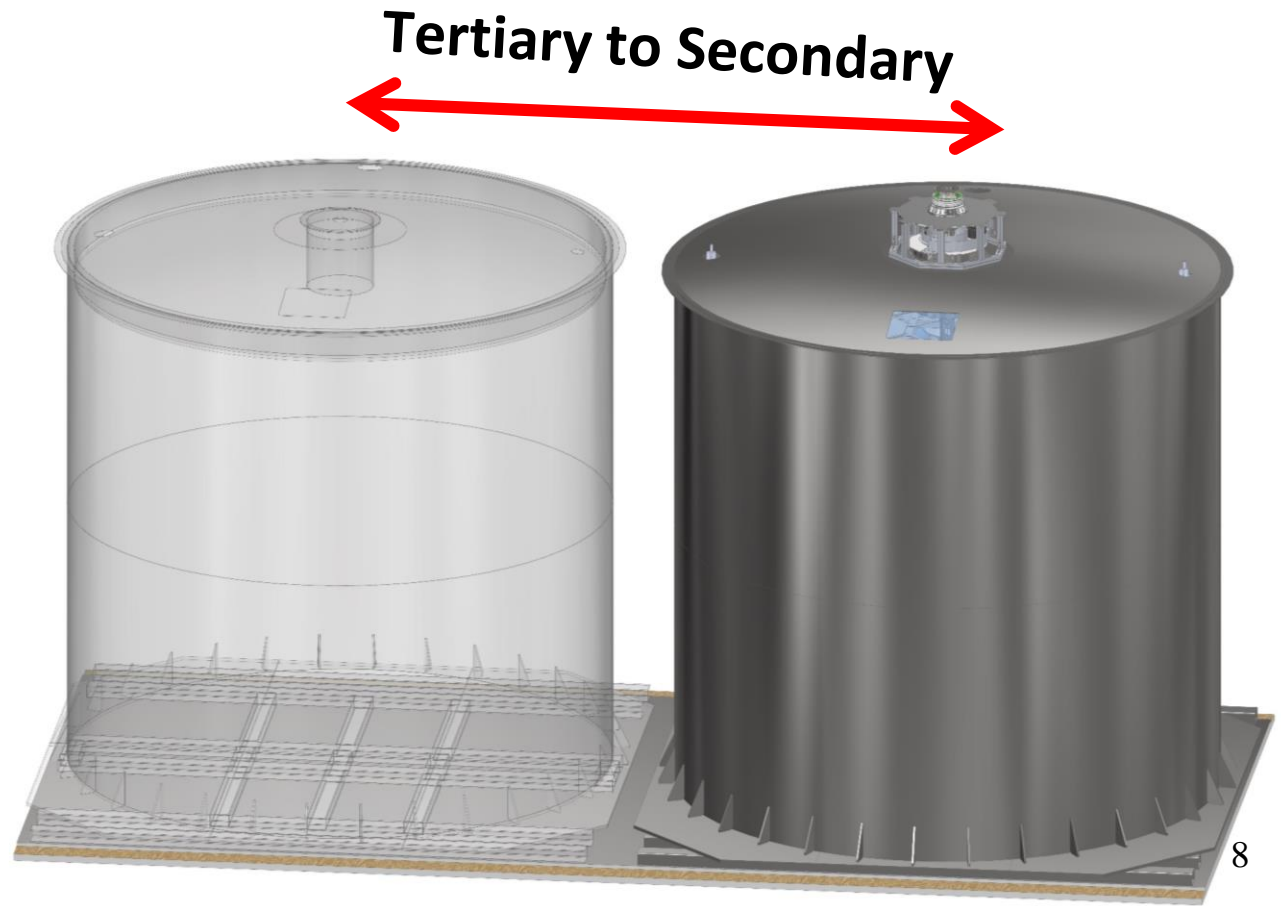


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Water Tank Move – Inside T9

Conceptual Methods:

- Pneumatic Air Skate
- Hydraulic Rail

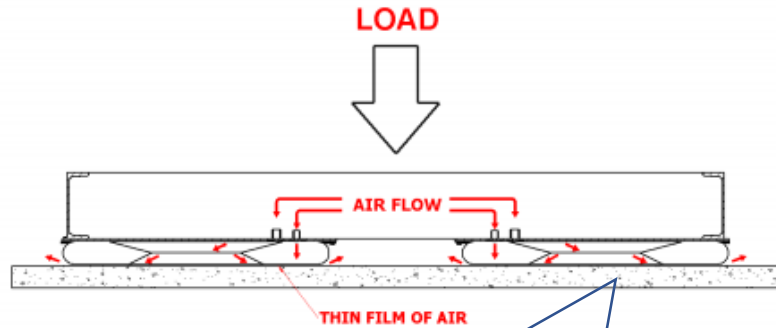


Air Skate

General Specifications for Concrete Floors

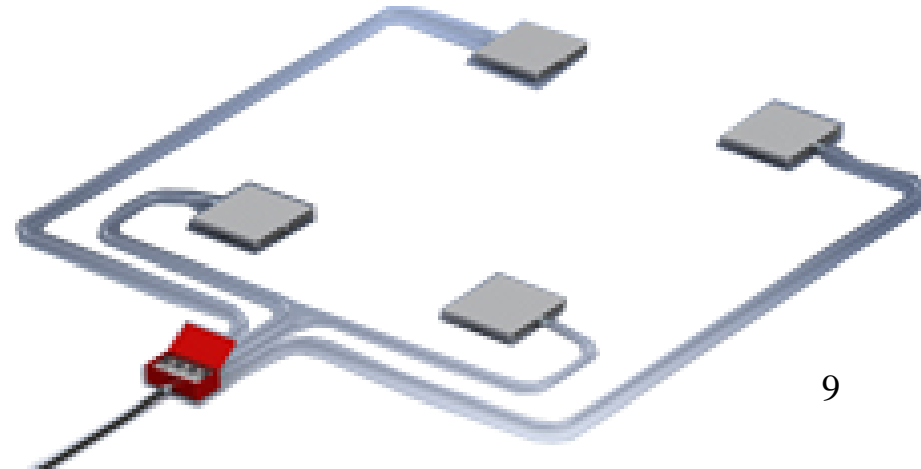
The floor is part of the air film technology and certain floor qualities must apply to ensure efficient operation of the air film equipment. The most important qualities are flatness, free of steps, airtight (non-porous) and smoothness of the surface.

When in operation the air bearing is floating on a thin film of air, the thickness of this air film is about 0,1 mm.



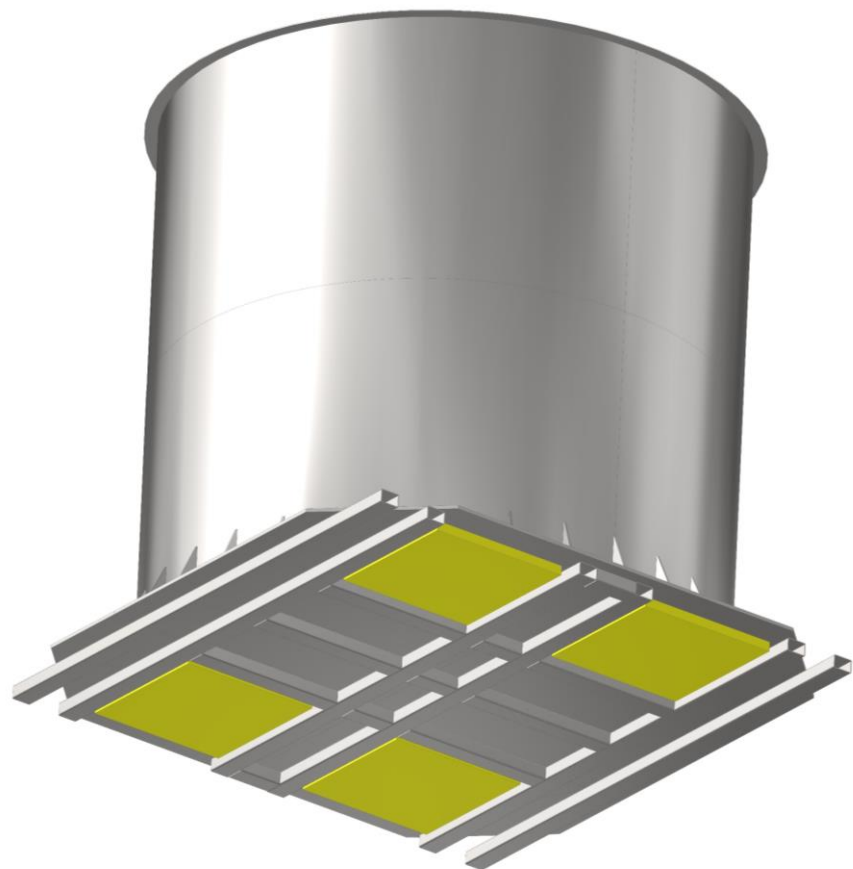
Floor needs to have a max deviation of around 5mm

If T9 floor is not flat, then we can generate a flat surface ourselves



Air Skate

Water Tank Move – Inside T9



X4 air skate shown in yellow

Each skate connects back to a manifold and then onto a compressor

Underside of tank base designed to locate air pad permanently during the experiment

Air Skate Size mm	Lift Capacity Kg	Factor of Safety
□ 1070	120,000	1.7:1 10

Air Skate

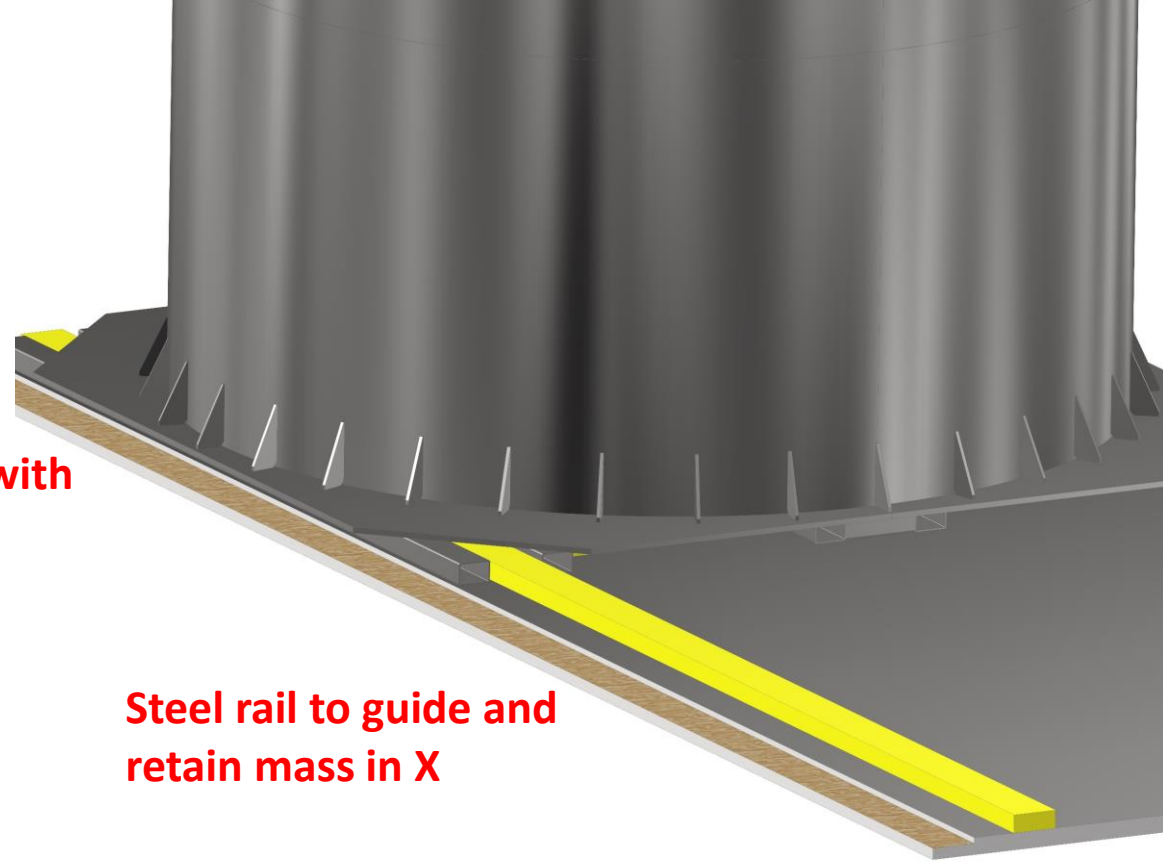


4 Bar/60 PSI of pressure

Winch at each end – to pull tank along and provide a counter force

Air Skate

The Floor, how we control the tank during the move:

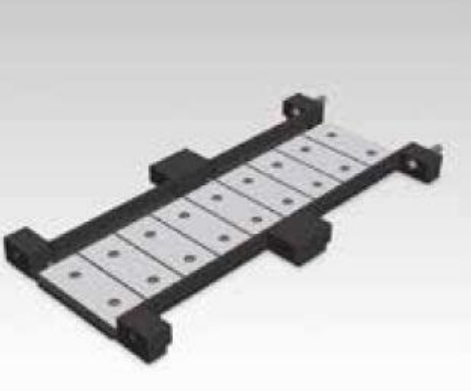


Axis	Degree of Freedom
X	Captive due to rail
Y	Wire Rope at each end of axis
Z	+ ~40mm lift on air skate

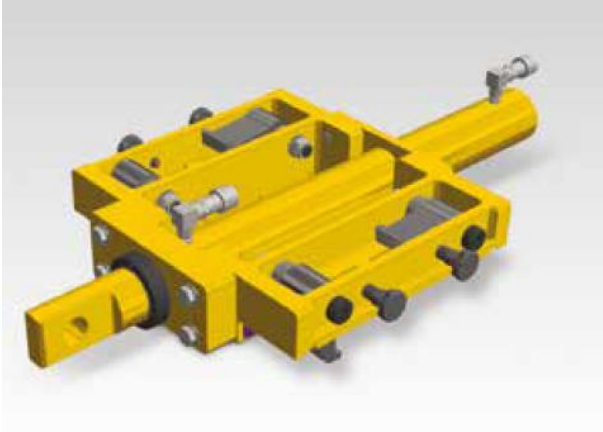
Hydraulic Rail



Rail Module



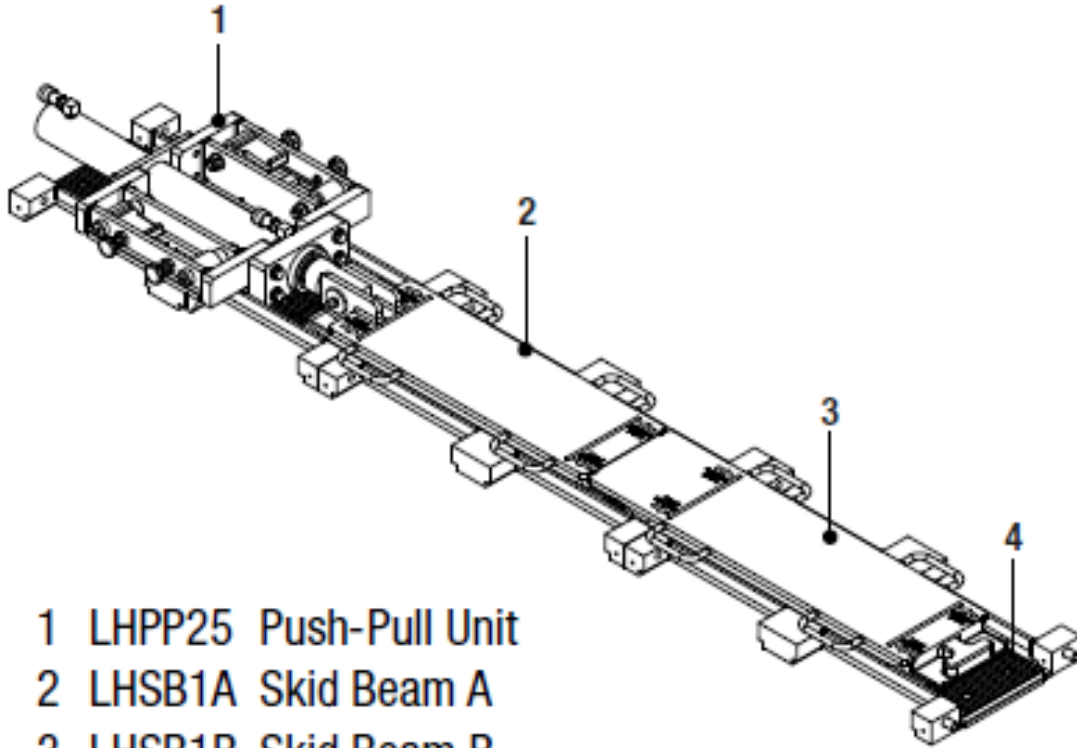
Skid / Tank Support



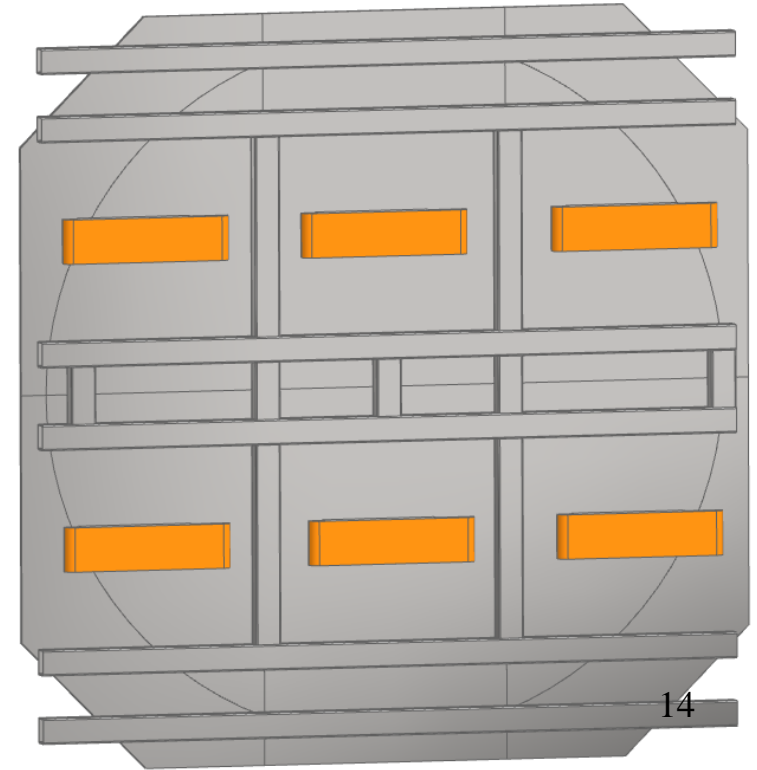
Push / Pull Unit

Hydraulic Rail

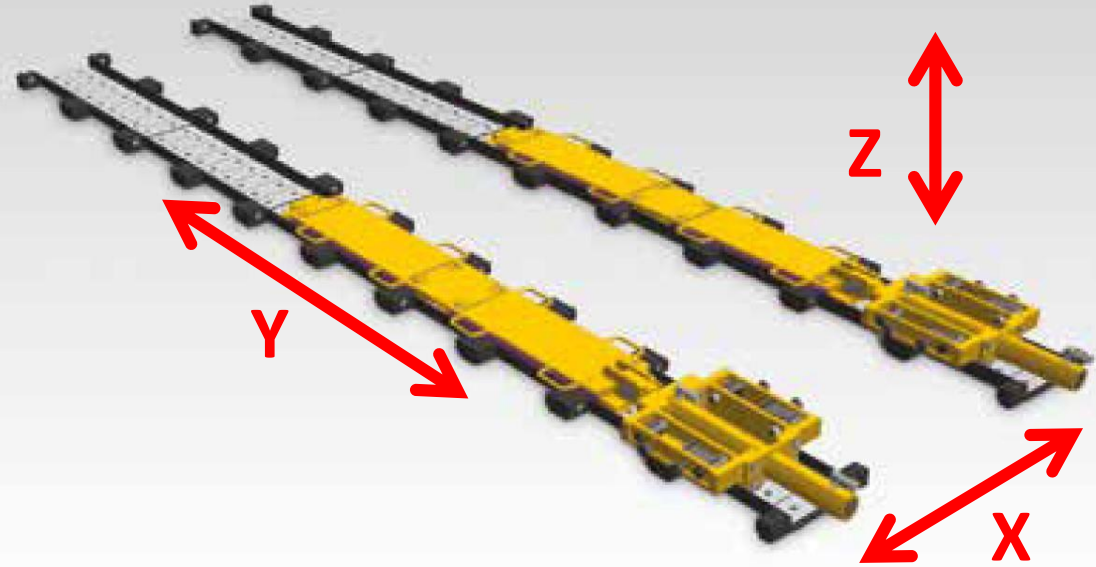
Using a 2 track system	Lift Capacity Kg	Factor of Safety
	363,018	5:1



- 1 LHPP25 Push-Pull Unit
- 2 LHSB1A Skid Beam A
- 3 LHSB1B Skid Beam B
- 4 LHST1 Skid Track (includes PTFE Skid Pads)



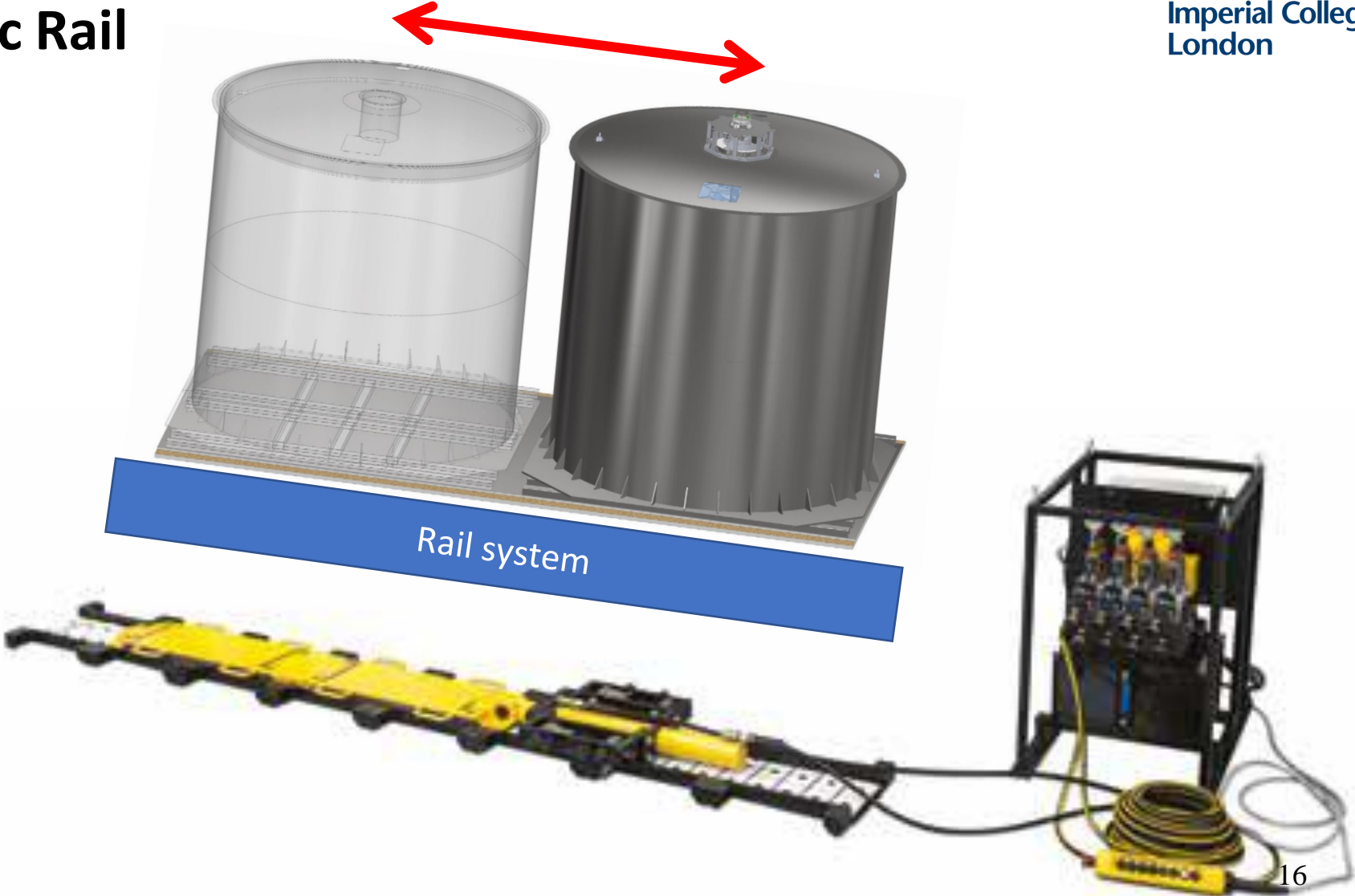
Hydraulic Rail



**700 Bar / 10,000 PSI
(max) of Hydraulic
pressure**

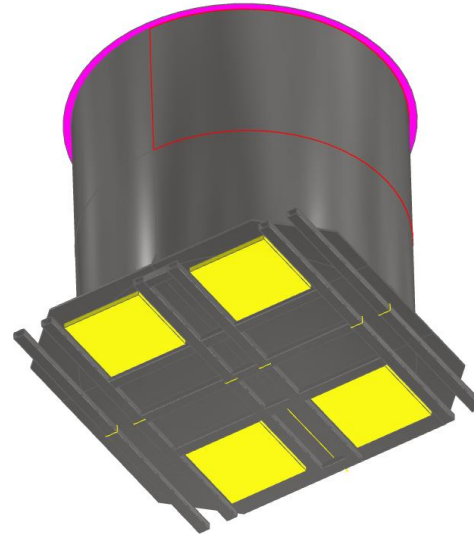
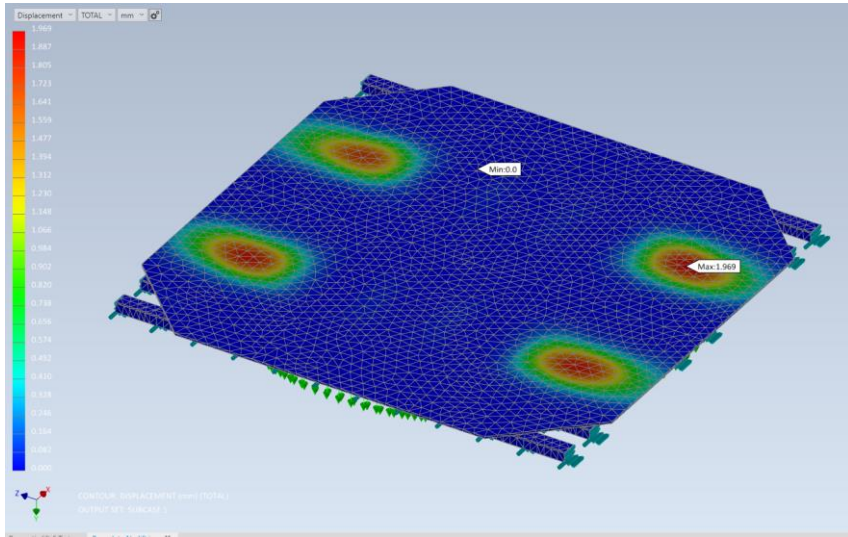
Axis	Degree of Freedom
X	Captive across 2 rail
Y	Captive along rail
Z	No Lift, gravity acting on tank

Hydraulic Rail

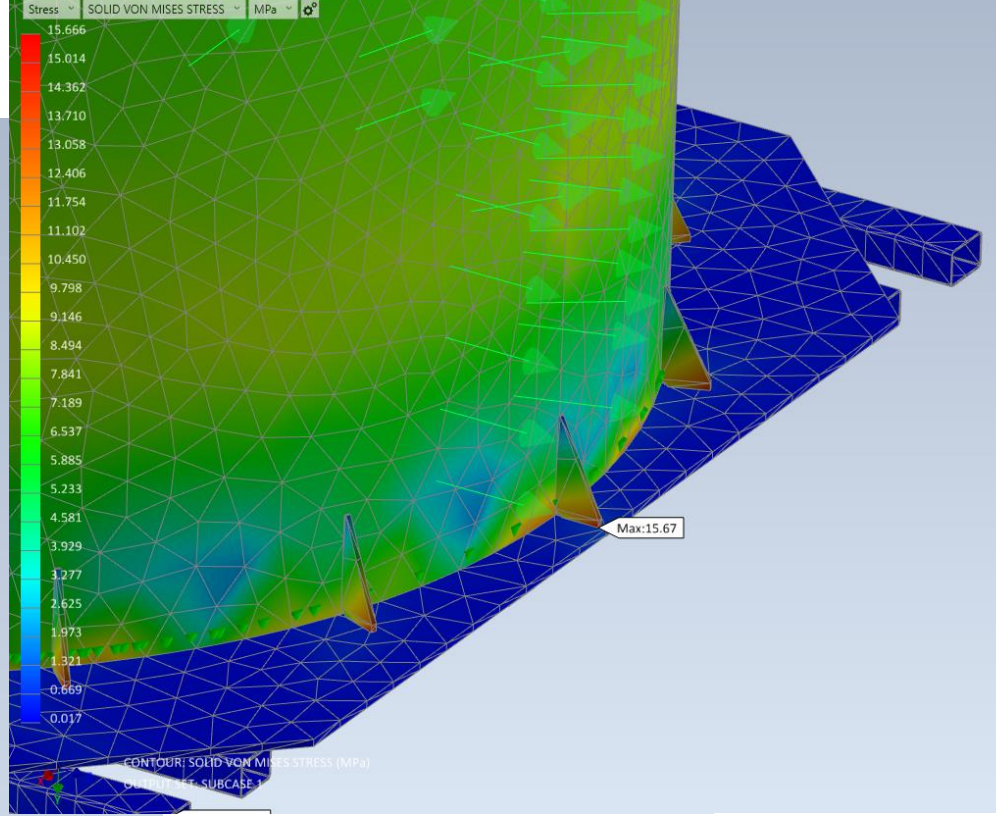
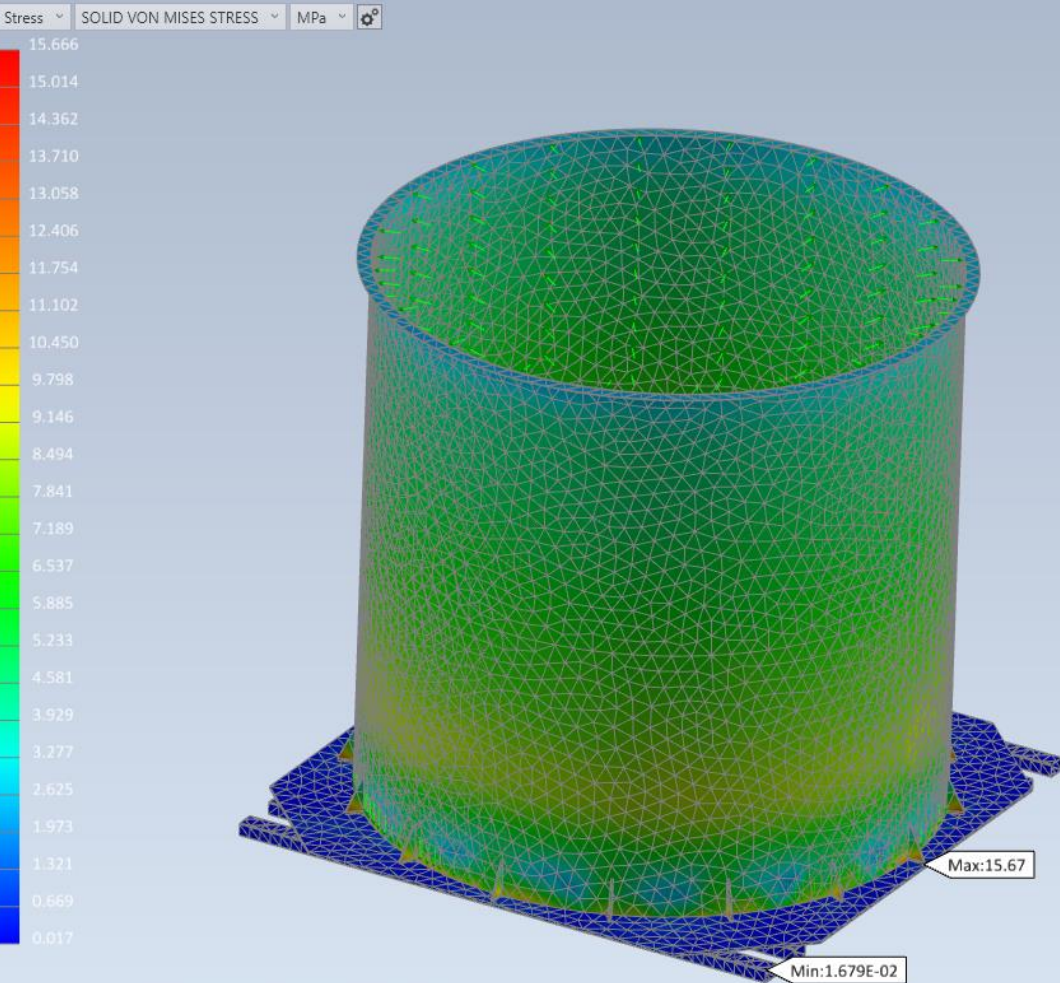


Water Tank Lifting - Analysis

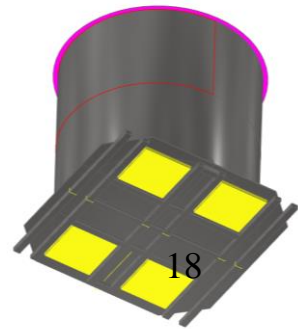
- FEA carried out on tank full of water
- Initial assessment to understand the tank deformation when lifted



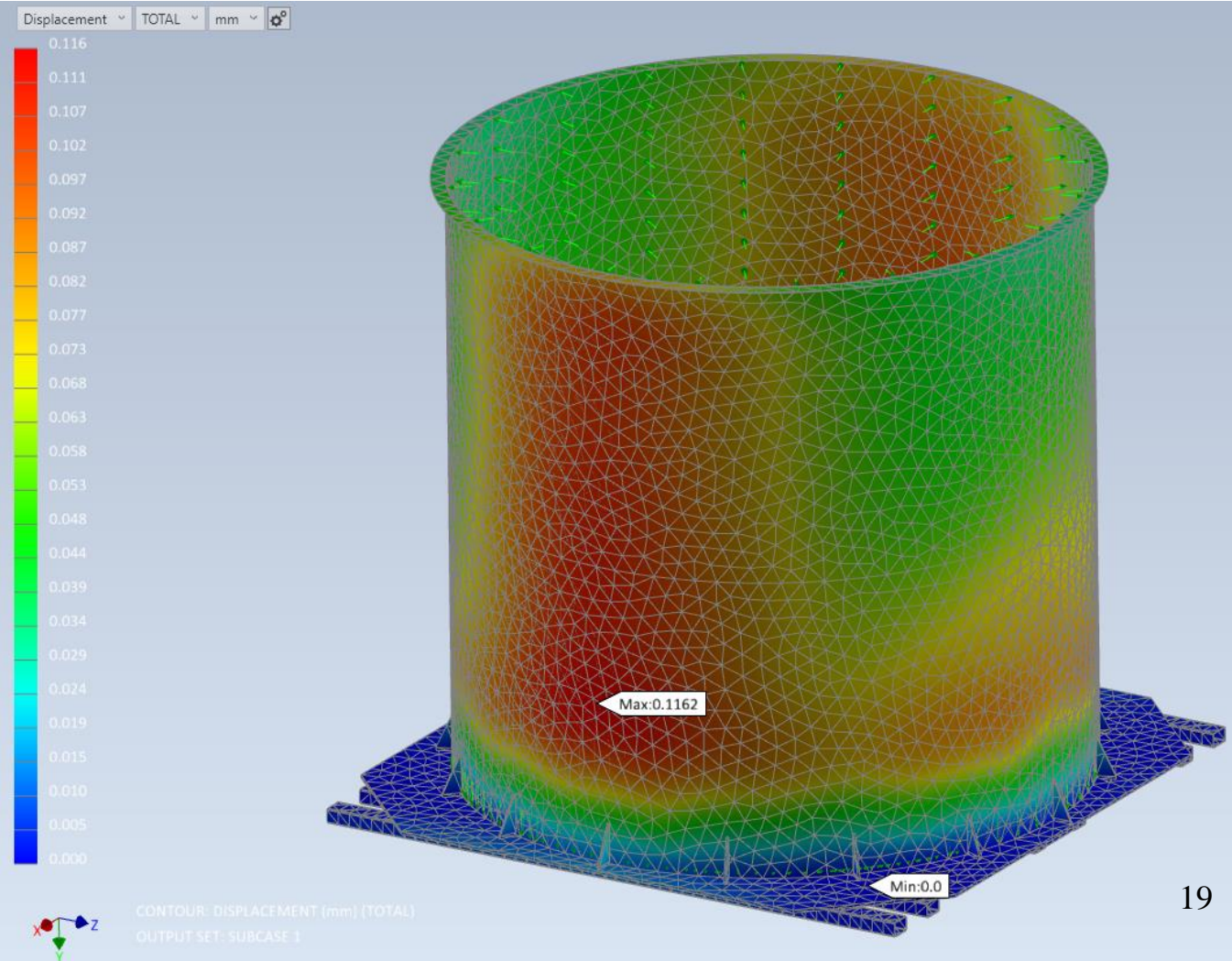
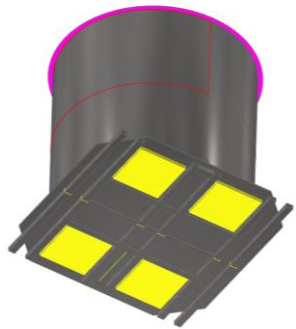
AIR SKATES – TANK AT 6mm THK



CONTOUR: SOLID VON MISES STRESS (MPa)
OUTPUT SET: SUBCASE 1



AIR SKATES – TANK AT 6mm THK



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Next Steps

- CERN Transport Group have become involved in past month.
- CERN assessing what equipment they could provide.
- Meetings upcoming to review and progress this part of the project.

