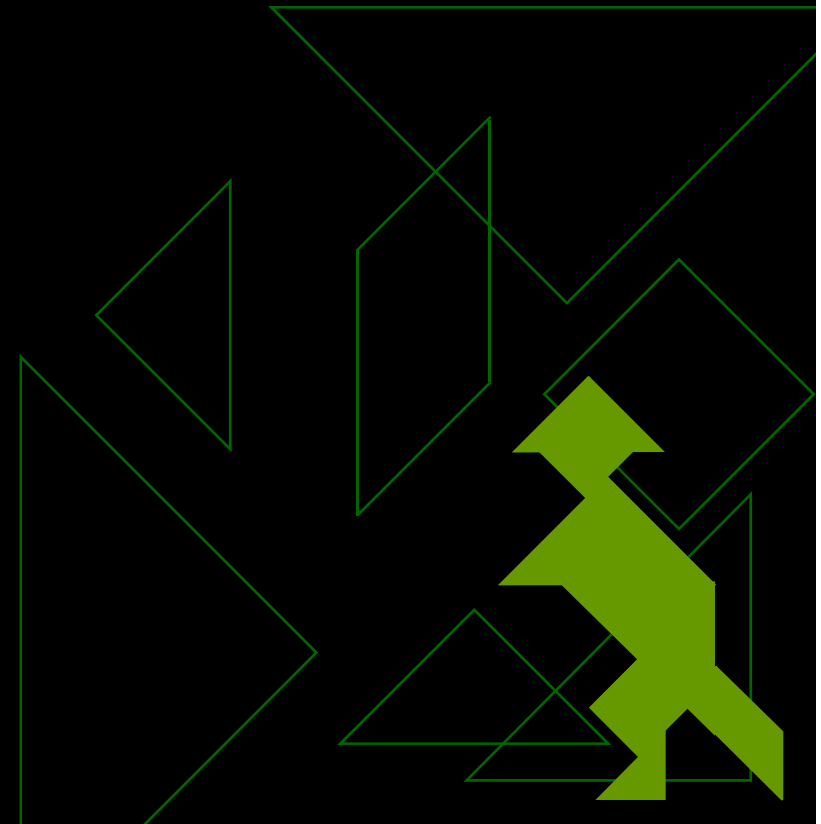
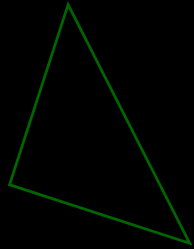


Aspects of CMS assembly origami



Yoke


The yoke represents the structural backbone of the whole detector



Yoke



Take the right decisions early because
then you are fixed forever

- Overall Dimensions, Weight, Tolerances
 - All radial dimension for sub-detectors
 - Yoke will go ahead all other manufacture
 - Problems will affect general planning
- 

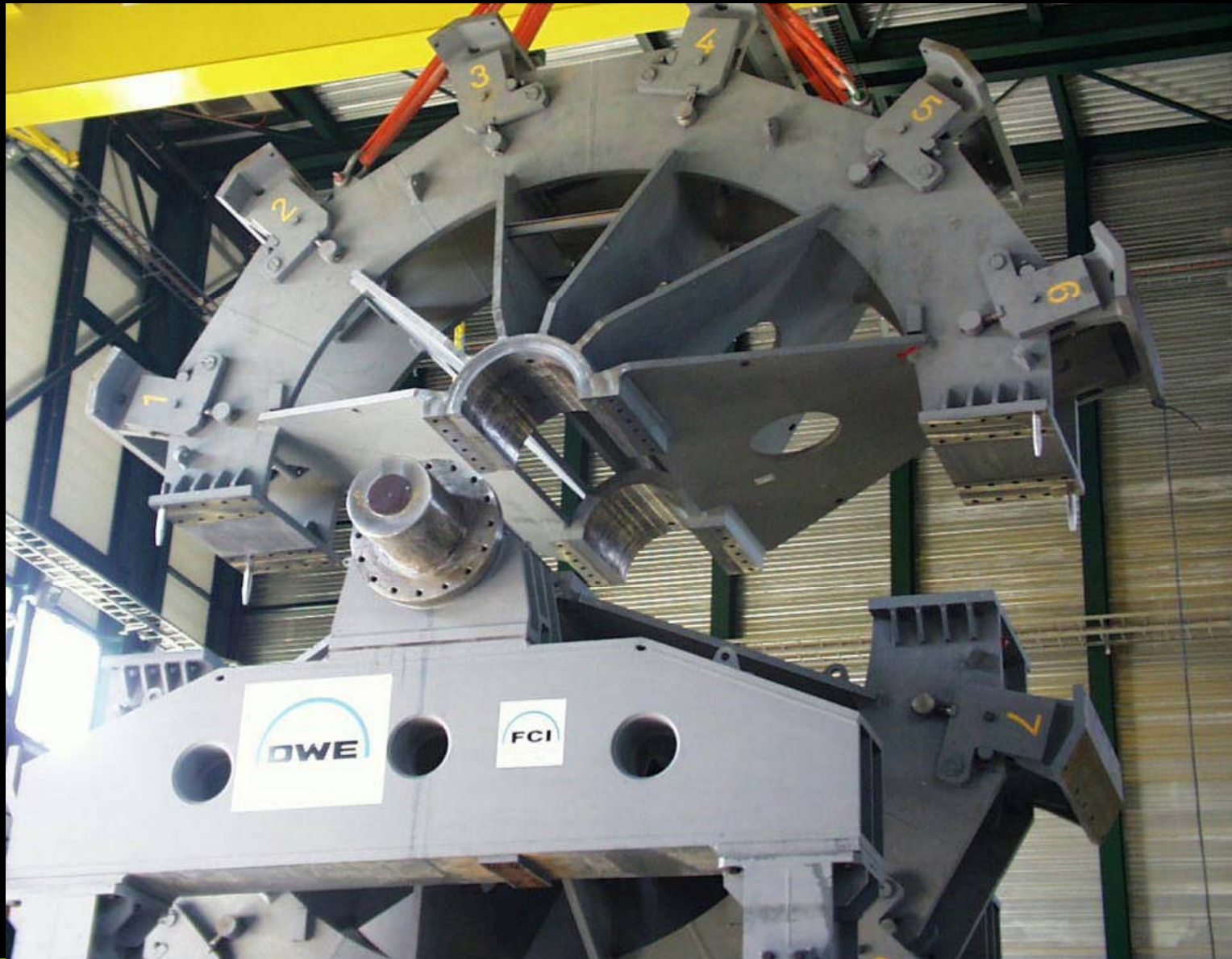
Yoke associated problems

- ◆ Blanc Assembly at company
- ◆ Transport
- ◆ Assembly jigs/ tooling
- ◆ Access / safety
- ◆ Mechanical soundness/ quality
- ◆ Errors = substantial additional cost

Examples

- ◆ Manufacture
- ◆ Blanc assembly at company
- ◆ Quality check
- ◆ Transport
- ◆ Final Assembly

Jig for external Barrel assembly, called Ferris Wheel





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Ferris Wheel for central Barrel with vacuum tank part
as integral part of the jig, trial assembly at the manufacturer



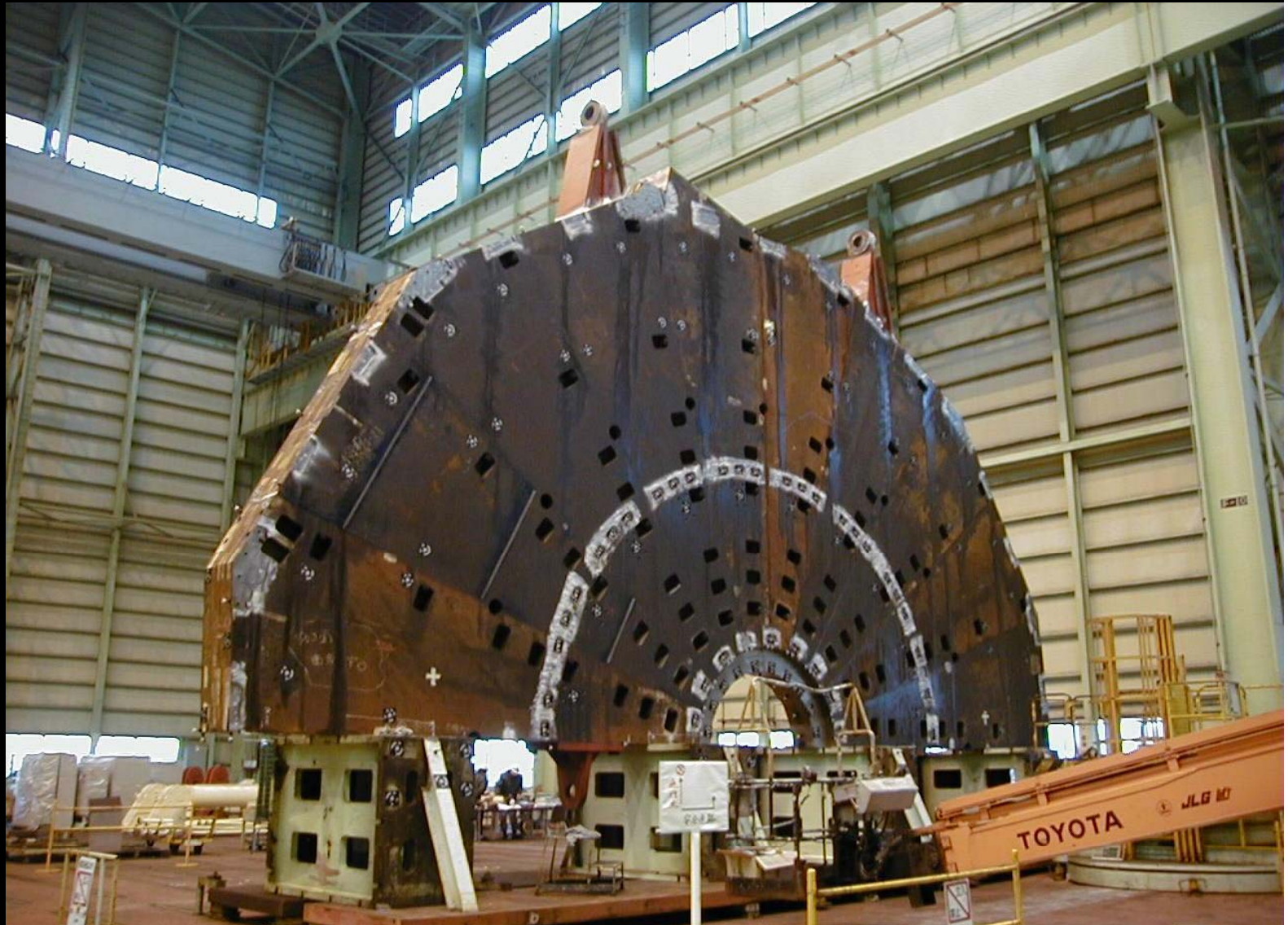
Small objects in A4 drawings maybe BIG, too



Endcap in situ drilling, machine is installed on endcap!



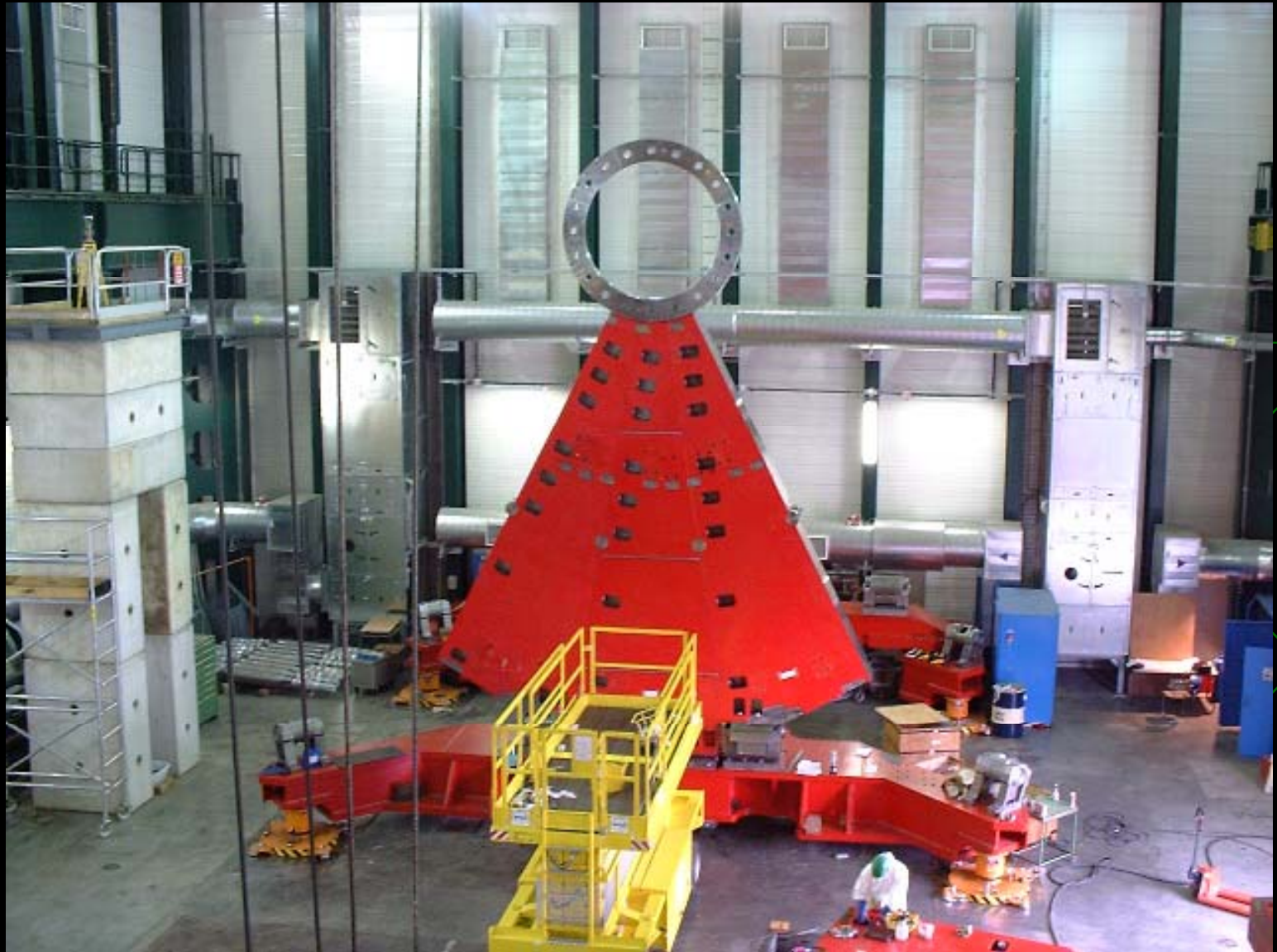
Quality check by photogrammetry



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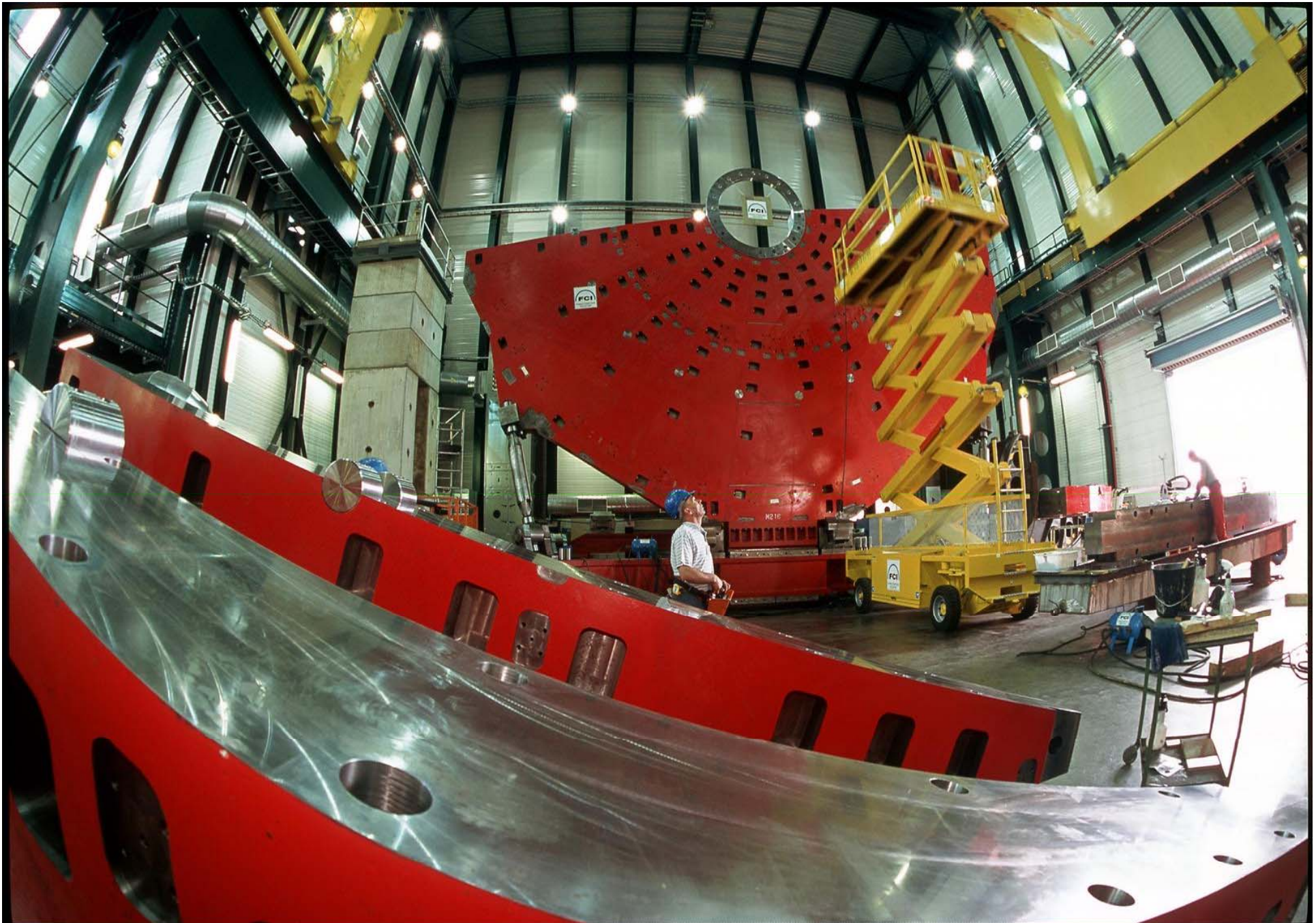
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Starting final endcap assembly at P5



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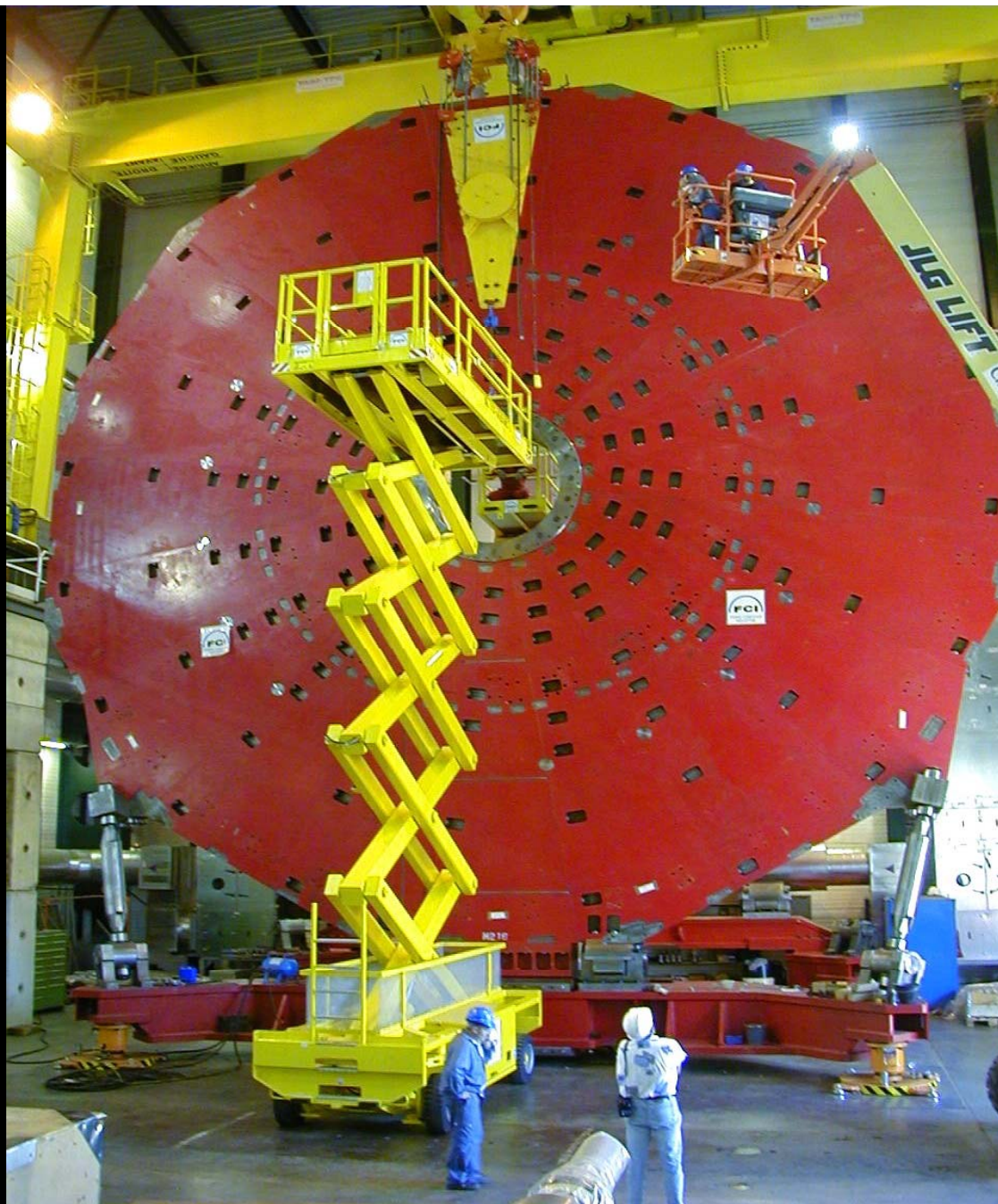
12 Hubert Gerwig, CERN, Jan. 2009



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13 Hubert Gerwig, CERN, Jan. 2009

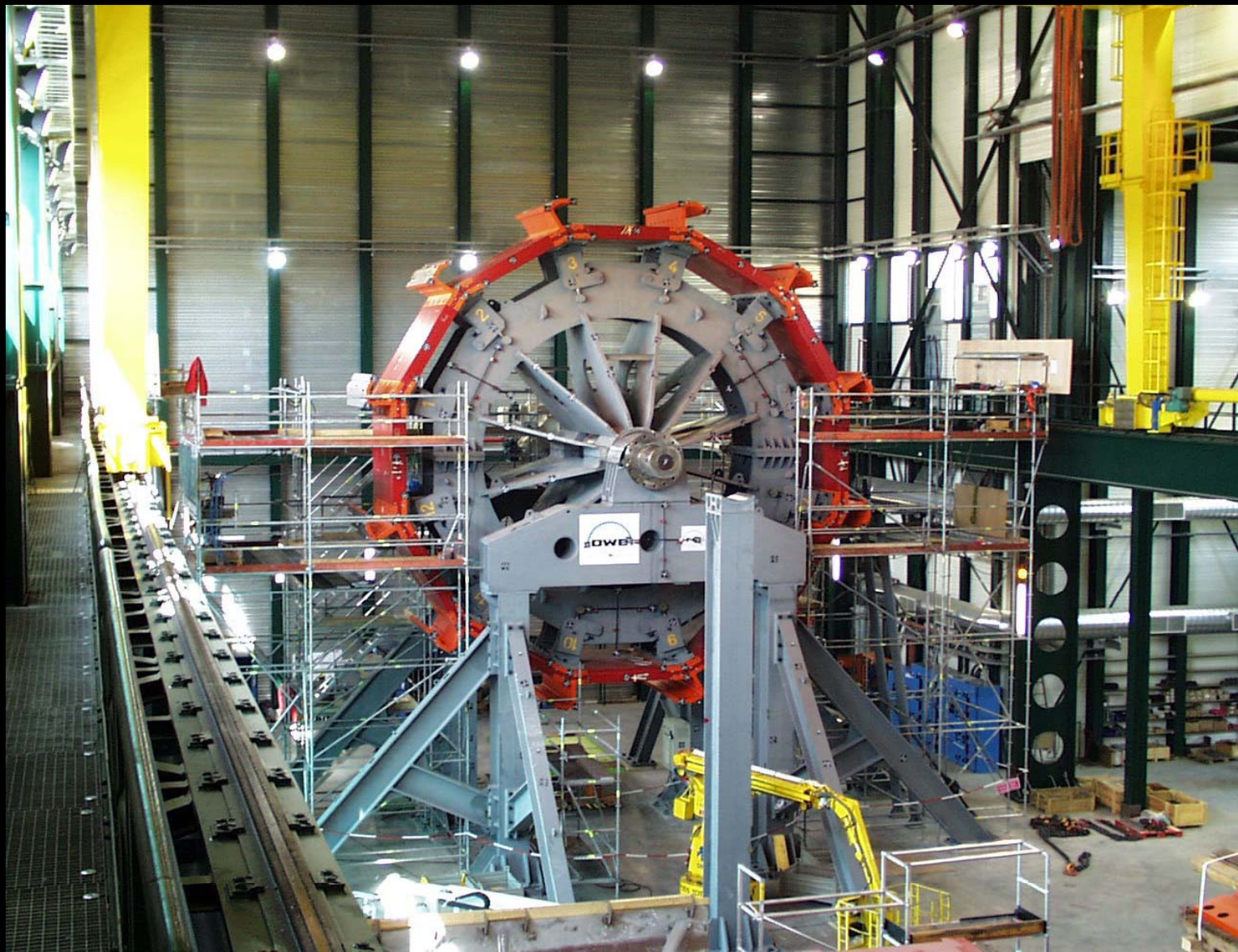
A
C
C
E
S
S





Save money by limiting number of exceptional transports

Final assembly Barrel ring, first layer and cornerpiece

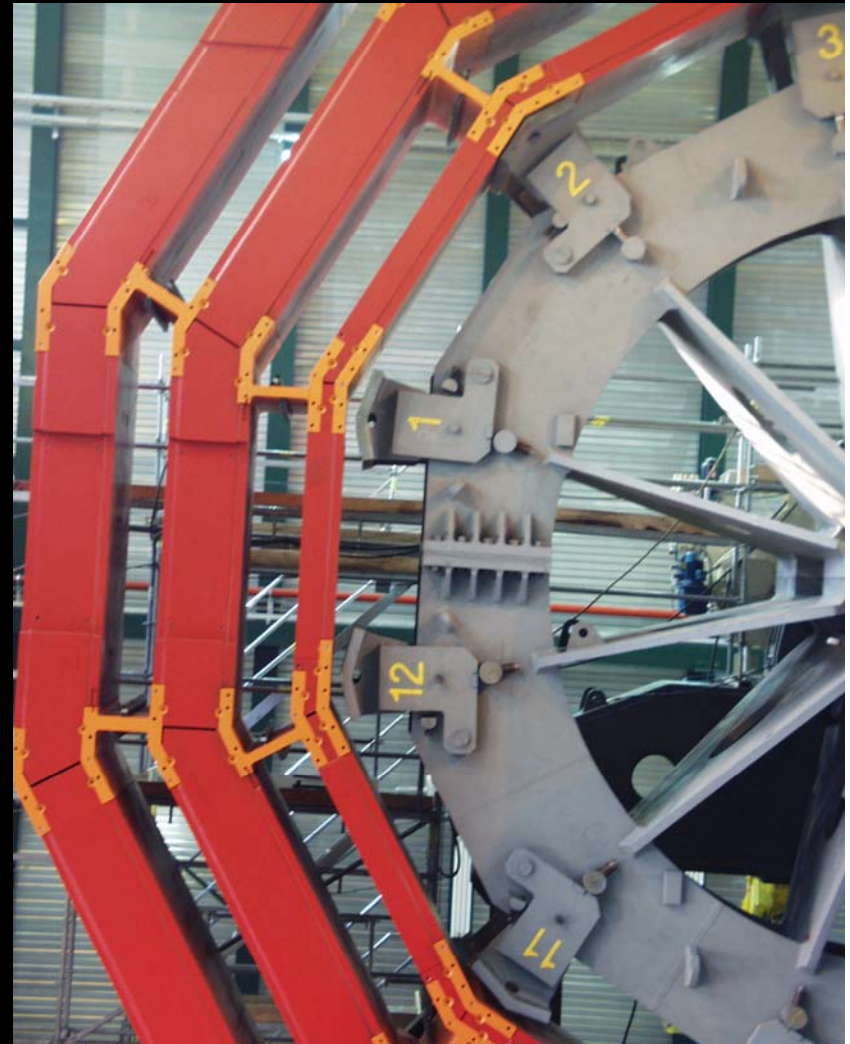


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Release of supports!

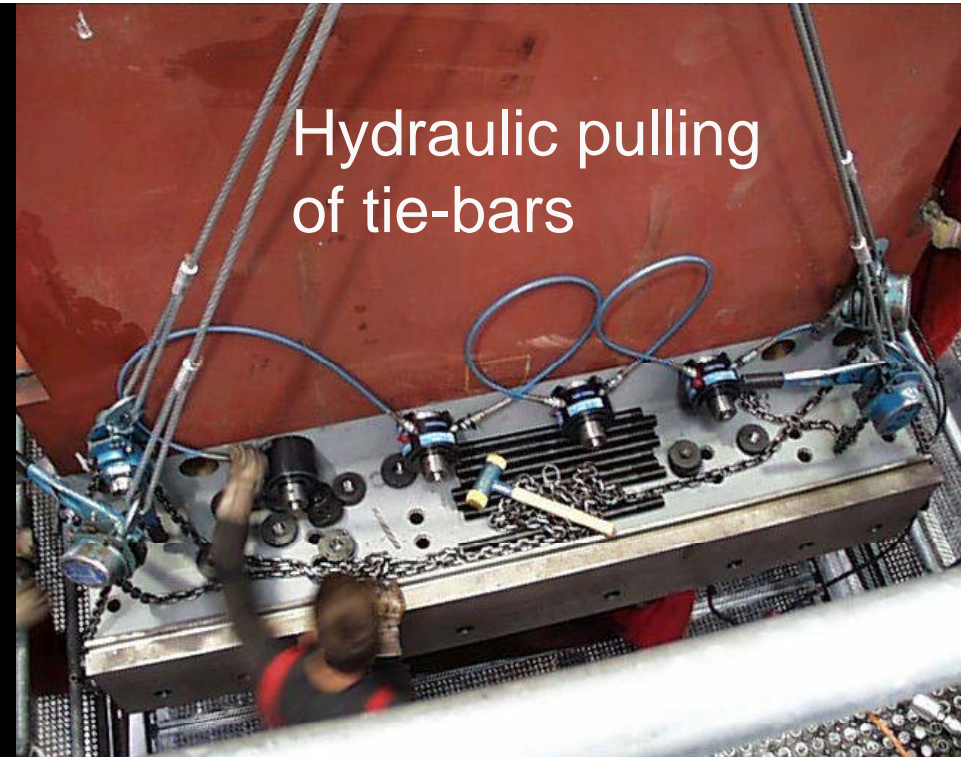




Vacuum tank with deep drilling for shear forces

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Hydraulic pulling of tie-bars



Swiveling of inner vacuum tank



Insertion of Hadronic Calorimeter (2x500t)

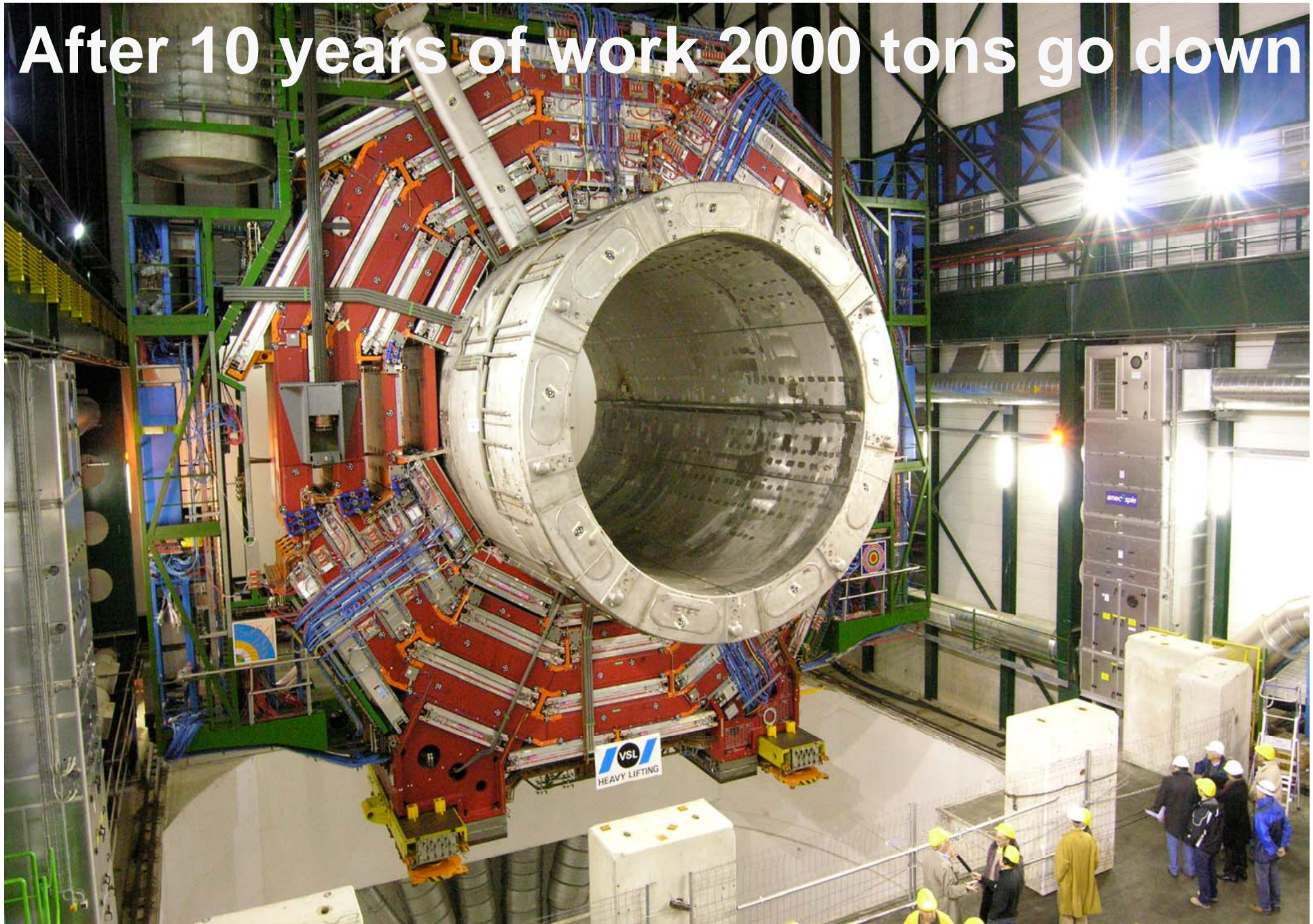


Coil insertion into outer vacuum tank





After 10 years of work 2000 tons go down





Thank you for your attention,

Hubert Gerwig