

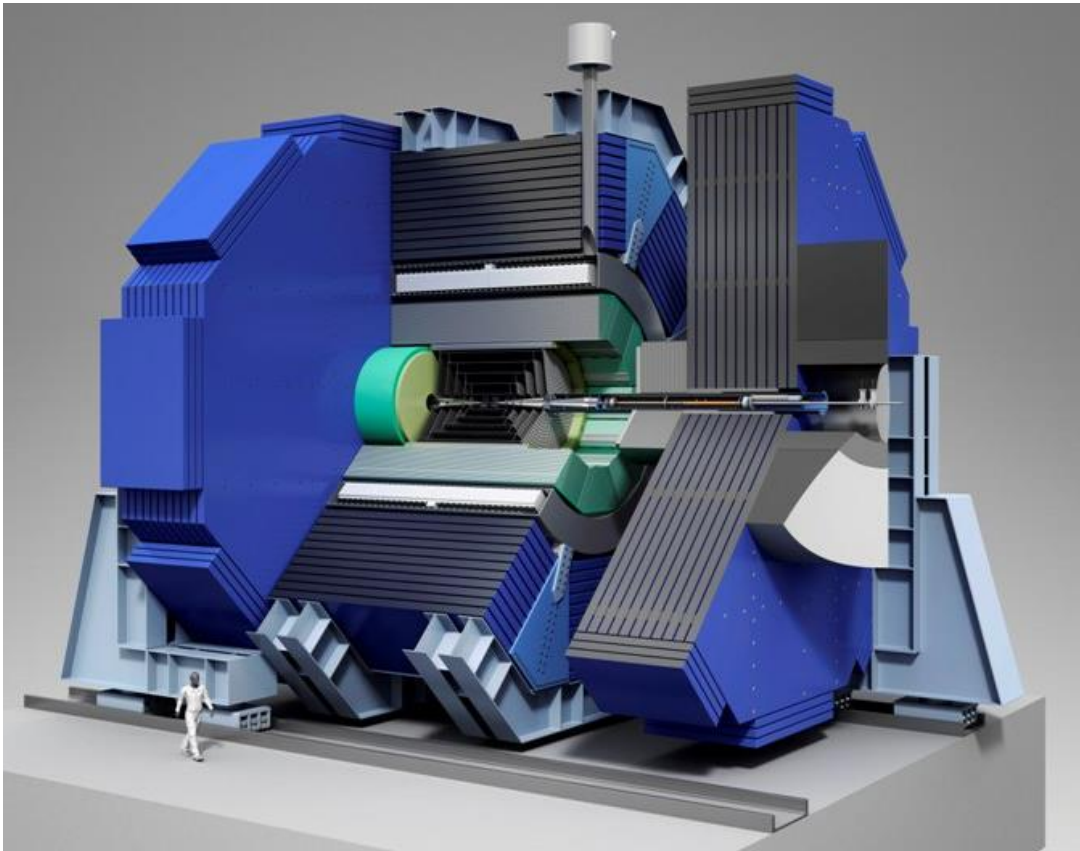
# SiD Surface assembly

MDI-CFS Meeting Sep. 4-6, 2014, Ichinoseki (Japan)

Marco Oriunno (SLAC)

# SID Assembly Assumptions

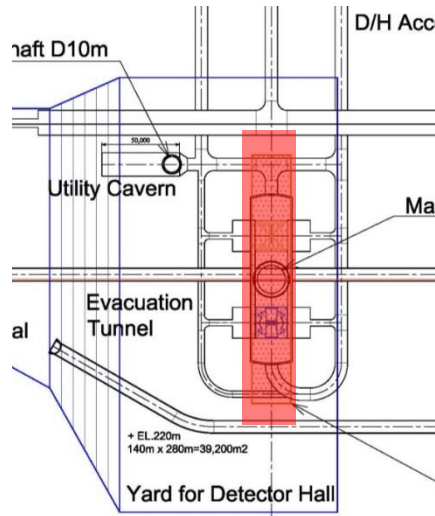
1. Maximum Permissible Load on Road, 60 ÷ 80 tons
2. Assembly on surface of Magnet, Solenoid, Hcals



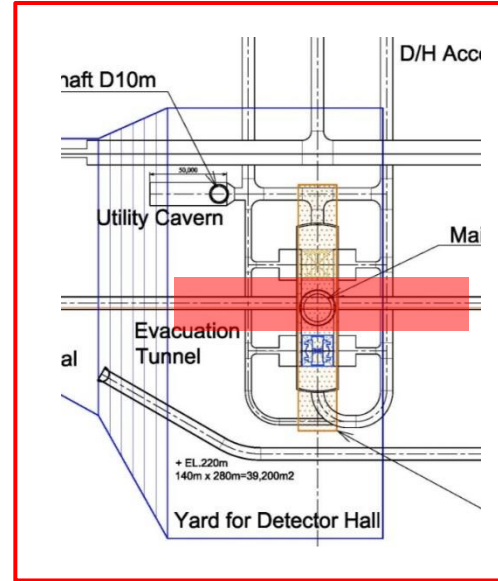
Weight	Metric Tons
Tracker	1.5
Barrel Ecal	60
Barrel Hcal	450
Coil	162
Barrel Iron	3100
Total Barrel	3773
Endcap Ecal	10
Endcap Hcal	38
Endcap Iron	2100
Pacman	100
BDS	5
Total Door (x1)	2253
Total SiD	8278

# Assembly Hall Layout Option

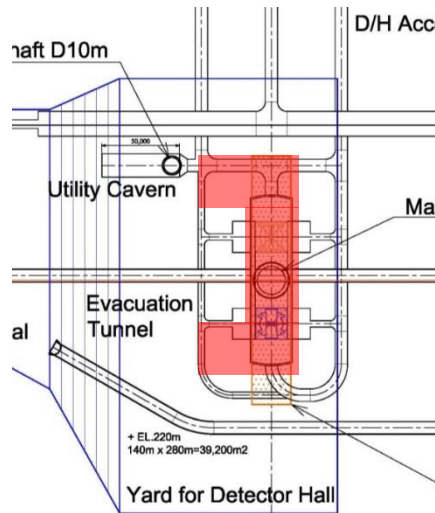
Baseline  
Orthogonal



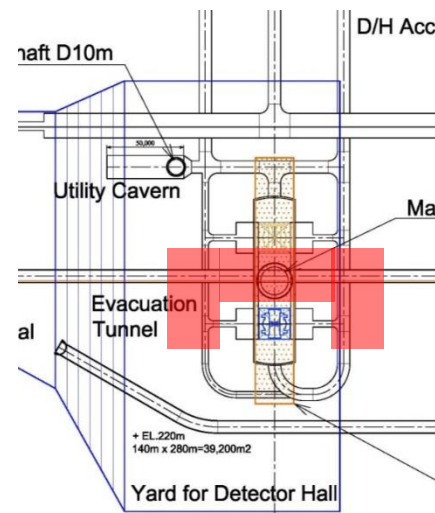
Op.1  
Parallel



Op.2  
C-shape  
Orthogonal

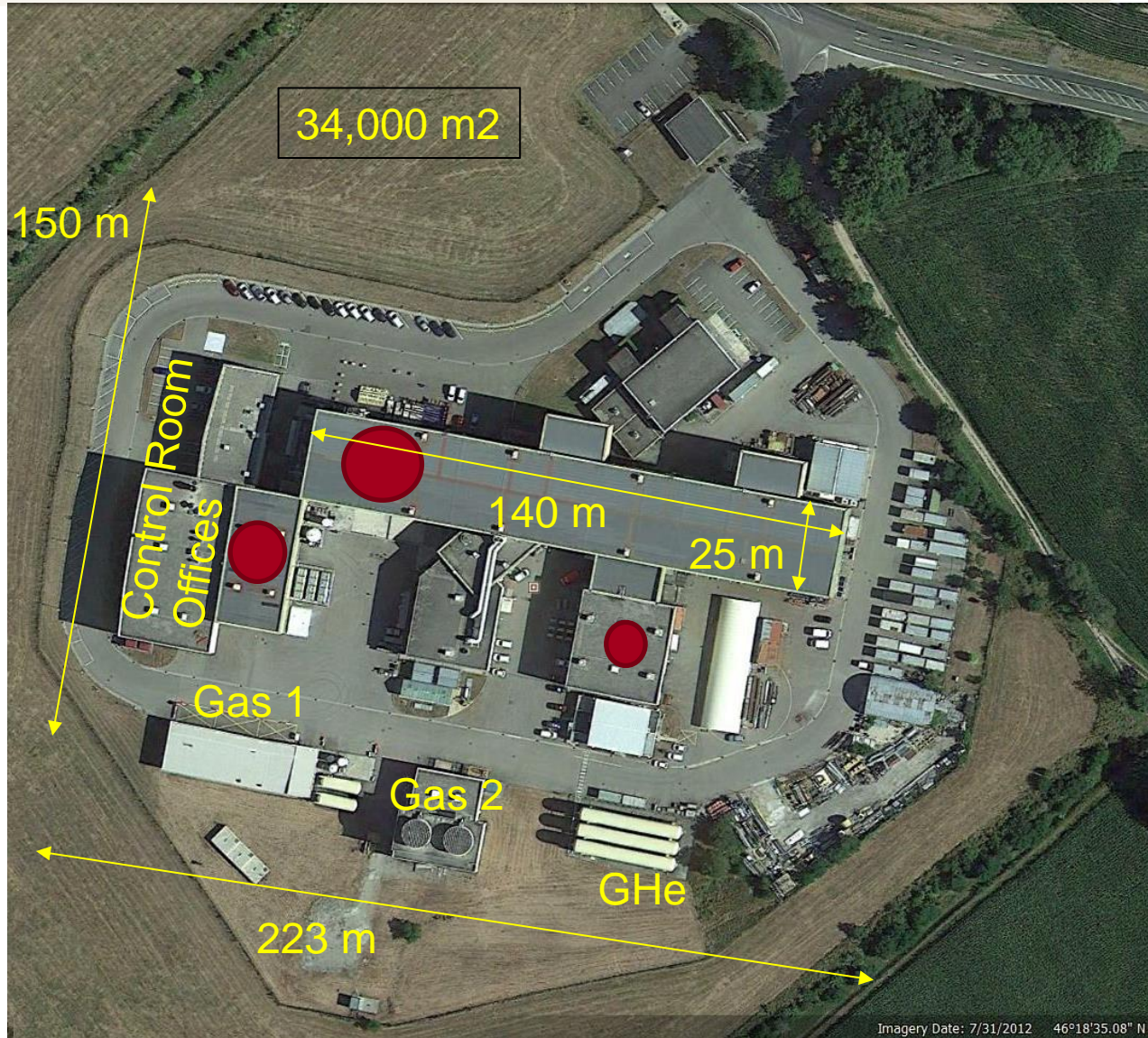


Op.3  
C-shape  
Parallel

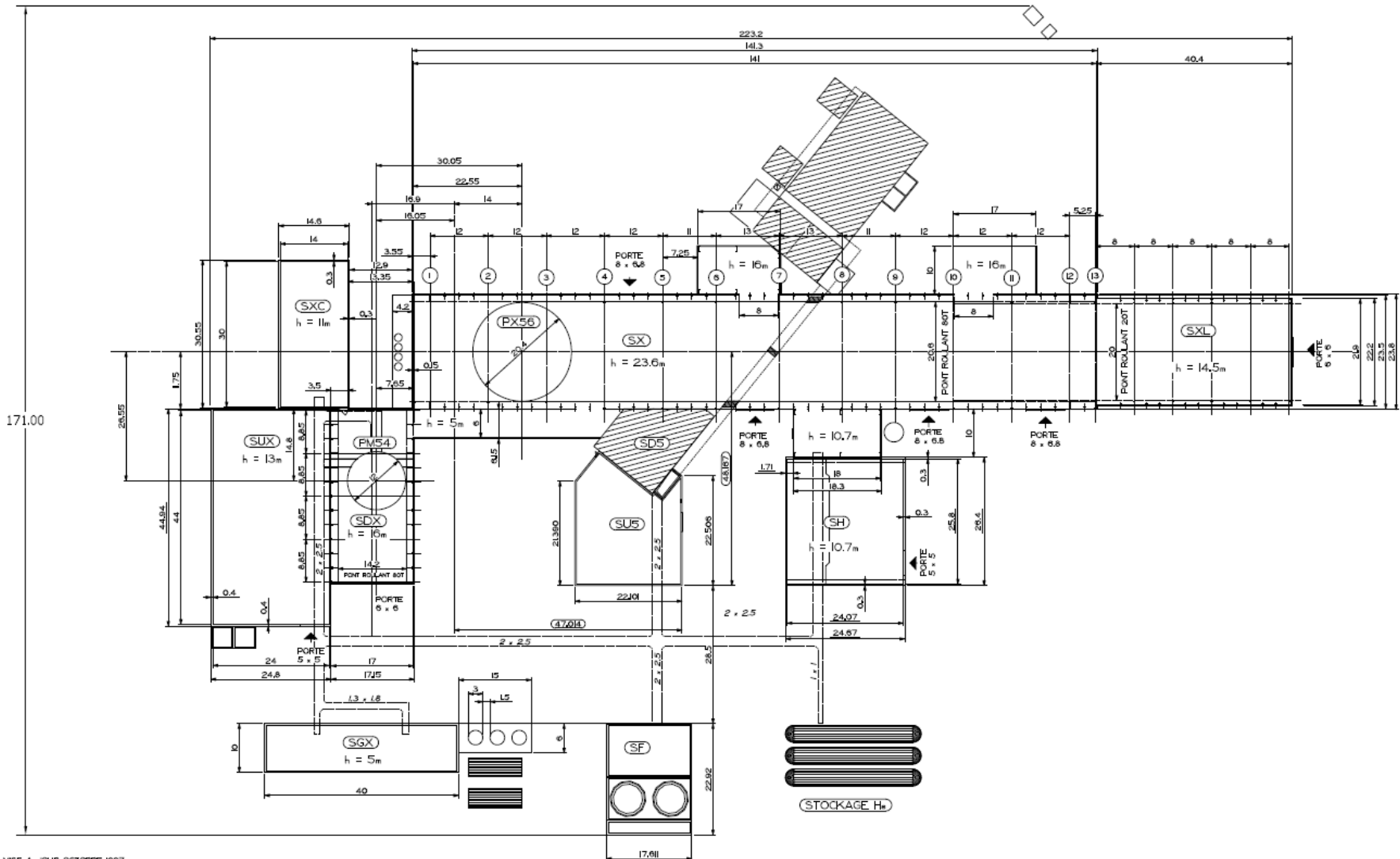




# Assembly Yard - CMS



# Assembly Yard - CMS



# CMS Assembly Hall

## FINAL ASSEMBLY HE+1 & OPTICS ON YE+1

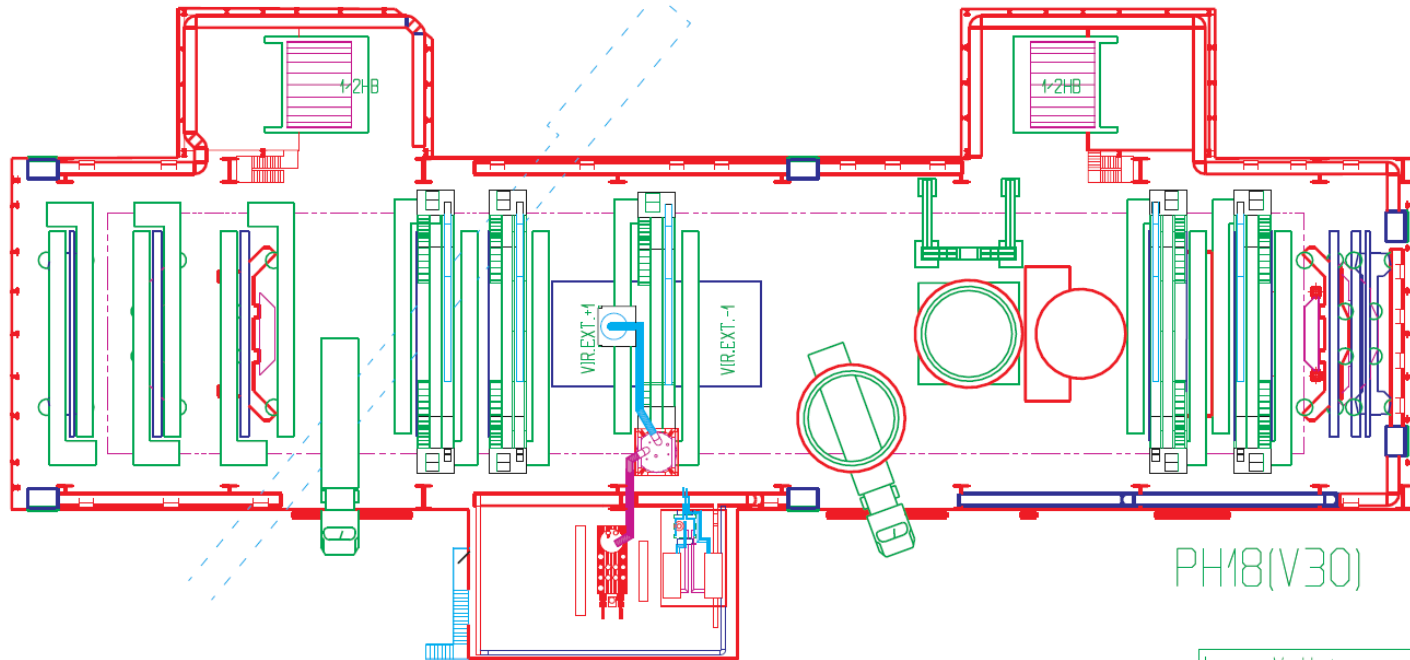
ASS. COIL MODULE 0 ON COIL MODULE -1

TEST COLD BOX WITH THERMIC CHARGE

EQUIP. INNER VV WITH SUPERINSULATION & THERMAL SHIELD

EQUIP & MOUNT MUON CHAMBERS ON YE+1,+2,+3.

EQUIP & MOUNT MUON CHAMBERS IN YBO,+1,+2,-1,-2.



VEILLET L. 27-09-2000

Phase 18: From 04-10-02 to 18-06-03

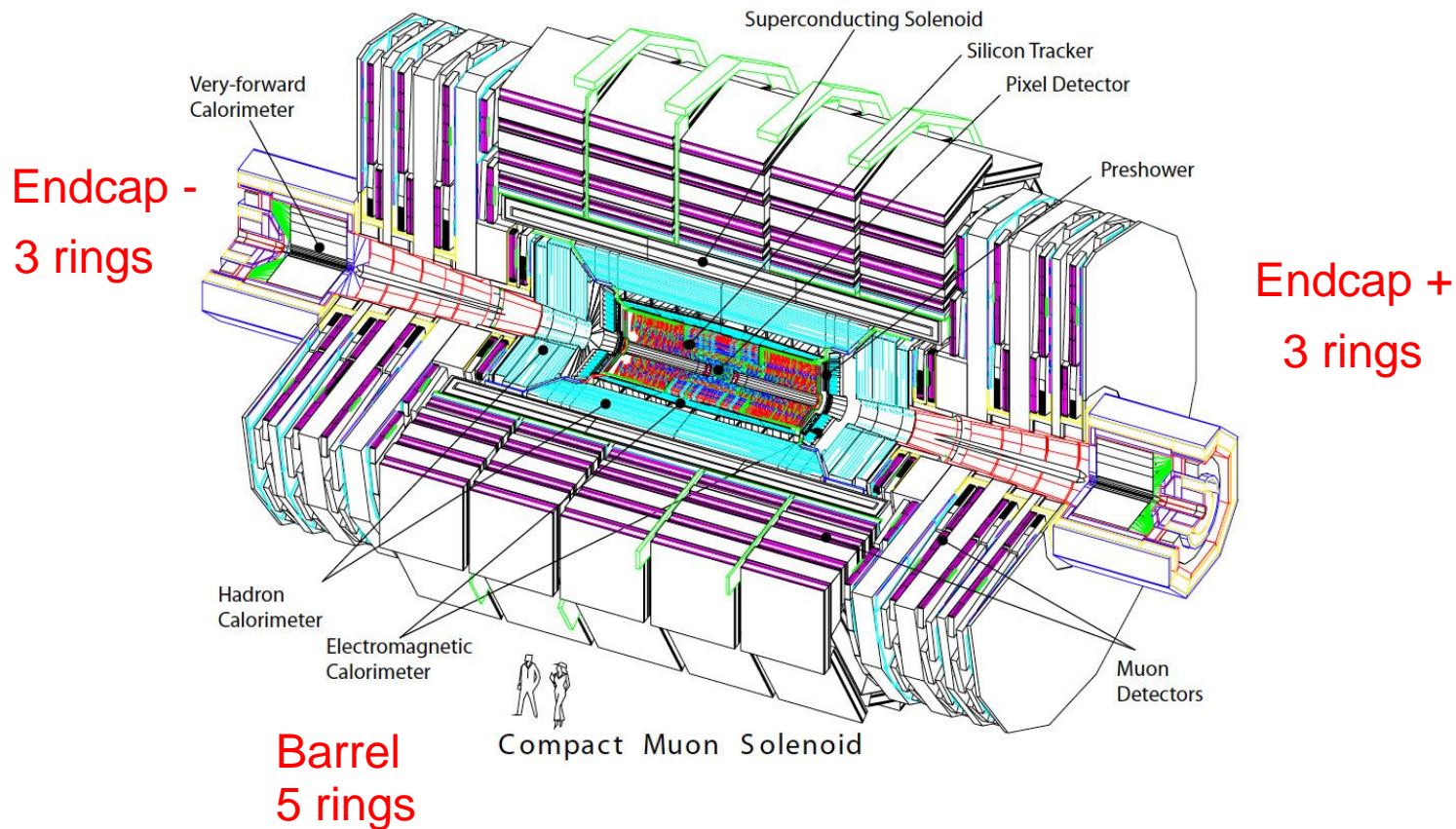
Lucien.Veillet@cern.ch  
DATE: 27-SEP-2000  
EJCLID: DI\_V2194-PL  
CDD:



# Handling of Large Weights

CMS Lowering Start-to-End = 12 months for 11 large components < 2,000 Tons

i.e. ~ 1 Heavy lift /month



- SID = 3 components (2 x 2,500 T and 1 x 4,000 T)
- ILD = 5 components ( 3 barrel rings and two doors)
- SID+ILD Combined < CMS



# Surface Hall Construction Schedule



# Surface Hall Construction Schedule

Ground Leveling, Pockets excavation

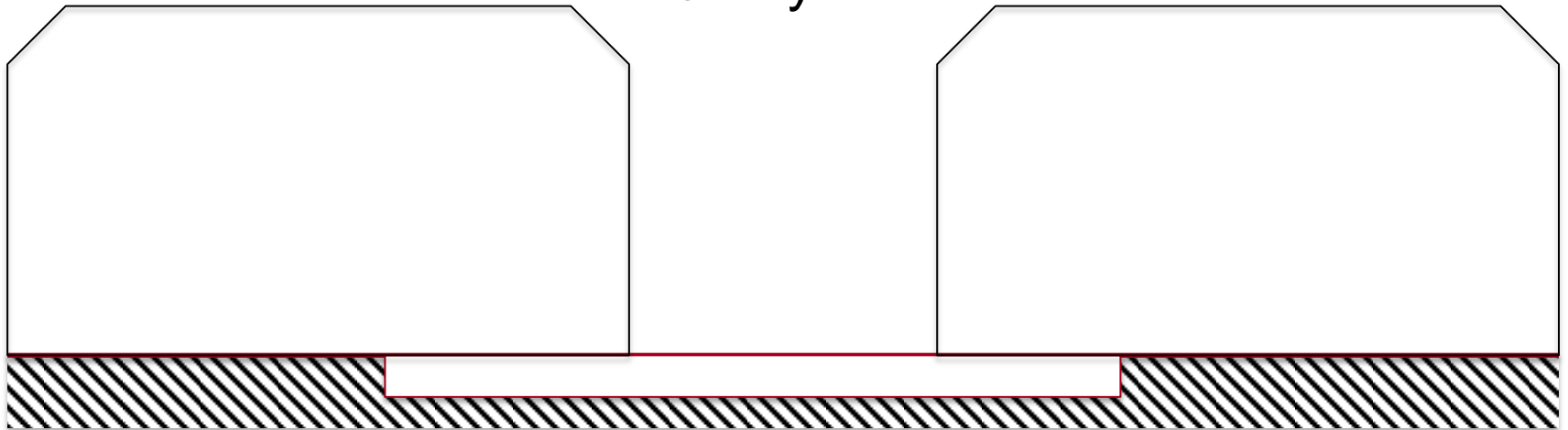
$t_1=0.5$  years

$t_0=0.5$  years



# Surface Hall Construction Schedule

Assembly Halls  
 $t_1 = 0.5$  years  
 $t_0 = 1$  year



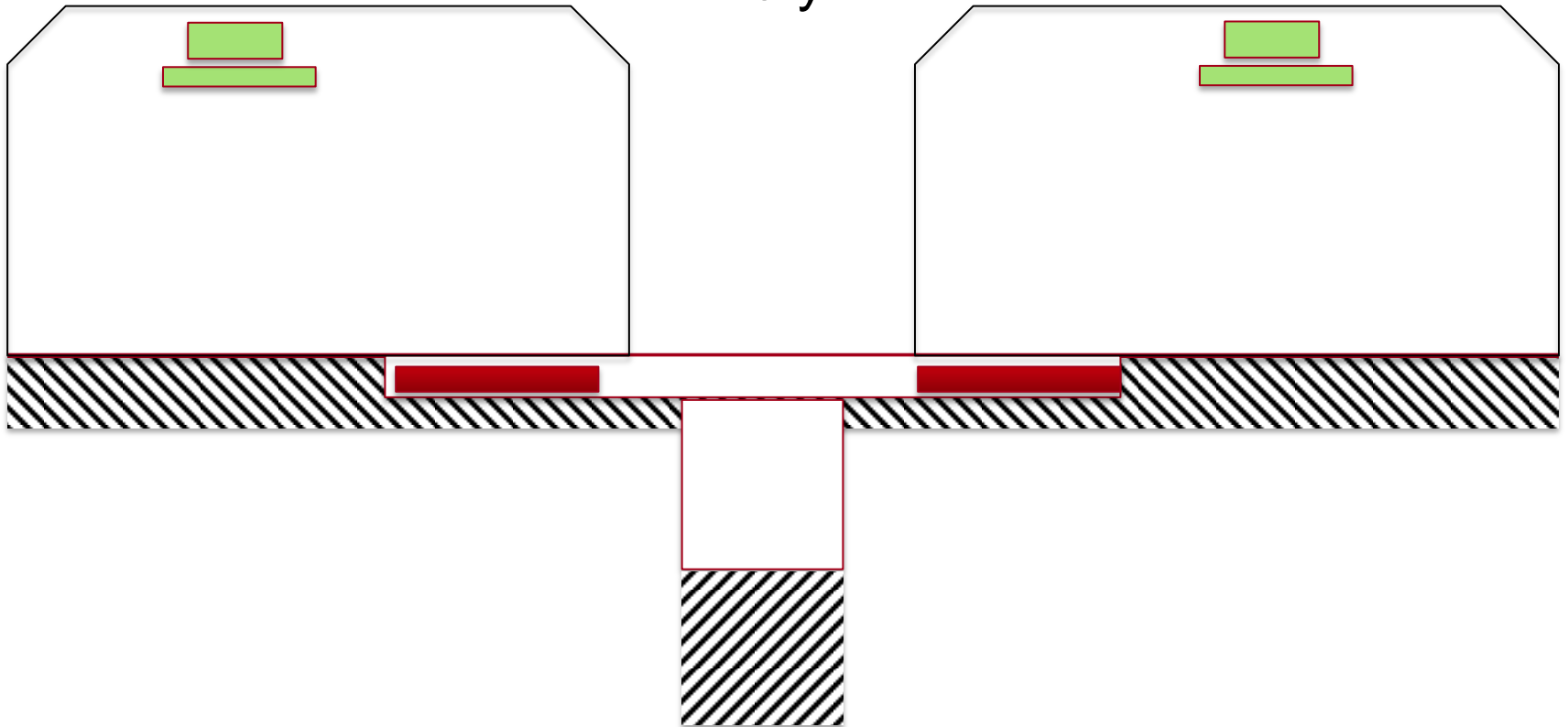
# Surface Hall Construction Schedule

Platforms  
 $t_1=0.5$  years  
 $t_o=1.5$  years



# Surface Hall Construction Schedule

Bridge cranes  
 $t_1=0.5$  years  
 $t_o=2.0$  years



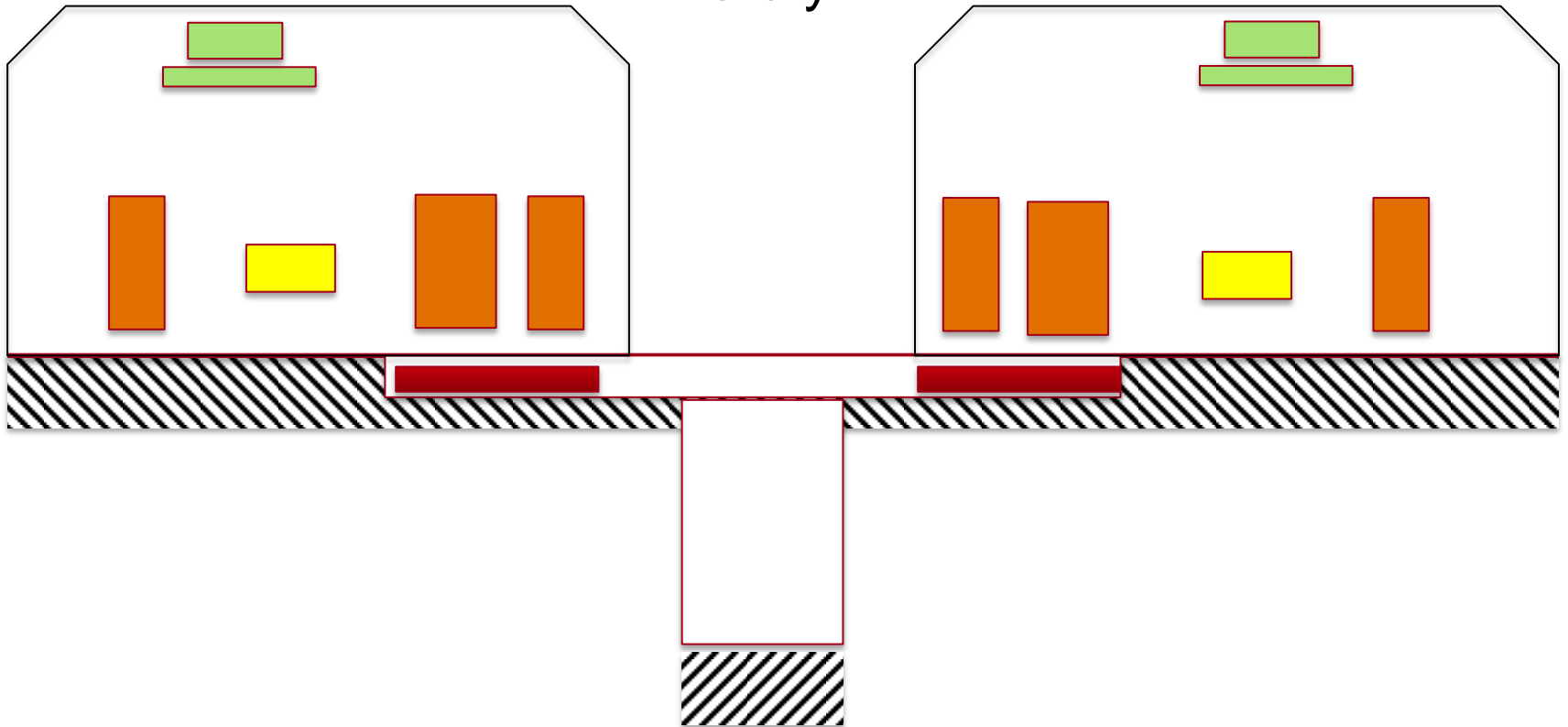


# Surface Hall Construction Schedule

Detectors construction

$T_1=4.0$  years

$T_0=6.0$  years

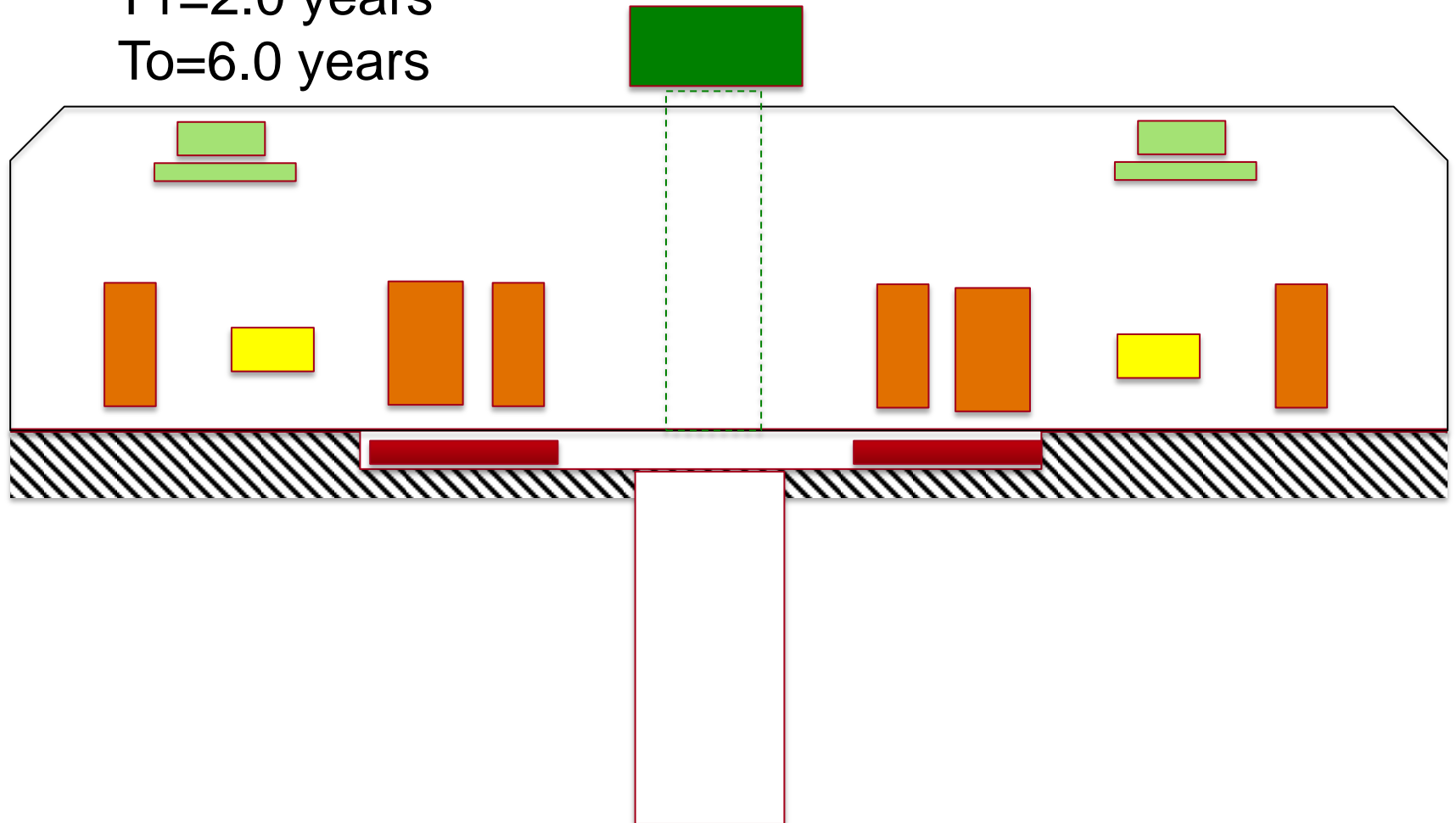


# Surface Hall Construction Schedule

Shaft excavation

$T_1 = 2.0$  years

$T_0 = 6.0$  years

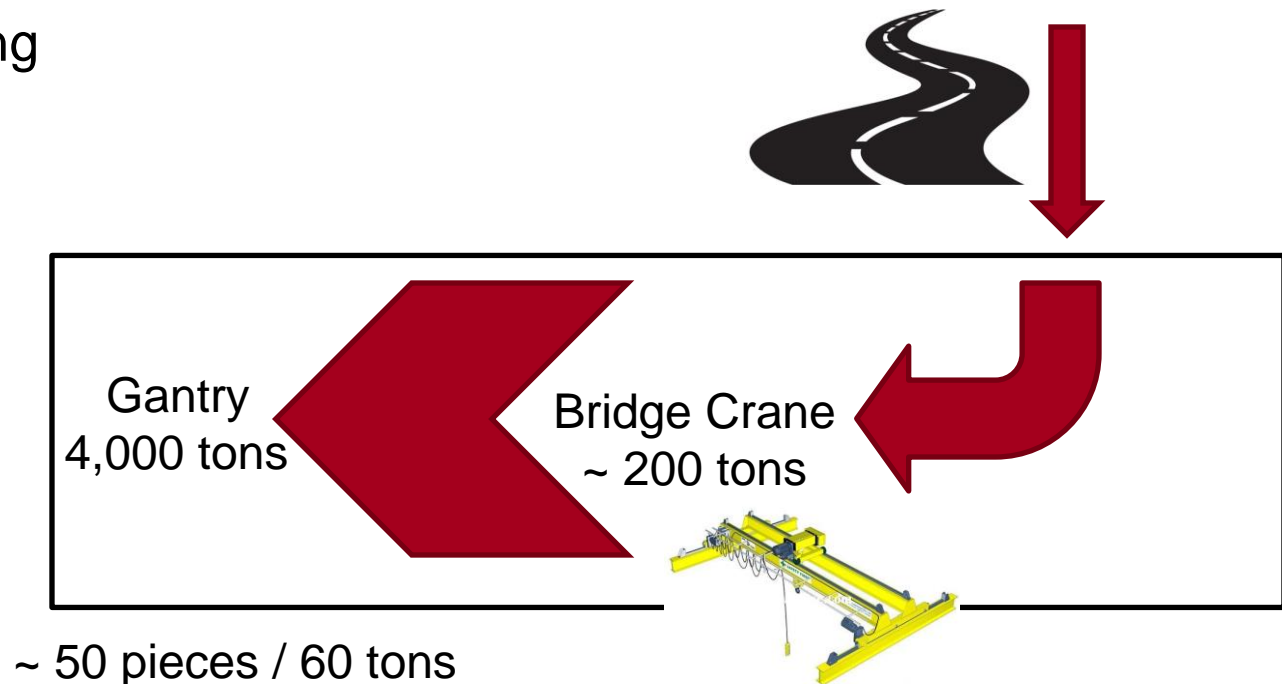
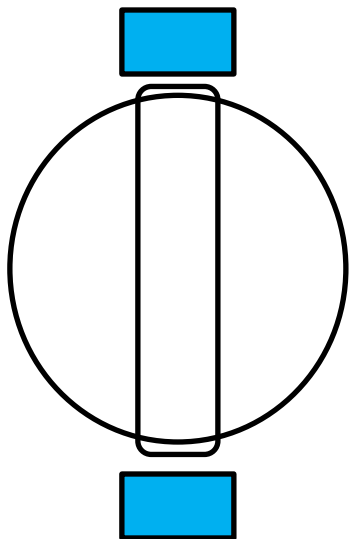


# SID Assembly Workflow

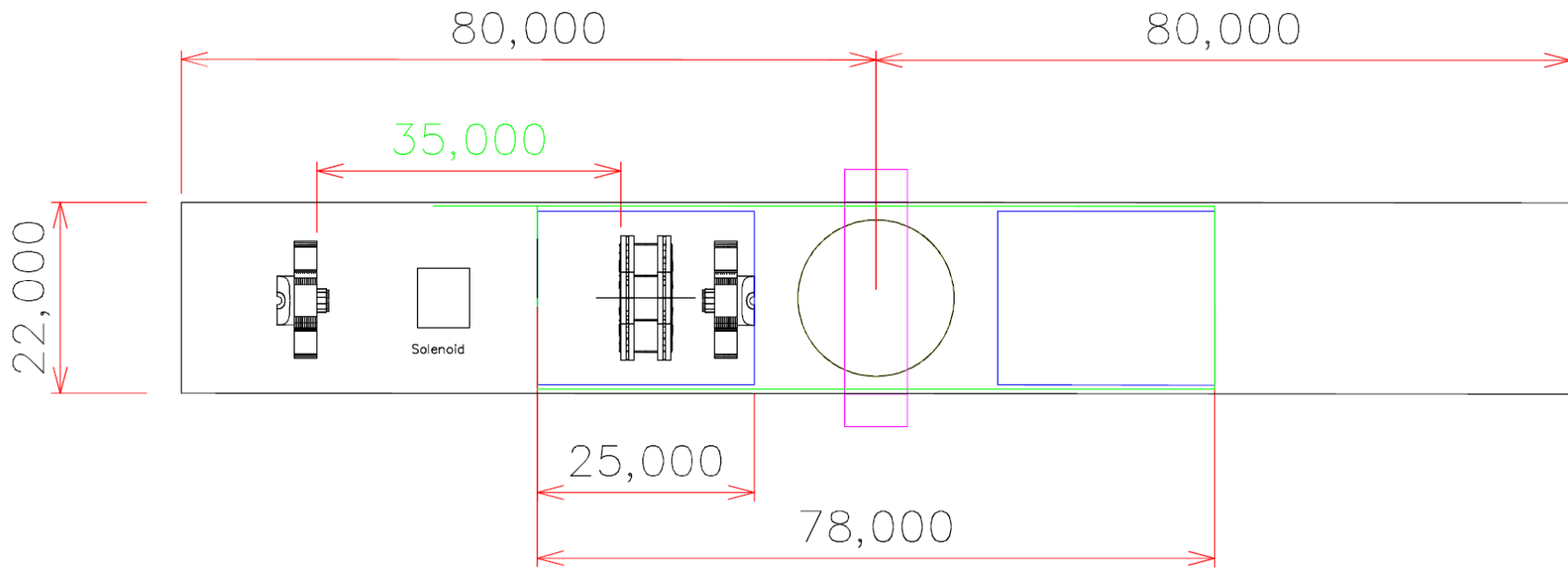
## Tasks

1. Transport from factories to the site
2. Assembly
3. Magnet Commissioning
4. Lowering

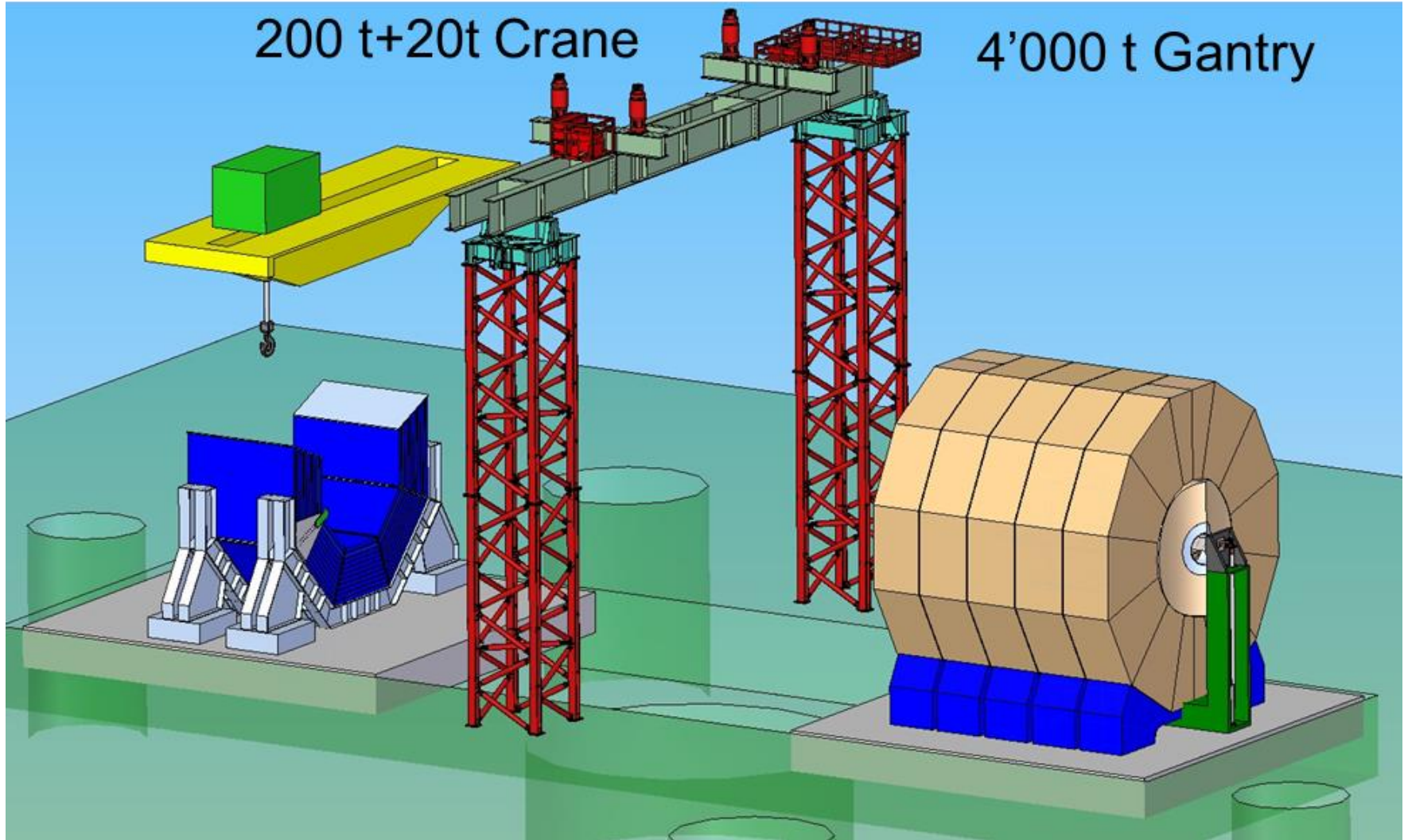
~ 60 tons Road Transport



# ILC Assembly Hall - Proposal



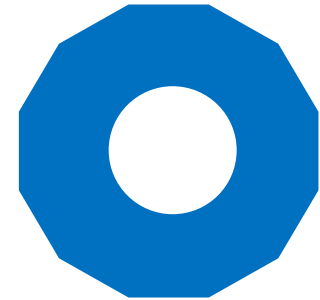
# Barrel Construction





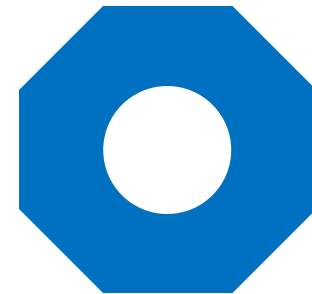
# Magnet Design – Segmentation Options

			R (m)	Width (mm)	Weight (tons)	Accrued Sector Weight	Accrued Barrel Weight
L	5900	Plate 1	3454	1851	17	17	204
Thickness	200	Plate 2	3694	1980	18	35	423
Gap	40	Plate 3	3934	2108	19	55	656
		Plate 4	4174	2237	21	75	903
		Plate 5	4414	2365	22	97	1164
		Plate 6	4654	2494	23	120	1440
		Plate 7	4894	2623	24	144	1729
		Plate 8	5134	2751	25	169	2033
		Plate 9	5374	2880	27	196	2351
		Plate 10	5614	3009	28	224	2684
		Plate 11	5854	3137	29	253	3030



12 edges

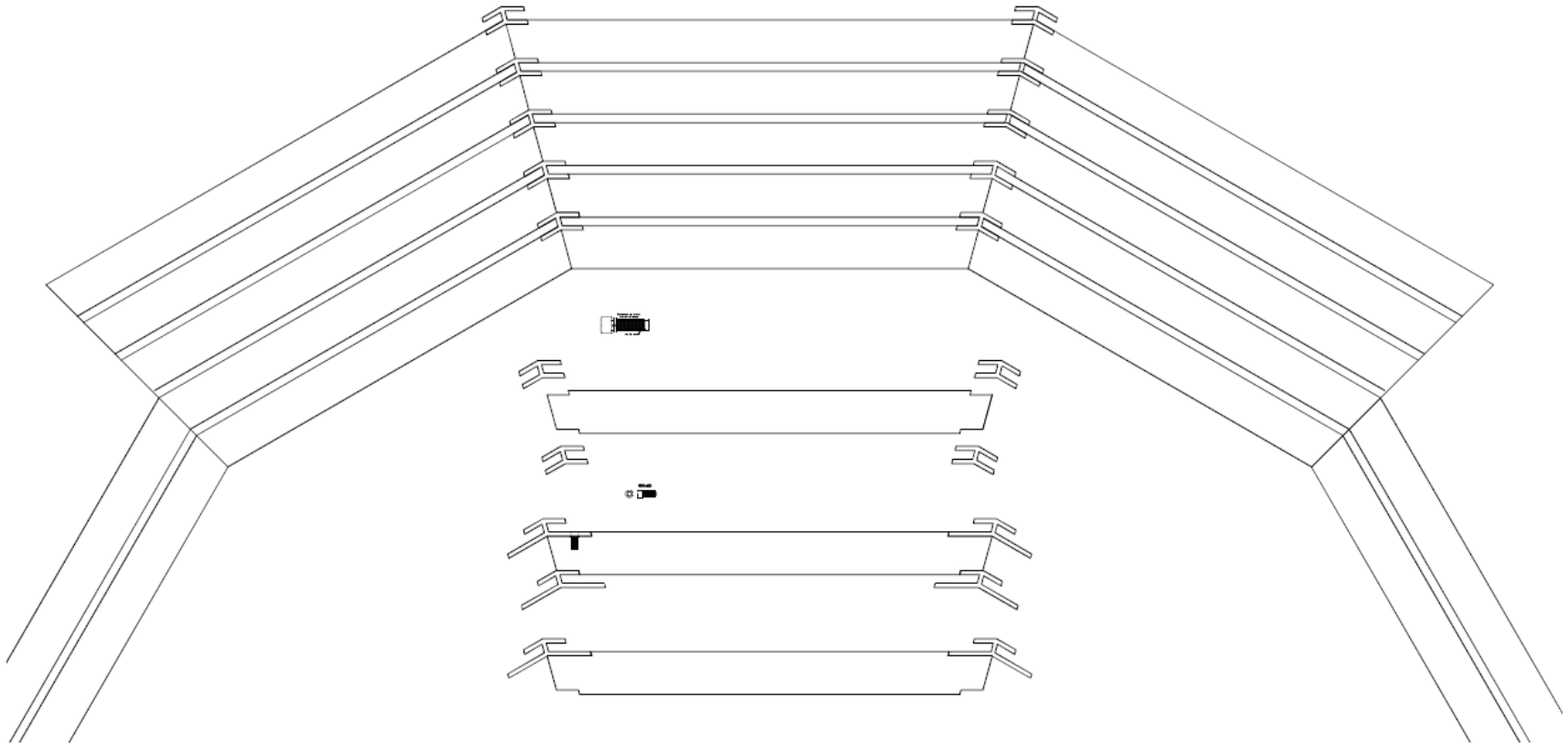
			R (m)	Width (mm)	Weight (tons)	Accrued Sector Weight	Accrued Barrel Weight
L	5900	Plate 1	3454	2861	26	26	211
Thickness	200	Plate 2	3694	3060	28	55	436
Gap	40	Plate 3	3934	3259	30	84	676
		Plate 4	4174	3458	32	116	931
		Plate 5	4414	3657	34	150	1200
		Plate 6	4654	3855	35	185	1484
		Plate 7	4894	4054	37	223	1782
		Plate 8	5134	4253	39	262	2095
		Plate 9	5374	4452	41	303	2423
		Plate 10	5614	4651	43	346	2766
		Plate 11	5854	4850	45	390	3123



8 edges

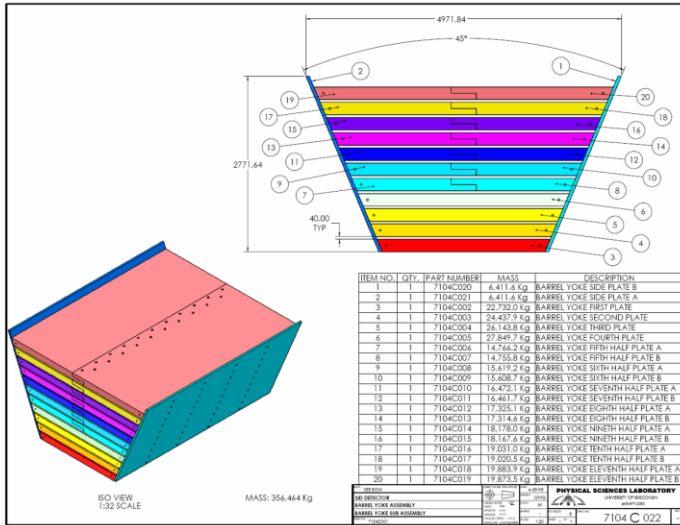
# Magnet Barrel Design

30 tons Max per plate



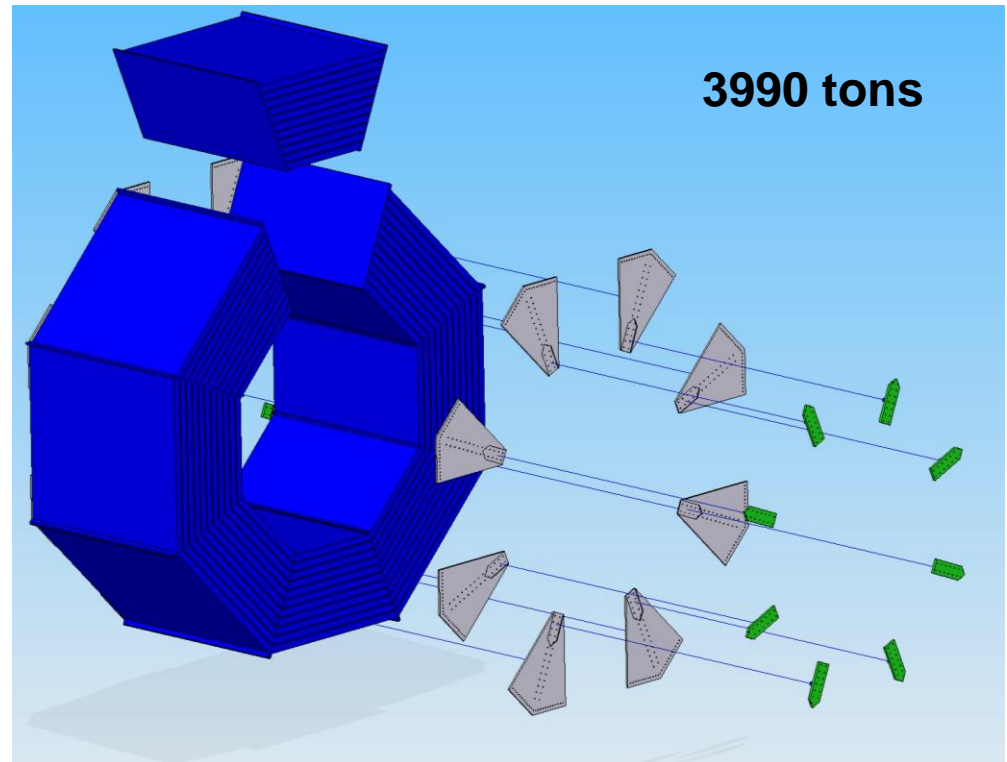
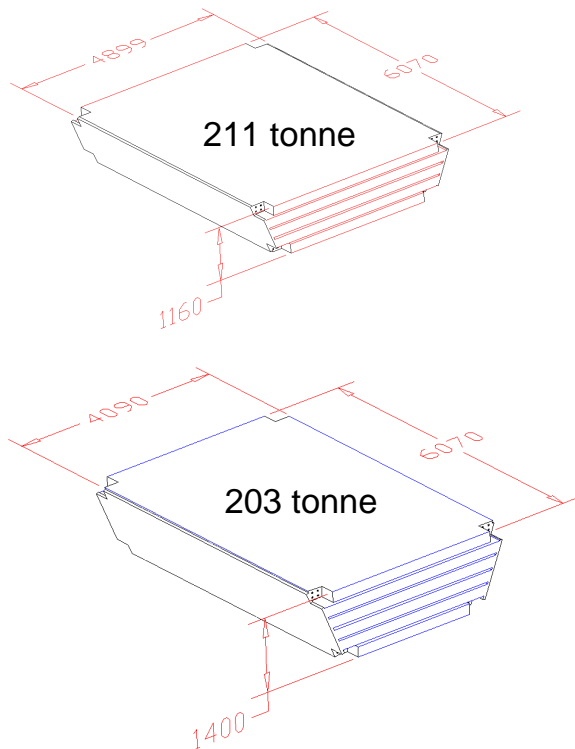
Single plate: 17 tons through 29 tons

# Iron Barrel Yoke layout



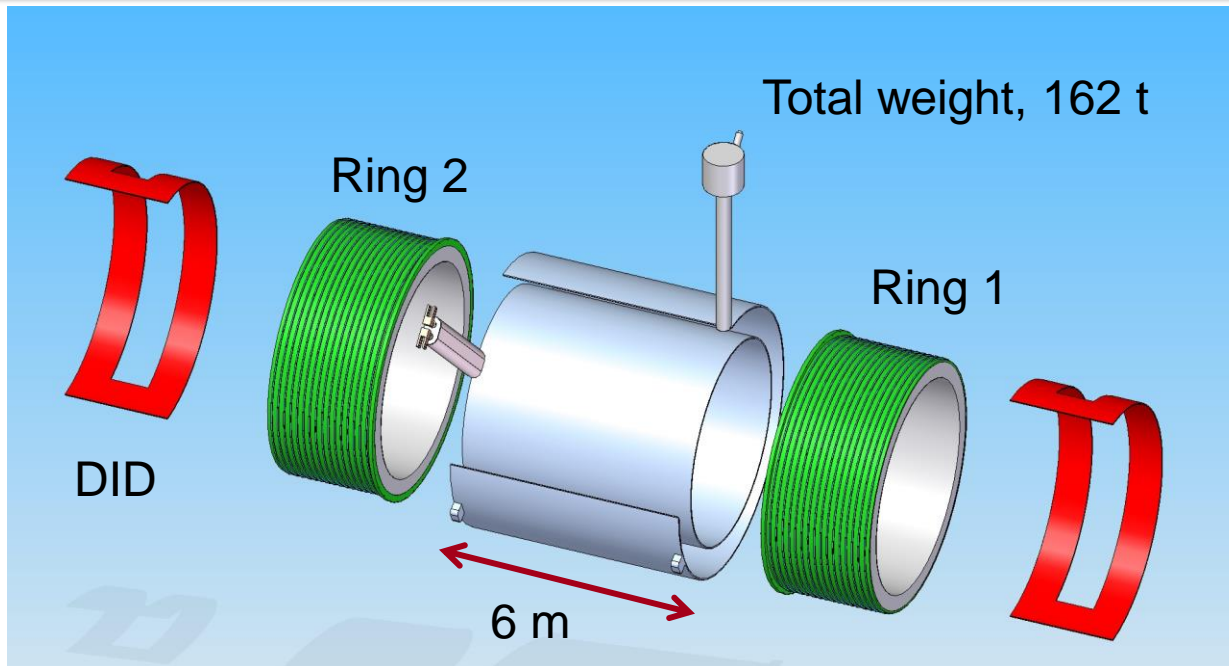
Bolted assembly, 144 plates 200 mm thick, 40mm gap  
 Opportunity to make blank assembly at the factory before shipping  
 Preliminary Contacts with Kawasaki Heavy Industries

- Plate thickness tolerance for each: 0.1mm
- Plate flatness: 4mm (in a plate)
- Fabrication (assembling & welding) tolerance: 2mm
- Full trial assembly: capable (but need to study)



# Solenoid Assembly

ITEM	QUANTITY	MASS (metric T)	Diameter (O.D. meter)	Length (meter)
COMPLETED COIL MODULE	2	64	6.578	2.793
CRYOSTAT OUTER VACUUM SHELL	1	16.5	6.858	5.800
CRYOSTAT INNER VACUUM SHELL	1	12.7	5.308	5.800
TOTAL CRYOSTAT WITH END FLANGES	1	33.3	6.858	5.900



# Magnet Assembly

60-80 tons assemblies delivered to the site and installed with 60-80 tons capacity cranes

33 tons vacuum tanks installed in the barrel

64 tons solenoid coils delivered to the site and vertically assembled in to a cold mass

Solenoid swiveled and inserted inside the vacuum cryostat

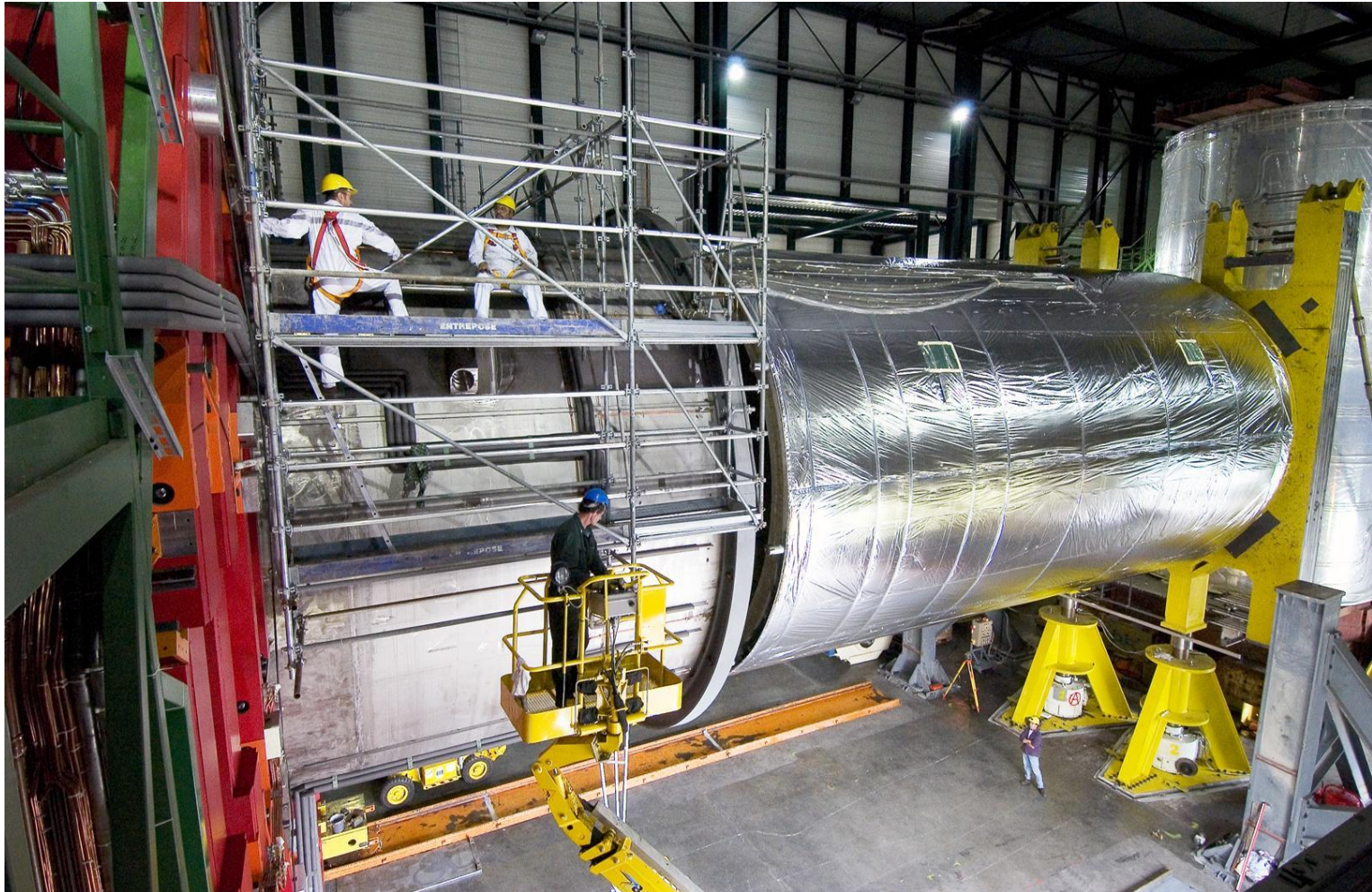


# Solenoid Coil Module 64 tons Max.

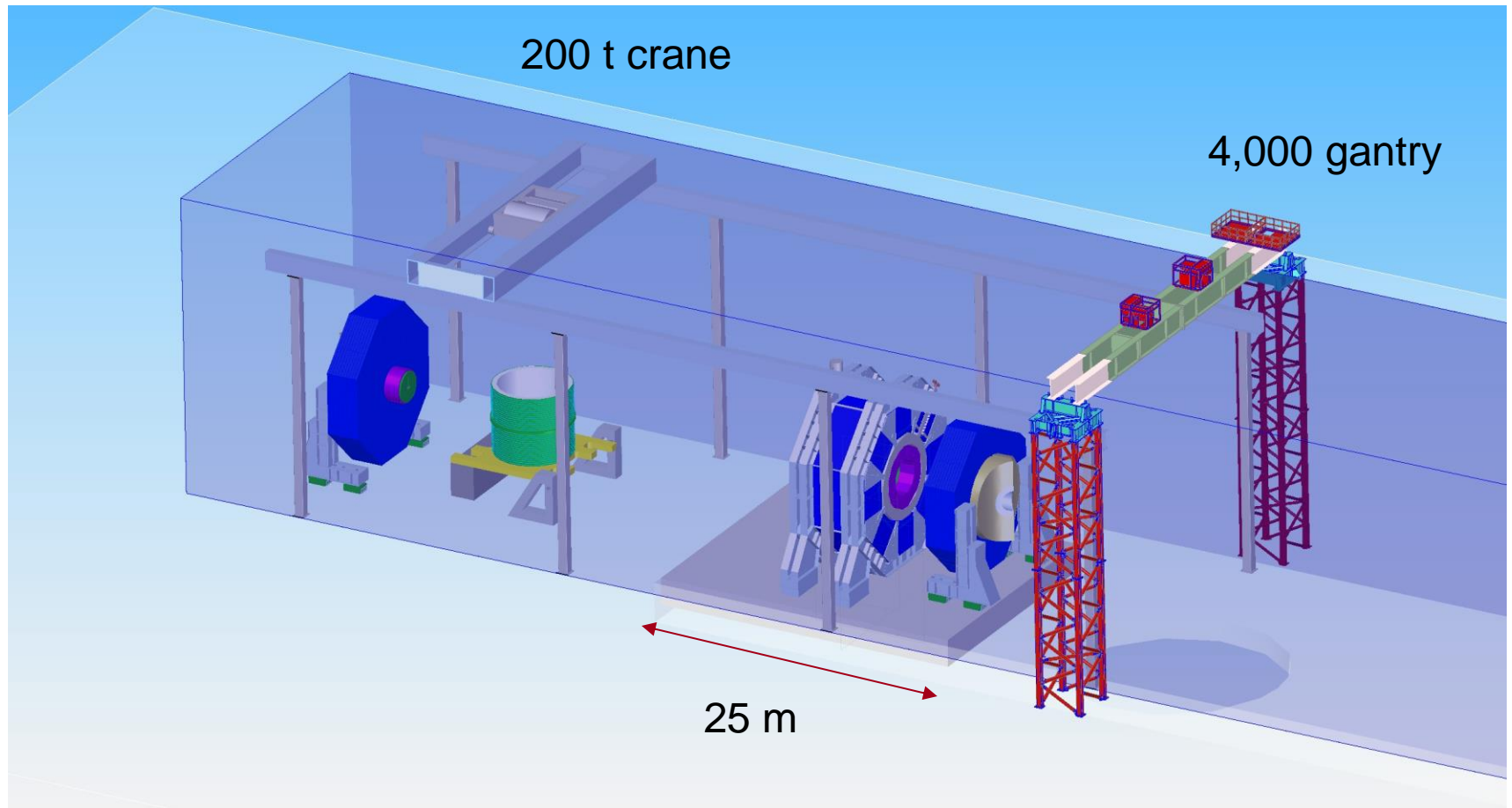




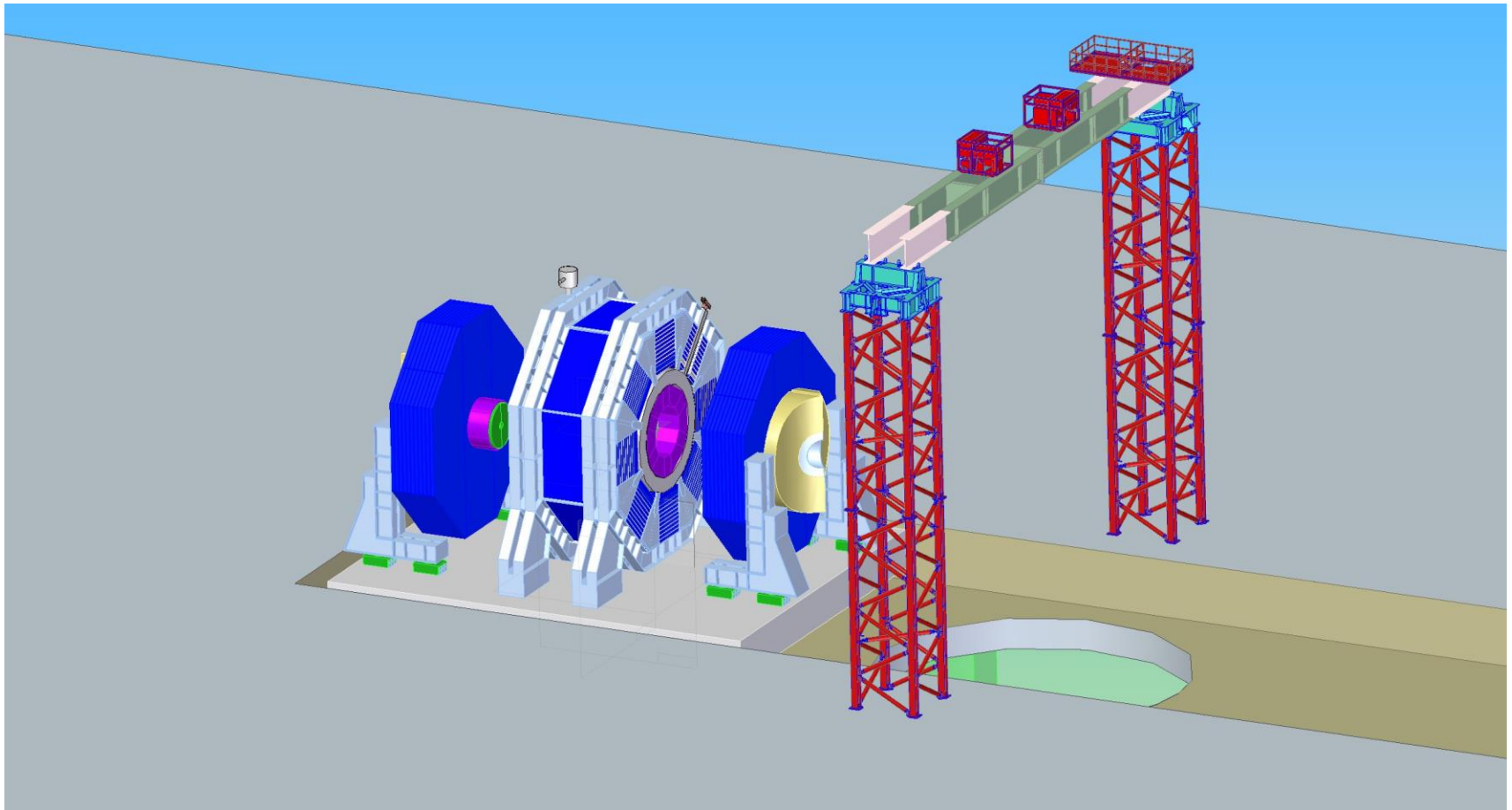
# Swiveling platform



# SID Assembly Hall

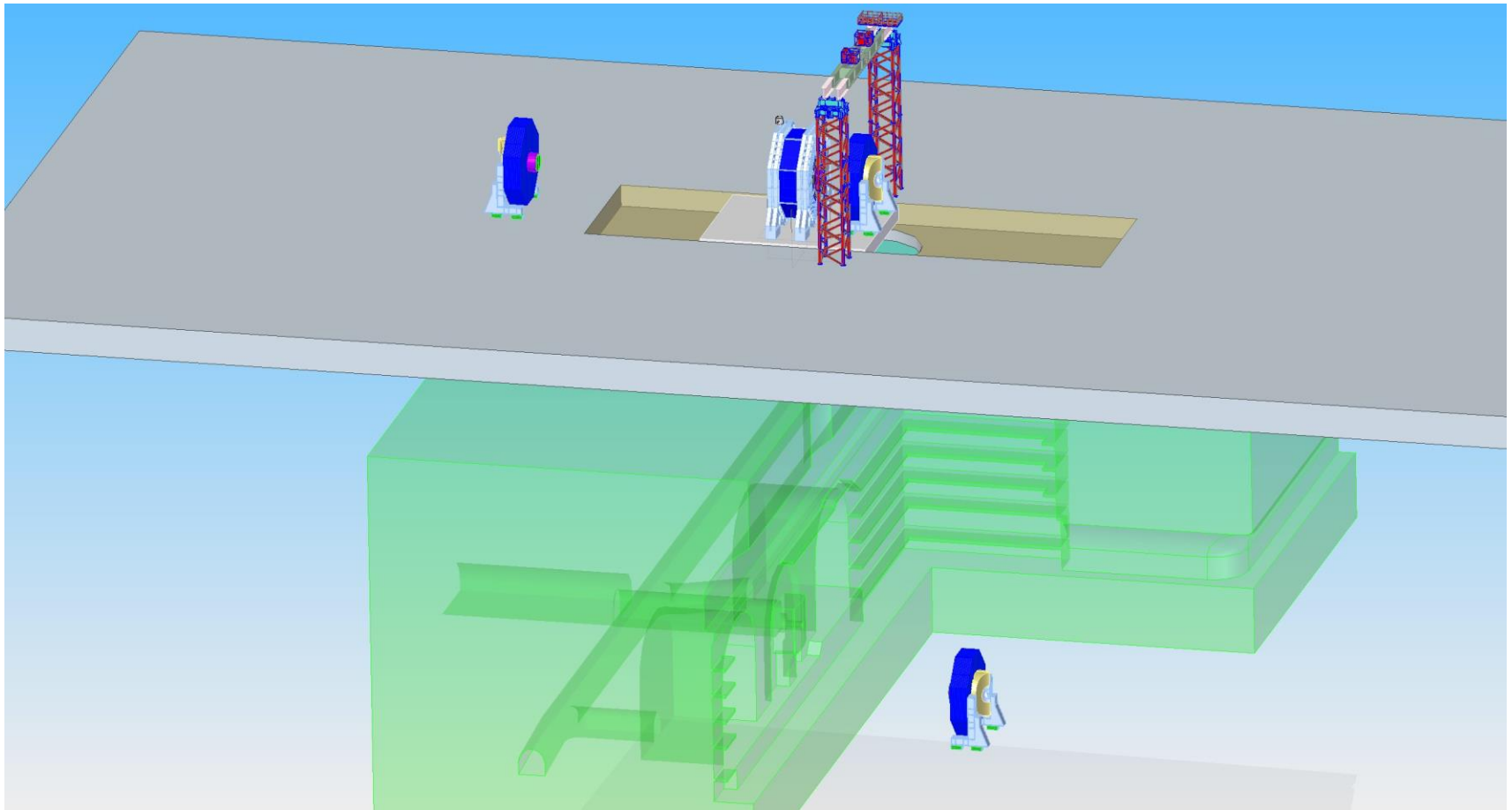


# Magnet Commissioning, Field Map



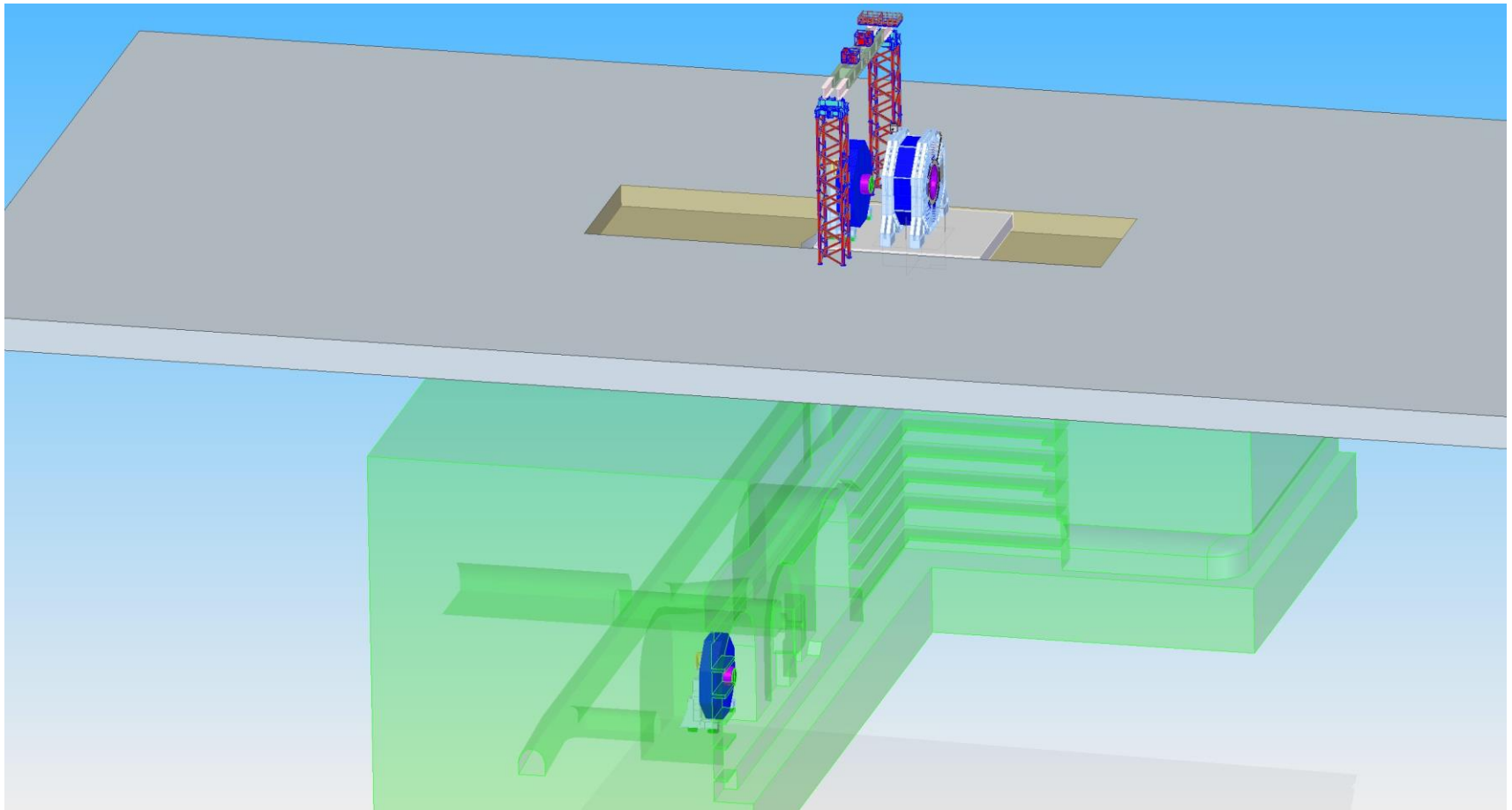


# Lowering Step 1, Door +

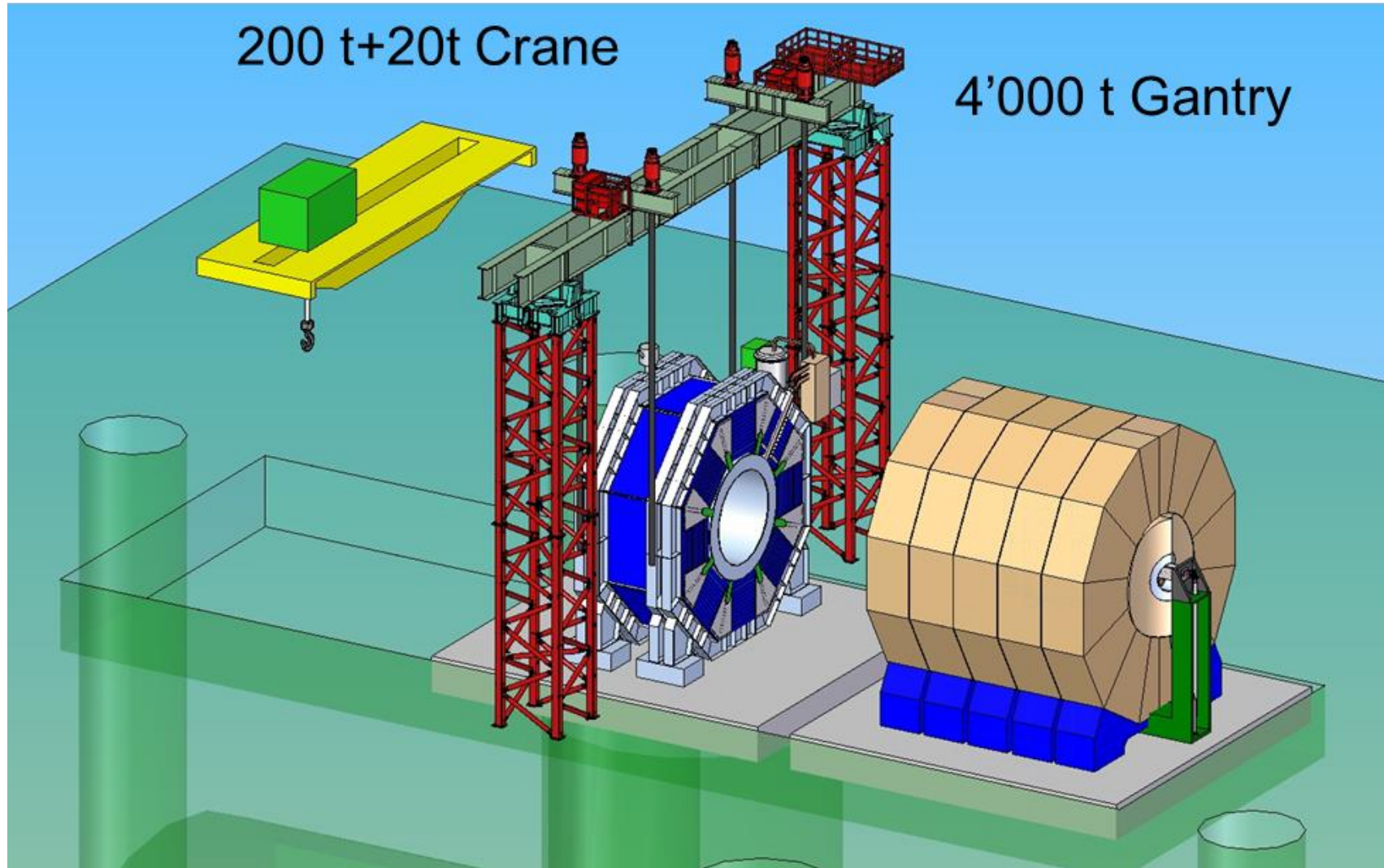




# Lowering Step 2, Door -

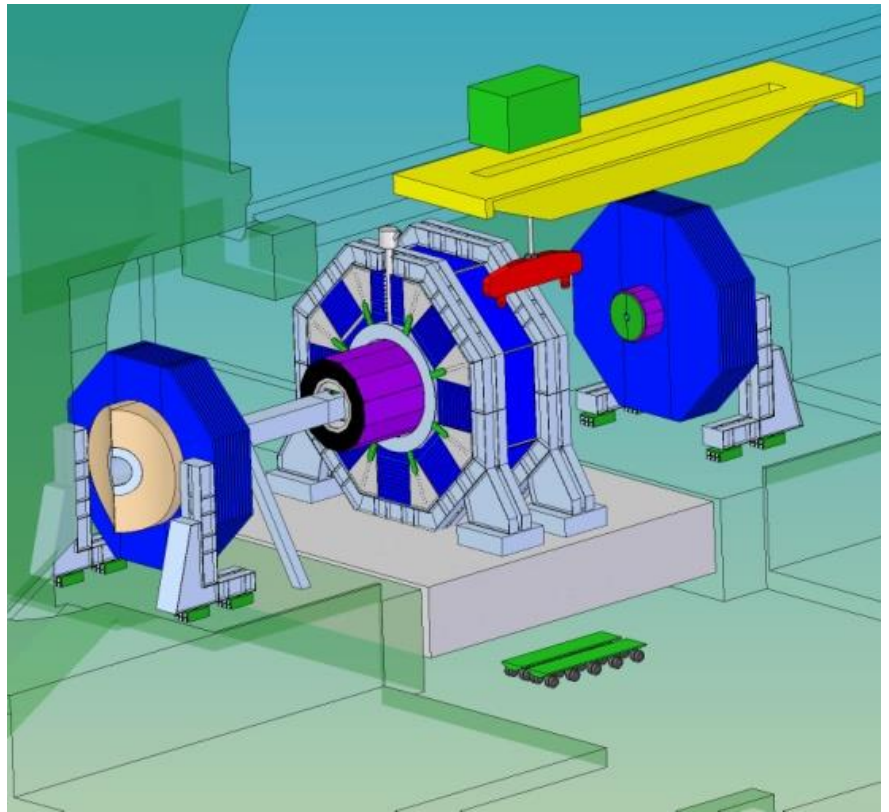
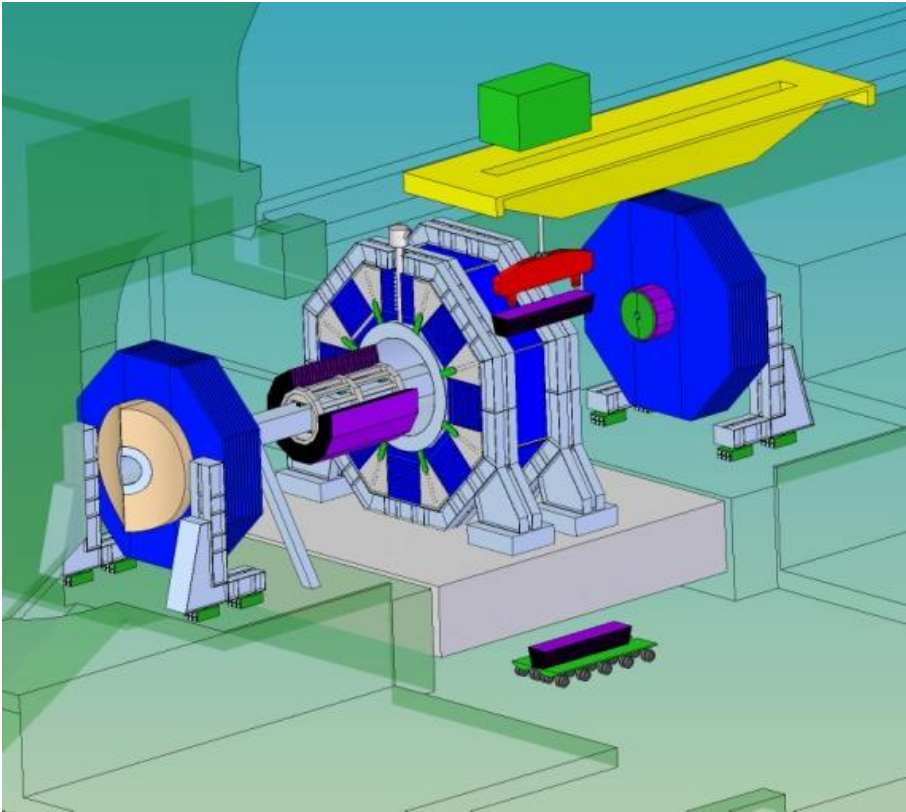


# Lowering Step 3, Barrel



# HCAL Installation, Underground

Through the Horizontal Tunnel or the Vertical shaft



## Required Infrastructures on surface

~ 200 metric tons bridge crane with double trolley

~ 4,000 metric tons Gantry

One platform 25 m x 20 m with 50 m motion range

Motion system at floor for Doors and HCals

Cold box 4K for the commissioning of the Solenoid

Gas system for the commissioning of the muon detectors

Machine Shop

Adequate Storage for heavy tooling

Office space

**SPARE SLIDES**

