

# Report from KEK Mini-Workshop on Infrastructures and from ILD Integration Workshop

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Karsten Buesser

LCWS15

03.11.2015

# KEK Infrastructure Workshop



- 31.08.-01.09.2015 at KEK
- ~15 participants
- Goal: understand impact of detectors on infrastructure requirements at Kitakami site

## Mini-Workshop on ILC Infrastructure and CFS for Physics and Detectors

from Monday, August 31, 2015 at 08:25 to Tuesday, September 1, 2015 at 18:00 (Asia/Tokyo)  
at KEK

**Description** This Mini-Workshop is dedicated to discussions on the detector driven infrastructure needs for the ILC campus at the IP and at the central lab.

**Material:** [Slides](#)

[Go to day](#) ▼

### Monday, August 31, 2015

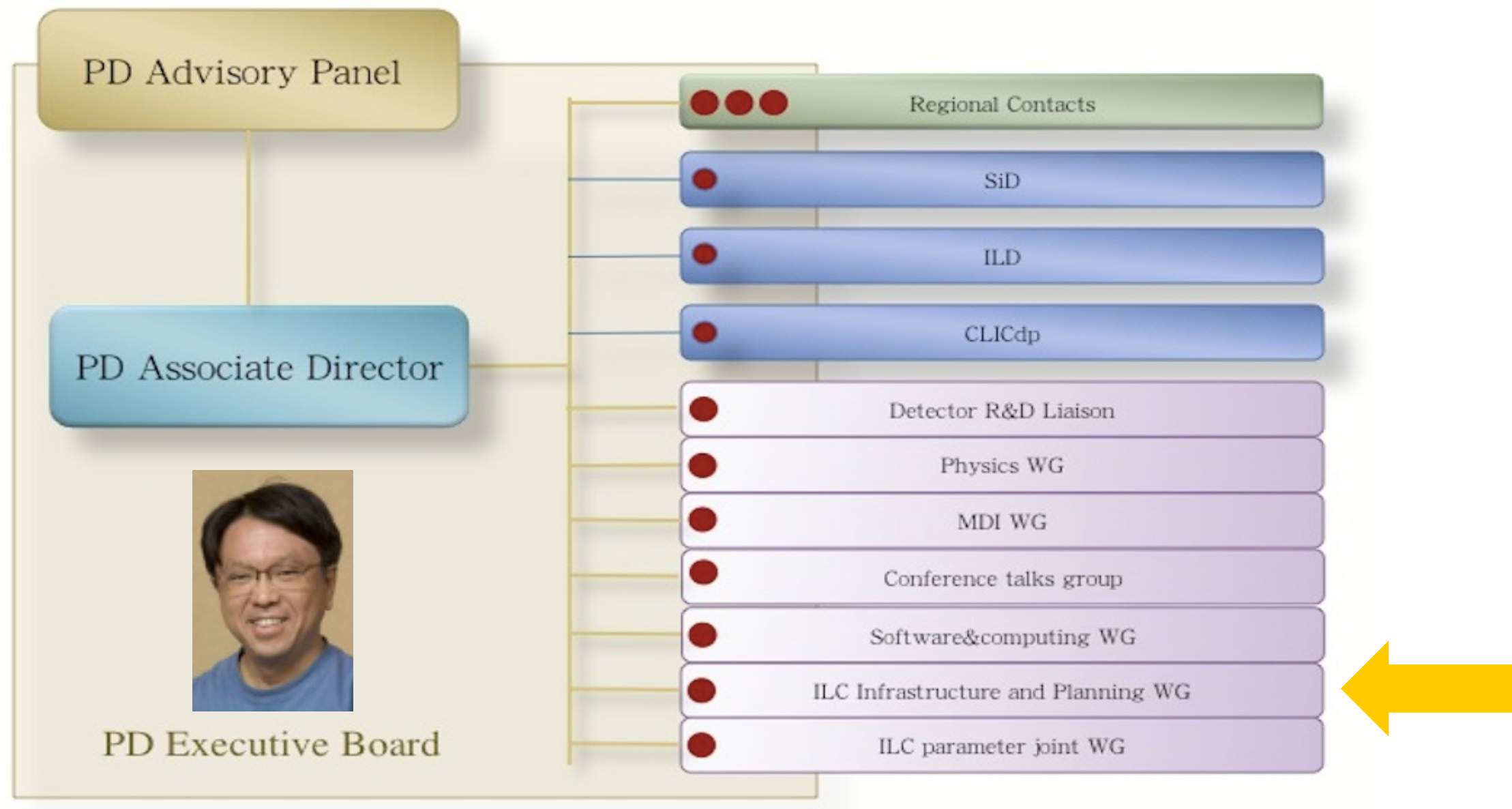
- |               |  |
|---------------|--|
| 15:00 - 15:05 | Introduction/Welcome 5'  |
|               | Speaker: Dr. Yasuhiro Sugimoto (KEK)                                       |
|               | Material: <a href="#">Slides</a>   |
| 15:05 - 15:25 | Introduction to Infrastructure Working Group 20'                           |
|               | Speaker: Sakue Yamada (KEK)  |
|               | Material: <a href="#">Slides</a>   |
| 15:25 - 15:55 | Computing Requirements for the Experiments 30'                             |
|               | Speaker: Akiya Miyamoto (KEK)  |
|               | Material: <a href="#">Slides</a>   |
| 15:55 - 16:15 | Introduction to E-JADE 20'   |
|               | Speaker: Thomas Schoerner-Sadenius (Deutsches Elektronen-Synchrotron (DE)) |
|               | Material: <a href="#">Slides</a>   |
| 16:15 - 16:45 | Infrastructure at DESY 30'   |
|               | Speaker: Thomas Schoerner-Sadenius (Deutsches Elektronen-Synchrotron (DE)) |
|               | Material: <a href="#">Slides</a>   |
| 16:45 - 17:45 | Discussion 1h0'  |

### Tuesday, September 1, 2015

- |               |  |
|---------------|--|
| 09:00 - 09:30 | Local Infrastructure 30'   |
|               | Speakers: Tomoyuki Sanuki (Tohoku University), Tokiko Onuki              |
|               | Material: <a href="#">Slides</a>   |
| 09:30 - 10:00 | Update on DH and AH Design 30'   |
|               | Speakers: Mr. MASANOBU MIYAHARA (KEK), Mr. Yoshinobu Nishimoto (J-POWER) |
|               | Material: <a href="#">Slides</a>   |
| 10:00 - 10:30 | Break  |
| 10:30 - 11:00 | Cryogenic System for IR 30'  |
|               | Speaker: Dr. Takahiro Okamura (KEK)                                      |
|               | Material: <a href="#">Slides</a>   |
| 11:00 - 11:30 | Sub-detector Assembly Area 30'   |
|               | Speaker: Dr. Yasuhiro Sugimoto (KEK)                                     |
|               | Material: <a href="#">Slides</a>   |
| 11:30 - 12:00 | Discussion 30'   |
| 12:00 - 13:30 | Break  |
| 13:30 - 14:00 | Homework from SLAC Meeting 30'   |
|               | Speakers: Dr. Karsten Buesser (DESY), Dr. Yasuhiro Sugimoto (KEK)        |
|               | Material:  |
| 14:00 - 14:30 | Magnetic Fields in Detector Hall 30'                                     |
|               | Speaker: Dr. Karsten Buesser (DESY)                                      |
|               | Material: <a href="#">Slides</a>   |
| 14:30 - 16:00 | Discussion and Action Plan 1h30'   |
|               | Material: <a href="#">notes</a>  |



# Infrastructure and planning WG: Chair: Sakue Yamada one of the Physics-Detector WGs, active since June 2014



## Members

ILD: K.Buesser, F. Simon/MC. Fouz,

SiD: M. Breidenbach, M. Stanitzki,

Local: K. Kawagoe, Y. Sugimoto,

Chair: S. Yamada

## Given mandate

- 1: Study of the human and budgetary resource needs and their availability during construction and operation
- 2: The time profile of the resources and their reality to quire
- 3: The organizational structure to interact with the ILC laboratory

## Purposes

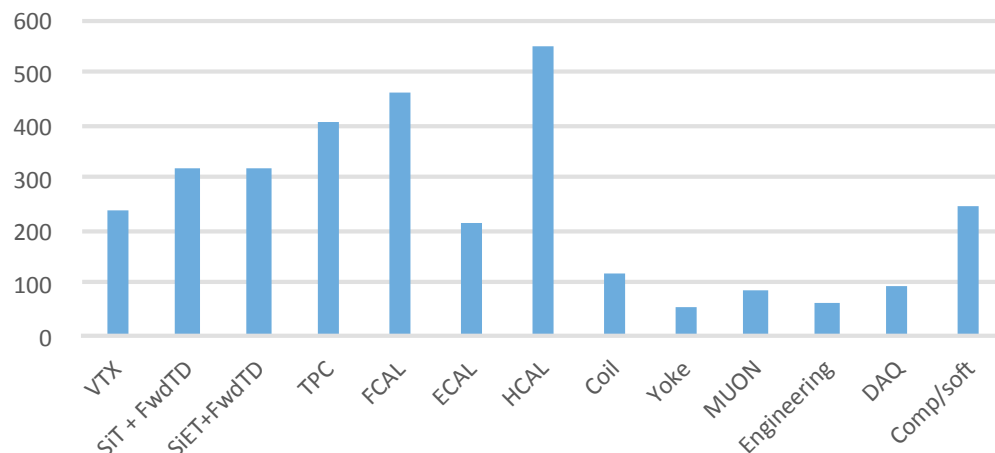
A: to provide inputs from the detector groups  
to the Infrastructure design studies for the ILC lab,  
and to the Governance discussions

B: to prepare answers to possible inquiry in the  
expert sub-committee of the MEXT

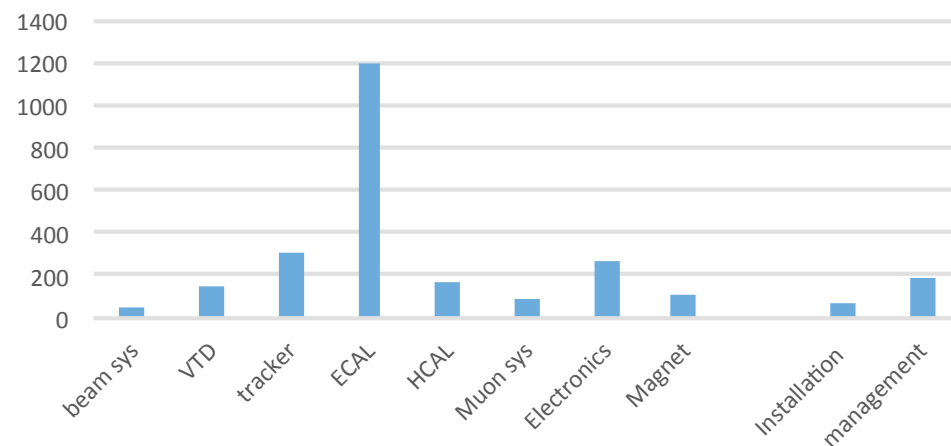
*The target date: February 2015.*

# Human resources for detector construction

ILD Hum. Res. need for const. in FTE  
( total: 3200)



SiD Hum. Res.need for const. in FET  
(total:2600)



- Both groups estimated the human power during the entire construction period (9 years) in FTE.  
(only the sum for each component shown)
- They will be mostly paid by collaborating institutions around the world.

Total FTEs: ILD 3200, SiD 2600

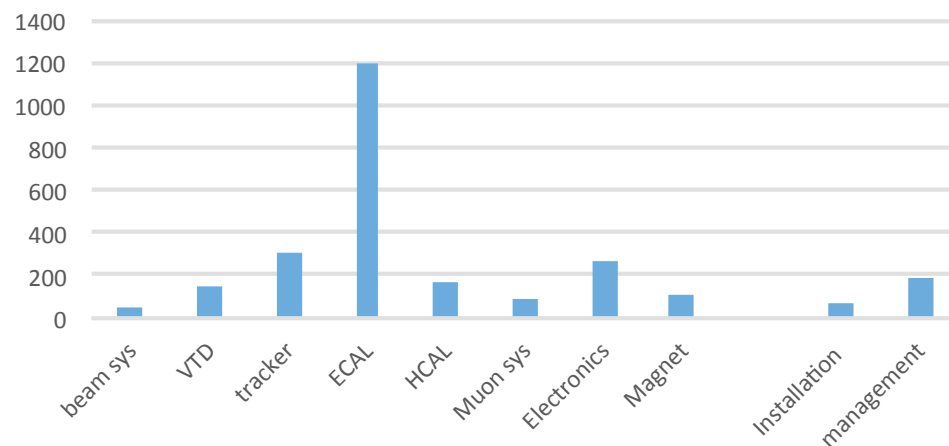
The numbers include physicists, post-docs, engineers and technical personnel with about the same fraction, and a small number of administrative support.

## Human resources for detector construction

ILD Hum. Res. need for const. in FTE  
(total: 3200)



How good are these numbers?

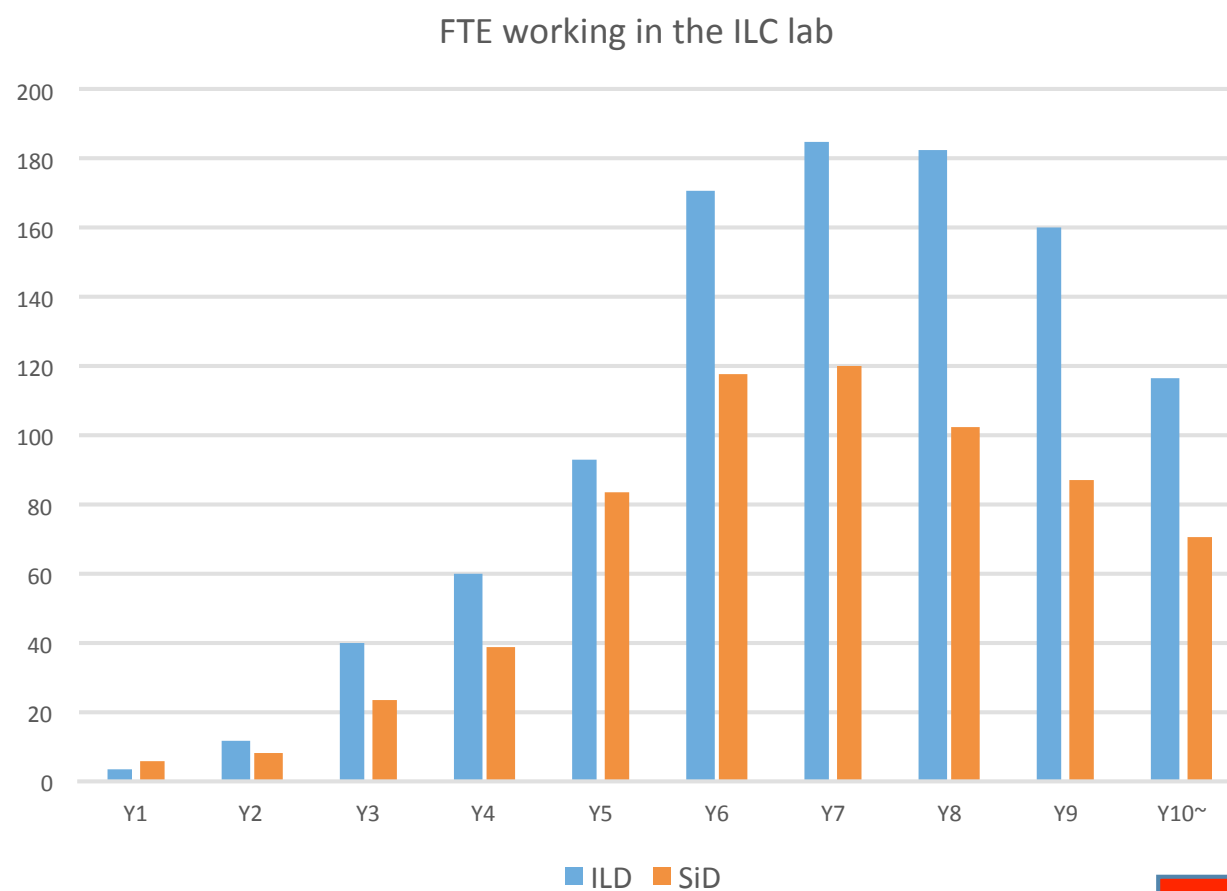


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The numbers include physicists, post-docs, engineers and technical personnel with about the same fraction, and a small number of administrative support.

## People visiting/staying on site for construction and operation/maintenance



More people will be on site as time goes and peaks around 7th~8th year. Total sum peaks ~300 FTEs.

**The Y10 level remains for operation and maintenance.**

A considerable part of them will be working at the IP region.

**(ILD: ~30~40%, SiD: 70~80%)**



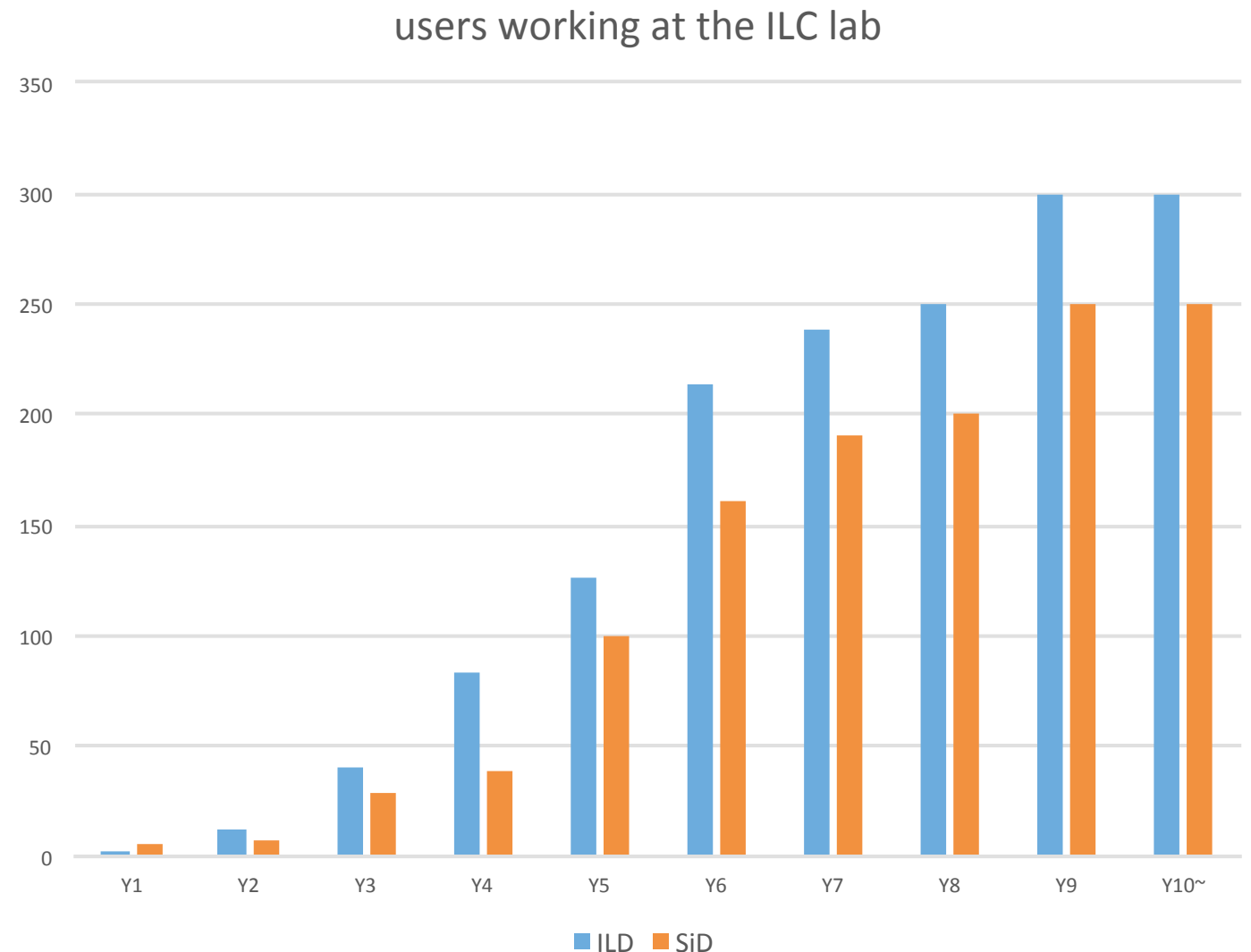
**The level remains the same for operation/maintenance**

## The number of users on site

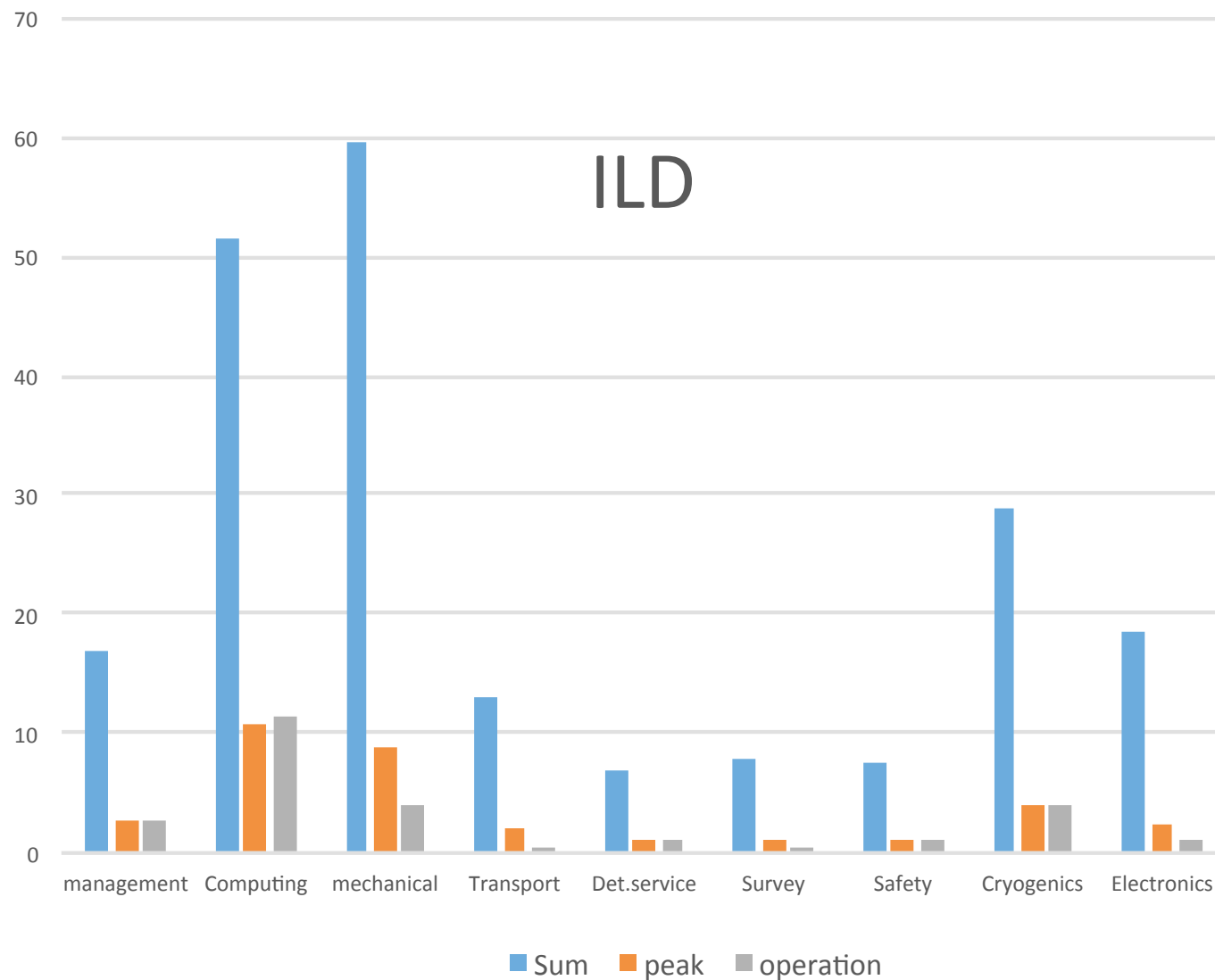
- There will be a big number of users from the time of commissioning through the physics run period.
- They start with a small number at Y1 but will reach in total (500~600)/year or more including physicists, post-docs and students.

Note: The numbers are  
in FTEs.

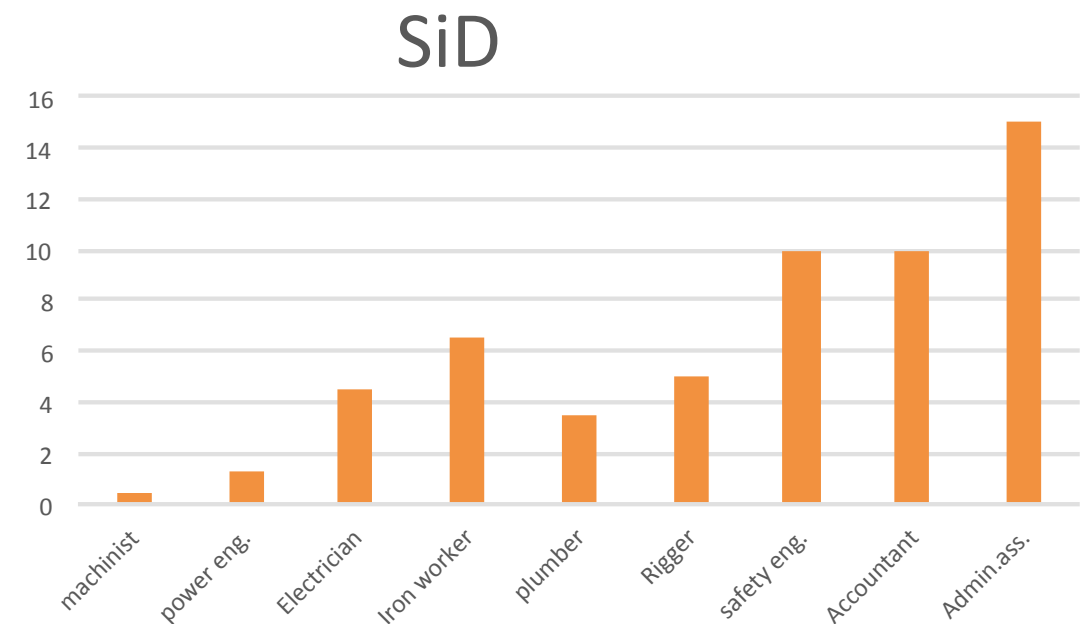
(They will peak e.g. during  
the collaboration meetings. )



## Services requested to the ILC lab



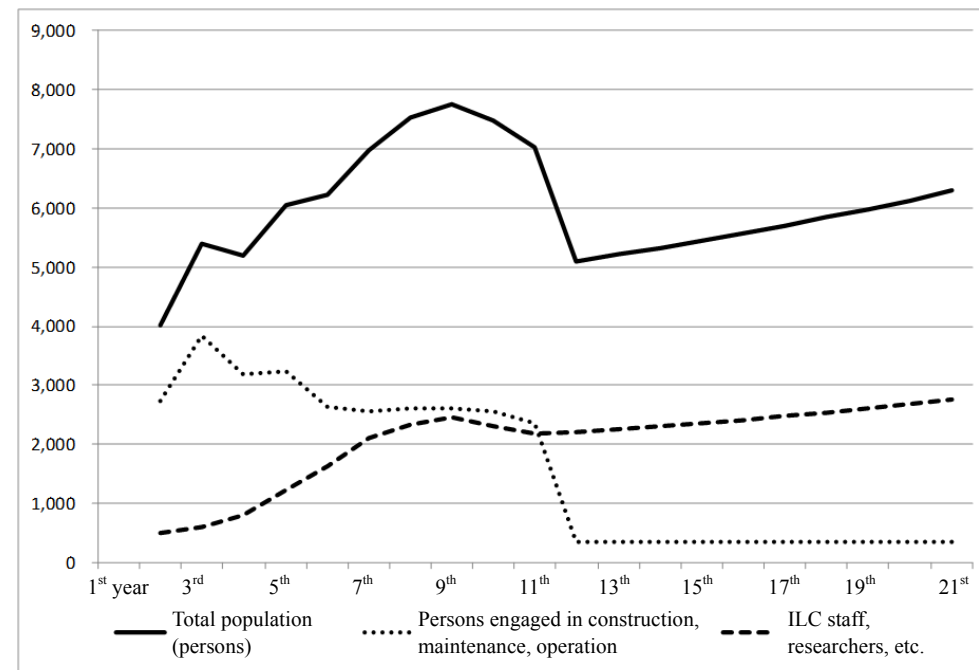
The categorization of services is different between ILD and SiD.  
(The SiD numbers are peak numbers.)





- Need to check these numbers in view of the work of the Infrastructure WG

Figure 11 Results of projections of total population in ILC multinational science city



(Unit: persons)

	Construction phase					Operation phase				
	1 <sup>st</sup> year	5 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	11 <sup>th</sup>	13 <sup>th</sup>	15 <sup>th</sup>	17 <sup>th</sup>	20 <sup>st</sup>
	2015	2019	2021	2022	2023	2025	2027	2029	2031	2034
■ Researchers, engineers, administrative staff - subtotal	100	1,278	2,481	2,291	2,318	2,200	2,303	2,416	2,540	2,751
(1) ILC International Research Institute staff (full-time + fixed-term)	100	840	1,760	1,440	1,400	1,200	1,200	1,200	1,200	1,200
(2) Experimental researchers, etc. <two experiment groups>		284	467	551	618	700	772	851	938	1,086
(3) Support staff, etc. (subcontractors, etc.)		154	254	300	300	300	331	365	402	465
■ Persons engaged in construction, maintenance, and operation - subtotal	2,610	2,522	2,658	2,562	2,550	360	360	360	360	360
(4) Persons engaged in construction work (including supervisors and contractees)	2,580	2,270	2,130	2,130	2,130	0	0	0	0	0
(5) Persons engaged in outsourced maintenance/operation	30	252	528	432	420	360	360	360	360	360
■ Dependent family members - subtotal	156	1,459	2,552	2,471	2,598	2,536	2,662	2,796	2,939	3,176
(1) Family members of ILC International Research Institute staff	142	1,128	1,952	1,845	1,936	1,844	1,897	1,949	2,001	2,079
(2) Family members of researchers, etc. participating in experiments	0	136	224	269	305	356	404	457	518	623
(3) Family members of support staff, etc.	0	74	122	146	148	153	173	196	222	267
(4) Family members of persons engaged in construction work	0	0	0	0	0	0	0	0	0	0
(5) Family members of persons engaged in outsourced maintenance/operation	14	121	253	210	208	183	188	194	199	206
■ Total	2,866	5,259	7,691	7,324	7,465	5,096	5,324	5,571	5,840	6,287

KEK Report 2013-5  
February 2014  
A/H

## 国際リニアコライダープロジェクト 立地に関わる調査検討報告書

### Study of the ILC Project Infrastructure Design Guidelines

編 者

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北村倫夫 (NRI)、片岡俊正 (FCC)

Edited by

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大学共同利用機関法人・高エネルギー加速器研究機構



High Energy Accelerator Research Organization

# KEK Report (cont)



- Report contains list of functional requirements to ILC central campus
- Needs to be synchronised with output of Infrastructure WG

**Figure 13 Functions/facilities envisioned for ILC Central Campus and accelerator laboratory site**

Function/facility category		Envisioned facilities at location	
		ILC Central Campus	ILC accelerator laboratory site
■ Research and operation functions	Office-related facilities	ILC International Research Institute HQ Office Offices for research organizations participating in experiments	ILC International Research Institute satellite office Satellite office for research organizations participating in experiments
	Control facilities	Experiment (accelerator) control center Computer center	Detection equipment operation center Accelerator maintenance center
■ Experiment and research functions	Detection and experimentation facilities		Experiment hall Detection equipment (ILD, SiD)
	Processing and assembly facilities	Assembly hall (for experiment preparations, testing/development experiments)	Detection equipment assembly facility Accelerator on-site assembly facility
	Experiment support facilities	Superconductor, low-temperature, vacuum experimental research facilities Equipment, instrument workshop Storage/stockpiling facilities	On-site workshop
■ Meeting and exchange functions	Lecture hall	Lecture hall	
	Meeting facilities	Large conference room Small and medium meeting rooms	Small and medium meeting rooms
	Exchange functions	Lounge Reception/party facilities Exhibition facilities (visitor center)	Lounge
■ Stay/residential functions	Accommodation functions	Visitor accommodation facilities (apartment-type) Visitor accommodation facilities (townhouse-type)	Simple accommodation facilities
■ Service functions	Information and exhibition functions	Reception facilities (reception desk) Exhibition facilities (visitor center) Library and information center	
	Welfare functions	Cafeteria Medical/health facilities Nursery school facilities Entertainment/sports facilities	Small cafeteria
	Daily living support functions	User service center (bank, ATM, post office, travel agency, etc.) Shop (convenience store)	Small user service center Shop (convenience store)
■ Transport functions	Parking facilities	Single-level/multi-level parking lots	Single-level parking lot
■ Supply and disposal functions	Supply and disposal functions	Electric power room, machinery room Disaster-prevention control room Waste disposal facilities	Special high-voltage receiver/transformer facilities Heat energy discharge facility Helium refrigeration plant



# Possible Regional Impact



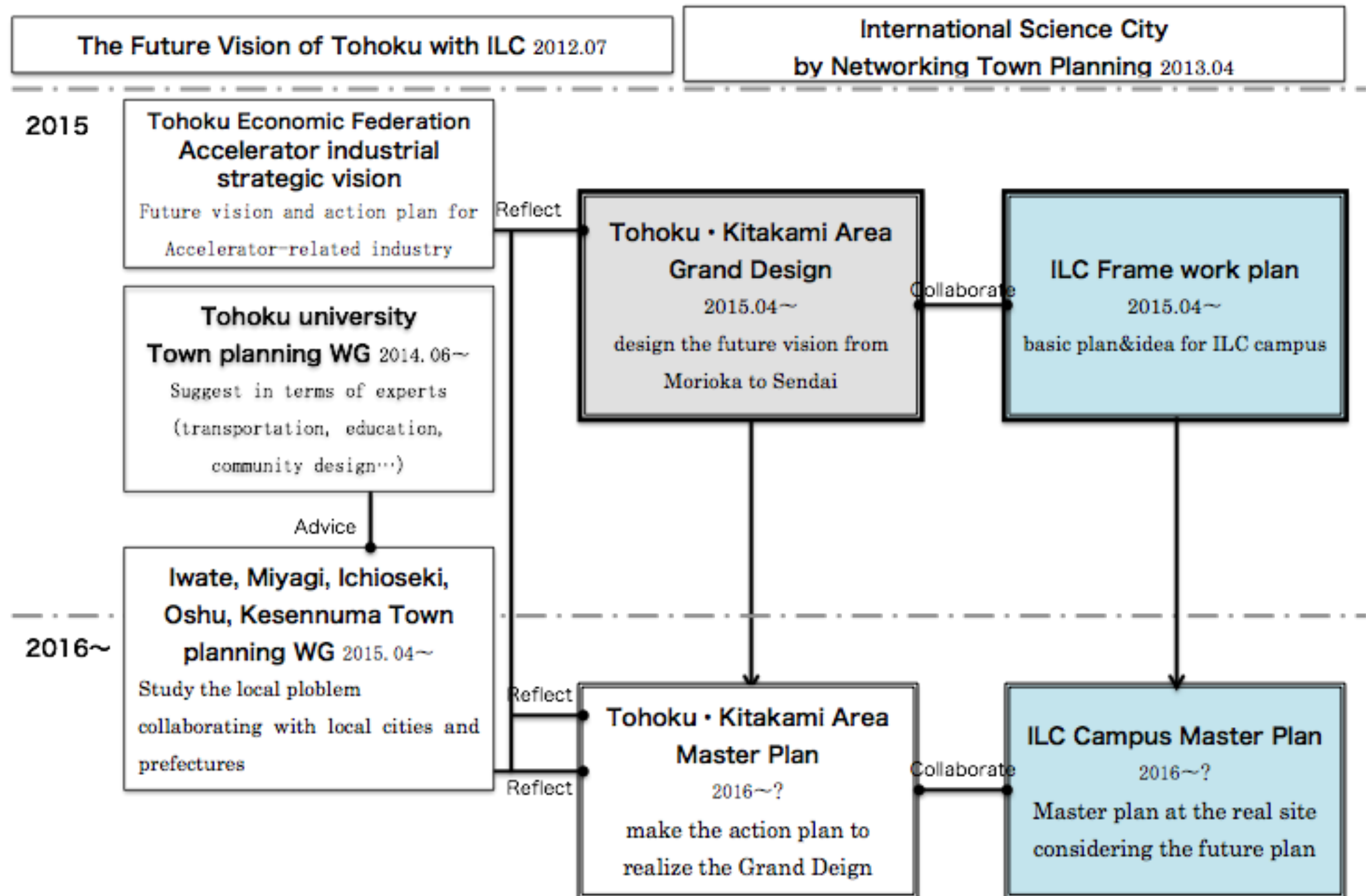
- Models of „ILC Science City“ under discussion in Japan:
  - From report on „The future vision of Tohoku with the International Linear Collider as a core facility.“, 2012:



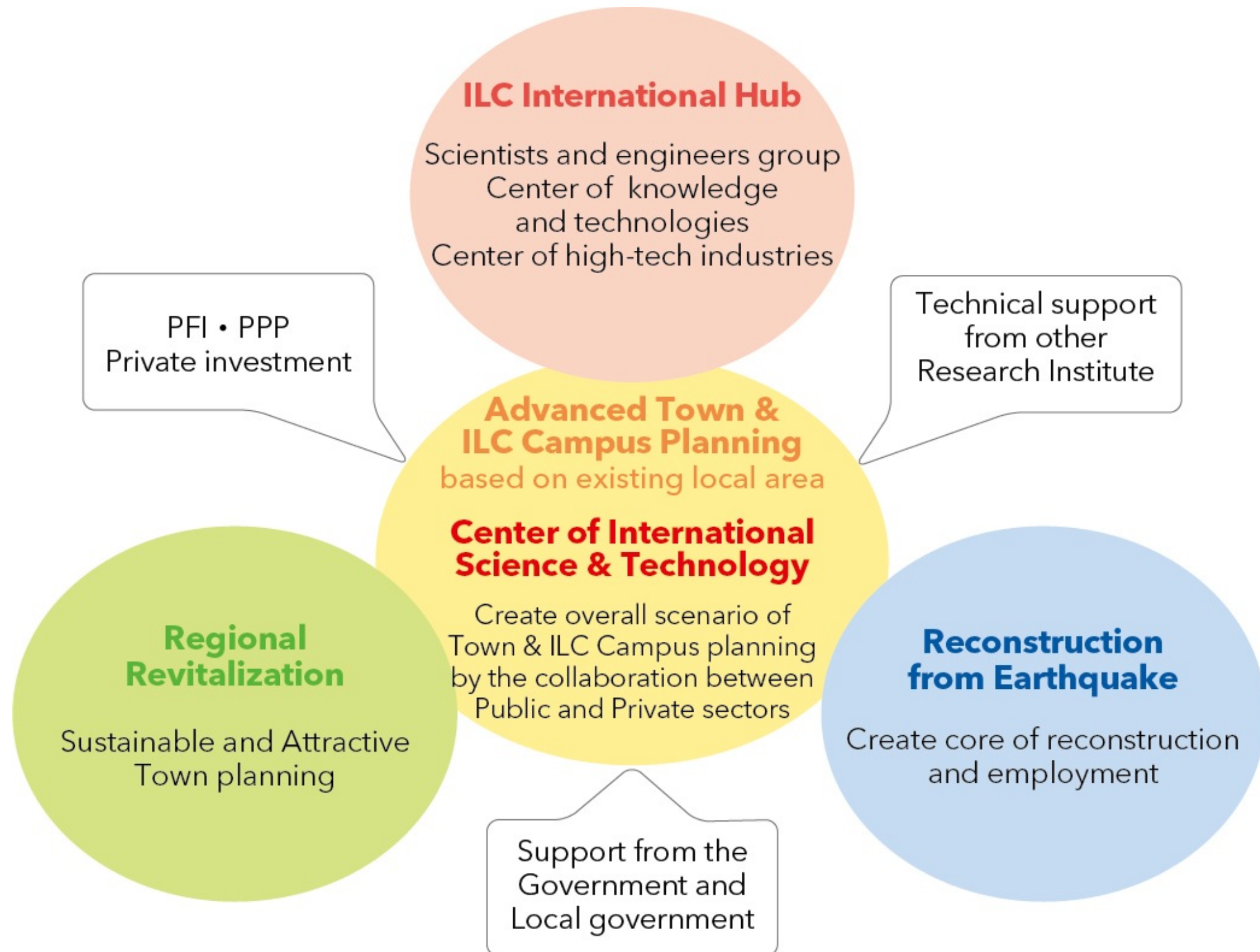


# 1.Town Planning

Slide from Tokiko Onuki



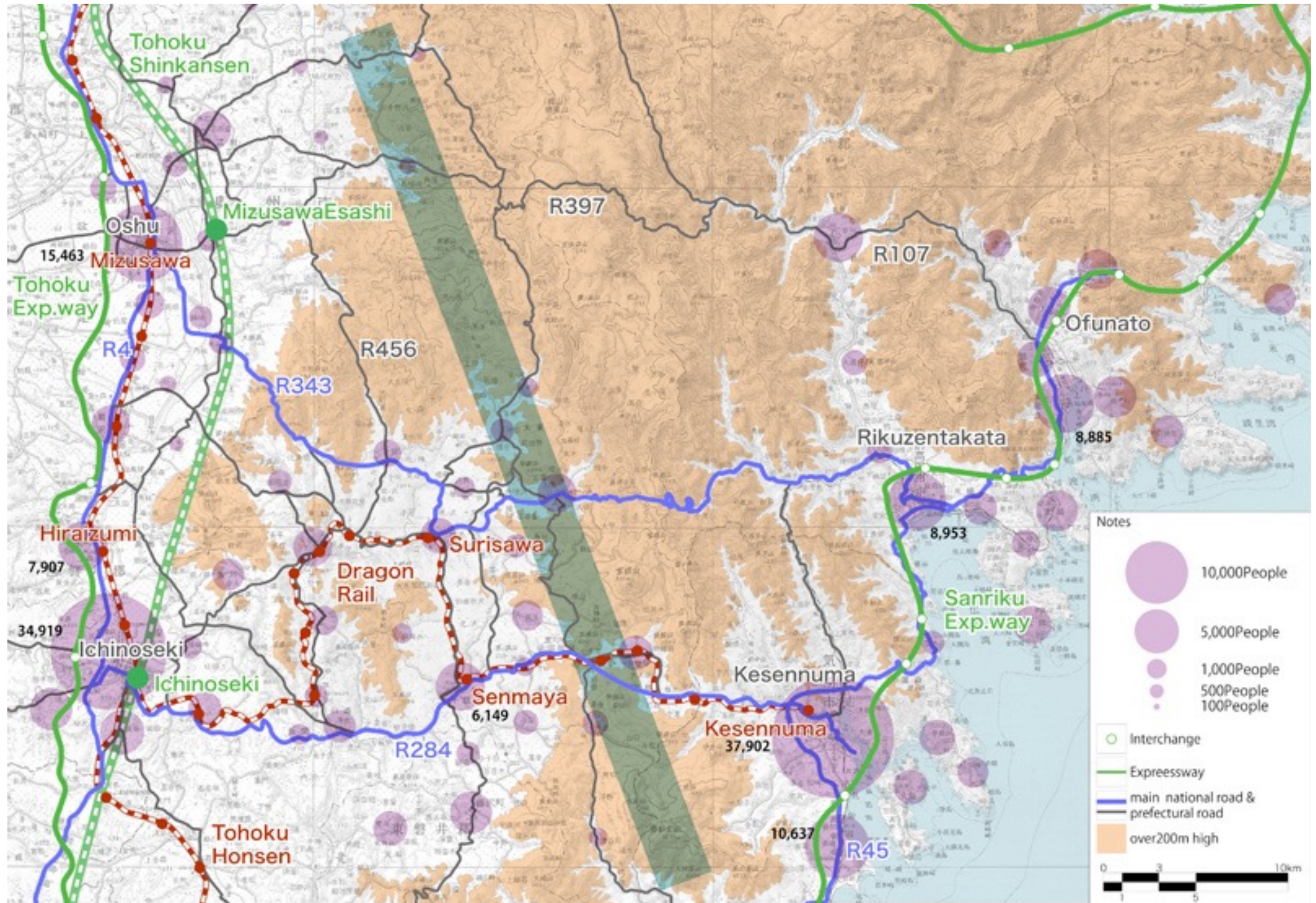
## Some Basic Town Planning Opportunities opened by the ILC





# KITAKAMI Site: Transportation

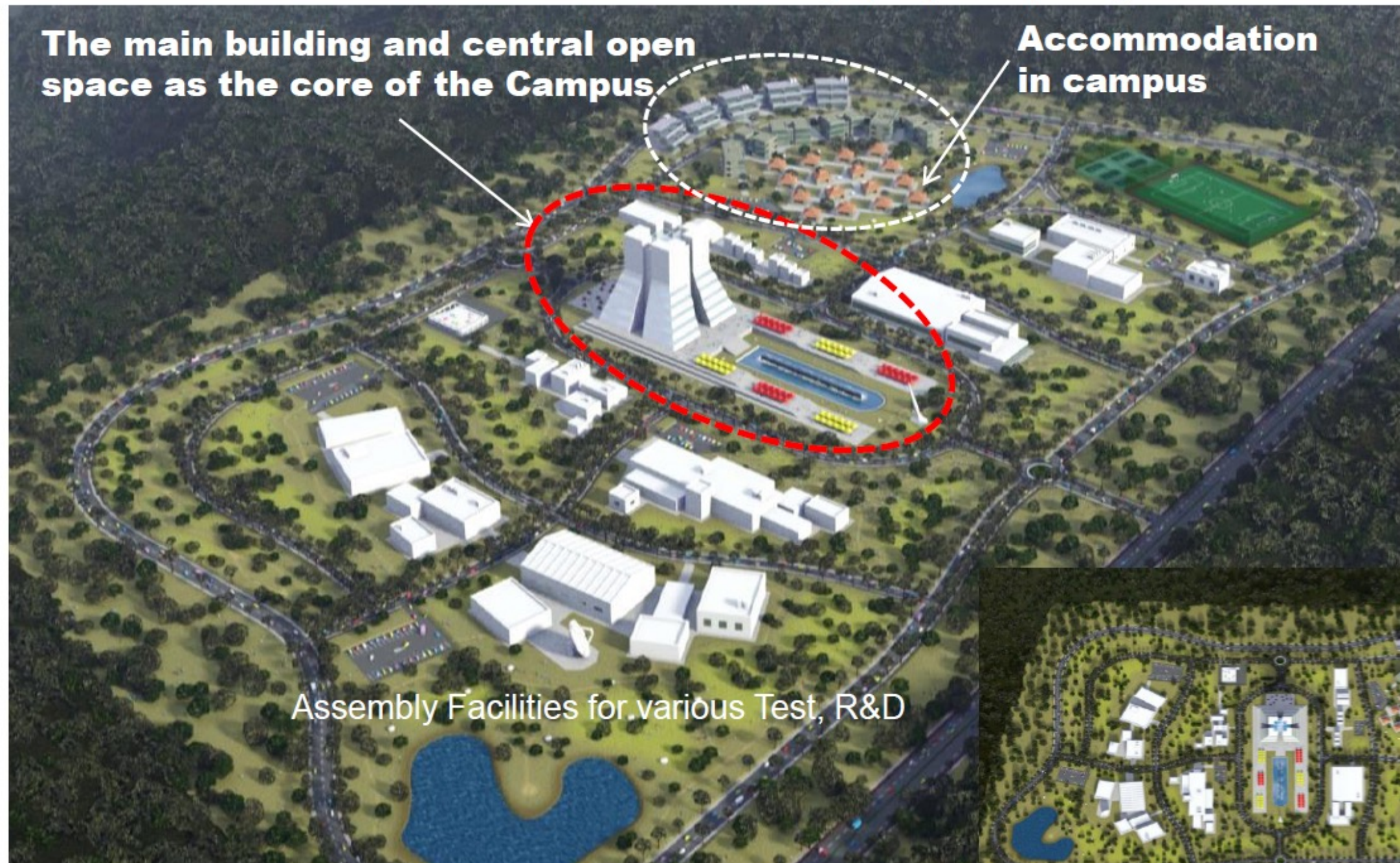
Slide from Tokiko Onuki





# Central campus

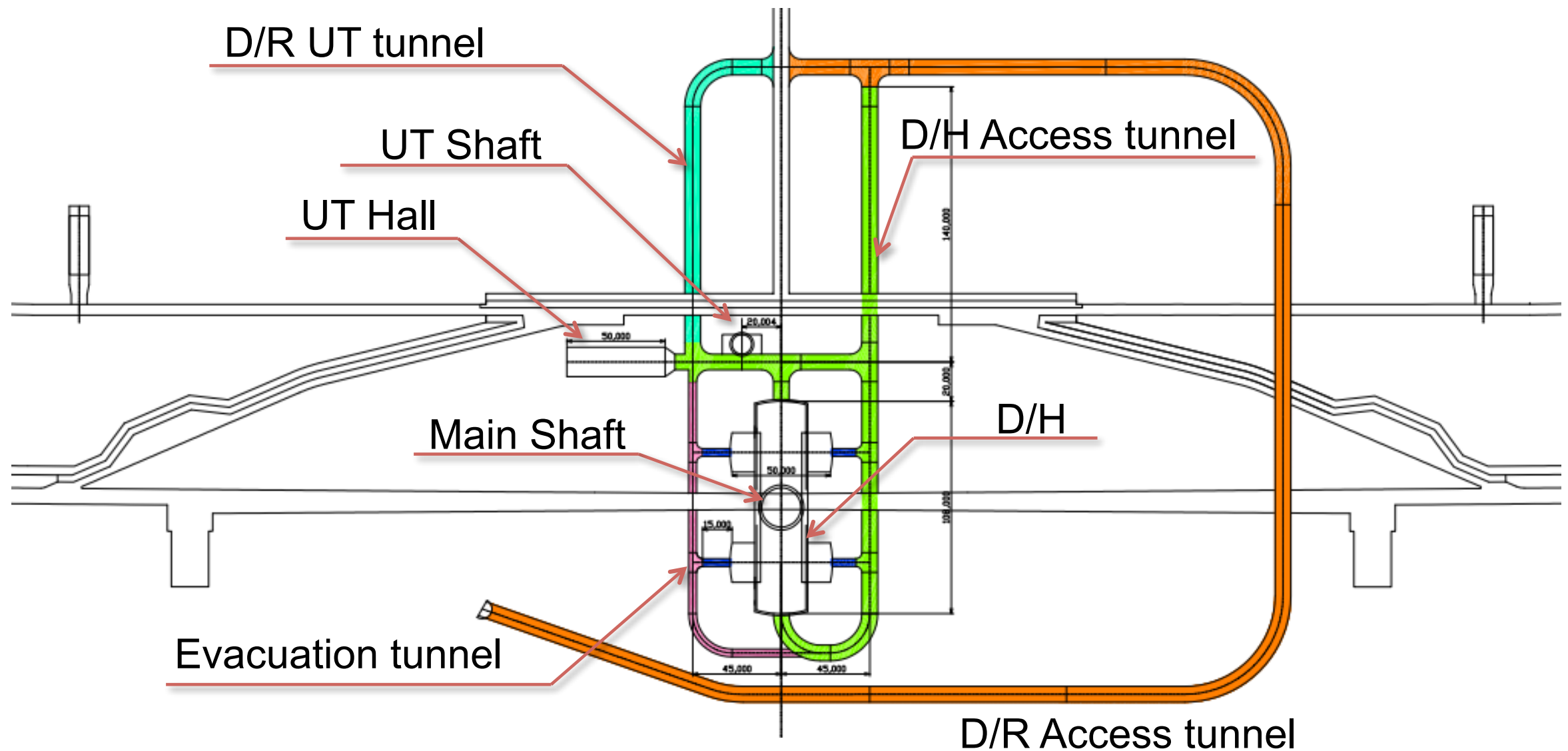
*Draft proposal plan for discussion*



(M. Miyahara, AWLC14)

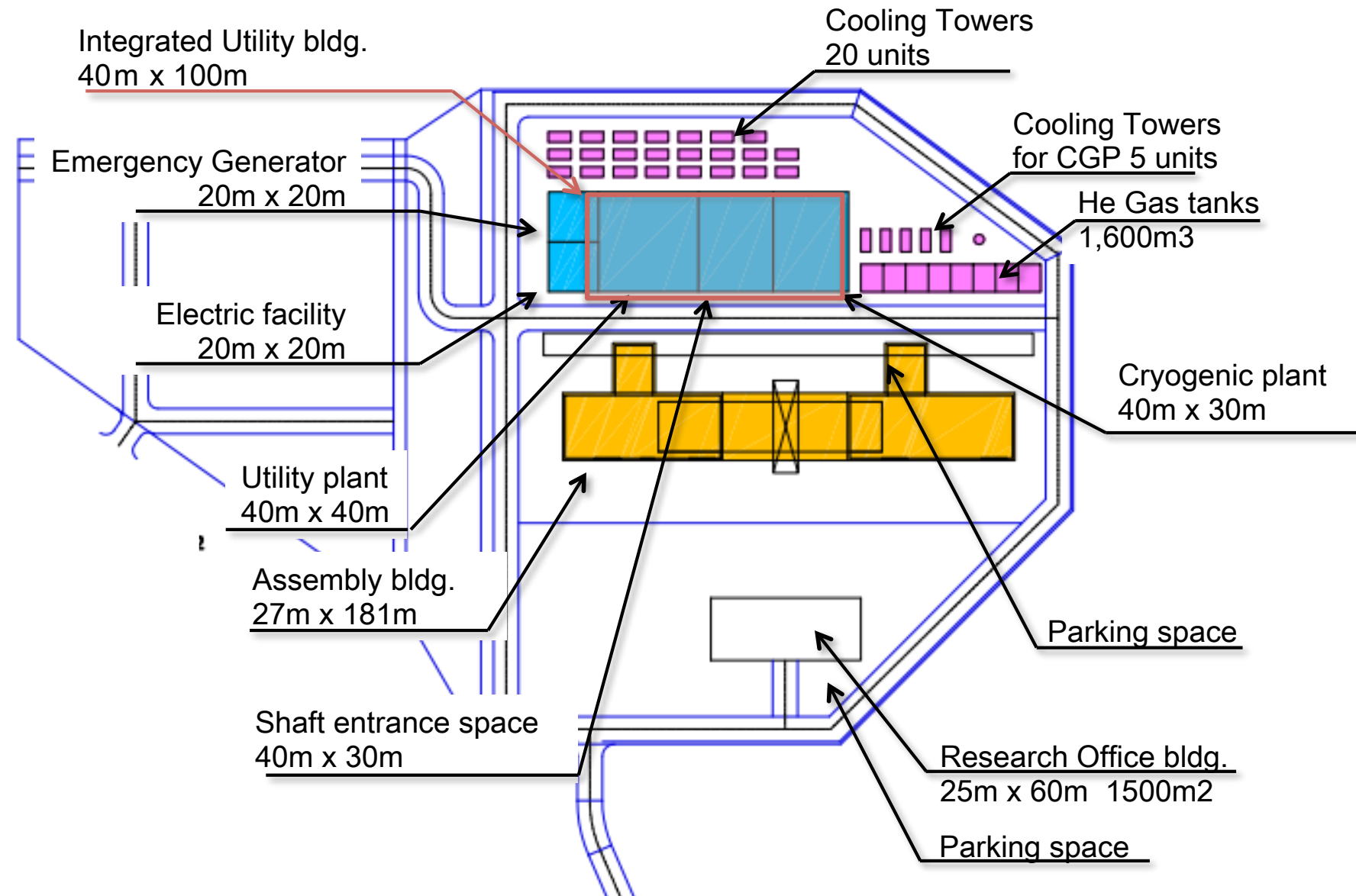


# Underground Structure

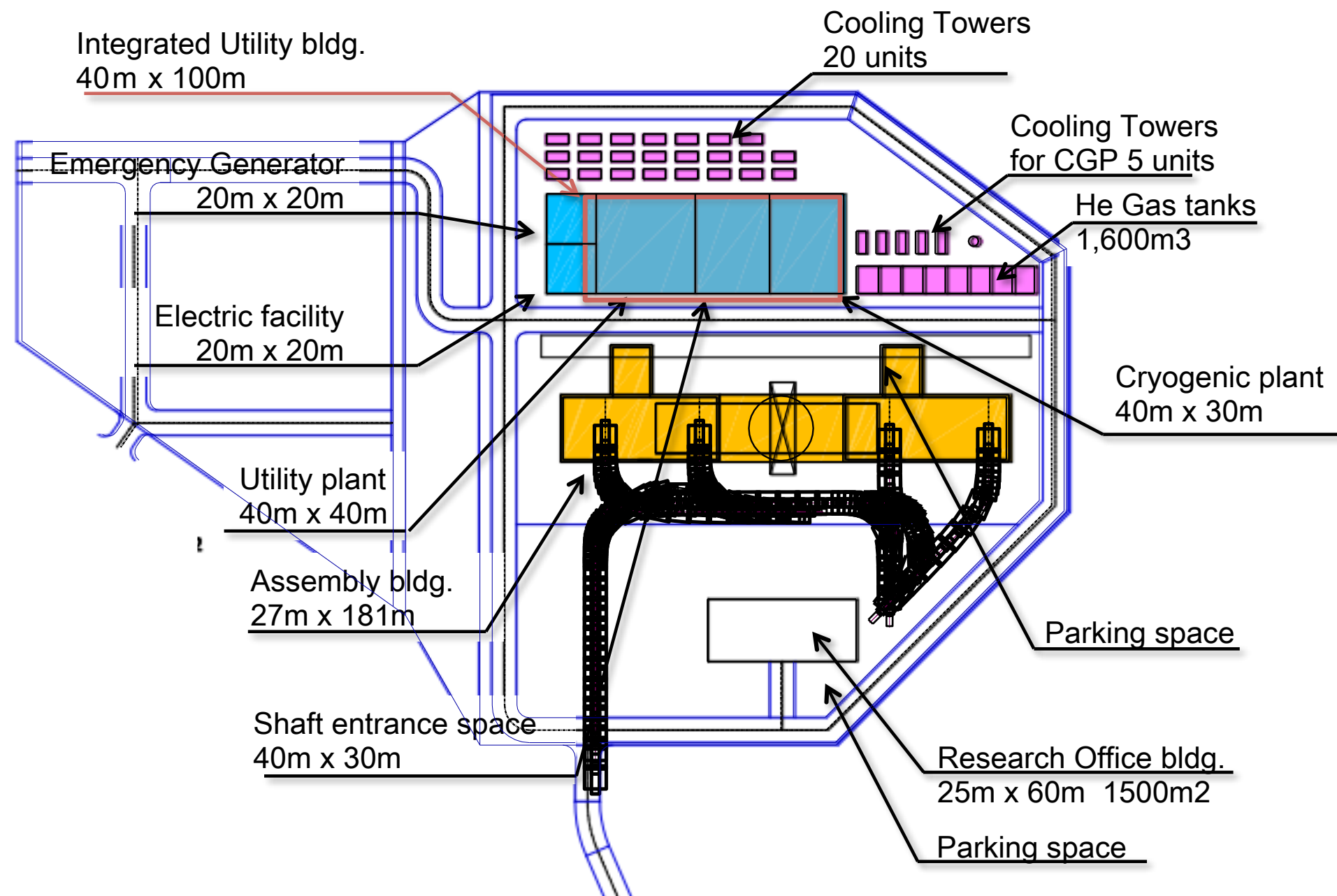




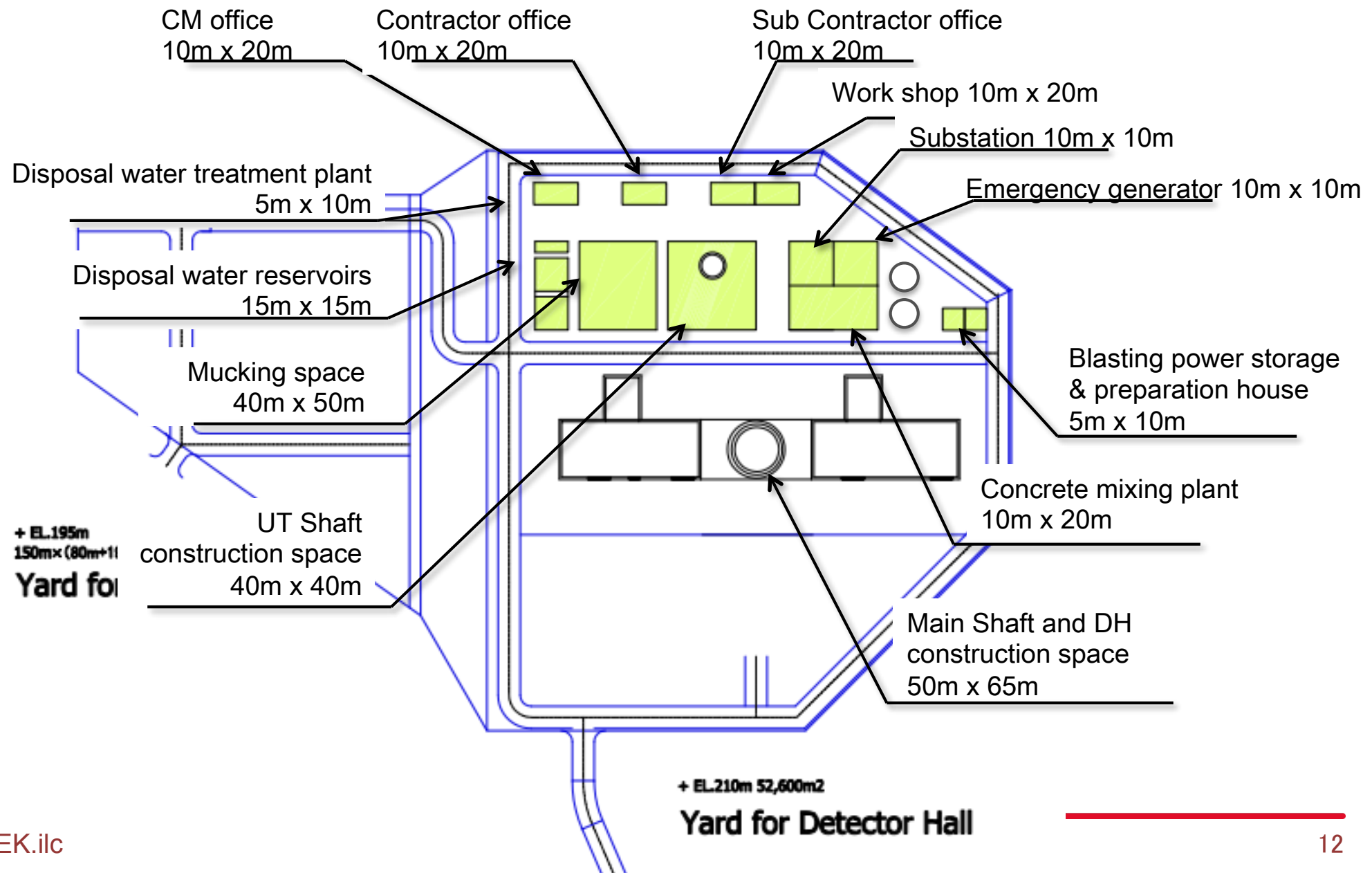
# Surface ground Buildings and facilities



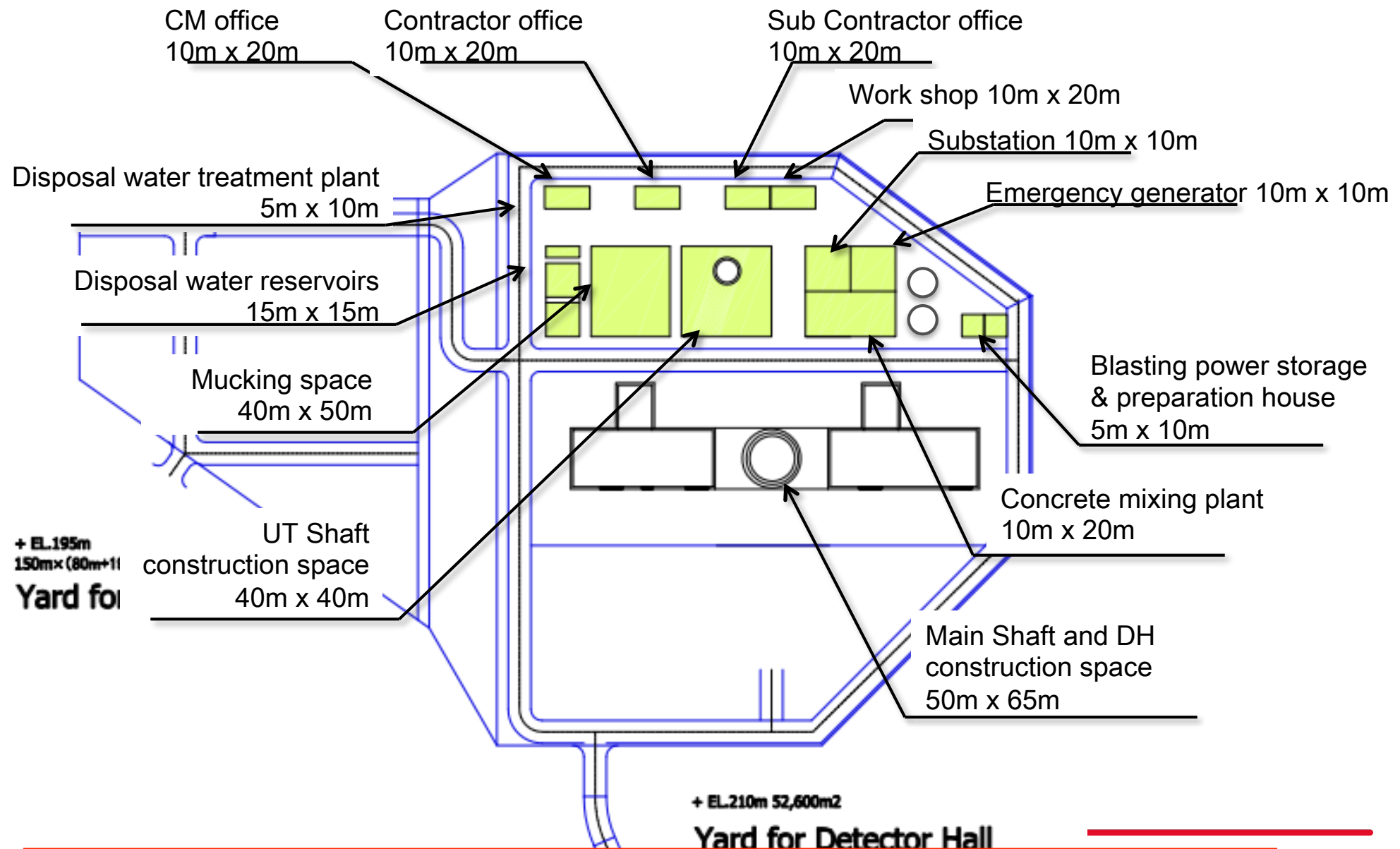
# Surface ground Buildings and facilities



# Construction facilities Arrangements



# Construction facilities Arrangements



# Cryo Configuration (ILD,SiD,QD0,QF1,CC,DR)

Hybrid A' (All pipes for Helium and cooling water.)

cooling tower for IR compressors including DR.  
volume flow rate = 1500L/min per 1 comp.  
total volume flow rate = 6000 L/min (4 comps)

sub buffer tanks for comp

main buffer tank

cooling towers

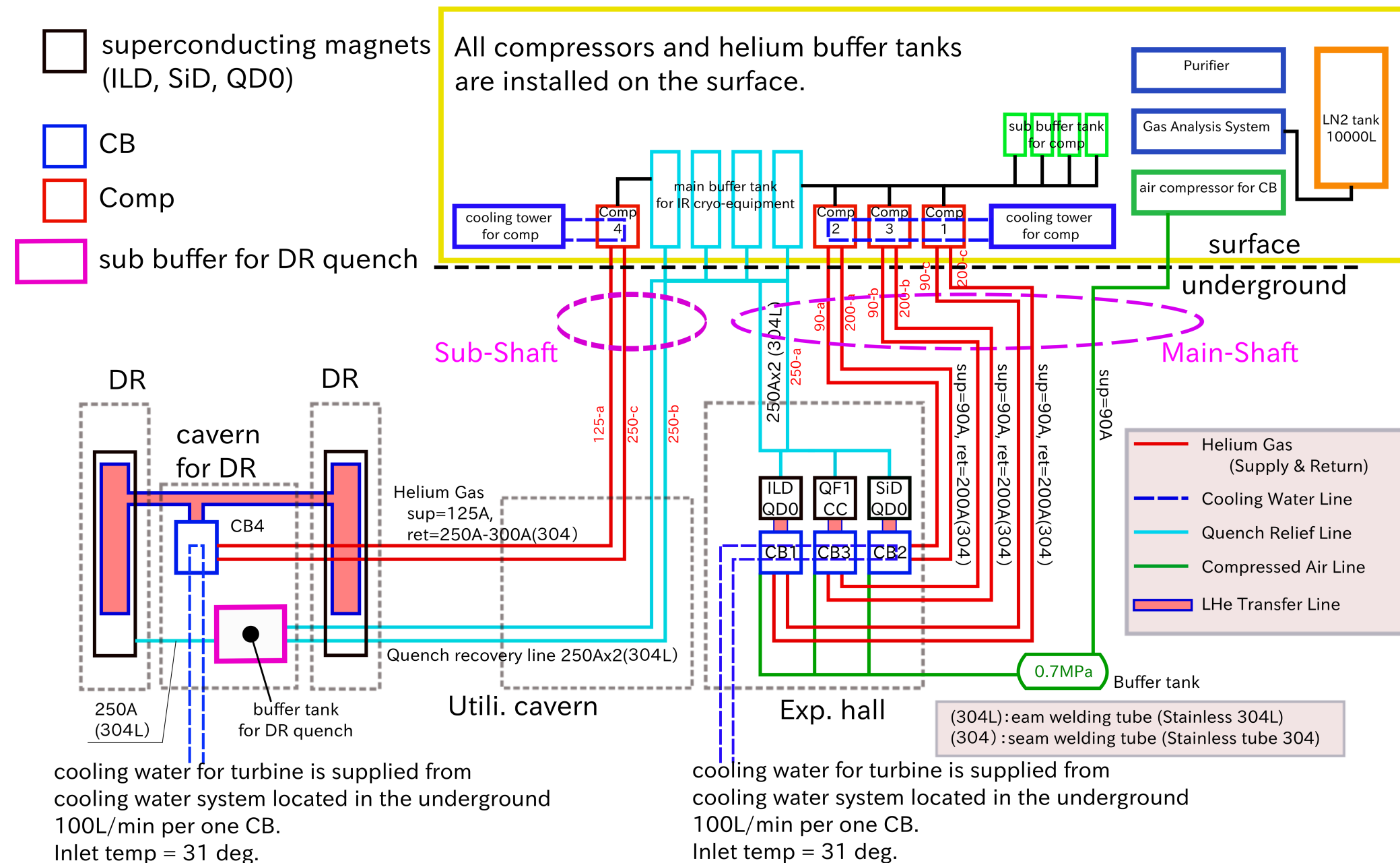
superconducting magnets (ILD, SiD, QD0)

CB

Comp

sub buffer for DR quench

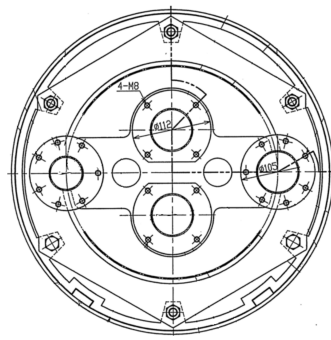
All compressors and helium buffer tanks are installed on the surface.





# Layout example for ILD

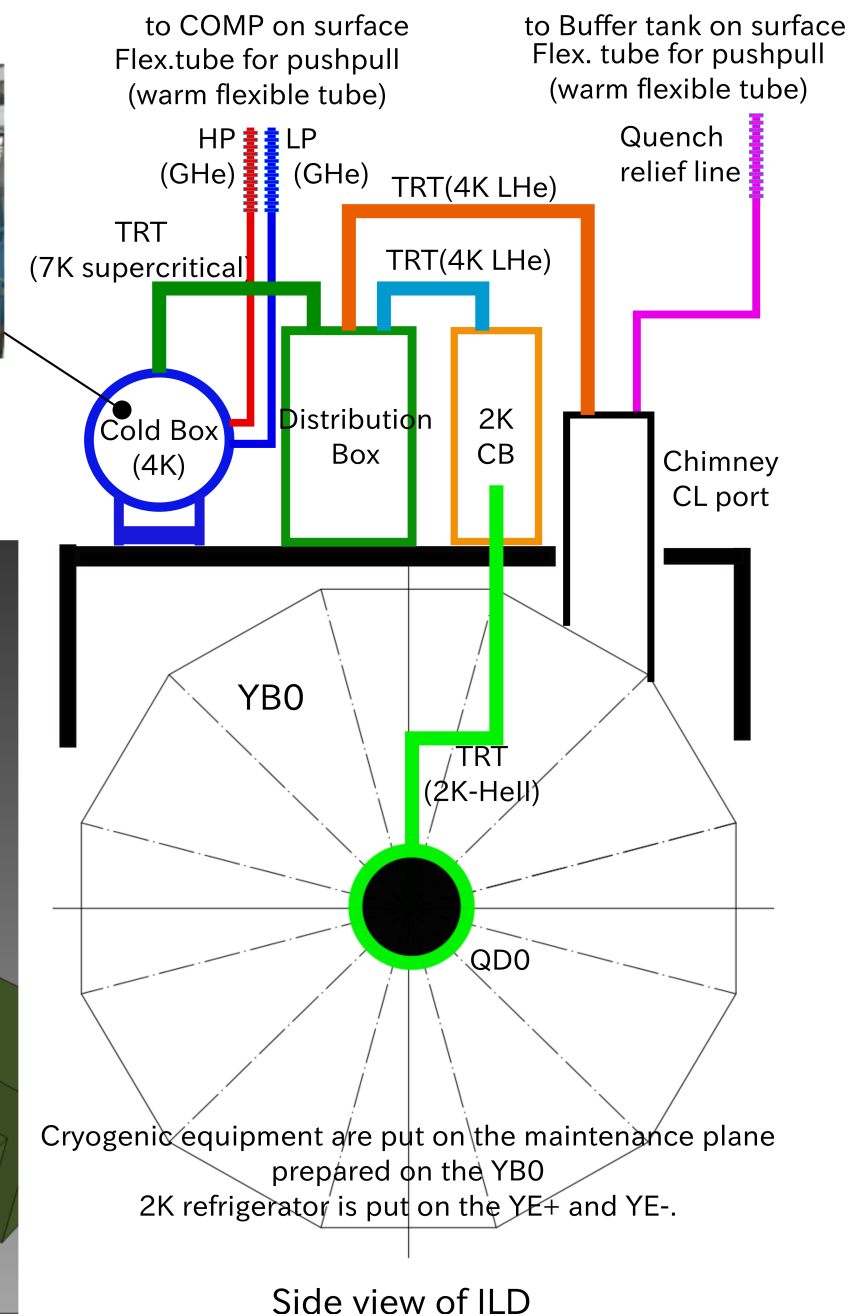
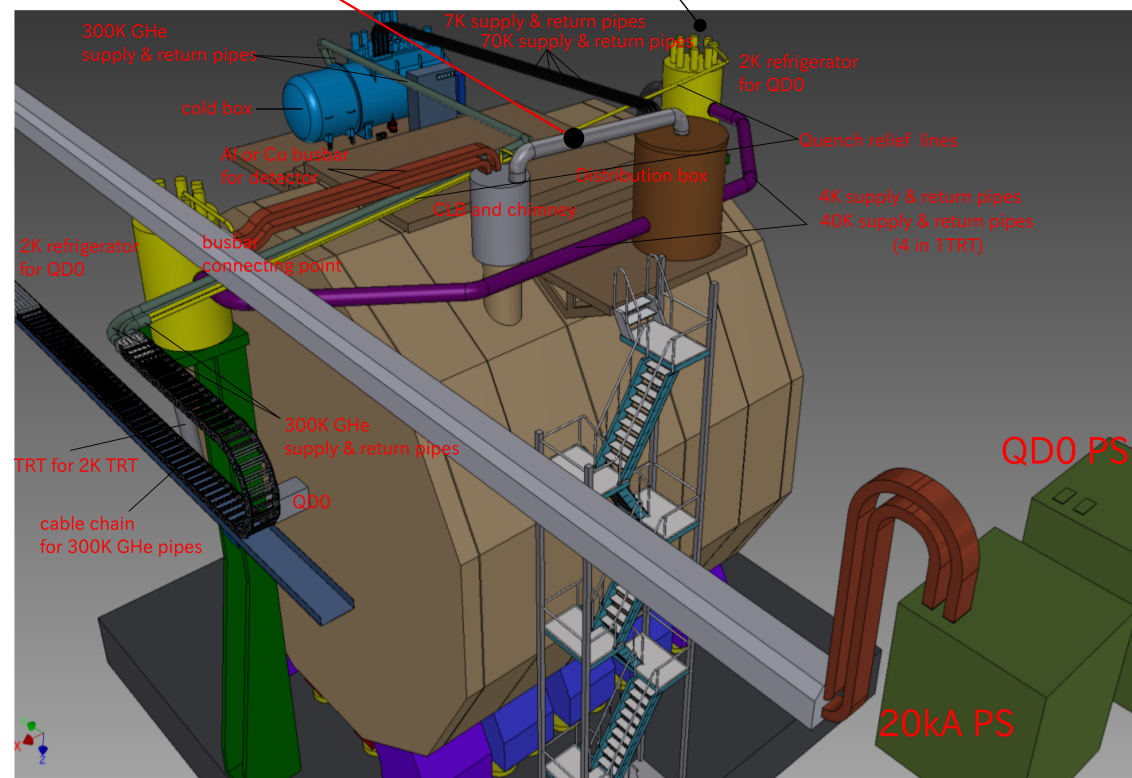
Cross section of TRT  
(7K supercritical, 4K LHe)



2K refrigerator  
(BNL)

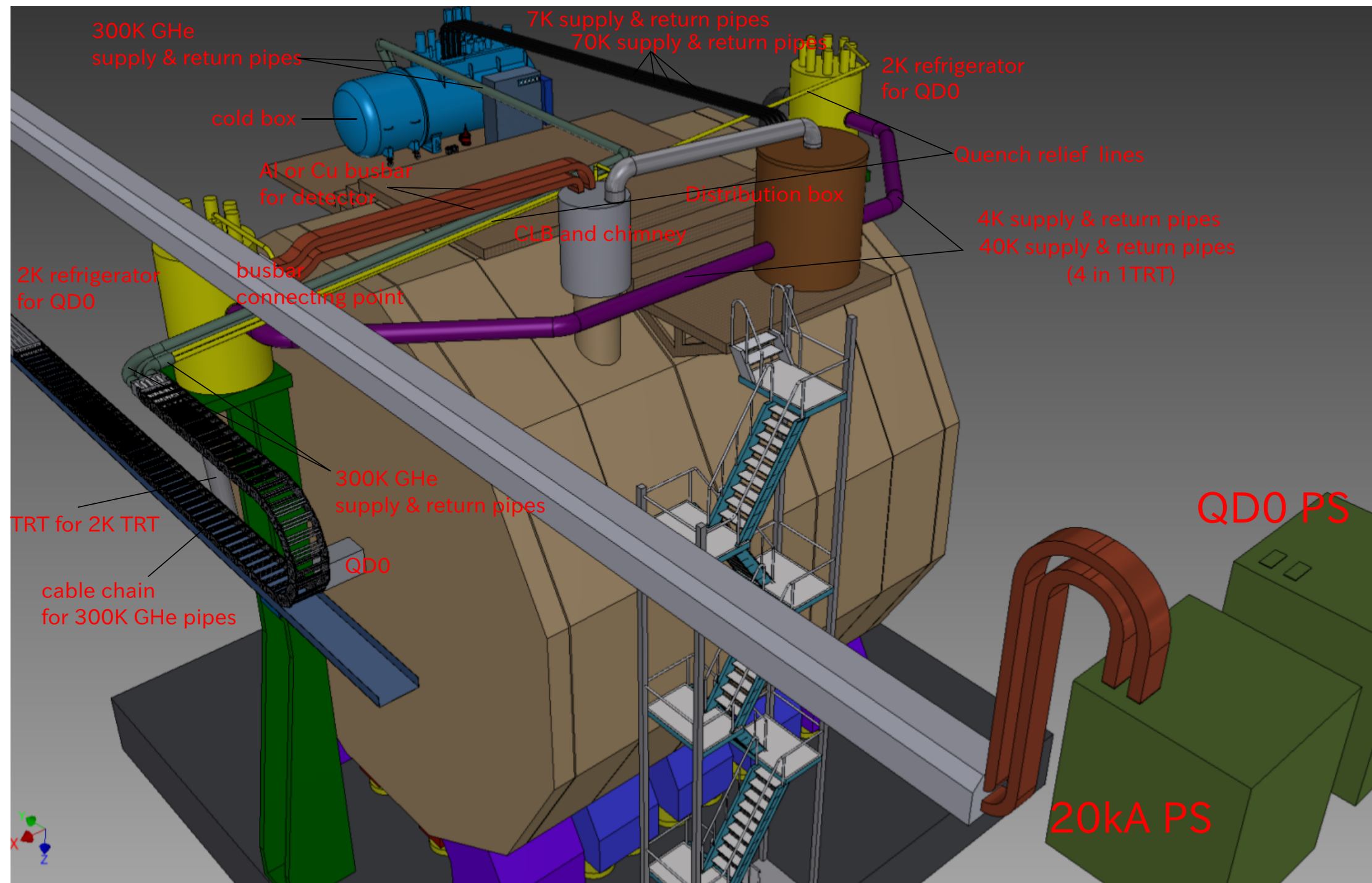


4K cold box



Most of the cryo-equipment should be located on the YB0 platform in order that ILD detector should be divided into 5 sectors as easy as possible.

# Appendix (E) : 3D view





# Appendix (E) : 3D view





# ILD Integration Workshop



## ILD Topical Integration Meeting

from Thursday, October 8, 2015 at 09:00 to Friday, October 9, 2015 at 15:30 (Europe/Zurich)  
at LAL Orsay

### Description

- Discussions on:
- assembly procedures and requirements (space, infrastructure) for ILD and the ILD subdetectors;
  - integration of ILD with the IR area in Kitakami;
  - definition of interfaces for subdetectors (as proposed in the document by Christian Bourgeois) ;
  - AOB.

Fuze Thursday: <https://www.fuzemeeting.com/fuze/7a8482d0/30698290>

Fuze Friday: <https://www.fuzemeeting.com/fuze/7a8482d0/30698322>

Support Email: [karsten.buesser@desy.de](mailto:karsten.buesser@desy.de)

### Thursday, October 8, 2015

- 09:00 - 10:30 **Kitakami Issues**  
Location: Room 166
- 09:00 **Welcome/Introduction 15'**  
Speakers: Roman Poeschl (Laboratoire de  
Material: [Slides](#)
- 09:15 **Update on Kitakami Site 30'**  
Speaker: Tomoyuki Sanuki (Tohoku Univer  
Material: [Slides](#)
- 09:45 **Report from KEK Mini-Workshop on I**  
Speaker: Dr. Karsten Buesser (DESY)  
Material: [Slides](#)
- 10:30 - 11:00 **Coffee Break**
- 11:00 - 12:30 **ILD General**  
Location: Room 166
- 11:00 **General ILD Assembly Plan 30'**  
Speaker: Dr. Yasuhiro Sugimoto (KEK)  
Material: [Slides](#)
- 11:30 **Status of ILD Engineering Model 20'**  
Speaker: Christian Bourgeois (Universite c  
Material: [Slides](#)
- 11:50 **Subdetector Interface Documents 20'**  
Speaker: Christian Bourgeois (Universite c

12:30 - 14:00

### Lunch Break

14:00 - 15:30

### ILD General II

Location: Room 166

#### 14:00 **Beam-Gas Background Simulations 30'**

Speaker: Mr. Robert Karl (DESY)

Material: [Slides](#)

#### 14:30 **Magnetic Field Simulations 20'**

Speaker: Dr. Karsten Buesser (DESY)

Material: [Slides](#)

15:30 - 16:00

### Coffee Break

16:00 - 18:00

### ILD Subdetectors I

Location: Room 166

#### 16:00 **Yoke Design Status 20'**

Speaker: Dr. Uwe Schneekloth (DESY)

Material: [Slides](#)

#### 16:20 **New Yoke Design 20'**

Speaker: Mr. Richard Stromhagen (Deutsc

#### 16:40 **AHCAL Seismic Studies 20'**

Speaker: Felix Sefkow (Deutsches Elektror

Material: [Slides](#)

#### 17:00 **AHCAL Assembly in Kitakami 30'**

Speaker: Mr. Karsten Gadow (DESY)

Material: [Slides](#)

20:00 - 22:00

### Informal Dinner ( )

Informal Dinner (self paid) at Les Papilles:

<https://agenda.linearcollider.org/event/6829/manage/general/>

- October 8-9, LAL Orsay, France
- 24 participants
- Discussion on ILD construction, assembly and maintenance in Kitakami

### Friday, October 9, 2015

- 09:00 - 10:30 **ILD Subdetectors II**  
Location: Salle Bleue
- 09:00 **SDHCAL Assembly in Kitakami 30'**  
Speaker: Mr. imad laktineh (IPNL)  
Material: [Slides](#)
- 09:30 **ECAL Assembly in Kitakami 30'**  
Speaker: Mr. Henri Videau (LLR-Ecole polytechnique)  
Material: [Slides](#)
- 10:00 **TPC Assembly in Kitakami 30'**  
Speakers: Thomas Schoerner-Sadenius (Deutsches Elektronen-Synchrotron Hamburg and Zeuthen (DE)), Volker Prah (Desy)  
Material: [Slides](#)
- 10:30 - 11:00 **Coffee Break**
- 11:00 - 12:30 **ILD Subdetectors III / Summary**  
Location: Salle Bleue
- 11:00 **Inner Detector Assembly 15'**  
Speaker: Christian Bourgeois (Universite de Paris-Sud 11 (FR))  
Material: [Slides](#)
- 11:15 **VTX/FTD Region Integration: Mechanical, Services, Cooling 30'**  
Speaker: Miguel-Angel Villarejo Bermudez (Instituto de Fisica Corpuscular (ES))  
Material: [Slides](#)
- 11:35 **Summary and Work Plan 30'**
- 12:30 - 14:00 **Lunch Break**

# AHCAL Assembly

**Kitakami Side**



**or anywhere in any detector**

# AHCAL Assembly

**solution: all needed AHCAL parts fit into here**

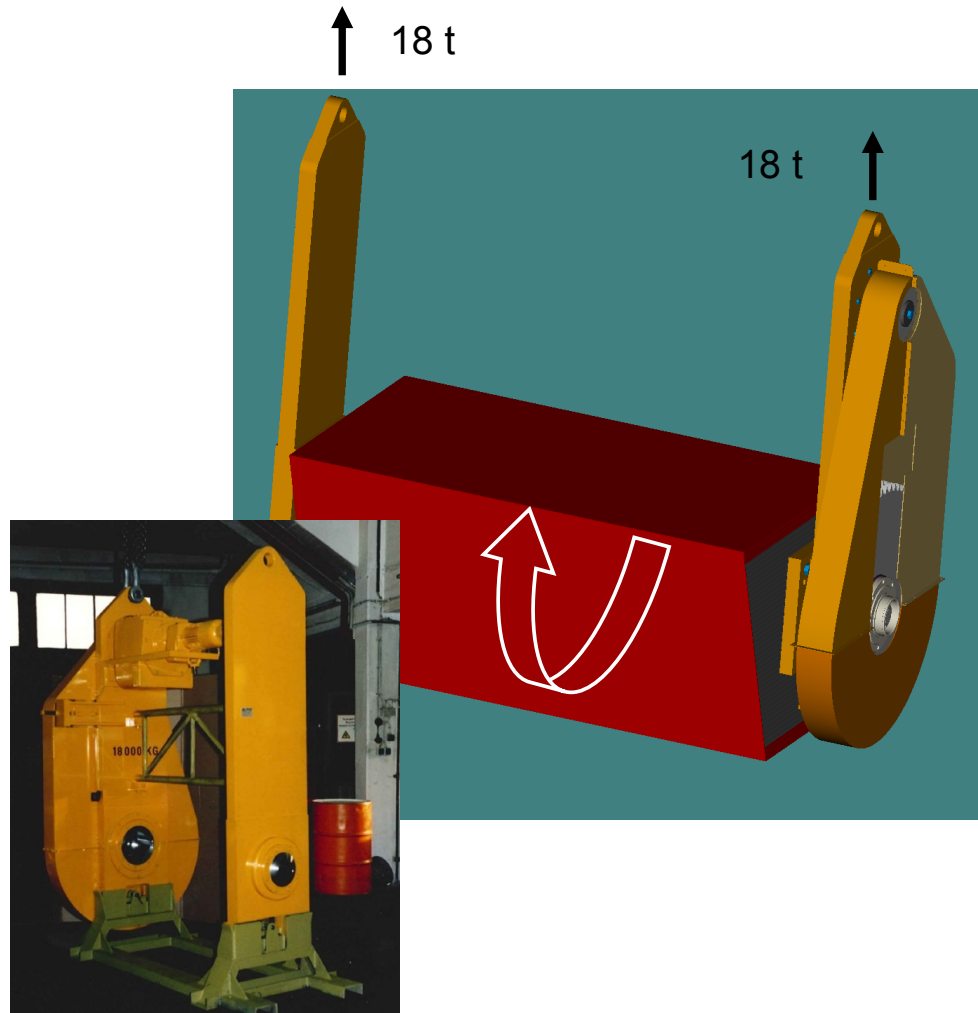


**the container fits to standard transport systems  
as ships, railways, trucks and through tunnels.....**

AUSSENMASSE		
Länge	mm	6058
	ft	19' 10 ½"
Breite	mm	2438
	ft	8'
Höhe	mm	2591
	ft	8' 6"

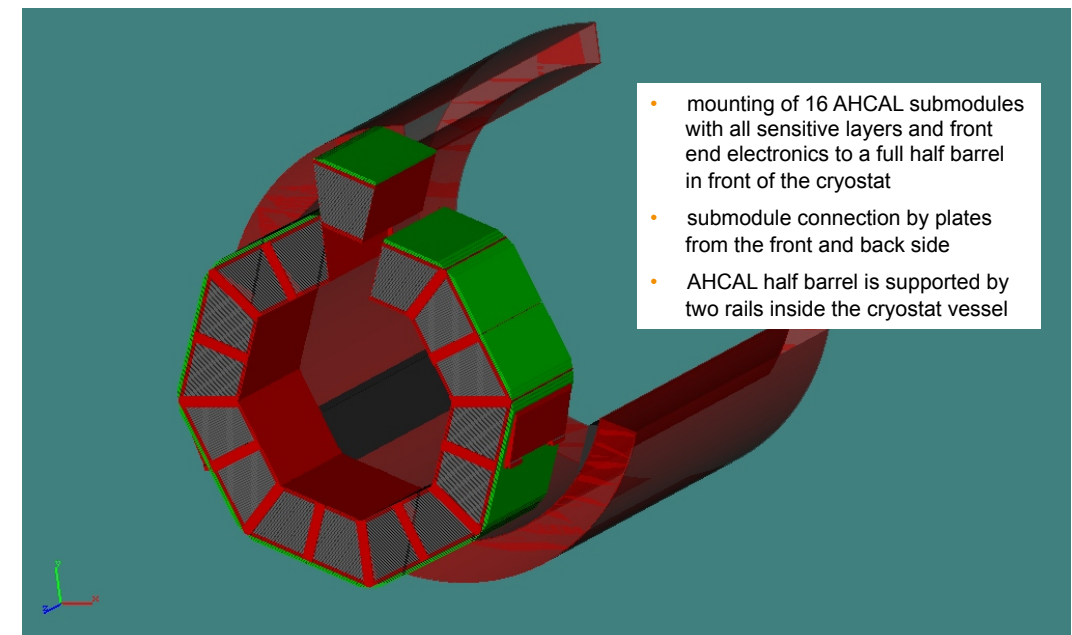
GEWICHT		
Tara	kg	2700
	pd	5950
Max. Zuladung	kg	27780
	pd	61250
Max. Bruttogewicht	kg	30480
	pd	67200

# AHCAL barrel integration tools



- lifting and turning tool for AHCAL barrel absorber submodules available
  - 2 x 18 t capacity
  - operation with 2 hooks (z angle adjustment)
  - precise motor controlled turning
  - design for adaptation for sub-modules with and without sensitive layers started
- mounting, support and insertion frame
  - insertion frame design ready
  - insertion frame support design depends on final yoke size and useable space
- push and pull tool available
  - must be modified to the rail distance and rail shape

## AHCAL half barrel absorber installation step 1



Karsten Gadow | ILD Topical Integration Meeting | LAL-Orsay (



# AHCAL assembly in ILD

## experimental site requirements

- experimental site must be reachable by standard trucks with 20“ containers and a payload of 20 t under convenient conditions (moderate slopes and curves)
- the AHCAL test hall must be passable with trucks like above
- the AHCAL test hall must be equipped with 2 x 20 t gantry cranes
- the two crane hooks must reach a distance of 2,5 m between each other and a height of 6 m over ground
- the operational area of the cranes for the AHCAL must be 10 m (crane bridge) x 20 m  
load area 4 x 8 m / AHCAL test area 6 x 8 m / AHCAL storage area 10 x 12 m
- the AHCAL test area must be air conditioned
- cooling water (16°C, 2 bar, 50 l/min) must be supplied to the AHCAL test area
- electrical power 4 x (3 phase x 400V / 50Hz, 32 A) must be supplied to the AHCAL test area
- workshop (5 m x 10 m with a height of 3,5 m) for sensitive layer repair directly at the AHCAL test area
- 4 offices with 20 m<sup>2</sup> directly at the AHCAL test area



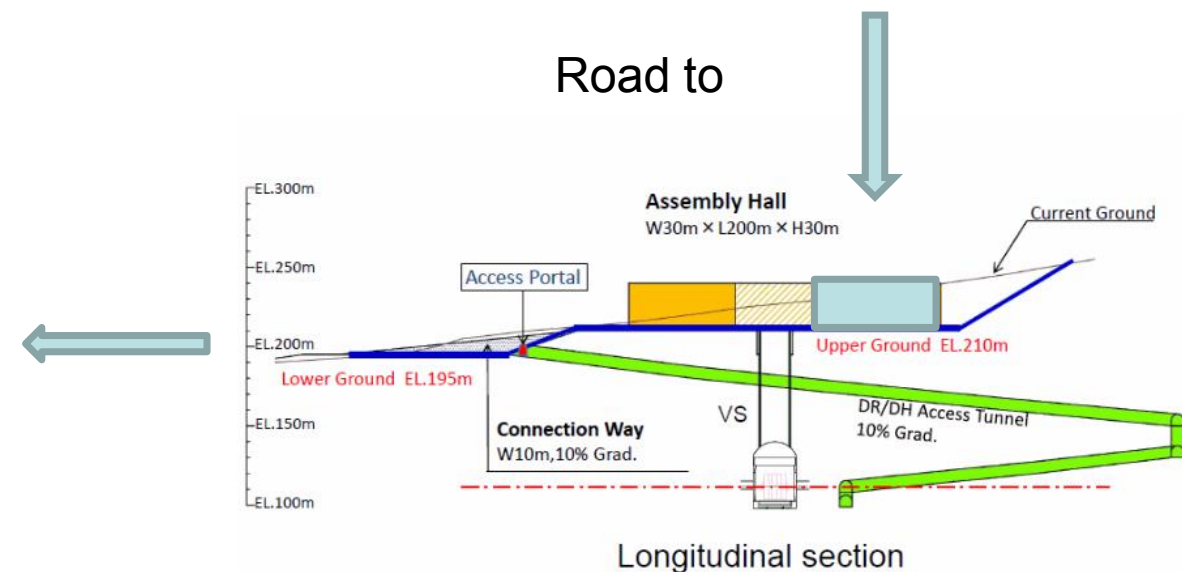
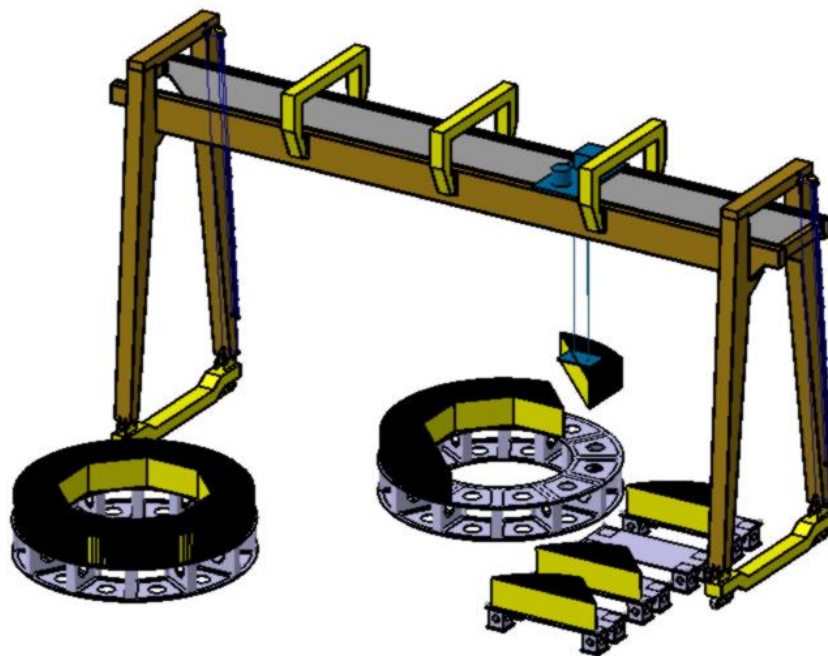
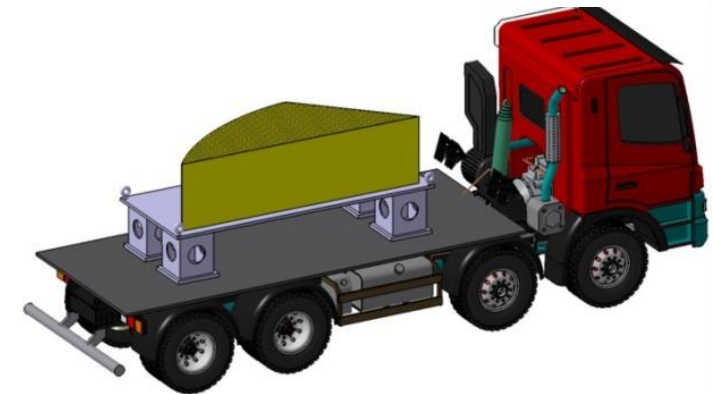


## Barrel integration : scenario A

### ■ Wheel Building in **Assembly Hall** : 8 modules x 5

#### *Transport to Assembly Hall with normal truck - ILD area*

- **Step 1** : Wheel structure transport (8 travels) & assembly
- **Step 2** : Modules transport 40 travels with 11 t
- **Step 3** : Modules assembly on the wheel structure with **100 t crane**
  - 8 modules in position on specific tool & screwing/welding

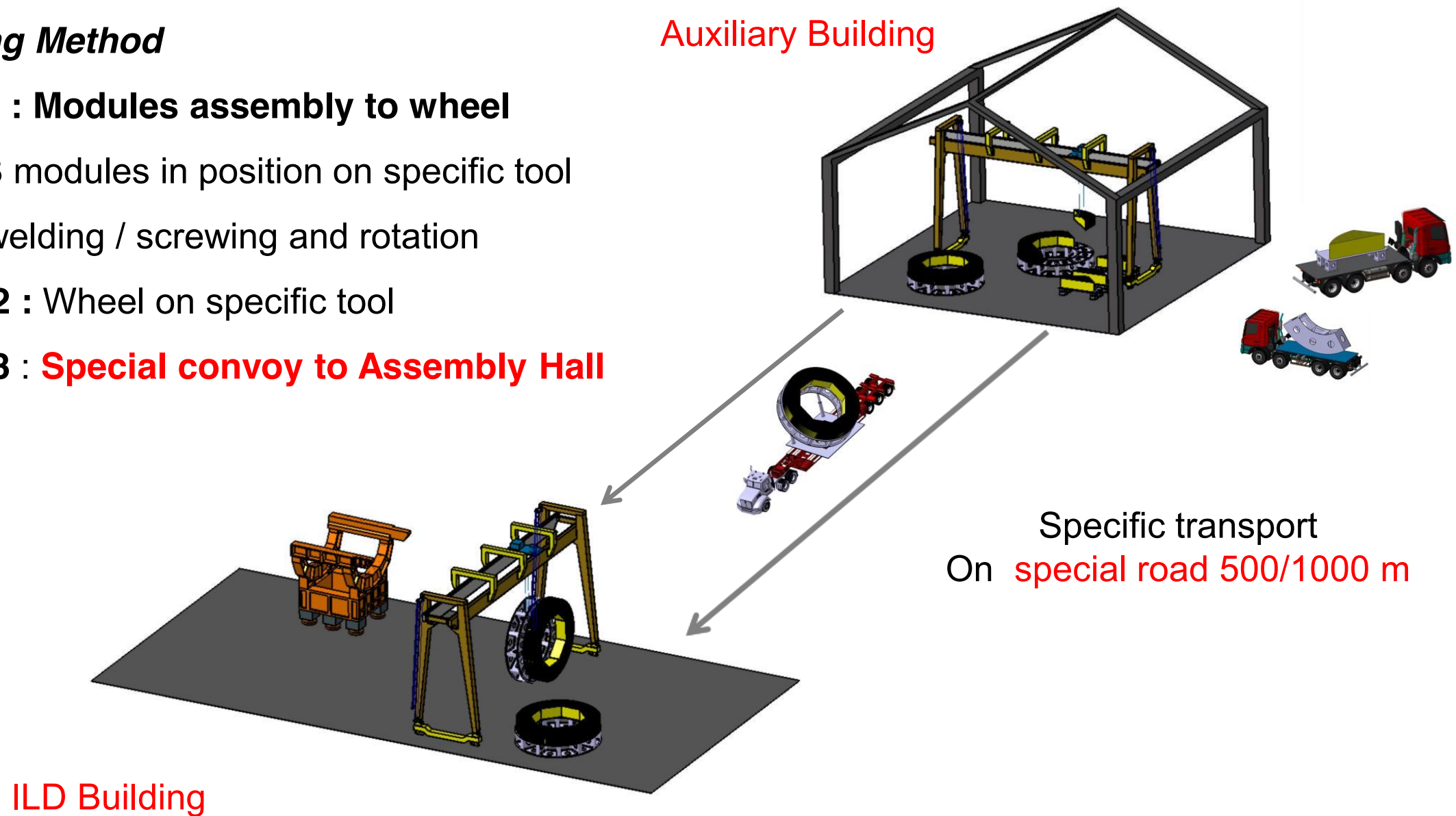




### ■ Wheel assembly in Auxiliary building :

#### *Building Method*

- **Step 1 : Modules assembly to wheel**
  - 8 modules in position on specific tool
  - welding / screwing and rotation
- **Step 2 : Wheel on specific tool**
- **Step 3 : Special convoy to Assembly Hall**





### ■ Wheel assembly in Auxiliary building : 8 modules => 5 wheels

#### *Building Method*

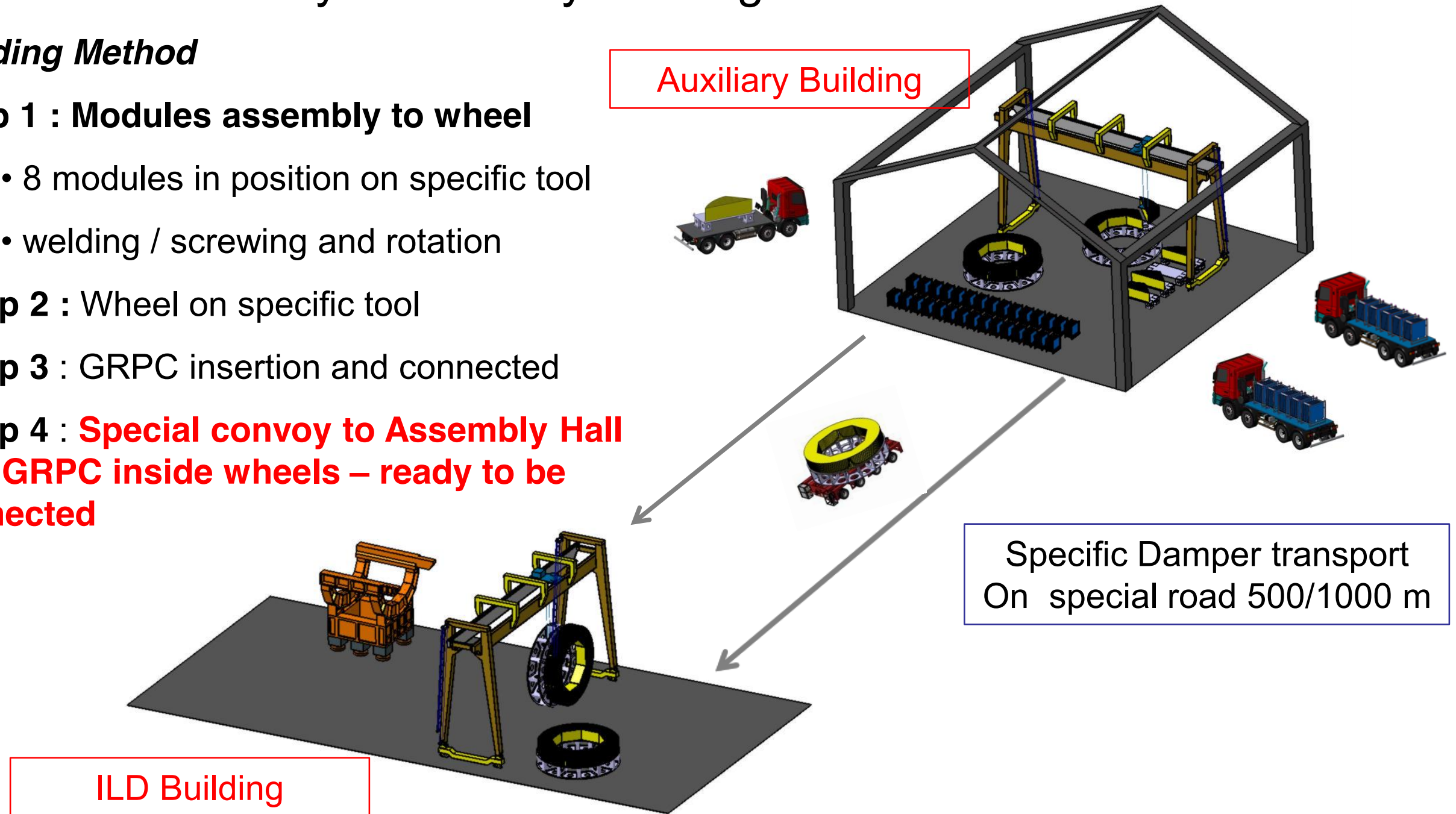
##### • Step 1 : Modules assembly to wheel

- 8 modules in position on specific tool
- welding / screwing and rotation

##### • Step 2 : Wheel on specific tool

##### • Step 3 : GRPC insertion and connected

##### • Step 4 : **Special convoy to Assembly Hall with GRPC inside wheels – ready to be connected**

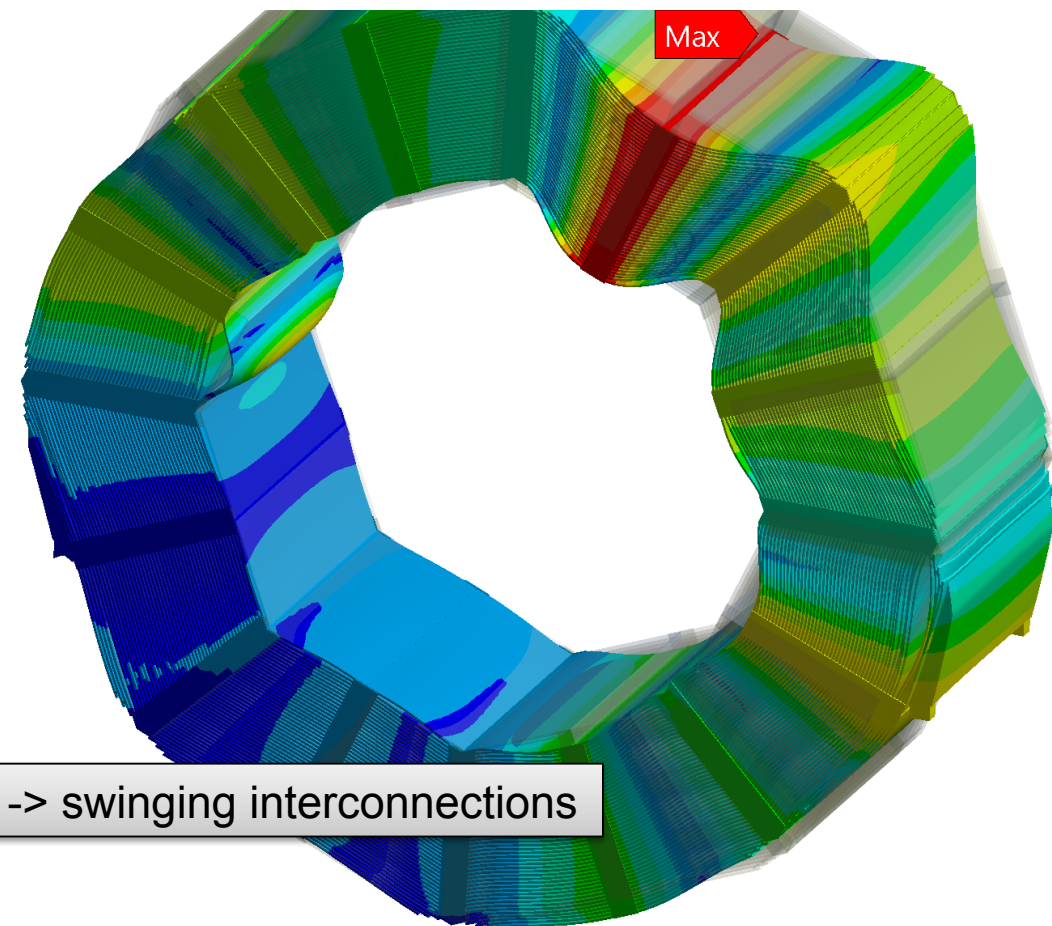
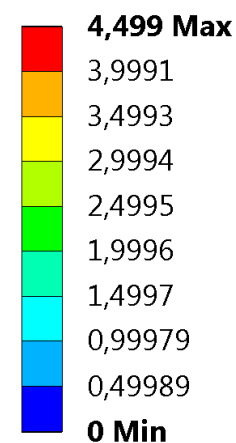




# Seismic Studies: AHCAL

- AHCAL group has started dynamic simulations of structural behaviour with real earthquake data from Kitakami
- Need to understand seismic protection for complete ILD detector during assembly and operations

Frequency: 24,48 Hz  
Unit: mm

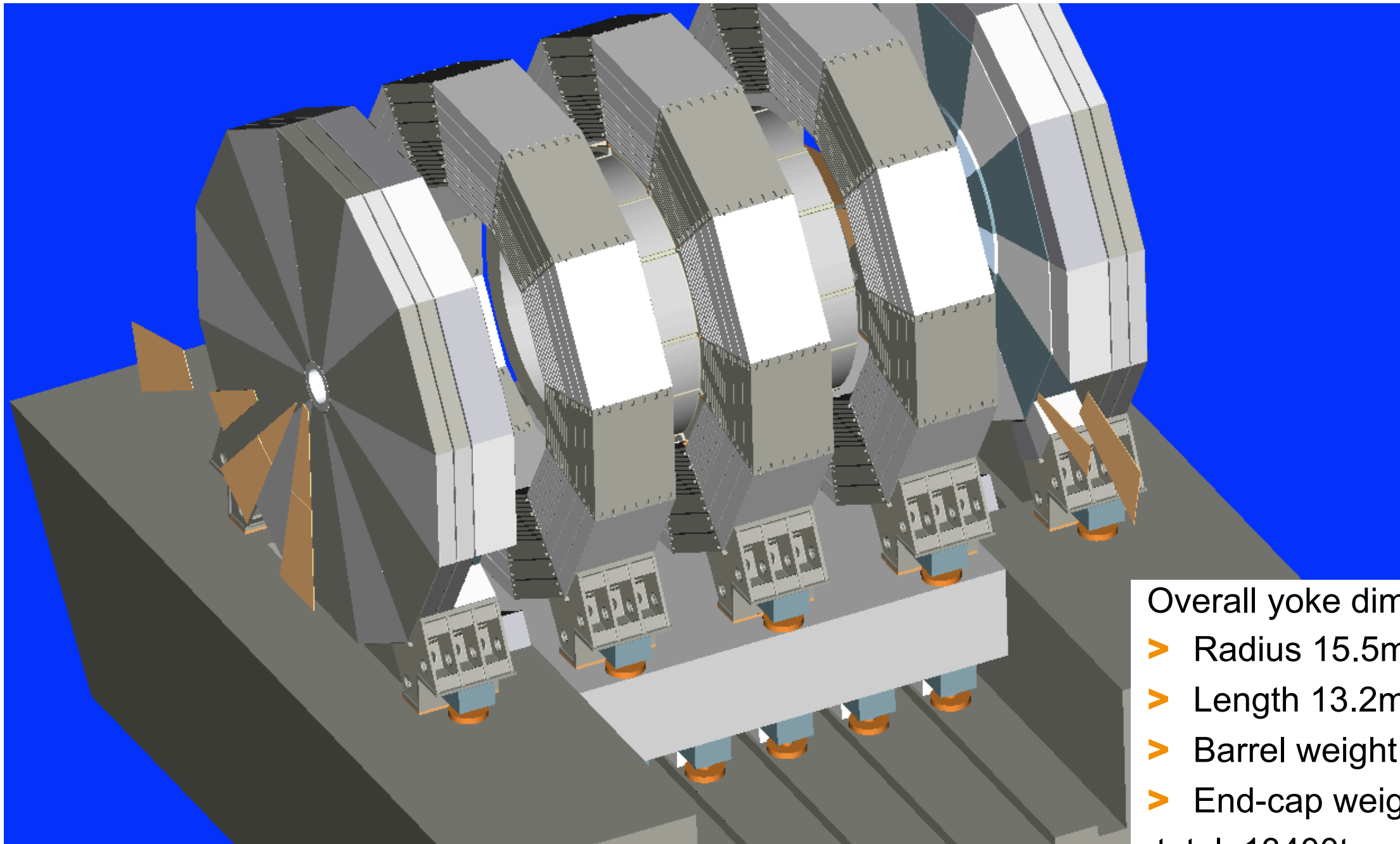


F. Sefkow

# Heaviest Problem: Iron Yoke



## Present Design



Overall yoke dimensions

- > Radius 15.5m
- > Length 13.2m
- > Barrel weight 6900t
- > End-cap weight 6500t

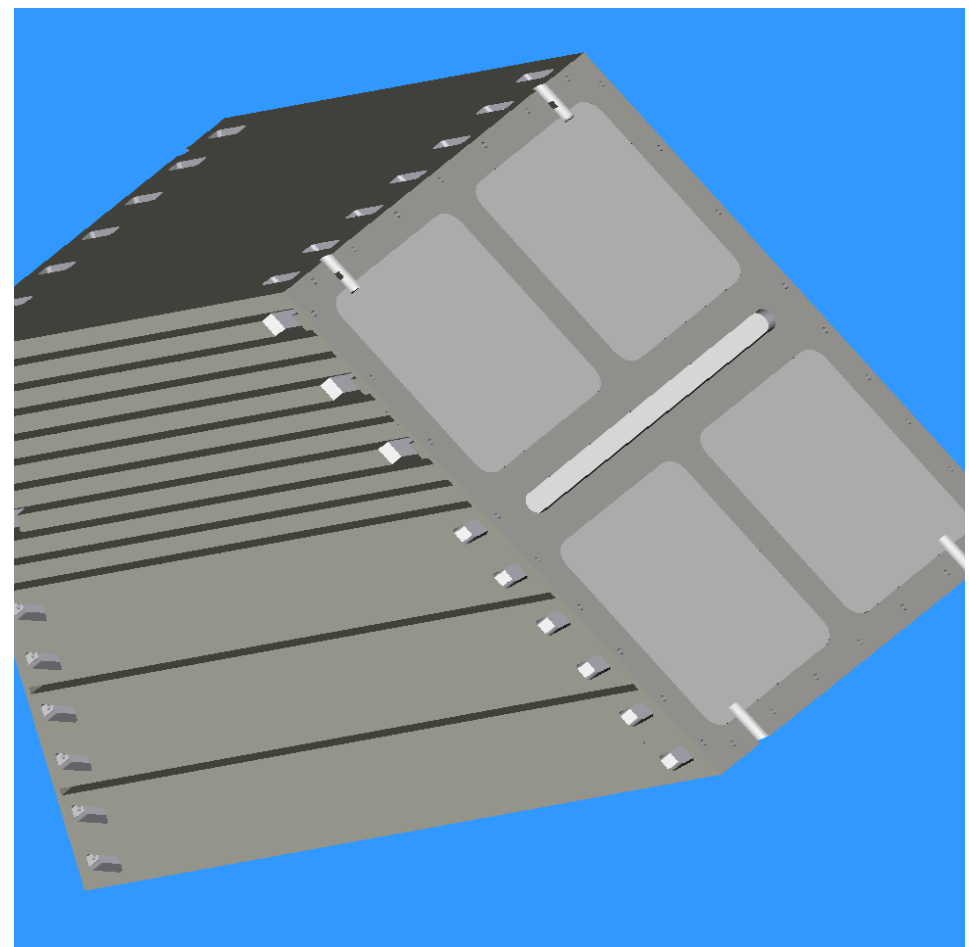
total 13400t



# Yoke Assembly

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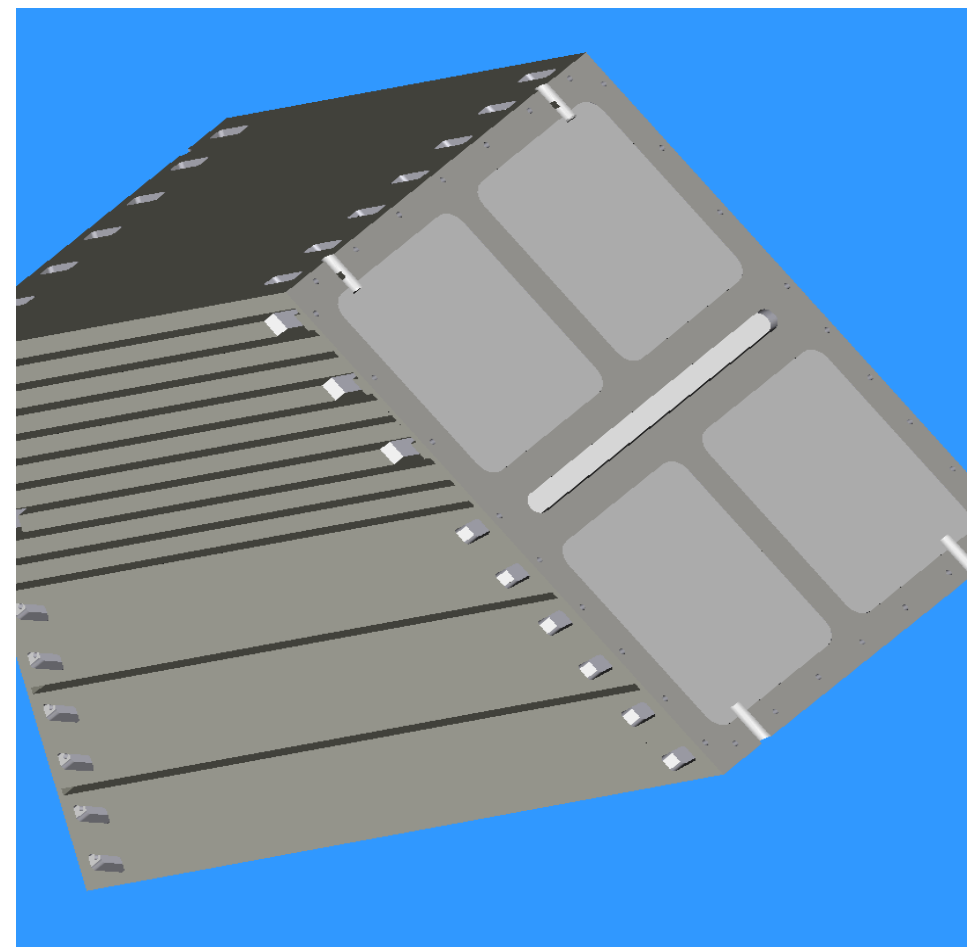
- Yoke segments ( $< \sim 210\text{t}$ ) cannot be transported in one piece
- Look into possibilities to weld or bolt these segments in or close by of the assembly hall
- Requirements under study:
  - additional assembly space
  - crane capacity in this space
  - storage space
  - time and person power
- Need to discuss this with possible local vendors



# Yoke Assembly

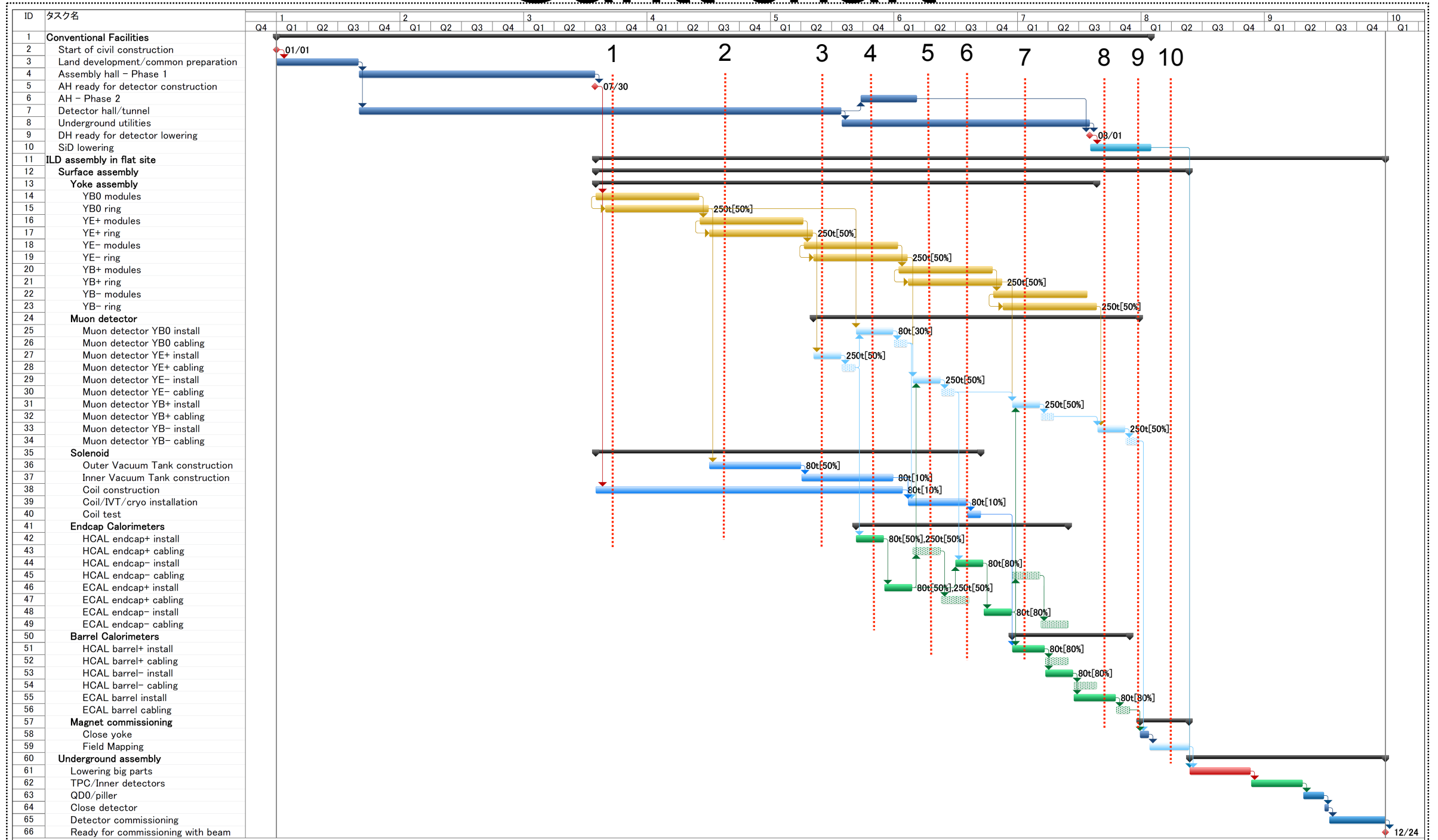
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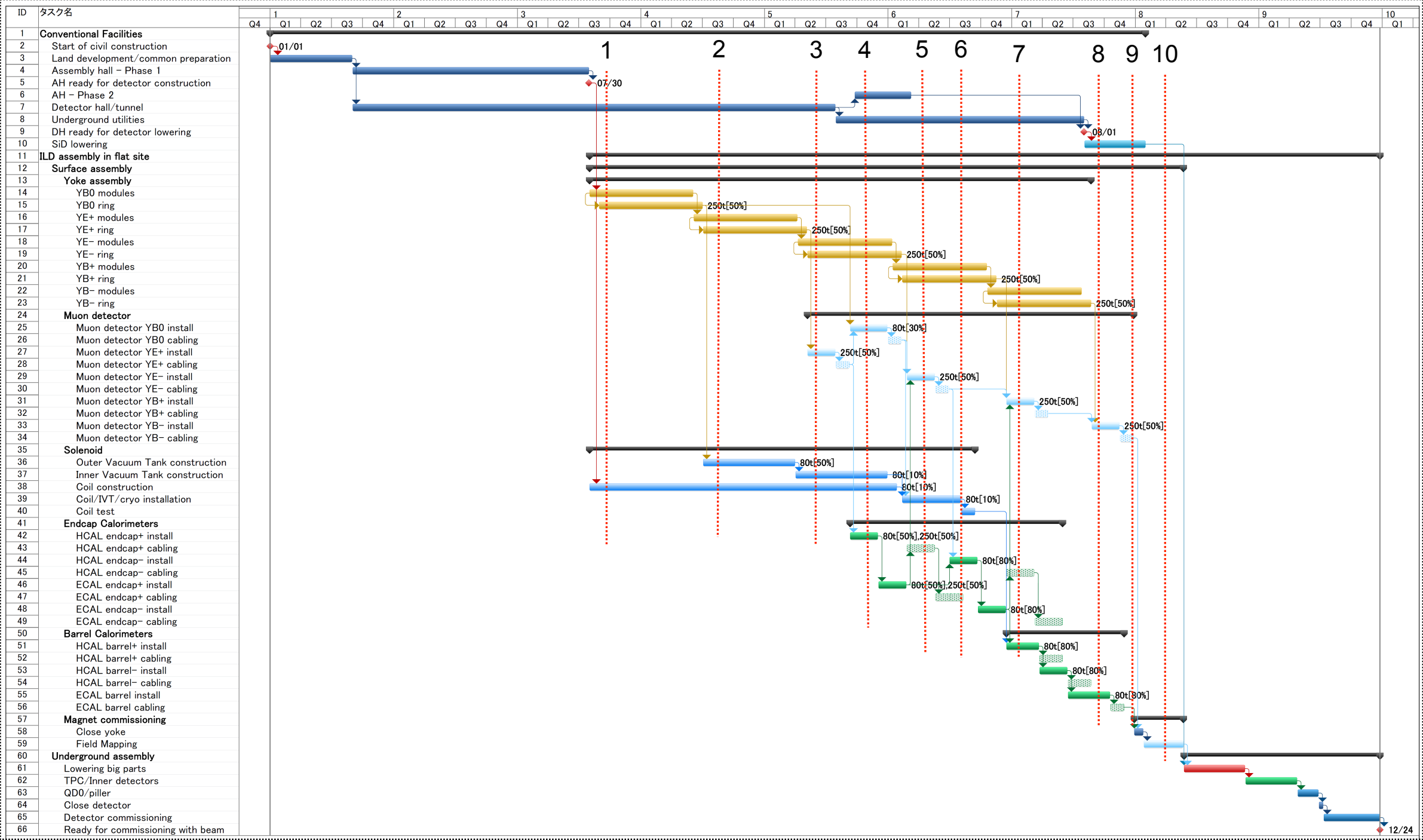
Update see talk by Uwe Schneekloth

# Gantt chart



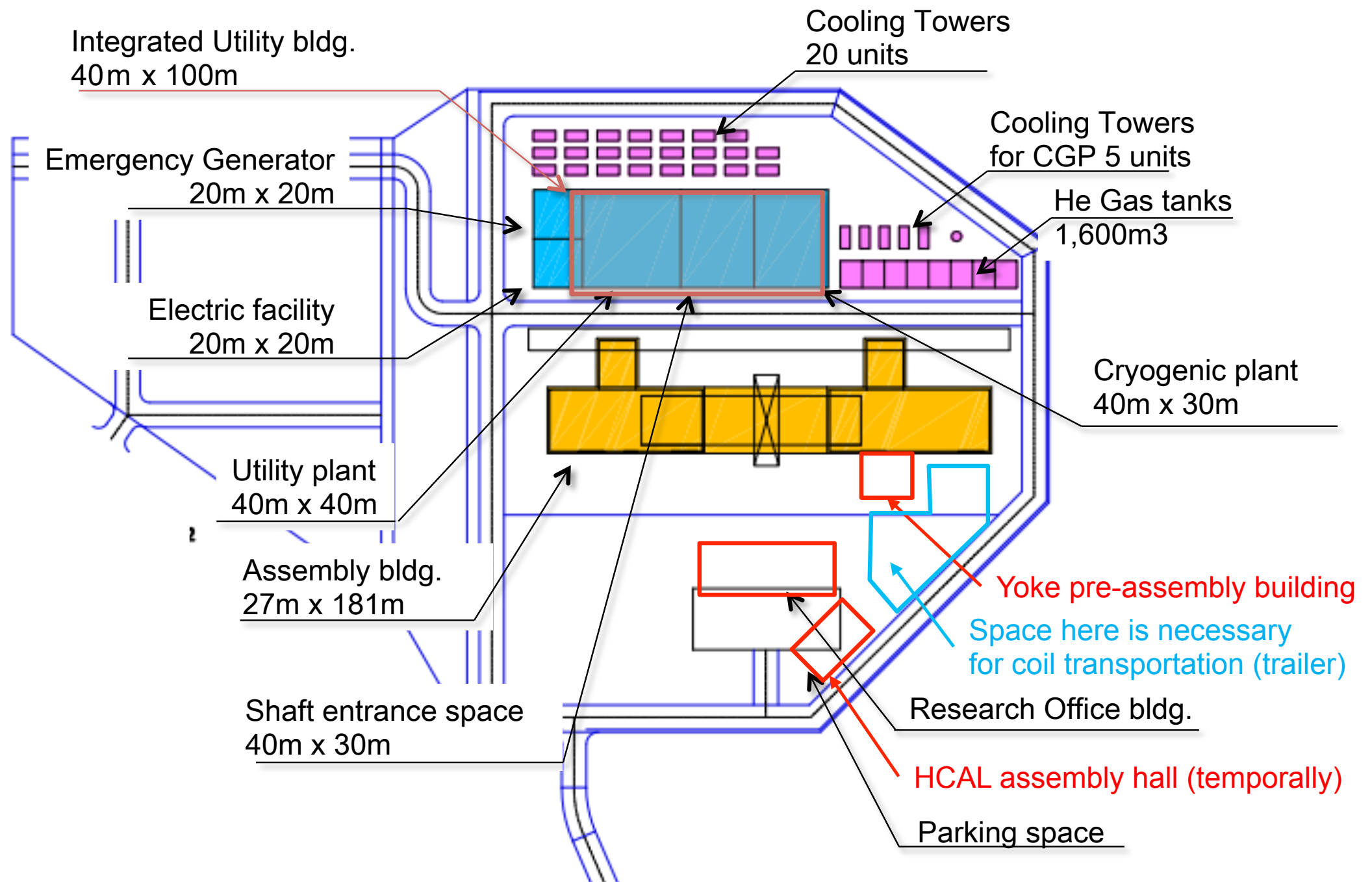
Update see talk by Yasuhiro Sugimoto

# Gantt chart





# IP campus with 600m<sup>2</sup> HCAL-AH



# Container Ship „MOL Comfort“

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- Container vessel „MOL Comfort“, 8110 TEU, Mitsui O.S.K. Lines
- Line service LP1: Japan - Hong Kong - Singapore - Jeddah - Rotterdam - Hamburg - Southampton - Le Havre and back to Japan





# „MOL Comfort“ 17.6.2013



- Indian Ocean between Singapore and Jeddah



# „MOL Comfort“ Rear Part

---

- Salvage operation failed, sunk on June 27th.



# „MOL Comfort“ Rear Part



- Salvage operation failed, sunk on June 27th.





# „MOL Comfort“ Front Part



- Salvage operation failed, caught fire, sunk on July 11th





# „MOL Comfort“ Front Part



- Salvage operation failed, caught fire, sunk on July 11th



# „MOL Comfort“ Front Part



- Salvage operation failed, caught fire, sunk on July 11th

Why should we care?



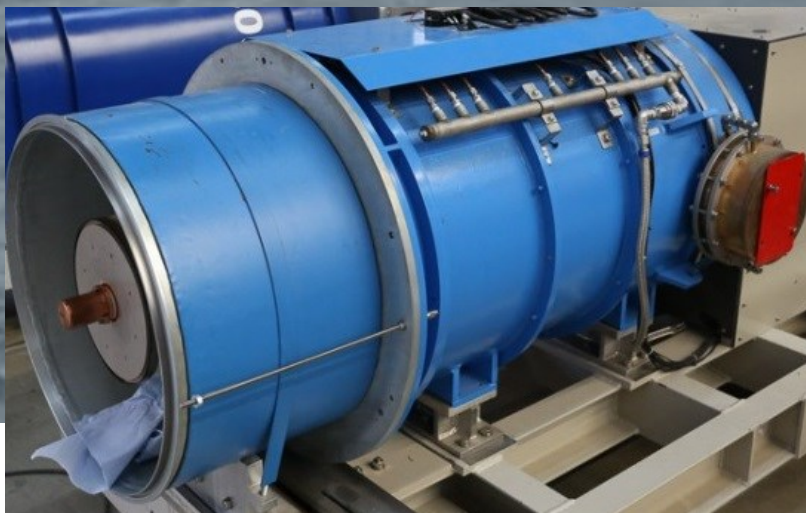


# „MOL Comfort“ Front Part



- Salvage operation failed, caught fire, sunk on July 11th

Why should we care?



A Toshiba klystron for the XFEL was on board of this ship....

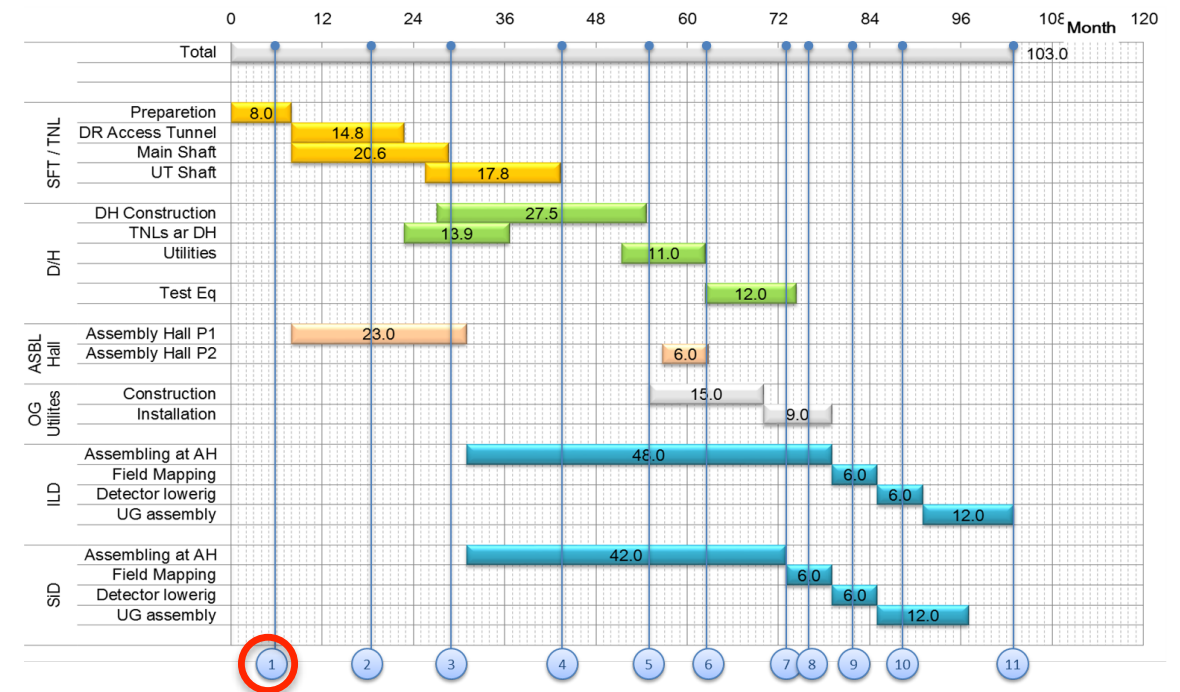
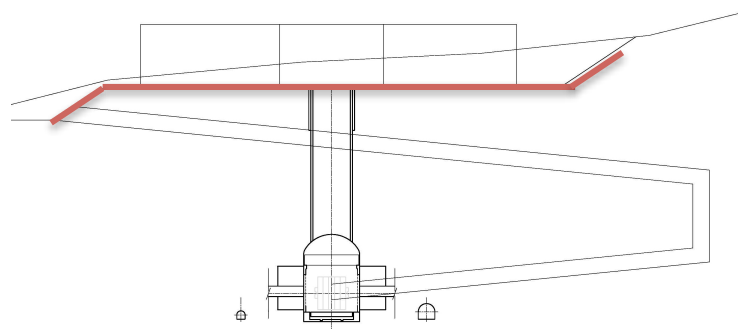
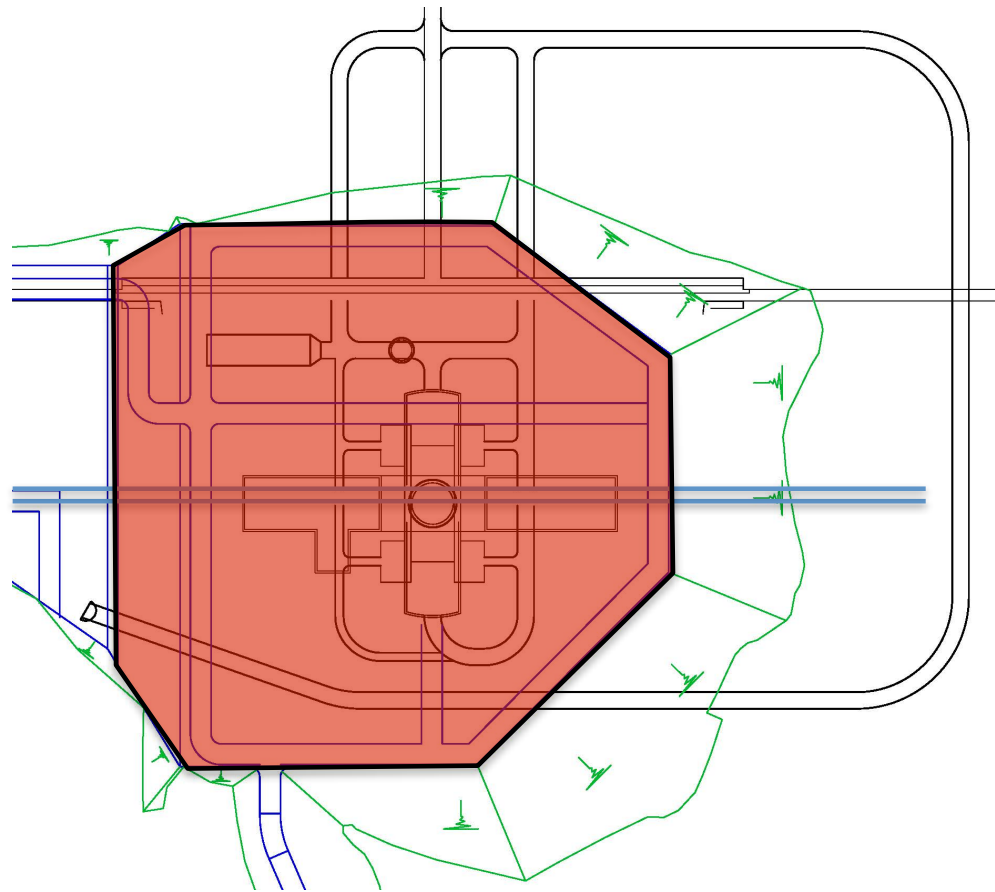


- The planning for the layout and infrastructure at the Kitakami site is advancing
- Now is the time to provide input from detectors for this process
  - Area and space requirements
  - Infrastructure: power, cooling, computing, etc.
  - Special environments: clean rooms, etc.
- Need to understand the dependencies on local conditions, e.g. transportation limits, on detector assembly and maintenance philosophy
- ILD is working on common installation timeline including planning status of all subdetector collaborations
- Should synchronise the work that is going on the accelerator and the detector sides of the game
- Proposed dates for a follow-up workshop on detector infrastructures:
  - March 15-16 2016 at KEK

Backup Slides



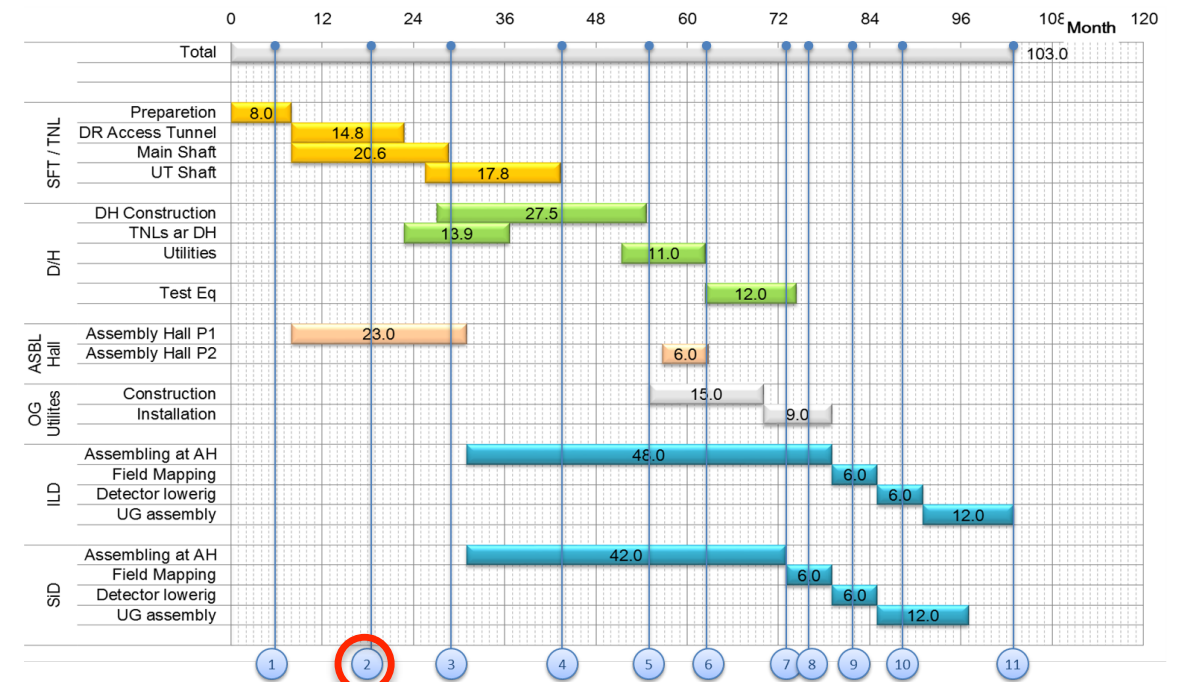
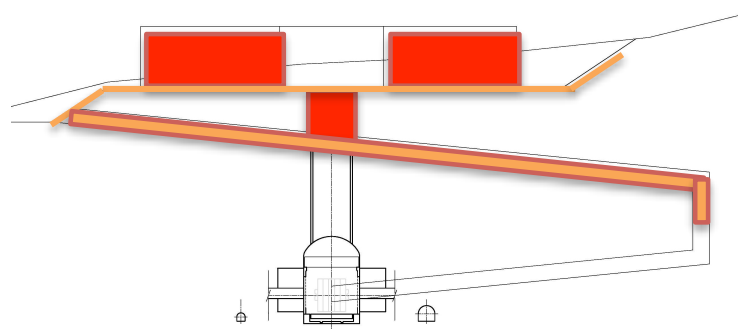
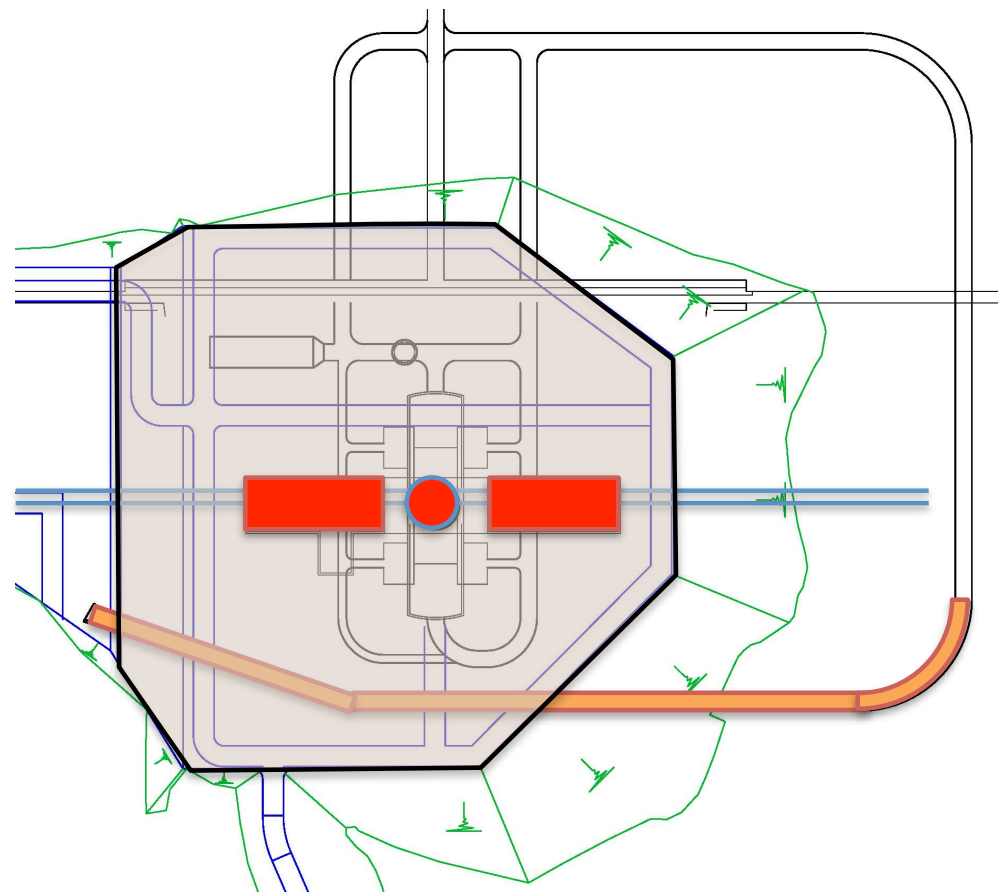
# No.1 Preparation work



## Notes

- Preparation work
- Assembly yard forming

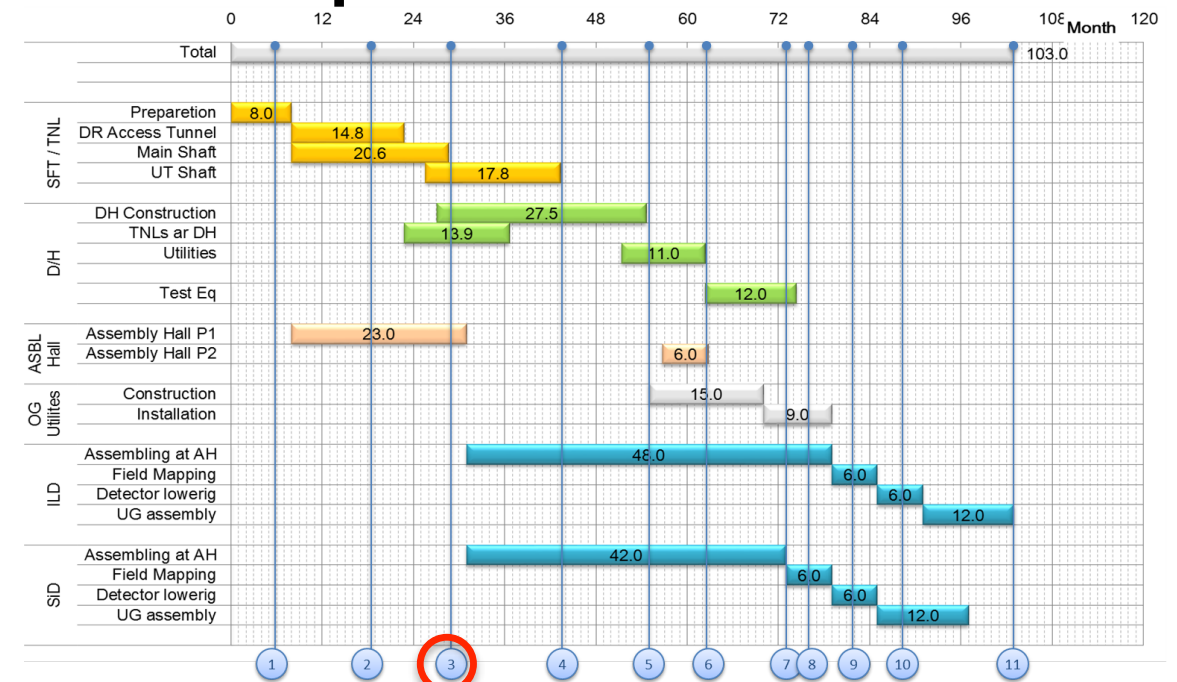
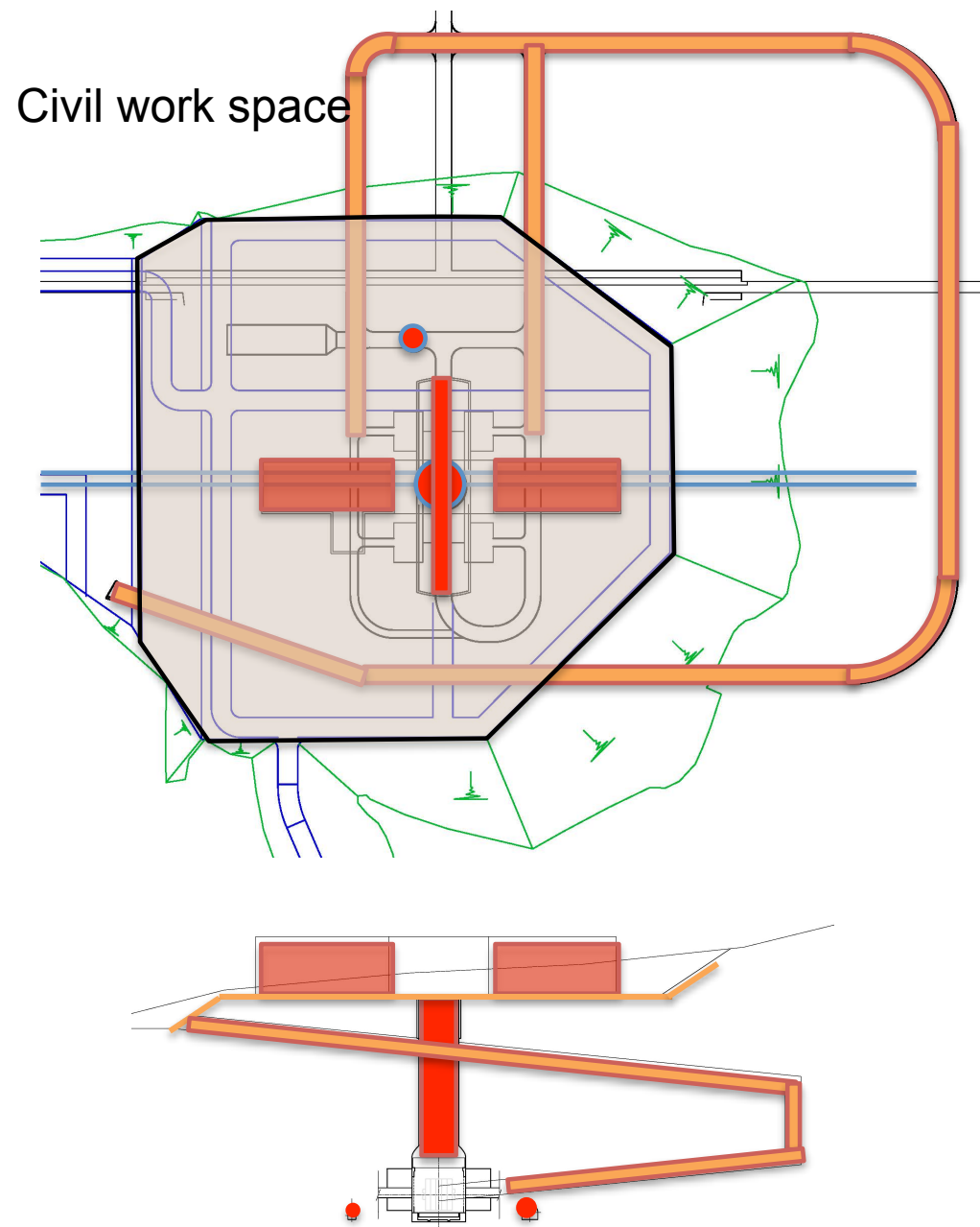
# No.2 AsH, Shaft, A/T Construction



## Notes

- Access tunnel excavation
- Main shaft construction
- Assembly hall 1 phase construction

# No.3 Main Shaft, AsH P1 completion

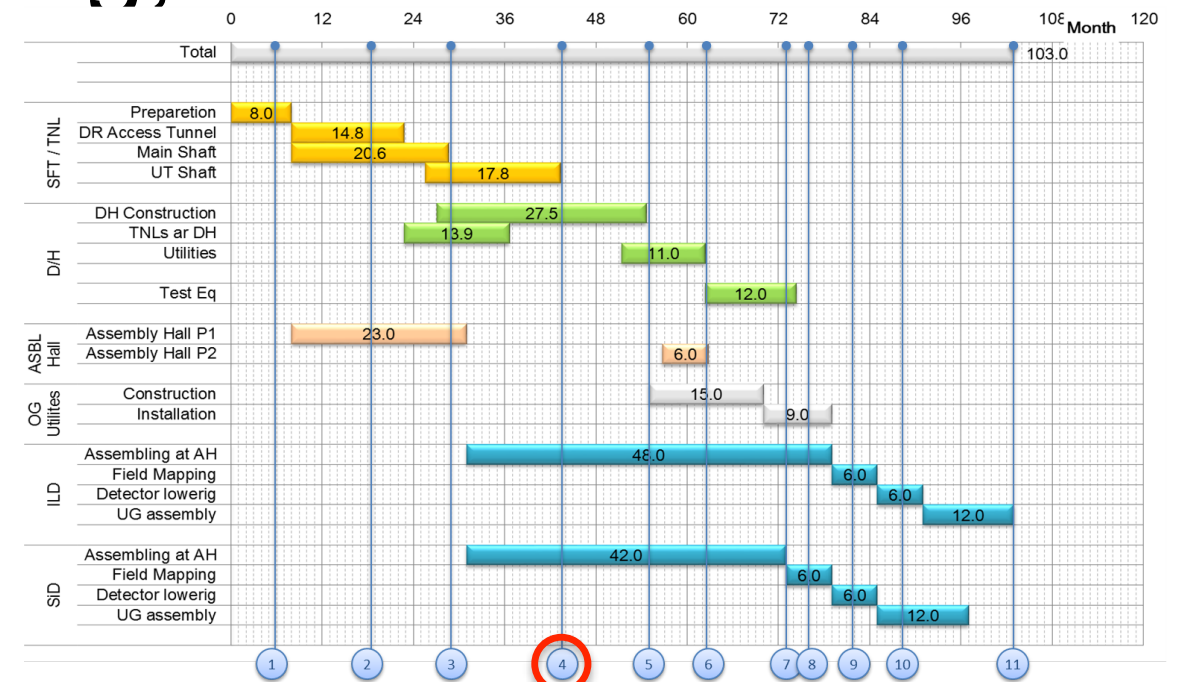
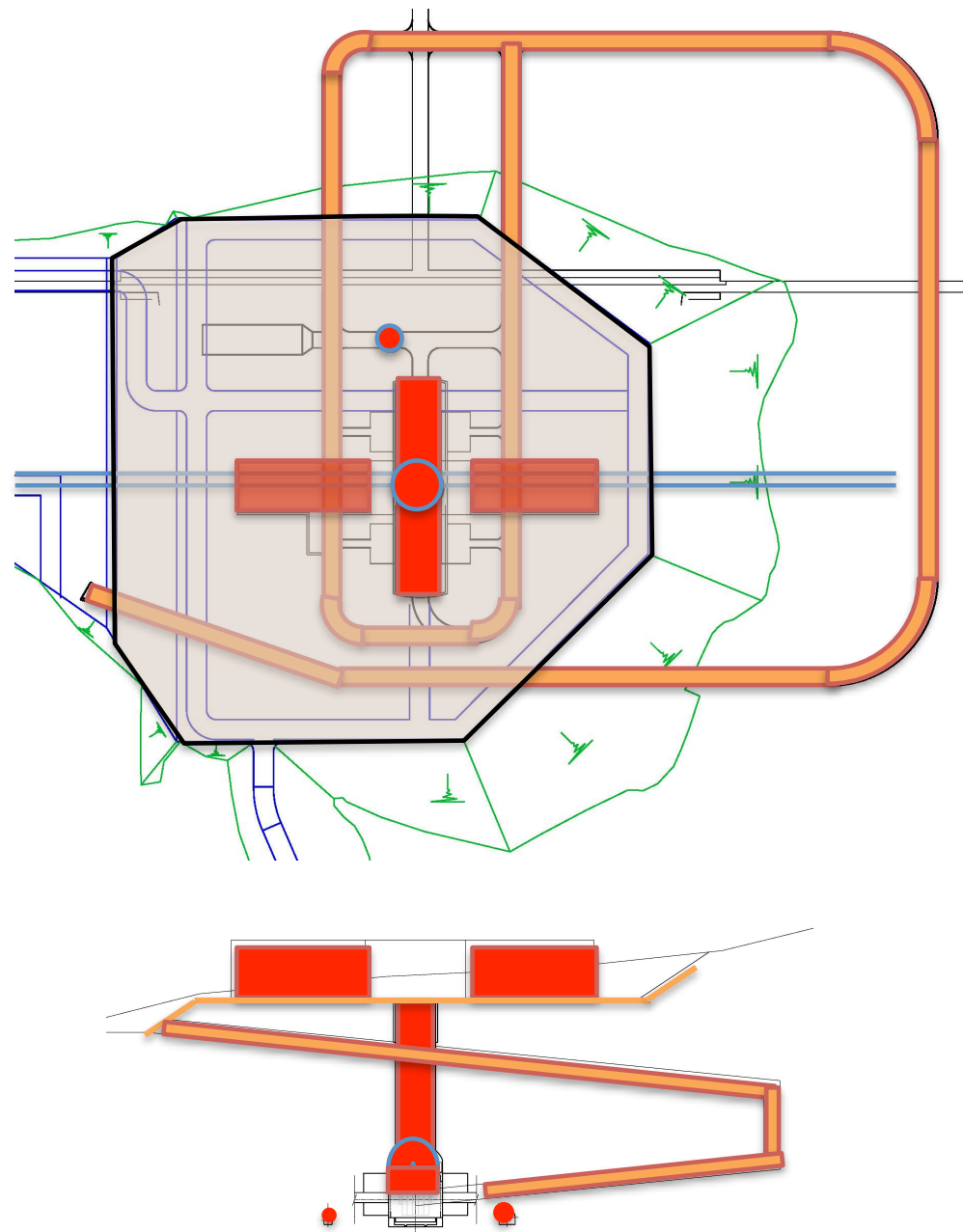


## Notes

- UT shaft construction
- Main shaft completion
- Access tunnel excavation
- Detector hall excavation
- Assembly Hall almost completion



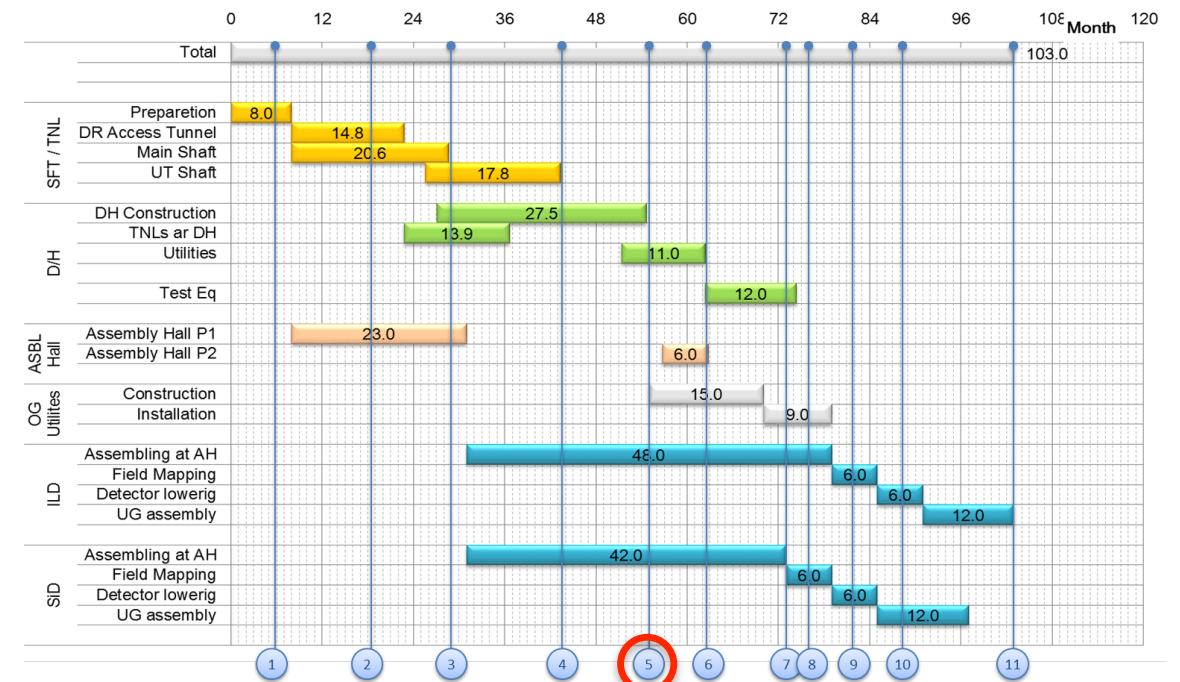
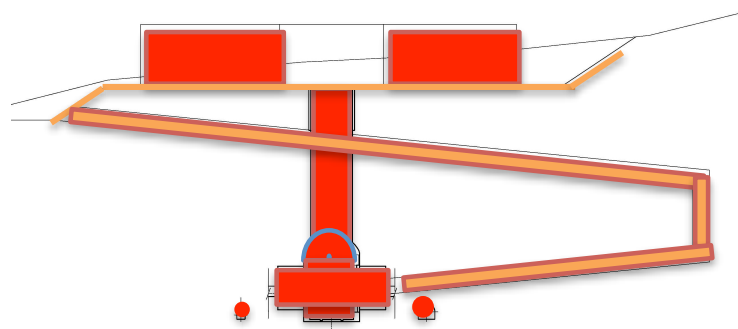
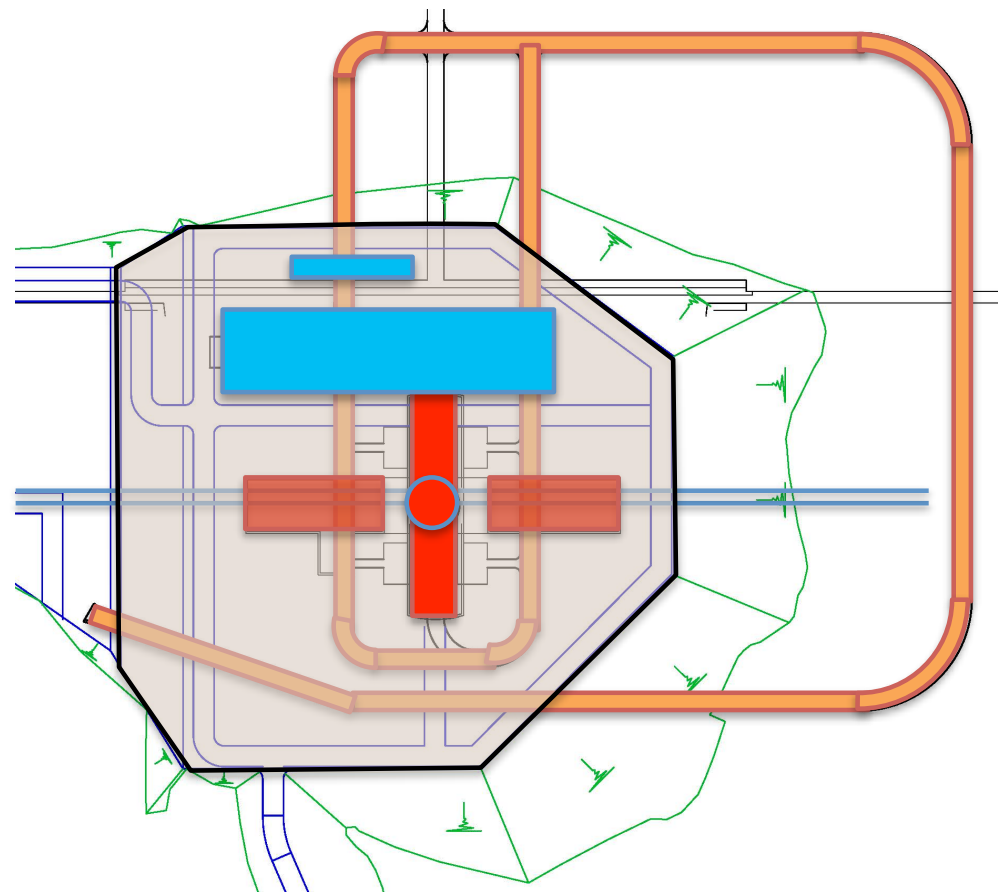
# No.4 Detector Assembling, DH construction



## Notes

- UT shaft completion
- Detector hall construction
- Detector hall excavation
- Detectors assembling at AsH

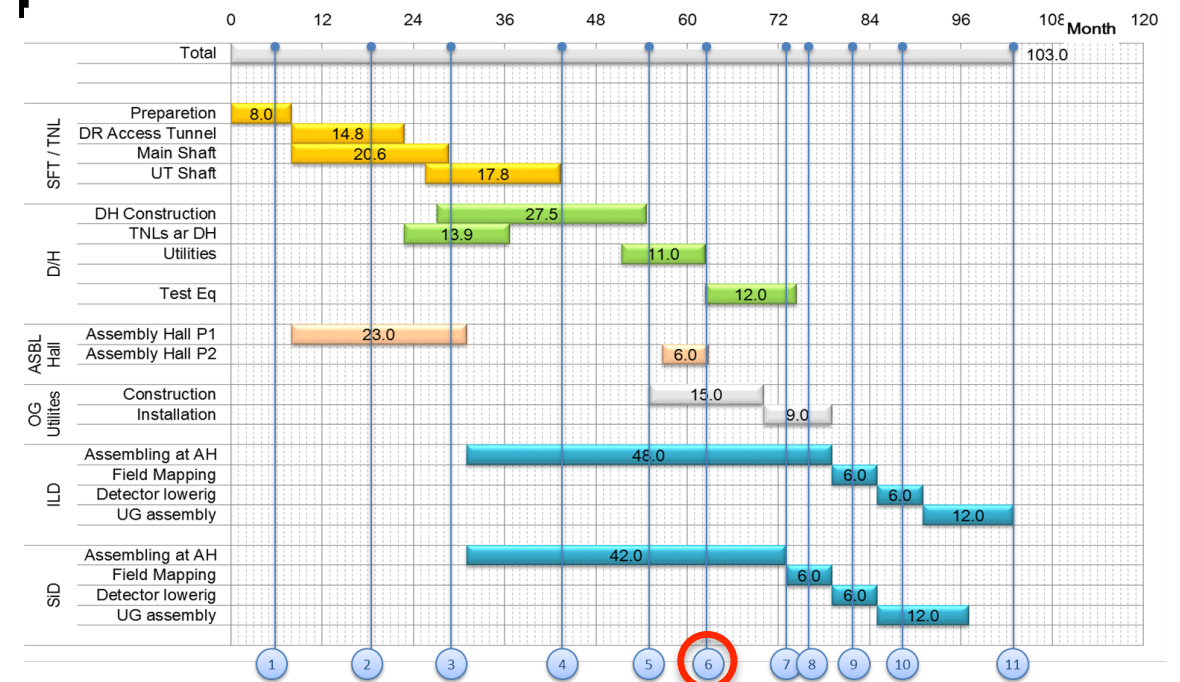
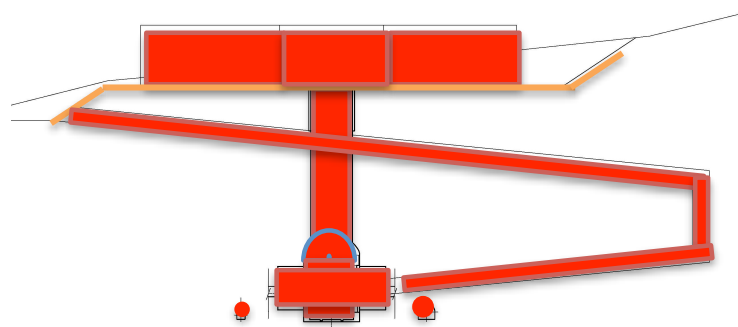
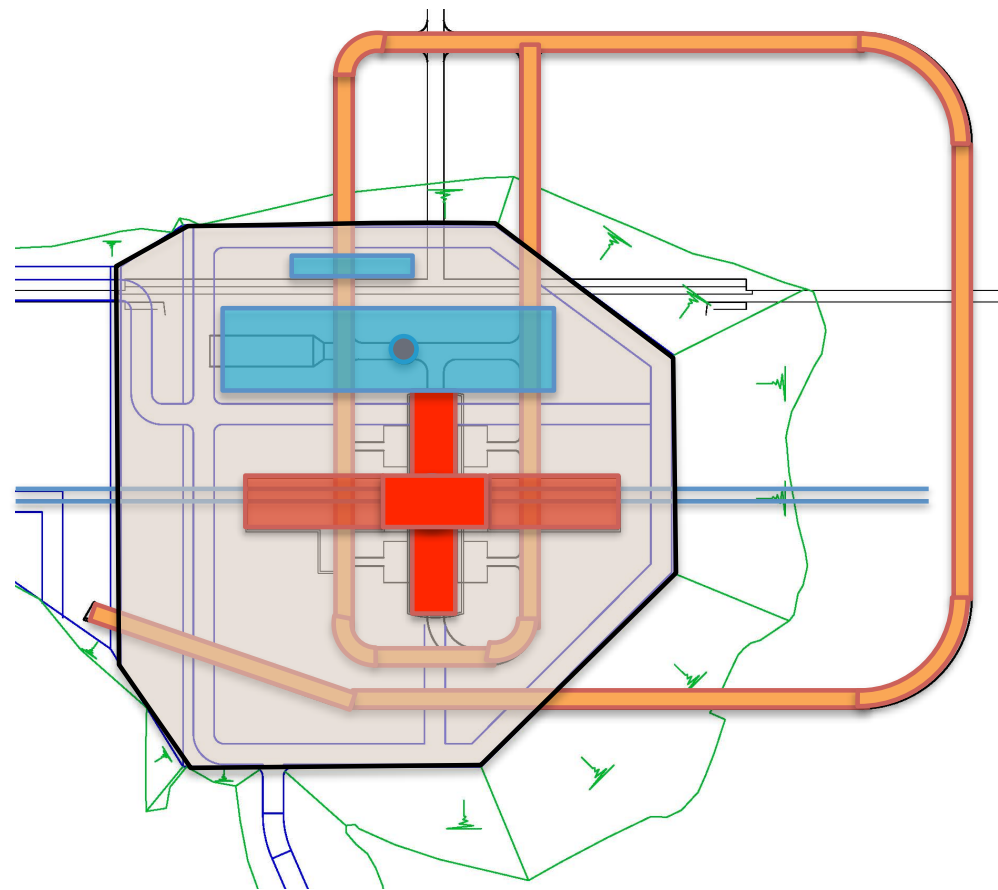
# No.5 DH Ex. Completion



## Notes

- Detector hall completion
- Utility facility construction
- On ground Service building construction
- Detectors assembling at AsH

# No.6 AsH Phase 2 completion

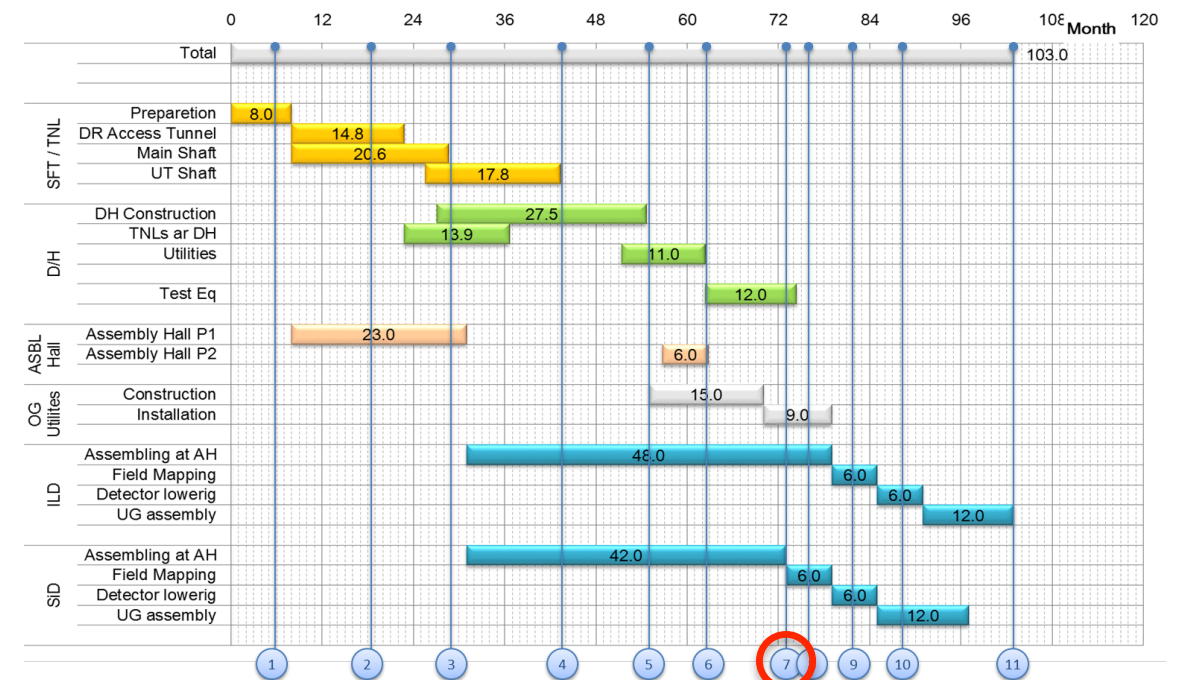
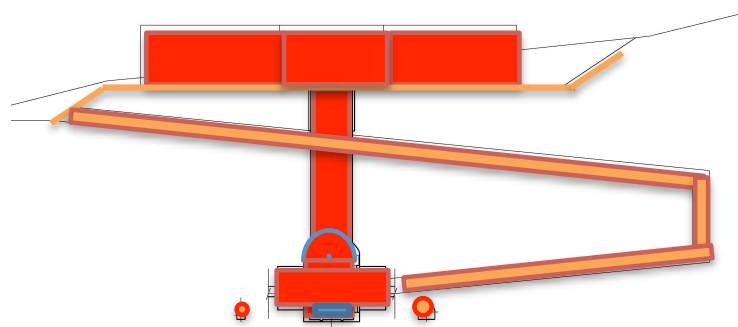
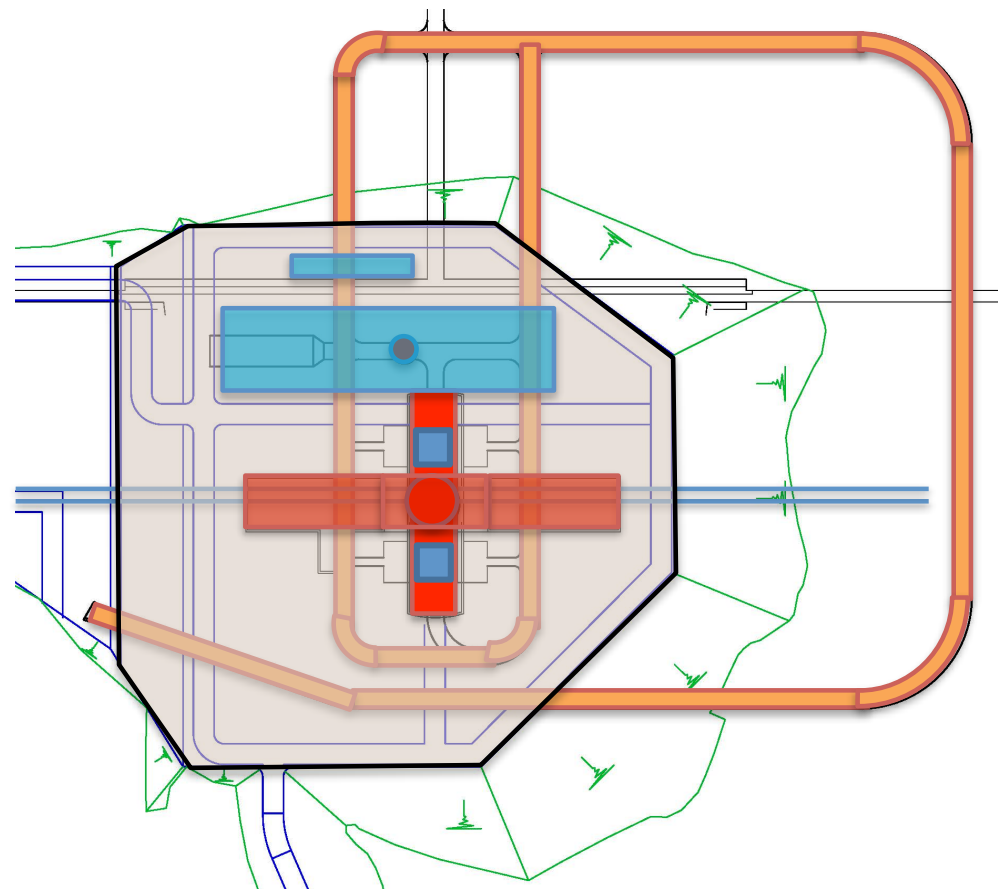


## Notes

- Assembly hall 2<sup>nd</sup> phase construction
- Detectors assembling at AsH



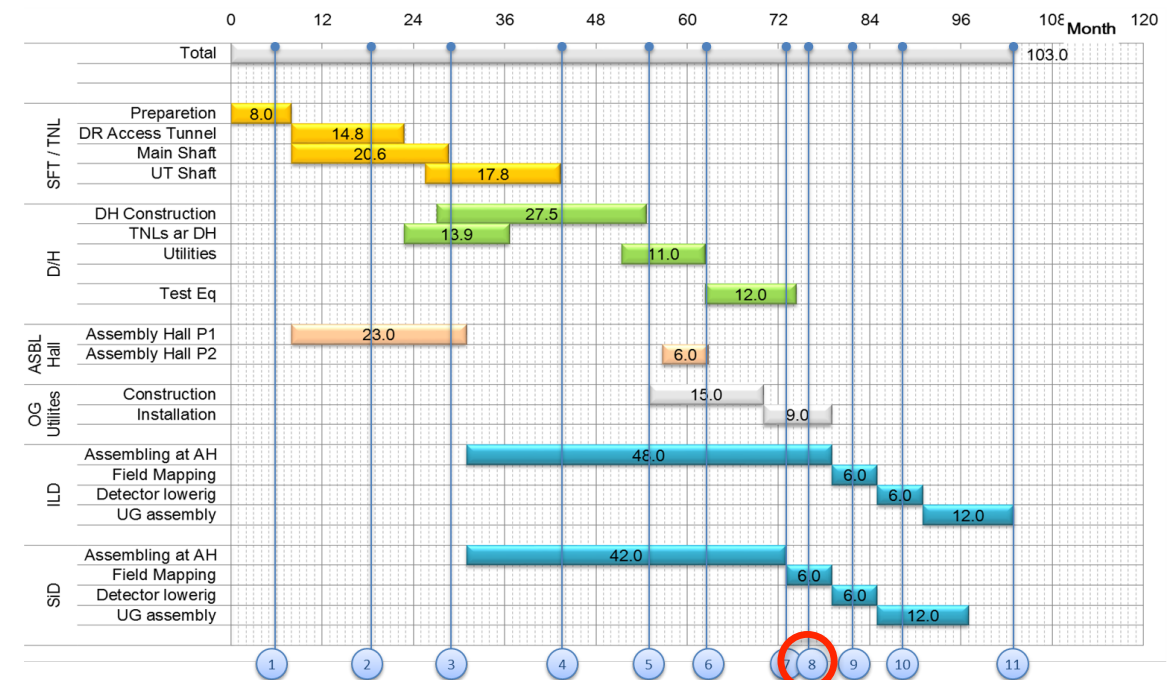
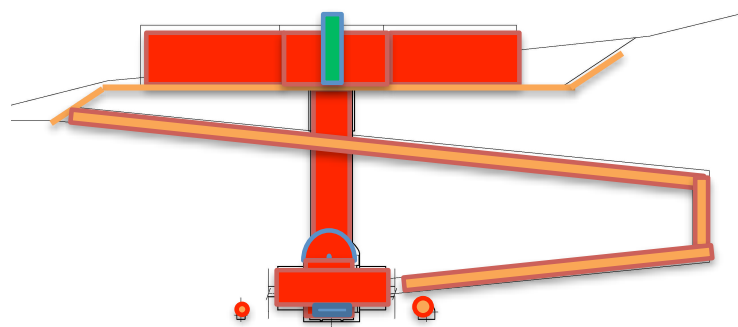
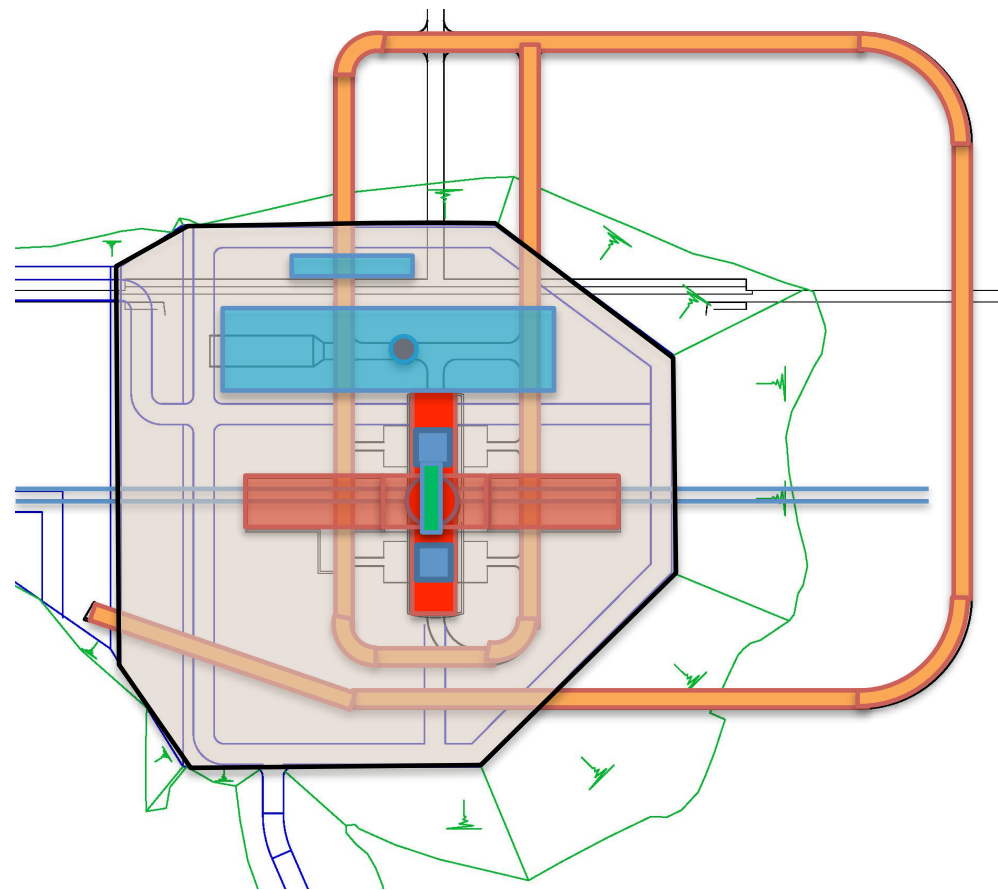
# No.7 DH platform completion



## Notes

- Assembly hall 2<sup>nd</sup> phase construction
- Detectors assembling at AsH

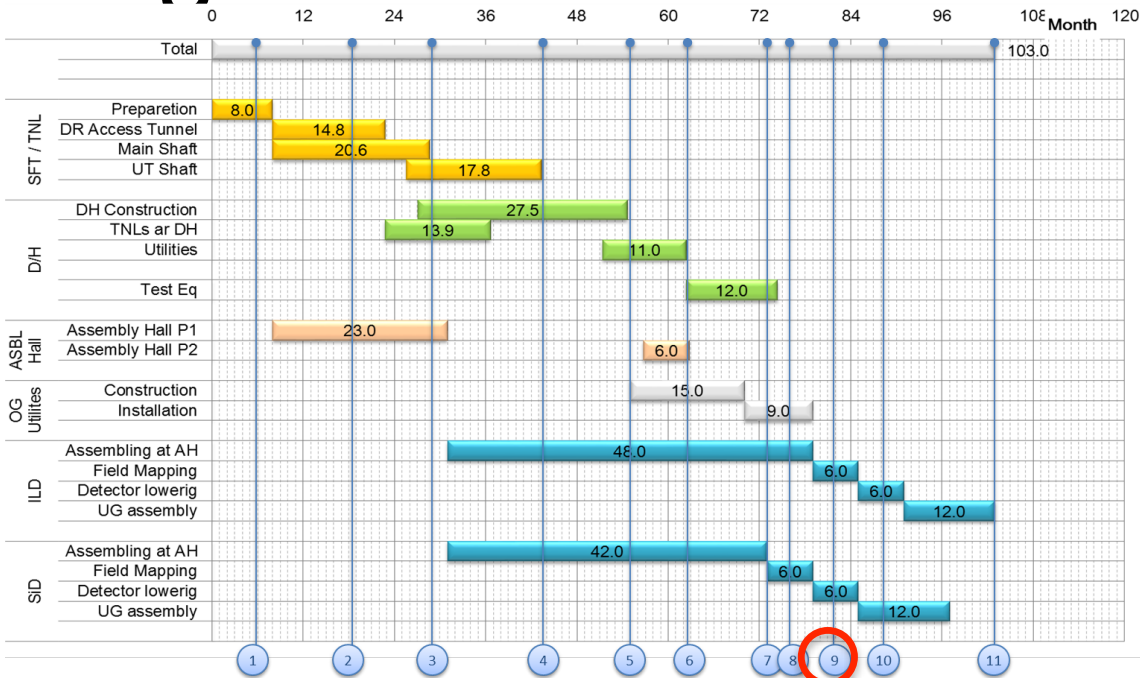
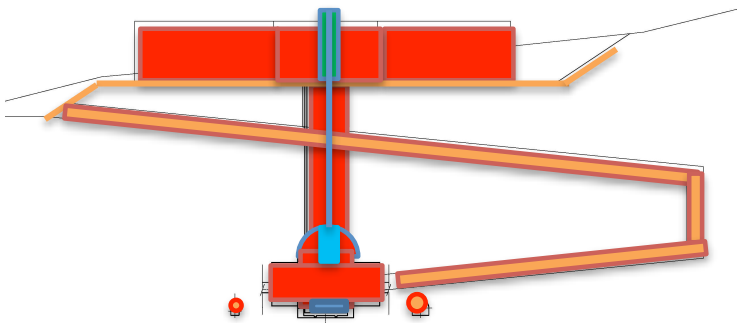
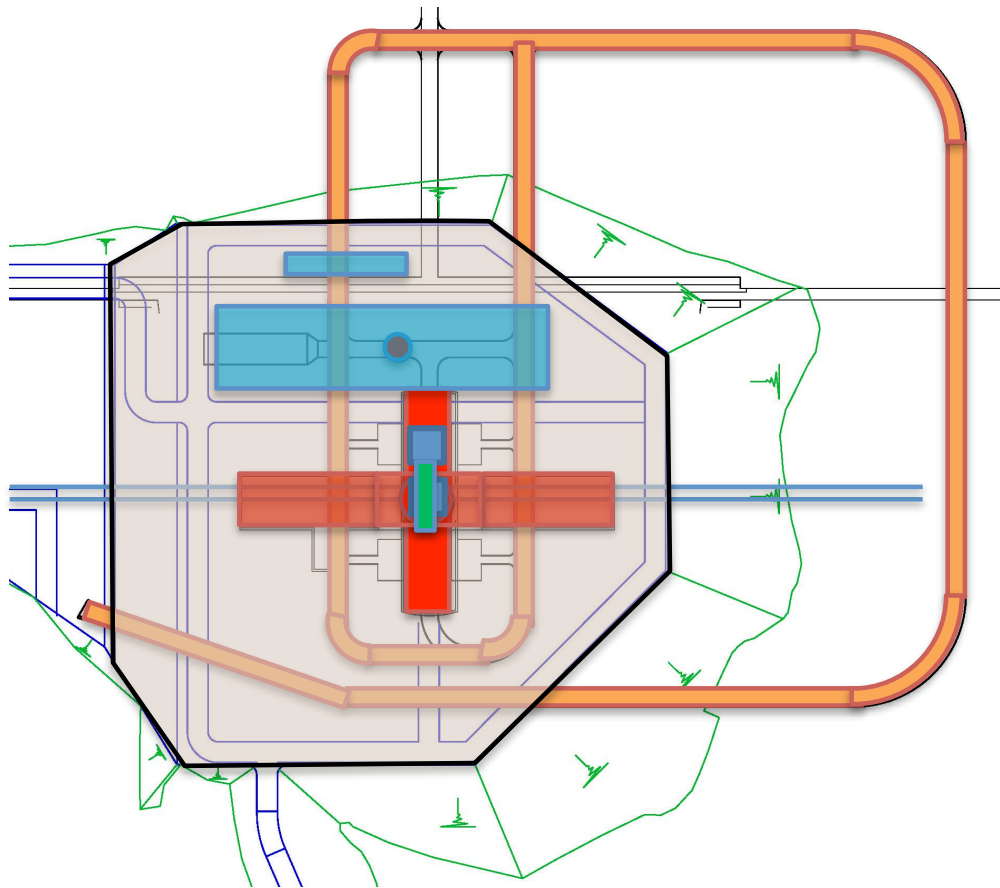
# No.8 Gantry Crane installation



## Notes

- Assembly hall 2<sup>nd</sup> phase completion
- Gantry crane installation
- Detectors field mapping at AsH

# No.9 SiD Detector Lowering

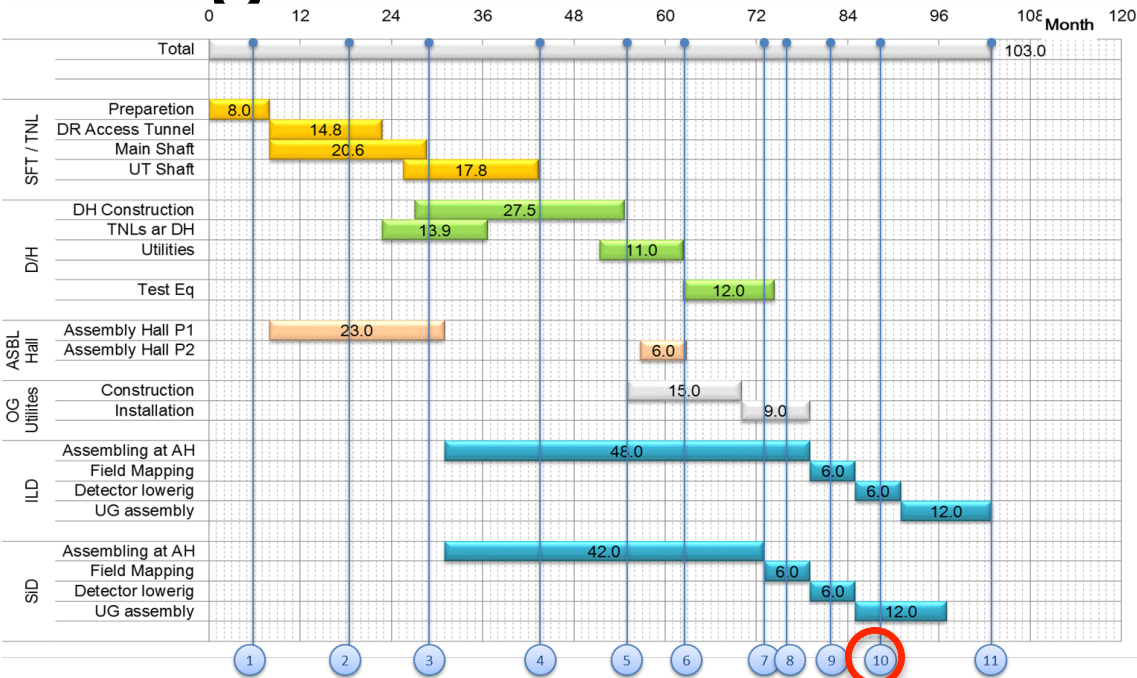
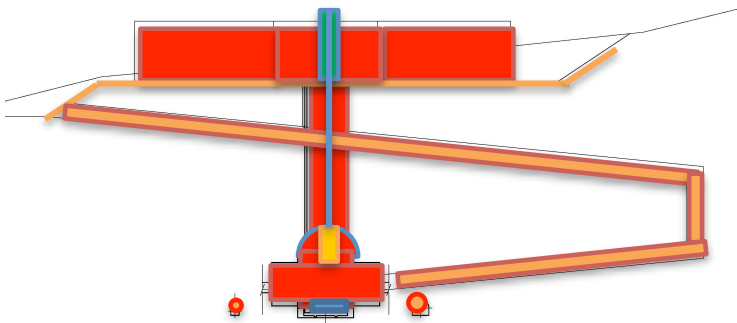
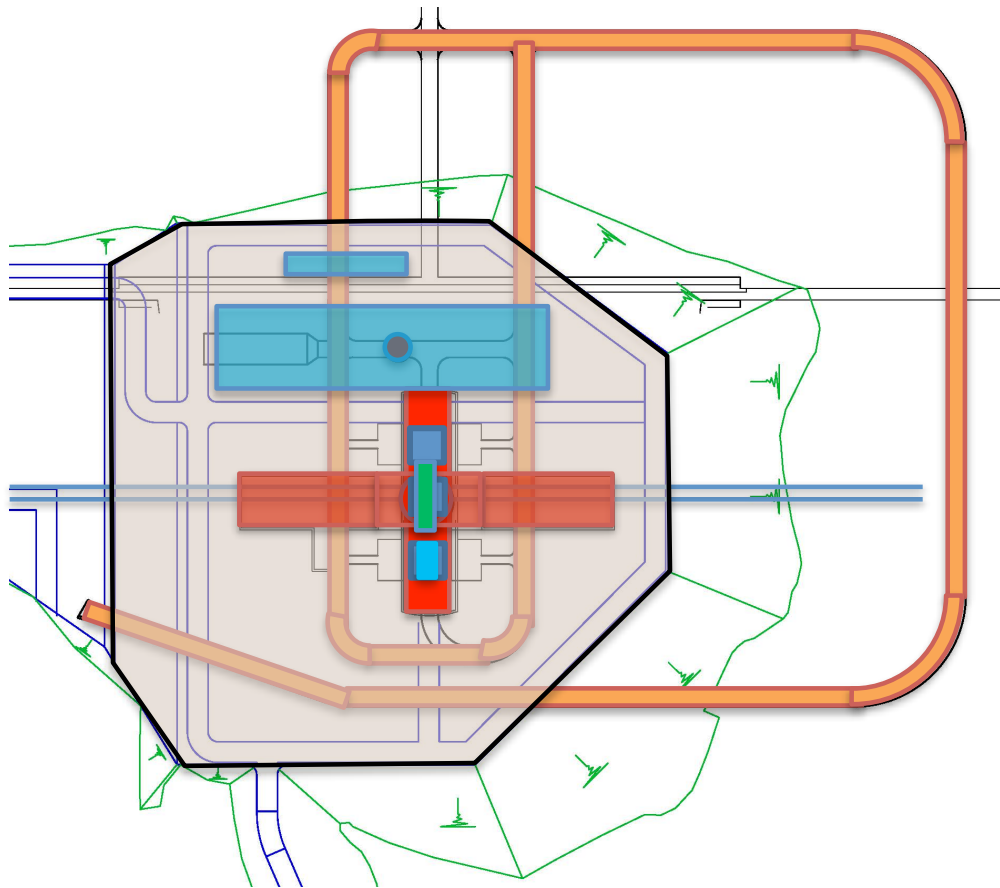


## Notes

- SiD lowering

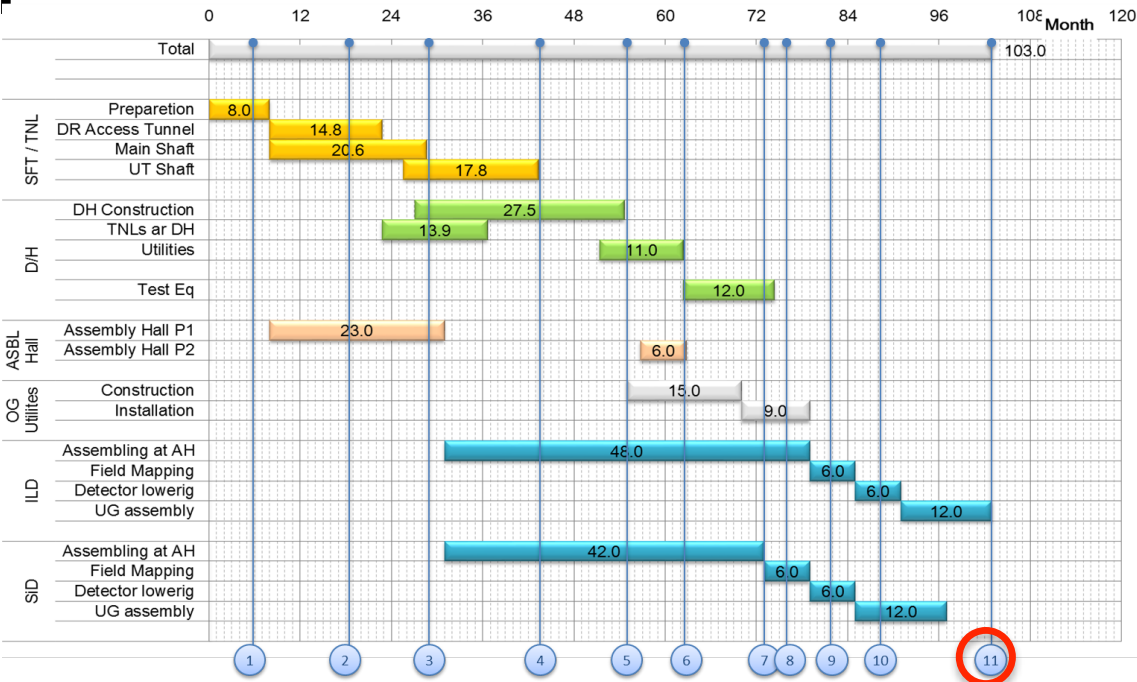
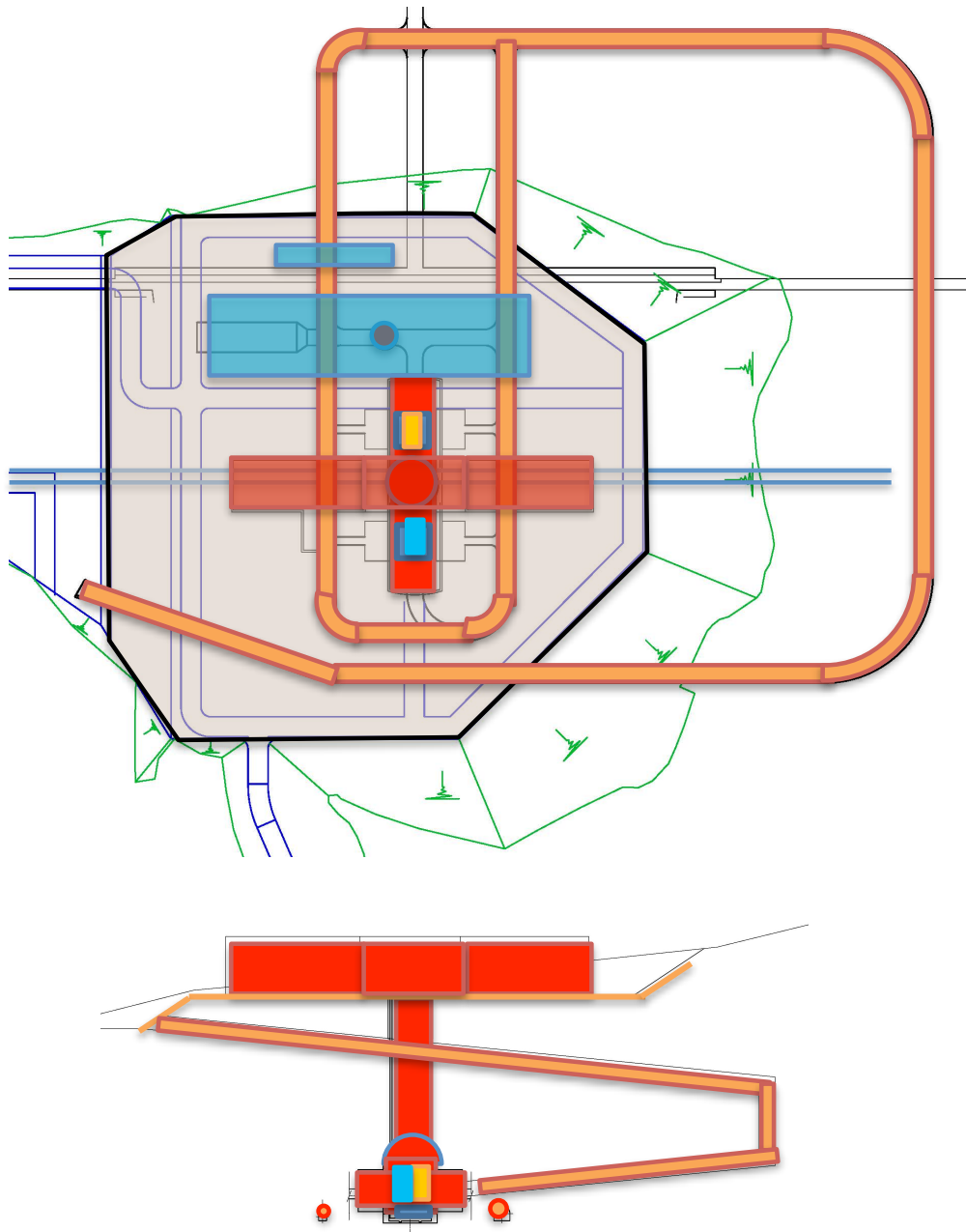


# No.10 ILD Detector Lowering



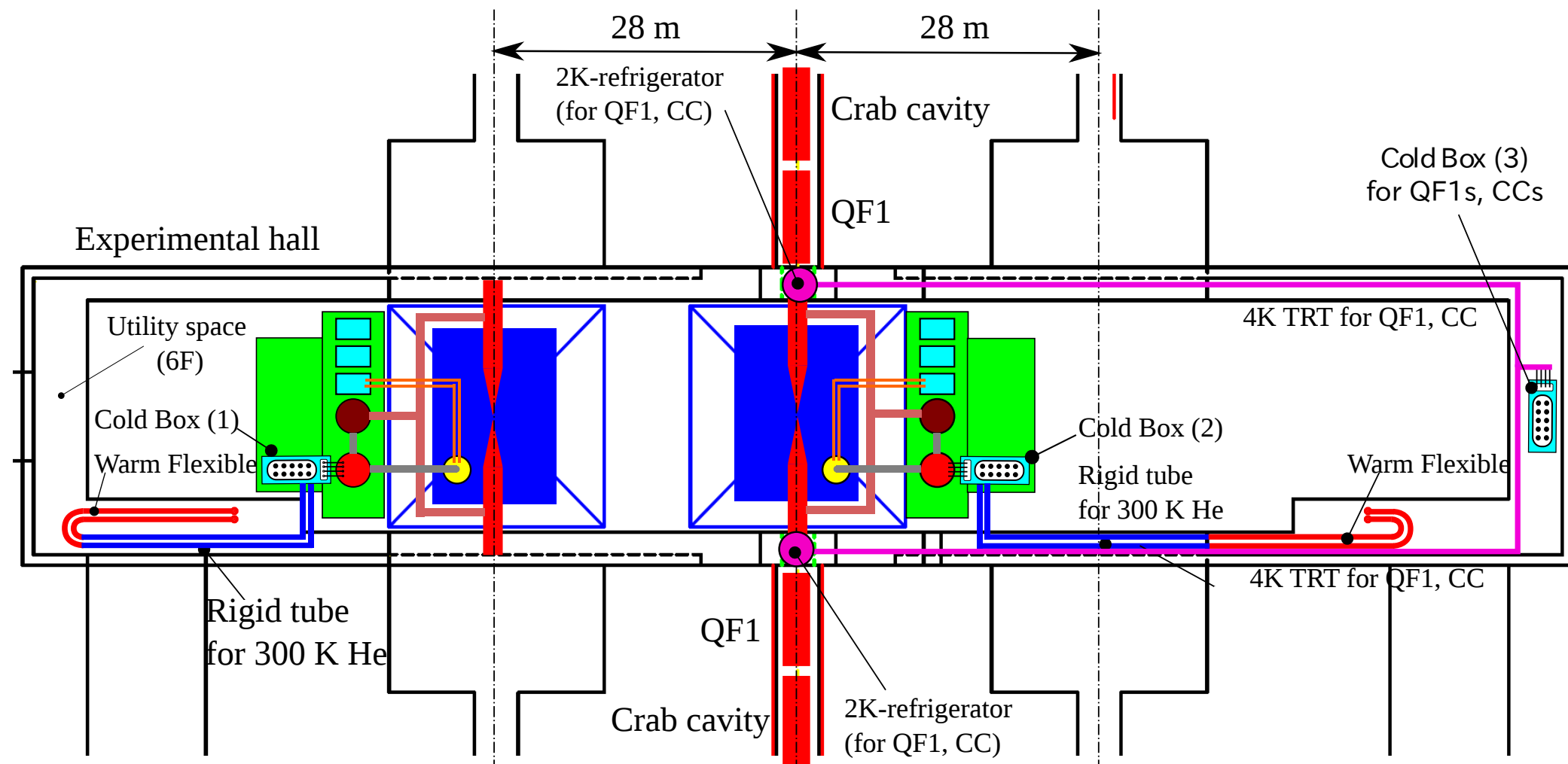
Notes  
- ILD lowering

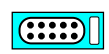
# No.11 Assembling Completion



Notes

# Layout example in DH (ILD,SiD,QD0,QF1,CC)




 Cold box (2 kW)


 2K refrigerator for QF1 and CC


 4K distribution box

 2K refrigerator for QD0

 Chimney and current lead box for detector


 Power supply for detector and QD0


 4K LHe TRT for QF1 and CC (four in one TRT)

 Fixed 300K Helium gas line (supply and return )

 Fixed TRT for 4.2 K liquid helium (Four in one)

 Fixed TRT for superfluid helium (2K, 4K 70K shield).

 Flexible 300 K helium gas line (supply and return)----

 Bus bar for detector between PS and chimney.