


# Linear Collider Interaction Region Studies with ARUP UK

Tuesday 02 August 2011 from 08:00 to 17:30 (Europe/Zurich)  
at CERN

Manage ▾

**Description** Purpose of this visit is to review existing CERN geological and geotechnical with ARUP, Geoconsult and Deriaz

**Material** Slides  ▾

## Tuesday 02 August 2011

- |               |   |   |
|---------------|---|---|
| 14:00 - 14:30 | Introduction / Goal of the meeting 30'<br>Speaker: John Andrew Osborne (CERN) | ▾ |
| 14:30 - 16:30 | ARUP status of study 2h00'  | ▾ |
| 16:30 - 17:30 | Site visit to CMS 1h00'   | ▾ |

<https://indico.cern.ch/conferenceDisplay.py?confId=149232>

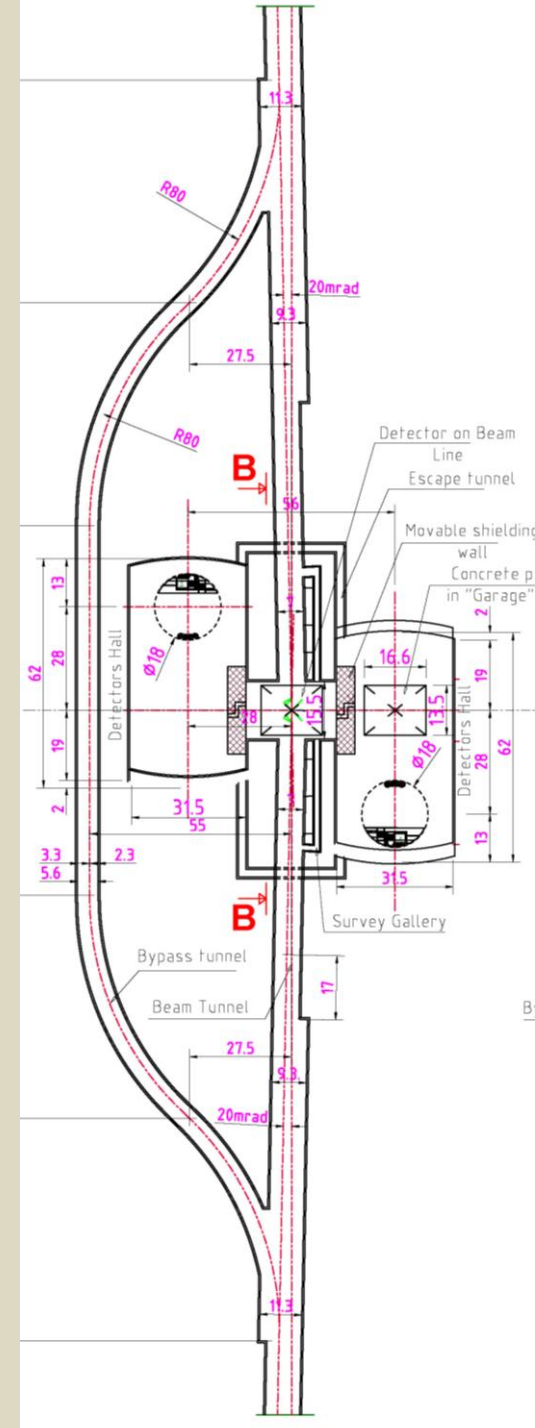


## ARUP's are studying the Interaction Region for a Linear Collider\* at CERN. Two design tasks have been commissioned :

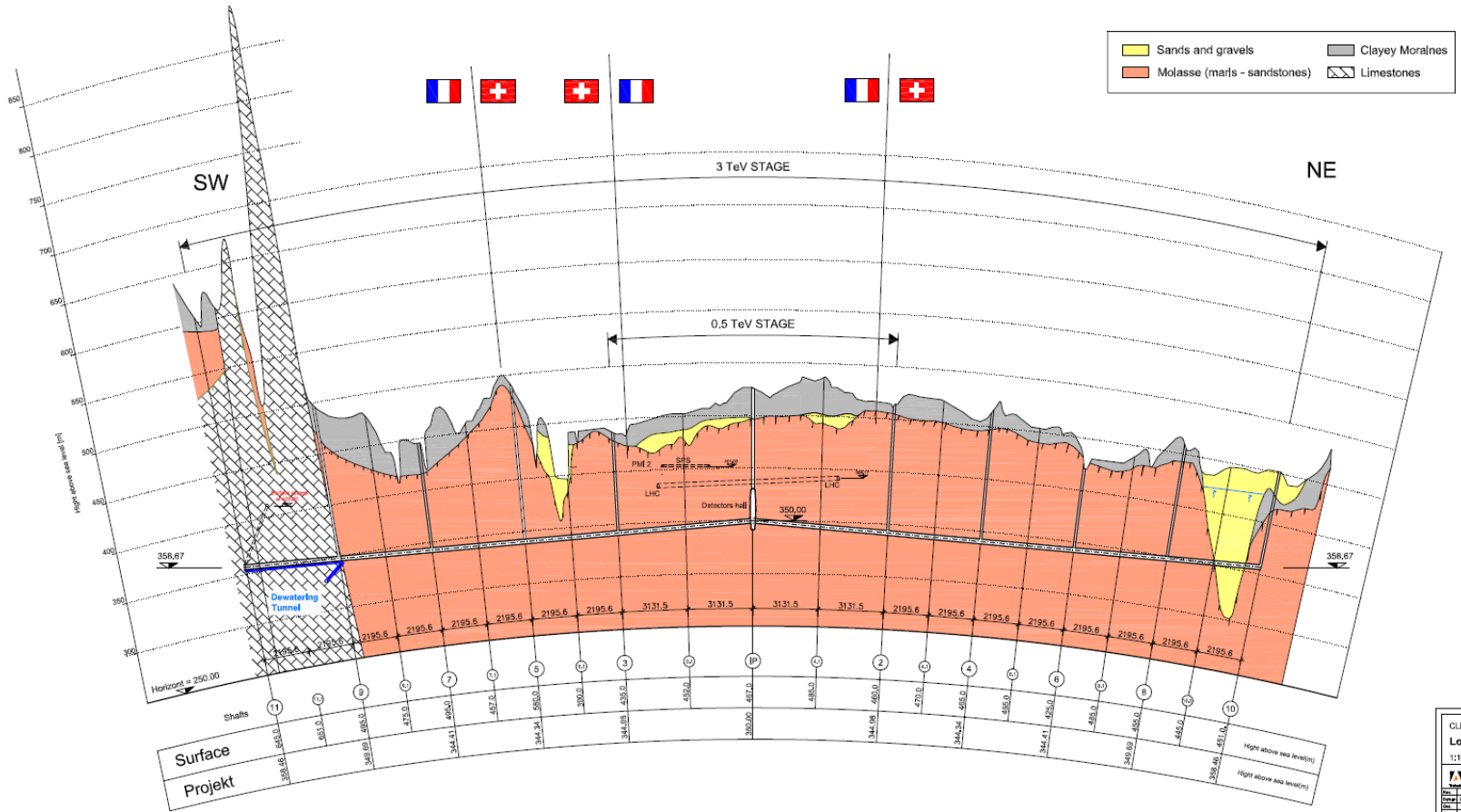
- Task 1 - The development of a design concept for a concrete platform to move two large detectors in and out of the beam line
- Task 2 - The layout of the detector cavern complex from a geotechnical standpoint, using the current CLIC layout and CERN geology as the initial model

## Today's meeting is to look at Task 2

\*CLIC=Compact Linear Collider, ILC=International Linear Collider



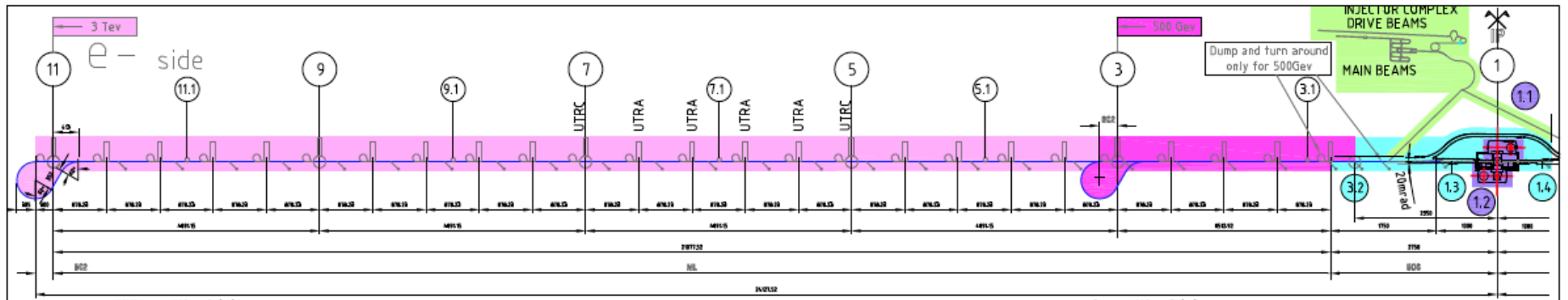
Longitudinal section 1:100'000 / 2000



|  |                               |  |                 |
|--|-------------------------------|--|-----------------|
|  | Sands and gravels             |  | Clayey Moraines |
|  | Moirasse (marls - sandstones) |  | Limestones      |

|                      |       |
|----------------------|-------|
| CLIC                 |       |
| Longitudinal section |       |
| 1:100'000 / 2000     |       |
|                      |       |
| Author               | 01/08 |
| Editor               | 01/08 |
| Client               | 01/08 |
| Scale                | 01/08 |
| Sheet                | 01/08 |
| Revision             | 01/08 |

\\smbdata\c017 CLICACAD\CLIC Jul 2011\lingproj\rand.dwg



TUNNEL LENGTHS (m)

|         | main beam turn-around | BC2  | e- side ML | BDS   | e+ side ML | TOTAL  |
|---------|-----------------------|------|------------|-------|------------|--------|
| 500 Gev | 3 898                 | 600  | 3 513      | 5 500 | 3 513      | 17 024 |
| 3 Tev   | 3 898                 | 600  | 17 565     | -     | 17 565     | 39 628 |
| Total   | 7 796                 | 1200 | 21 078     | 5 500 | 21 078     | 56 652 |

main + drive beam injector complex  
see drawing N°  
CLIC.CE-1.1799.0002.3

SITE LENGTHS (m)

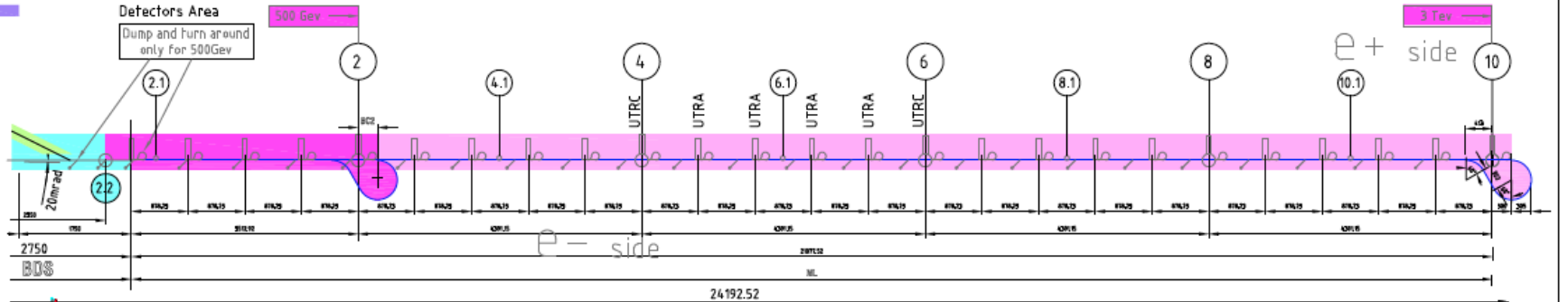
|         | main beam turn-around | BC2   | e- side ML | BDS   | e+ side ML | TOTAL  |
|---------|-----------------------|-------|------------|-------|------------|--------|
| 500 Gev | 610                   | 600   | 3 513      | 5 500 | 3 513      | 13 736 |
| 3 Tev   | 610                   | 600   | 17 165     | -     | 17 165     | 35 540 |
| Total   | 1 220                 | 1 200 | 20 678     | 5 500 | 20 678     | 49 276 |

Legend: 500Gev 3 Tev

- ML
- Main/Drive beam Injectors
- BDS
- Detectors Area

TUNNELS SECTIONS

| Area          | beam turn-around | e- e+ sides ML | BDS    |
|---------------|------------------|----------------|--------|
| section dims. | ø3 m             | ø5.6m          | ø5.6 m |



SHAFTS

| Point | 1.1 | 1.2 | 2 | 2.2 | 3 | 3.2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|-------|-----|-----|---|-----|---|-----|---|---|---|---|---|---|----|----|
| øm    | 18  | 18  | 9 | 9   | 9 | 9   | 9 | 9 | 9 | 9 | 9 | 9 | 9  | 9  |

SURVEY BORINGS

| Point | 2.1, 3.1 | 4.1, 5.1, 6.1, 7.1, 8.1, 9.1, 10.1, 11.1 |
|-------|----------|--|
| øm    |          | 150                                      |

SHAFT BASE CAVERNS (10 UTRC)

| Point     | 2, 3 | 4, 5, 6, 7, 8, 9, 10, 11  |
|-----------|------|---------------------------|
| (LxWxH) m |      | 55 x 16 x 18<br>2 storeys |

UTRA CAVERNS

| Number    | 8 x           | 8 x           | 8 x           | 8 x           | 8 x           |
|-----------|---------------|---------------|---------------|---------------|---------------|
| (LxWxH) m | 40 x 10 x 7.2 | 45 x 10 x 7.2 | 50 x 10 x 7.2 | 55 x 10 x 7.2 | 65 x 10 x 7.2 |

DETECTORS HALL

| Point     | 1.1, 1.2      |
|-----------|---------------|
| (LxWxH) m | 120 x 25 x 39 |

MAIN BEAM DUMP CAVERNS & SERVICE HALLS ( / )

| Point     | BDS CAVERNS<br>1.3, 1.4, 2.2, 3.2 | BDS SERVICE HALLS<br>2.2, 3.2 |
|-----------|-----------------------------------|-------------------------------|
| (LxWxH) m | 20 x 8 x 14<br>+ 1 storey         | 4.9 x 16 x 18<br>3 storeys    |

MUON WALL WIDENINGS

| Point     | 1.3, 1.4                       |
|-----------|--------------------------------|
| (LxWxH) m | 25 x 9 x 7.2<br>+ 15 x 9 x 7.2 |

CONNECTION CAVERNS

| Point     | 1.3, 1.4     |
|-----------|--------------|
| (LxWxH) m | 18 x 9 x 7.2 |

DRIVE BEAM DUMP CAVERNS ( \ )

| Number    | At each UTRAs and UTRCs  |
|-----------|--------------------------|
| (LxWxH) m | 10 x 40 x 5<br>6 x 9 x 5 |

DRIVE BEAM RETURN LOOP

| Number    | 18 x         | 30 x |
|-----------|--------------|------|
| (LxWxH) m | 63 x 2.4 x 3 |      |

BC2 CAVERNS

| Number    | 2 x          | 2 x |
|-----------|--------------|-----|
| (LxWxH) m | 100 x 10 x 3 |     |

INDICE B: 48 DB sectors modified to 878.23 m each, Phase 1 - repositionned to shafts 2 / 3 and reduced to 500Gev and drive beam dumps repositionned

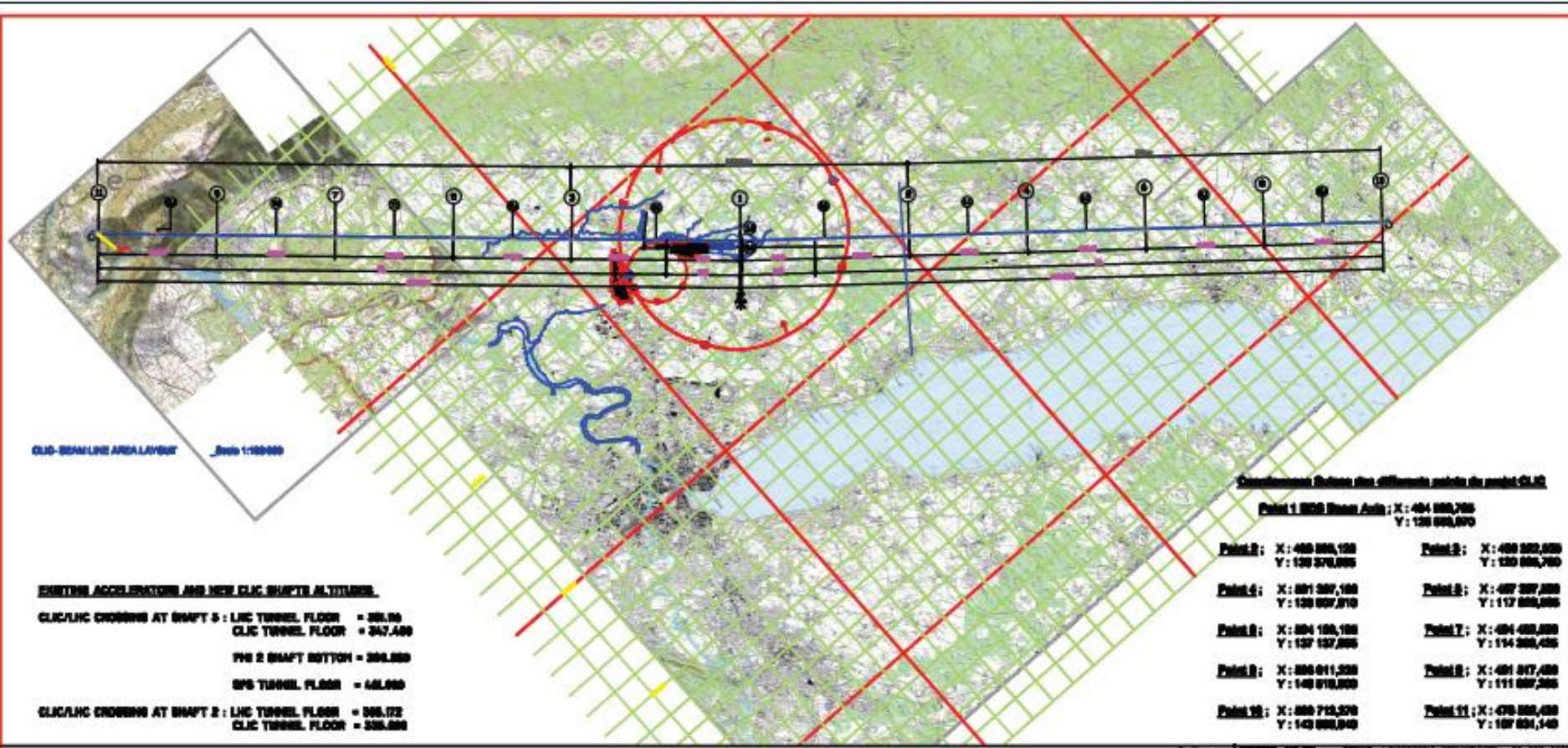
UTR = Underground Technical Room

CLIC - UNDERGROUND STRUCTURES SCHEMATIC LAYOUT(COLOURED BY ZONES)



GROUP : GS-SM  
CIVIL ENGINEERING  
SUPERVISOR : J.OSBORNE  
DESIGNER : N.BADDAMS

SCALE : 1/62500(A3\_FORMAT) DATE : 13\_AUG\_2010  
CLIC.CE-1.1749.0003 3 G



CLIC-BEAM LINE AREA LAYOUT  
\_Scale 1:100000

**EXISTING ACCELERATION AND NEW CLIC SHAFTS ALTITUDES.**

CLIC/LHC CROSSING AT SHAFT 5 : LHC TUNNEL FLOOR = 381.00  
 CLIC TUNNEL FLOOR = 347.600  
 PH 2 SHAFT BOTTOM = 385.000  
 OPS TUNNEL FLOOR = 448.000

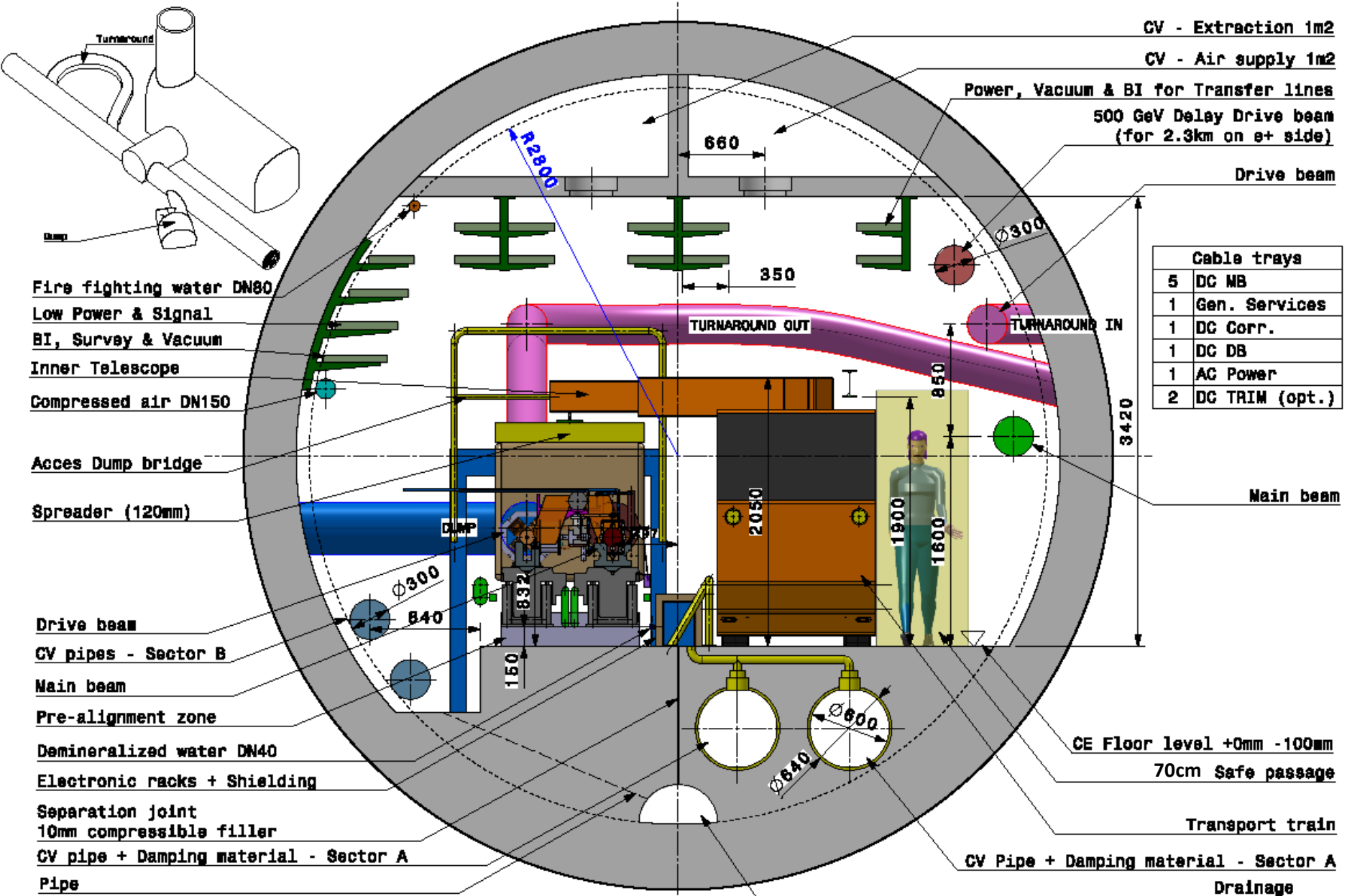
CLIC/LHC CROSSING AT SHAFT 2 : LHC TUNNEL FLOOR = 355.025  
 CLIC TUNNEL FLOOR = 326.000

**Coordonnées Géométriques des différents points de intérêt CLIC**

|                          |                |                |
|--------------------------|----------------|----------------|
| Point 1 : 100% Beam Axis | X: 484 888,700 | Y: 126 688,070 |
| Point 2 :                | X: 488 888,120 | Y: 126 370,000 |
| Point 3 :                | X: 488 888,000 | Y: 126 688,700 |
| Point 4 :                | X: 491 387,160 | Y: 126 687,870 |
| Point 5 :                | X: 494 188,180 | Y: 127 137,000 |
| Point 6 :                | X: 496 811,320 | Y: 148 870,000 |
| Point 7 :                | X: 496 710,370 | Y: 143 888,040 |
| Point 8 :                | X: 488 888,000 | Y: 126 688,700 |
| Point 9 :                | X: 487 387,000 | Y: 117 888,000 |
| Point 10 :               | X: 484 488,000 | Y: 114 388,400 |
| Point 11 :               | X: 481 817,000 | Y: 111 887,300 |
| Point 12 :               | X: 478 888,000 | Y: 107 884,140 |

**CLIC BEAM LINE AREA LAYOUT**

BUREAU D'ETUDES  
 CIVIL, MECHANICAL  
 ENVIRONMENTAL ALTERNATIVE  
 DESIGN & SERVICES  
 11/1000000000\_P000000000\_000\_000\_000  
**CLIC-CE-1.1799.0001** 2 6



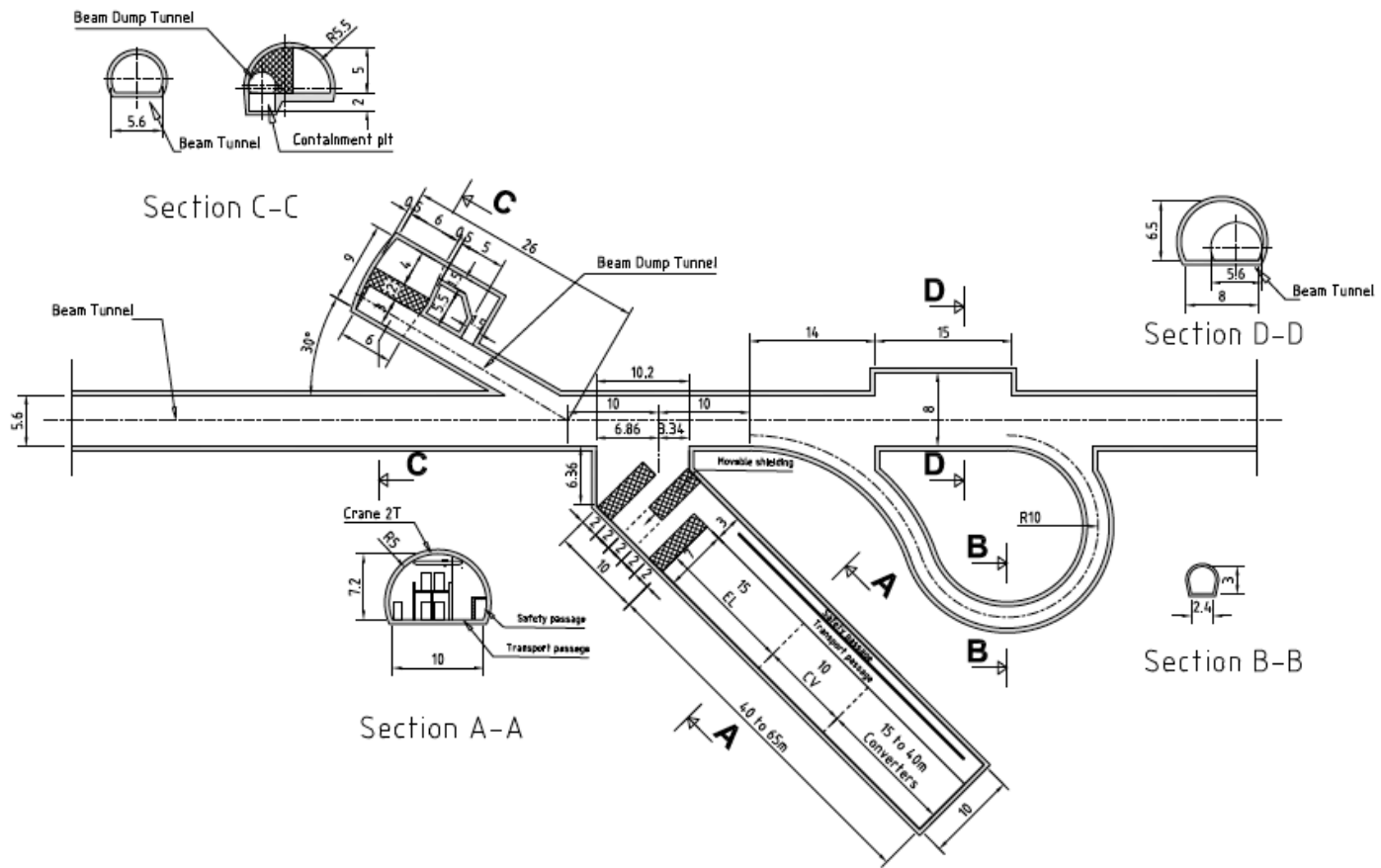
CV - Extraction 1m2  
 CV - Air supply 1m2

Power, Vacuum & BI for Transfer lines  
 500 GeV Delay Drive beam  
 (for 2.3km on + side)

| Cable trays |                |
|-------------|----------------|
| 5           | DC MB          |
| 1           | Gen. Services  |
| 1           | DC Corr.       |
| 1           | DC DB          |
| 1           | AC Power       |
| 2           | DC TRIM (opt.) |

CLIC - Typical Cross Section - Diameter 5600mm - Junction with Turnaround - 1:25  
 Draft - J.Osborne / A.Kosmicki - August 9th 2010





CLIC - UTRA CAVERN, DRIVE BEAM LOOP AND BEAM DUMP



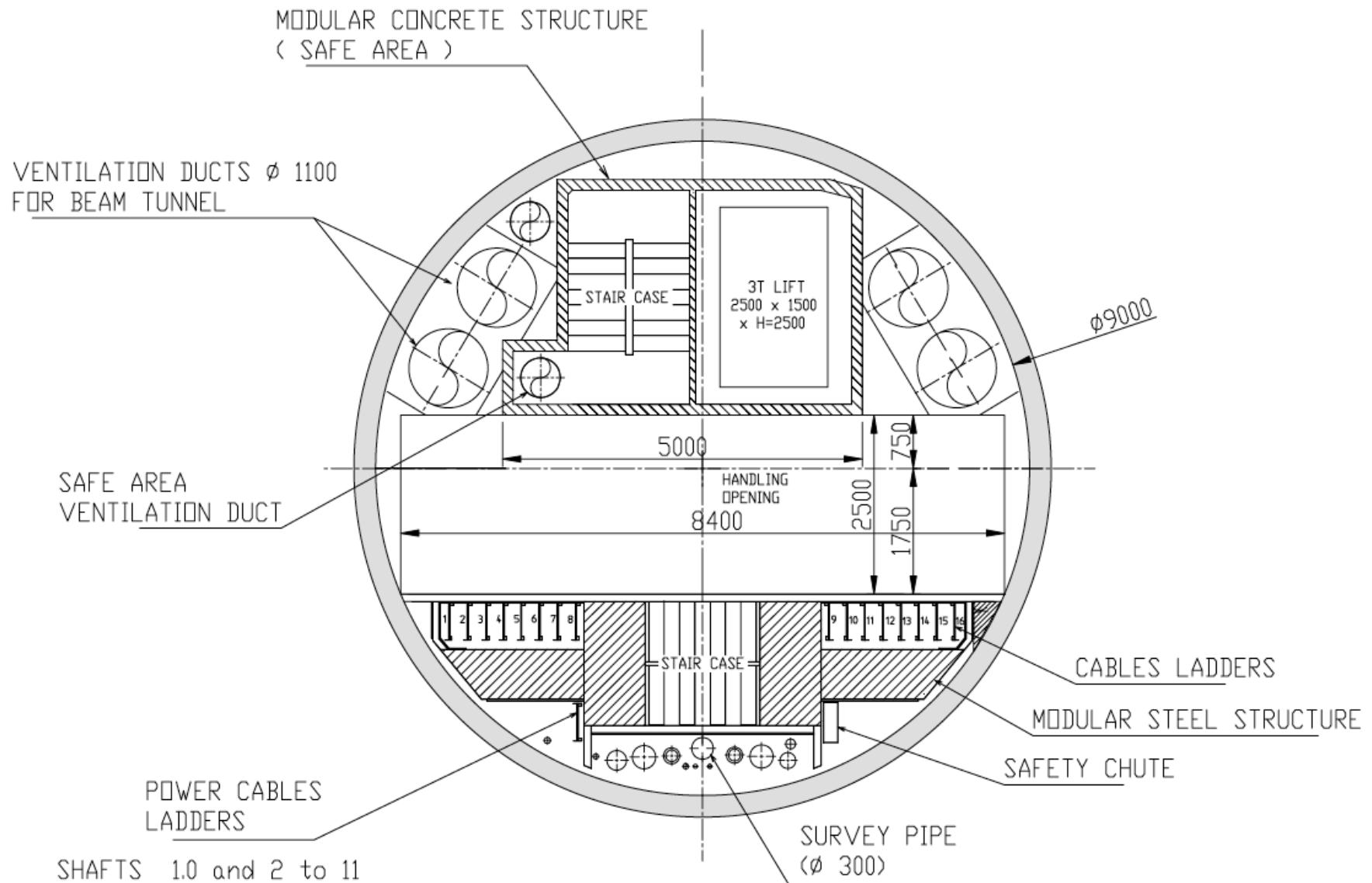
GROUP : 08-08M  
 CIVIL ENGINEERING  
 SUPERVISOR : J.OSBORNE  
 DESIGNER : N.BADDAMS

SCALE : 1/500(A3\_FORMAT) DATE : 17\_AUG\_2010

CLIC-.CE-1.1710.0002

SIZE INCHES  
 3 B



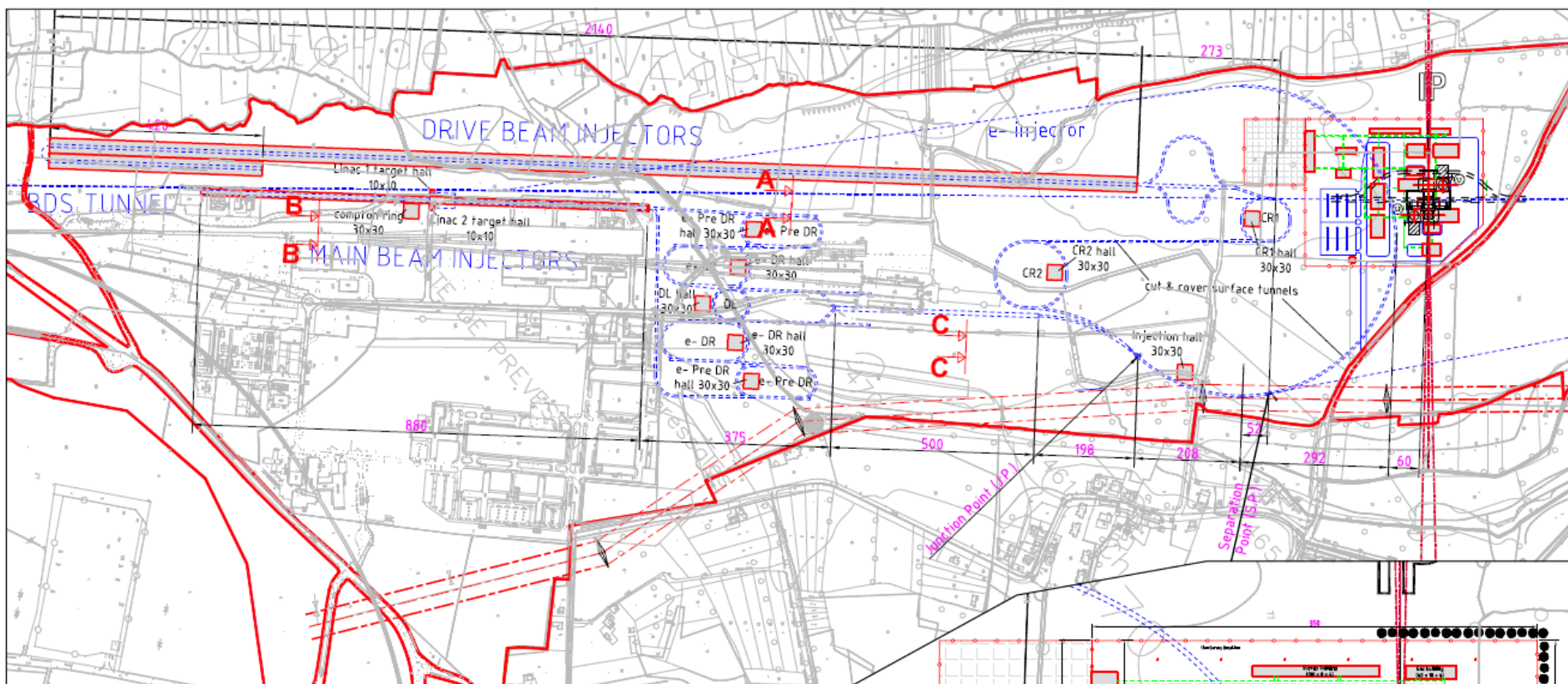


**CLIC-ML SHAFT (9m-3t Lift) CROSS SECTION**



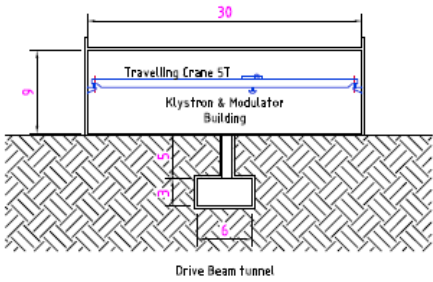
GROUP 1 TS-CE  
 CIVIL ENGINEERING  
 SUPERVISOR : J.L.BALDY  
 DESIGNER : N.BADDAMS

SCALE : 1/50(A3\_FORMAT) DATE : 14\_MAY\_2007  
 CLIC-CE-1.1710.0005 3 -



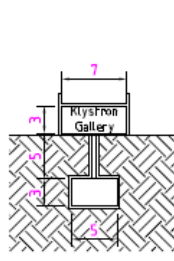
Main Beam & Drive Beam Injector Cross Sections

Section A-A



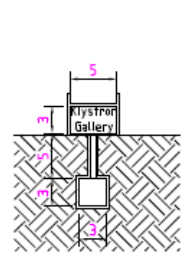
Drive Beam tunnel

Section B-B

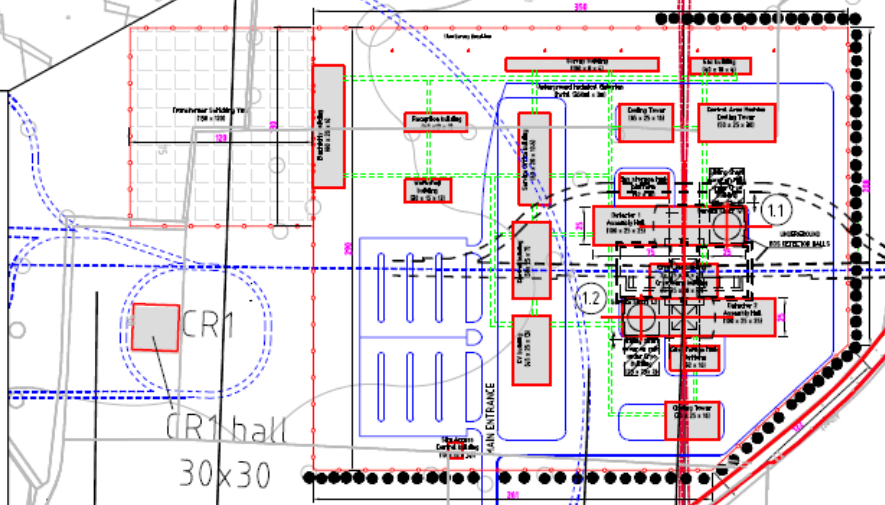


Main Beam tunnel

Section C-C



Booster tunnel



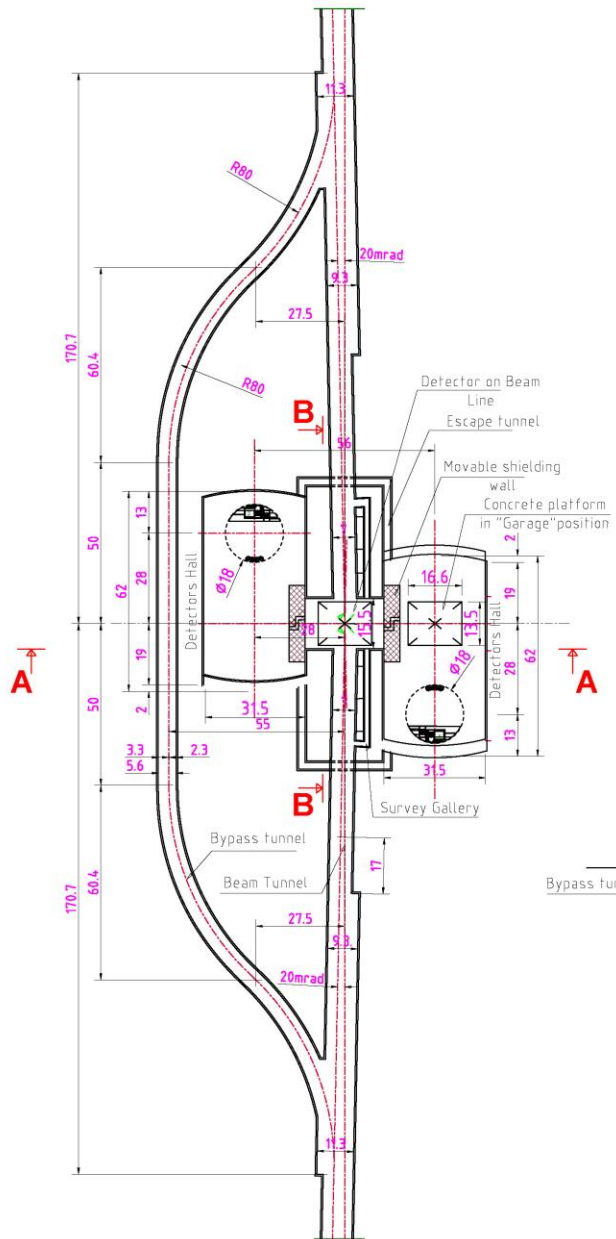
CLIC- MAIN / DRIVE BEAM INJECTORS AND EXPERIMENTAL AREA SURFACE BUILDINGS LAYOUT

GROUP : CS-SRM  
 CIVIL ENGINEERING  
 SUPERVISOR : J.OSBORNE  
 DESIGNER : N.BADDAMS

SCALE : 1/7500(A3\_FORMAT) DATE : 07-OCT-2010

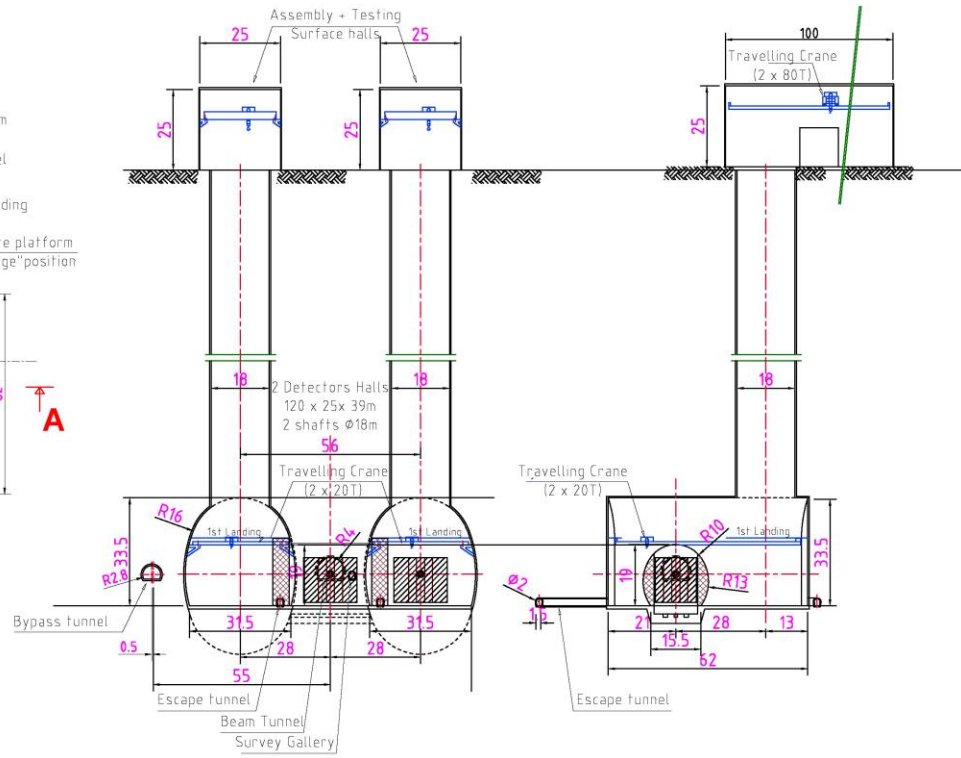
CLIC.CE-1.1799.0005

SIZE INDEX  
 3 B

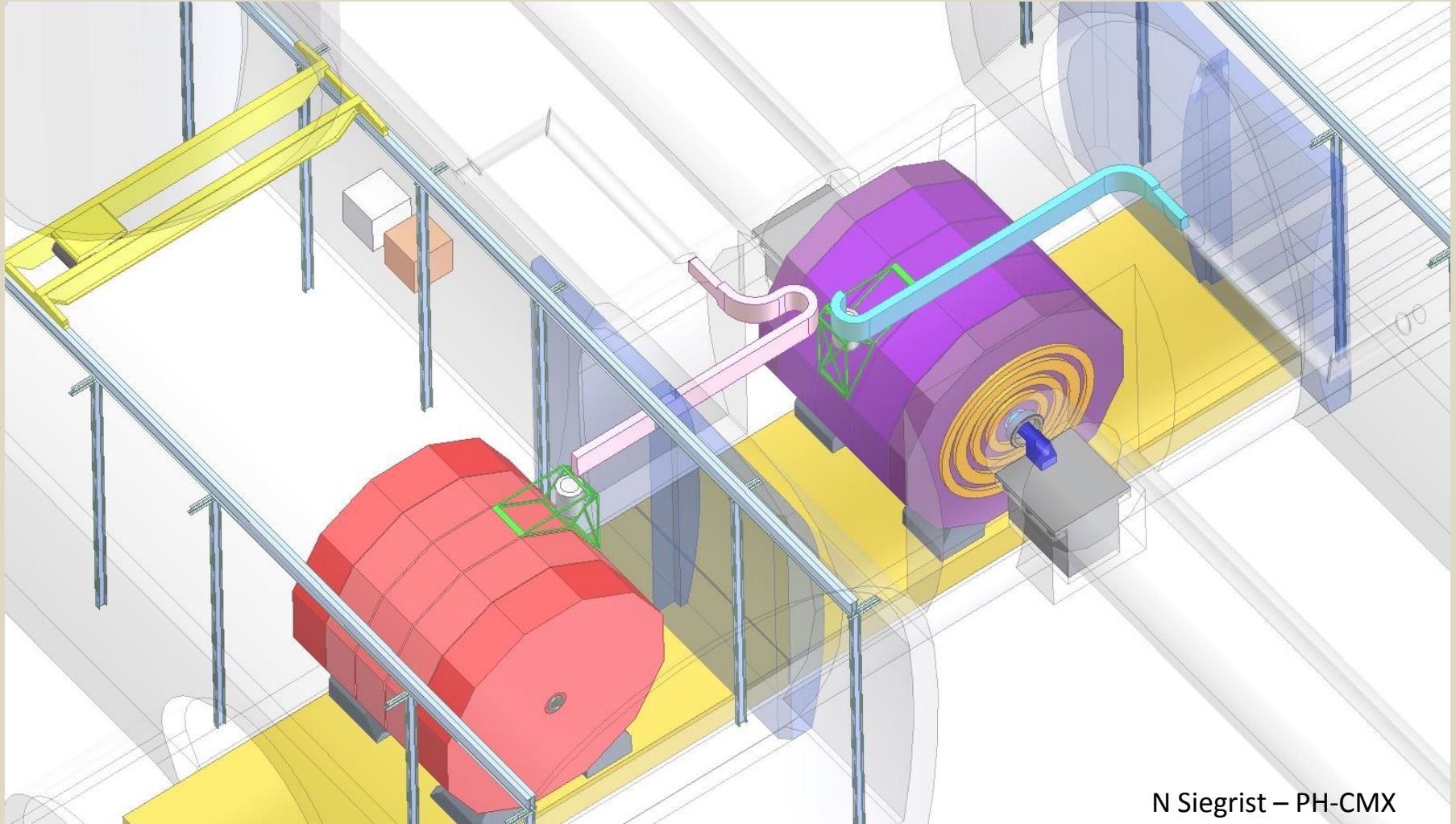


## Section A-A

## Section B-B

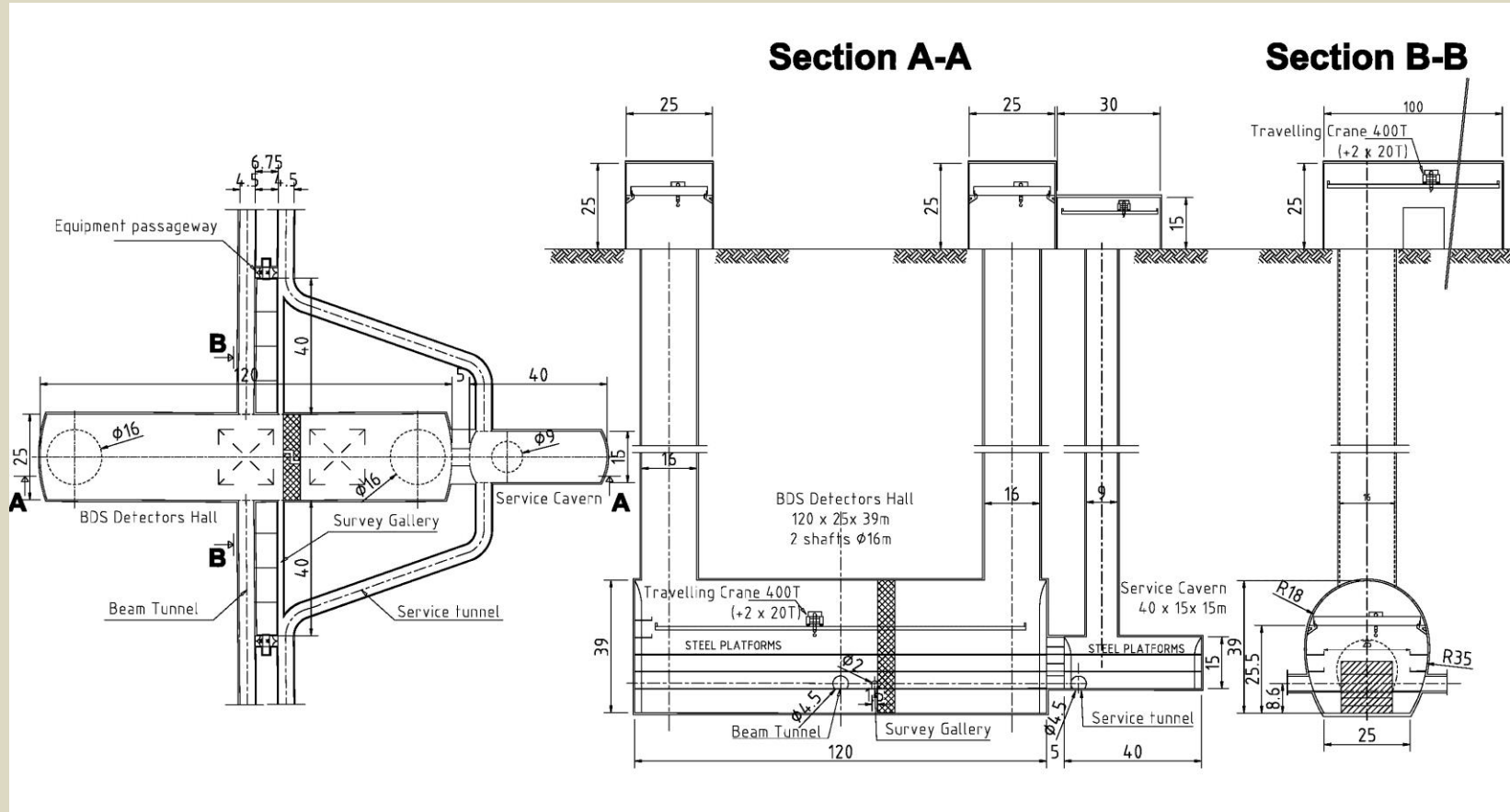


The detector would be moved into beam position on a moving platform  
The concept could be similar to the PX56 plug (2200 tons)

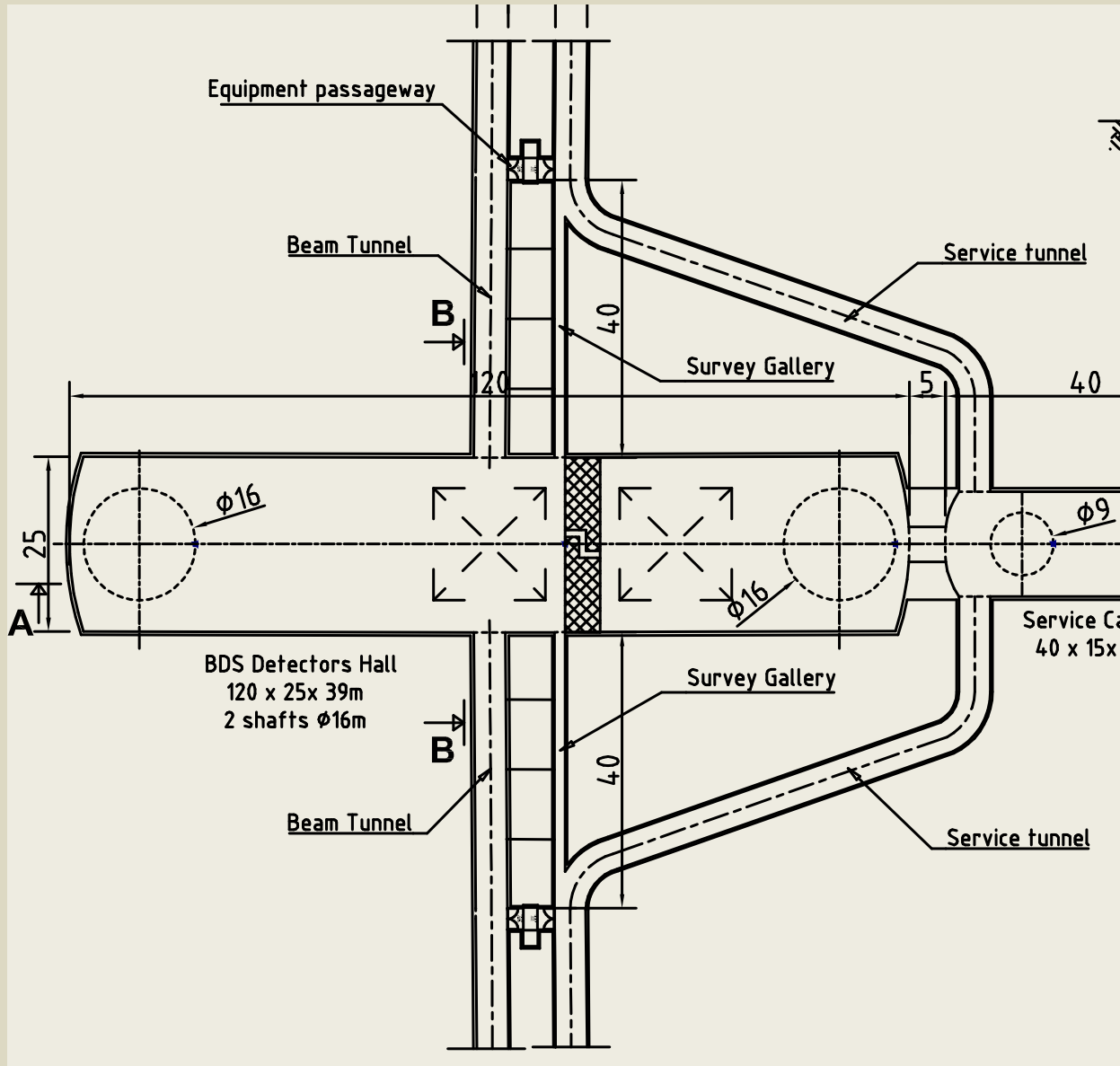


N Siegrist – PH-CMX

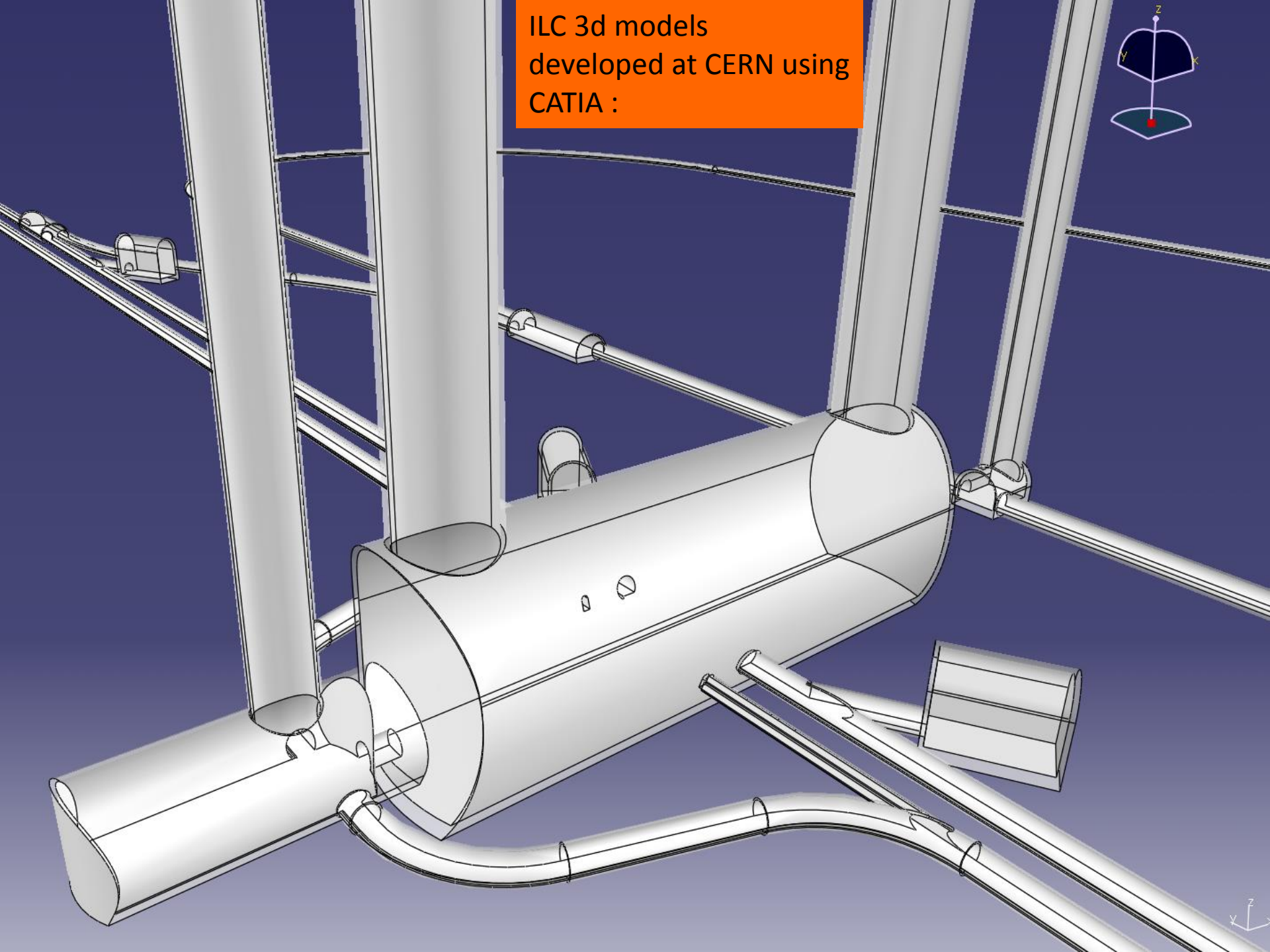
# ILC IR RDR Layout (CERN)



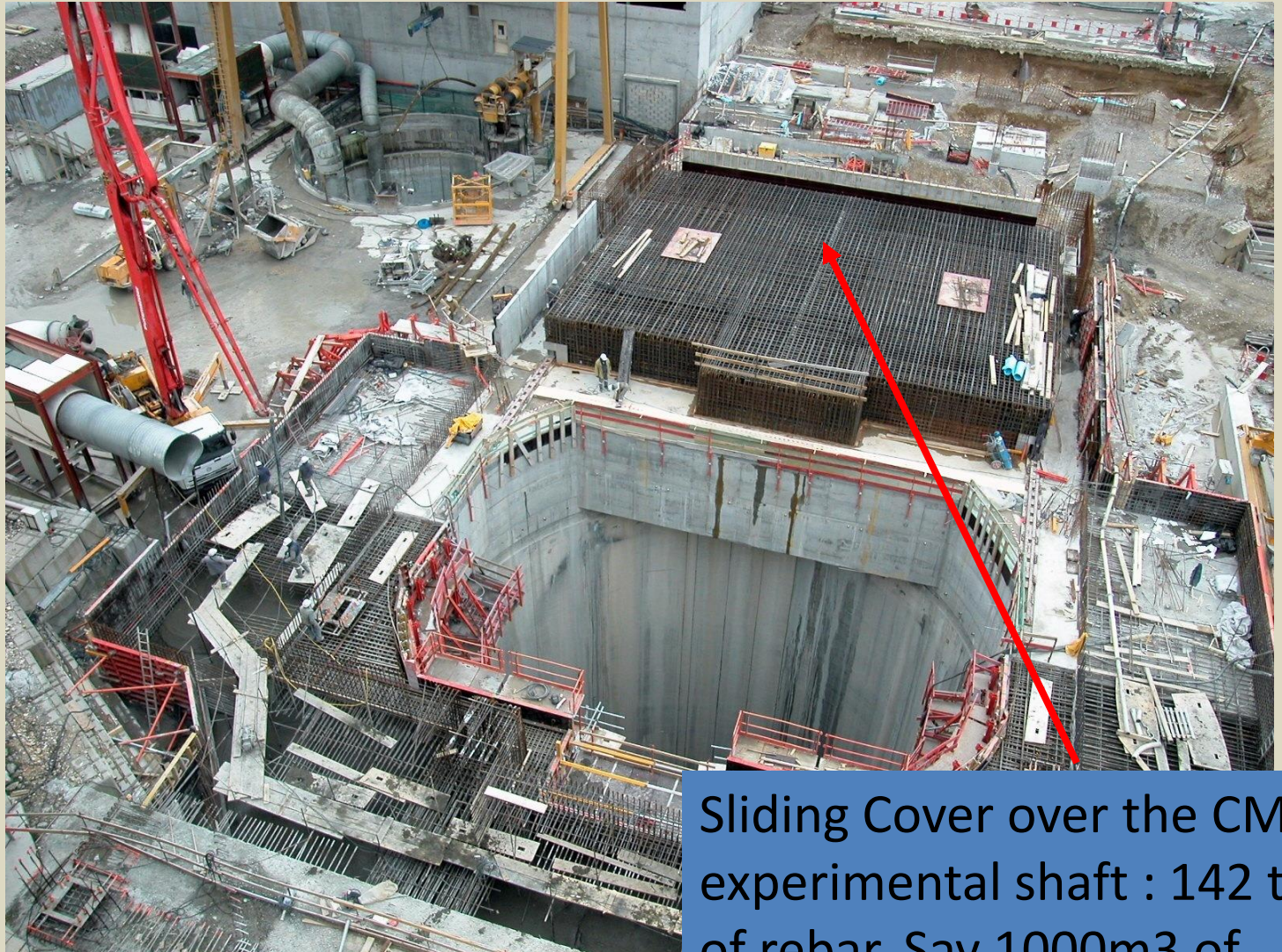
# ILC RDR Baseline Layouts for Interaction Region



ILC 3d models  
developed at CERN using  
CATIA :



# CMS Concrete platform just before concreting



Sliding Cover over the CMS experimental shaft : 142 tons of rebar. Say 1000m<sup>3</sup> of concrete = 142kg/m<sup>3</sup> ("normal" for a slab)





Sliding Cover complete prior to completion of Phase 2 of experimental building



19/10/2010

[martin.gastal@cern.ch](mailto:martin.gastal@cern.ch)

# Main Goals of this meeting

- Learn from LEP/LHC ‘Molasse’ experience
- To agree on any further data that needs to be supplied to ARUP for this IR study
- Most data is on CERN’s EDMS database (and keys reports attached to Indico Site for this meeting.)

<https://edms.cern.ch/nav/P:GS-DEP:V0/P:CERN-0000075614:V0/TAB3>