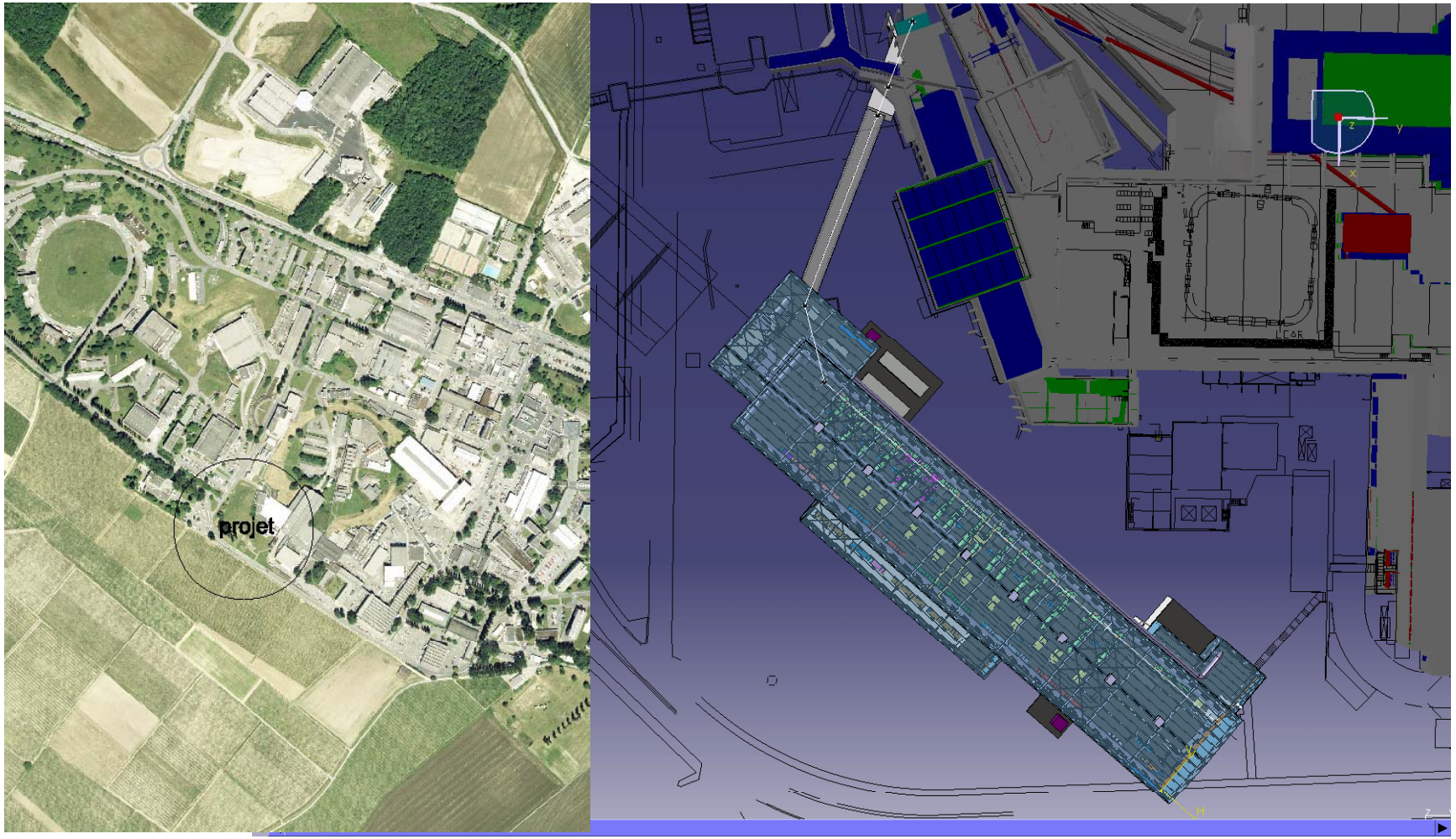
Linac 4 Building and Infrastructure

OUTLINE

1. Linac 4 layouts
2. Civil engineering
3. Technical services
4. TS Schedule
5. TS Cost estimate October 2007
6. Status in January 2008

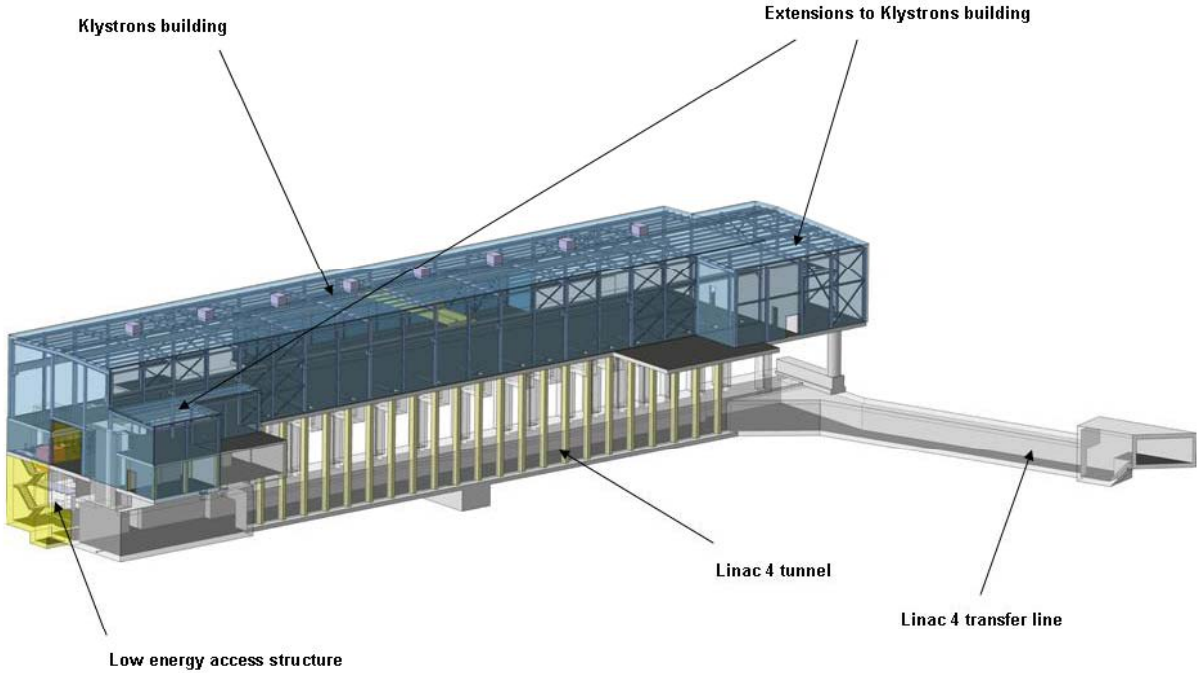
1. Linac 4 layouts

Location and top view



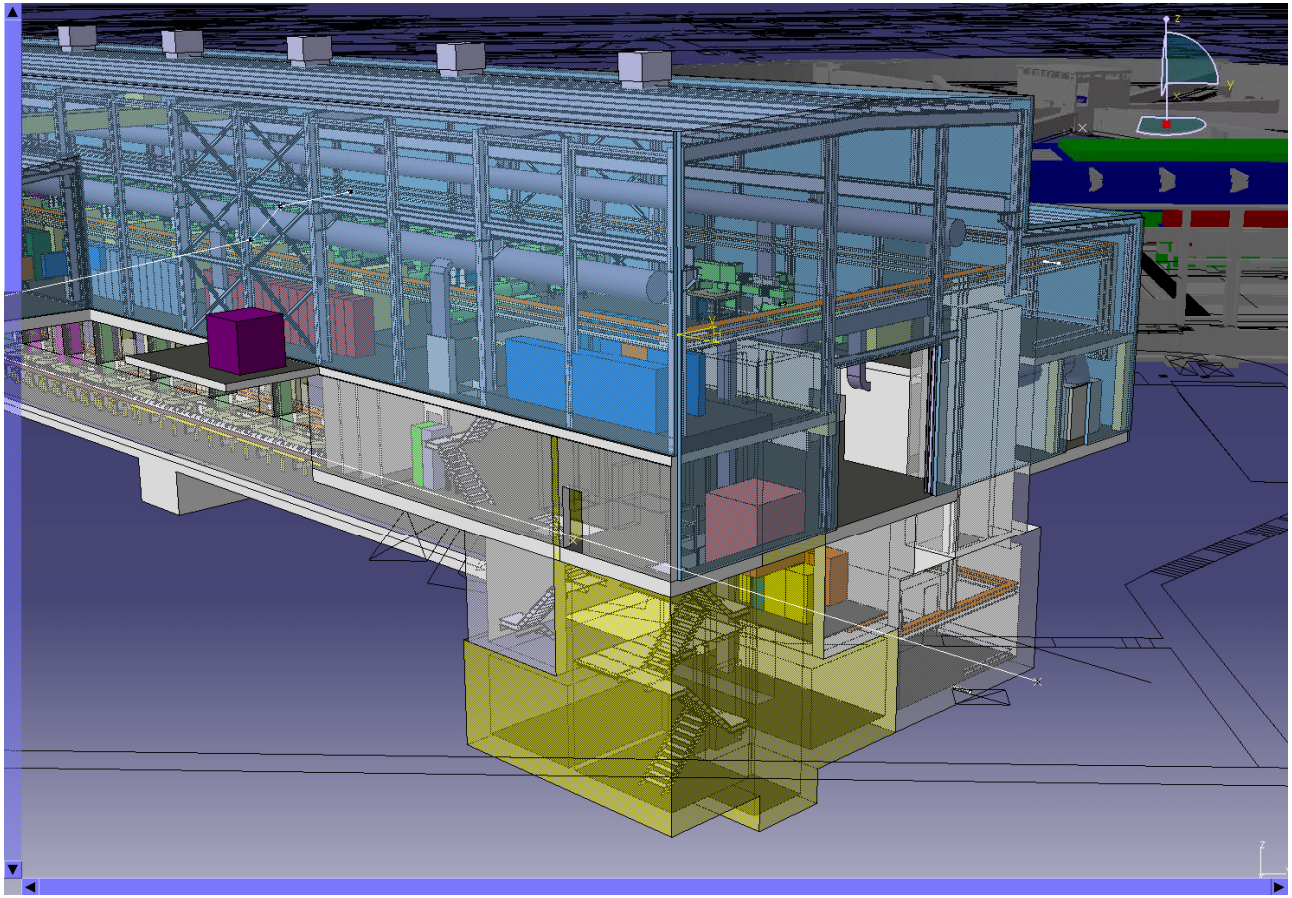
1. Linac 4 layouts

General layout



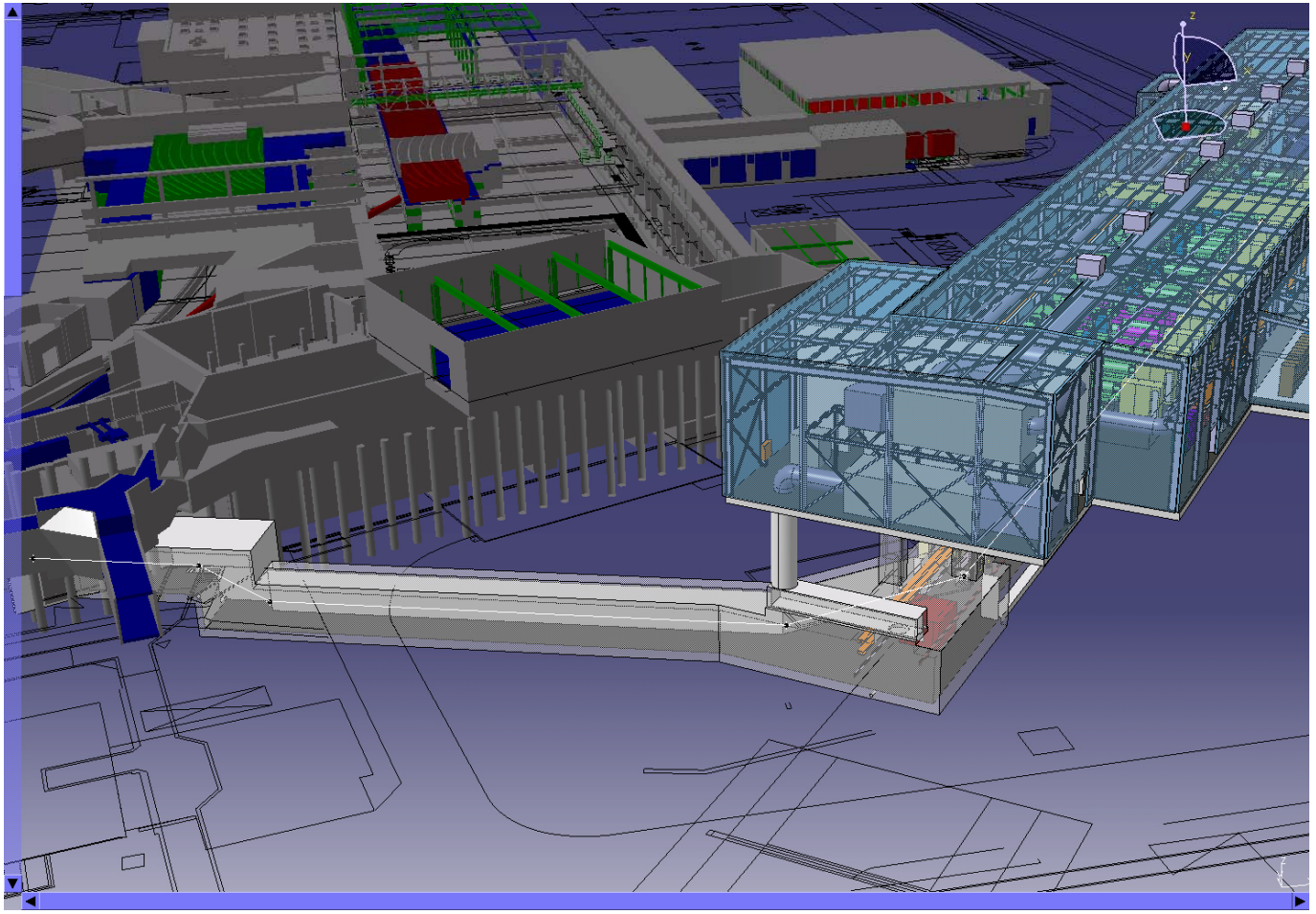
1. Linac 4 layouts

Low energy access structure



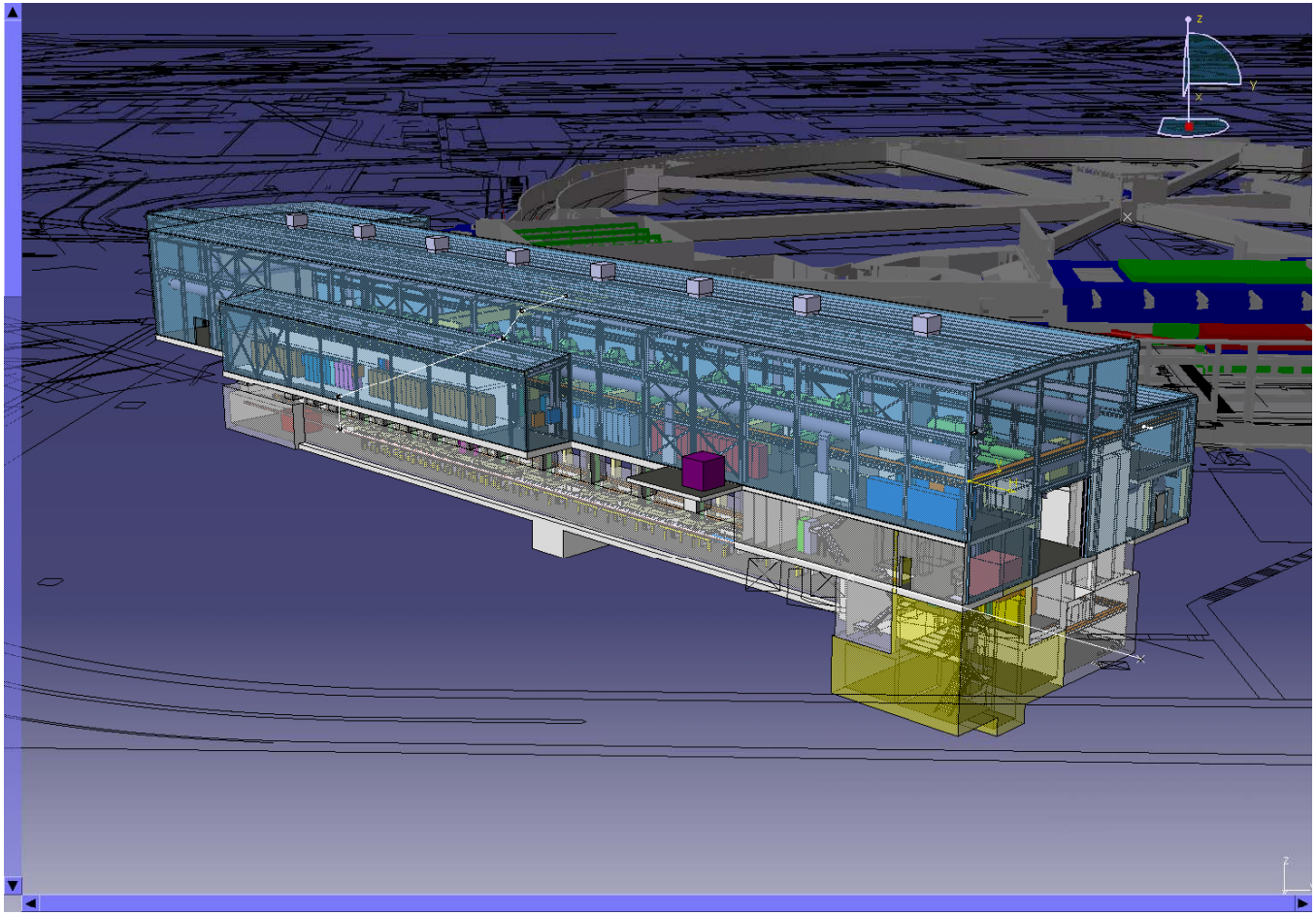
1. Linac 4 layouts

Ventilation annex and transfer line



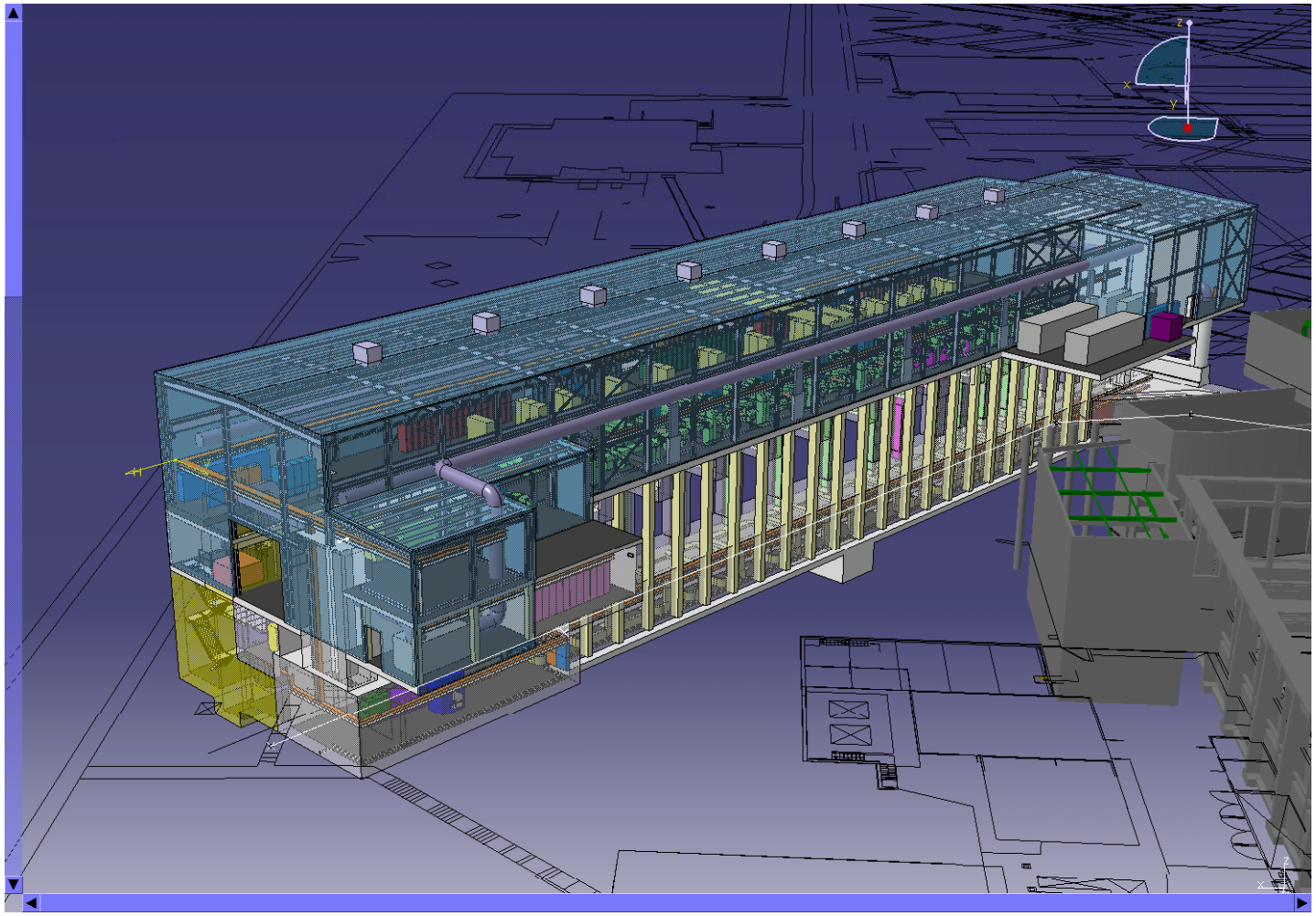
1. Linac 4 layouts

Klystron building and faraday cage



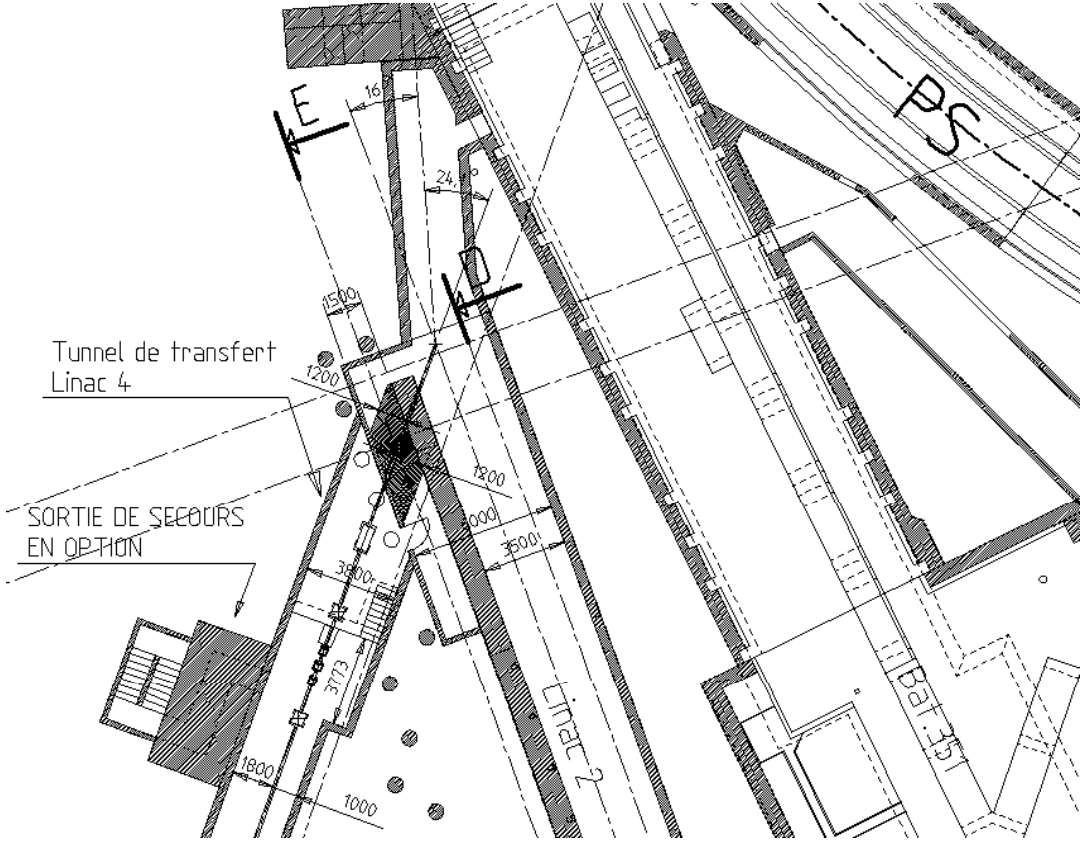
1. Linac 4 layouts

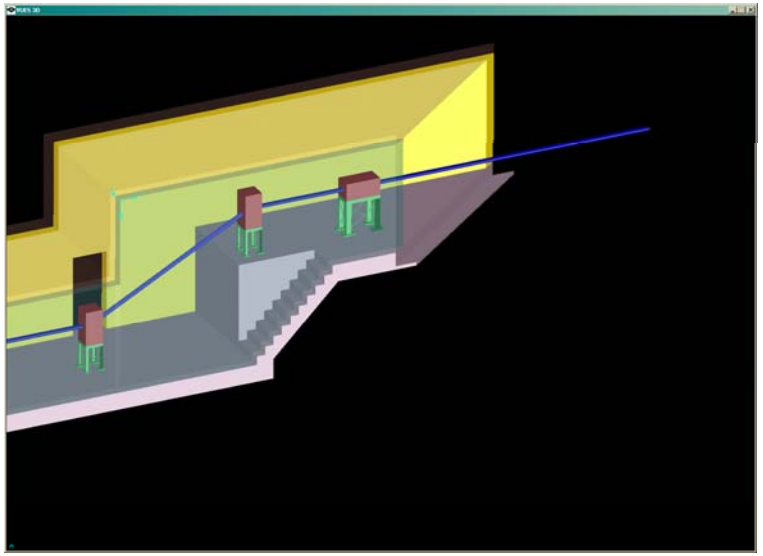
Linac 4 and ducts for wave guides



1. Linac 4 layouts

Transfer line and connection into linac 2

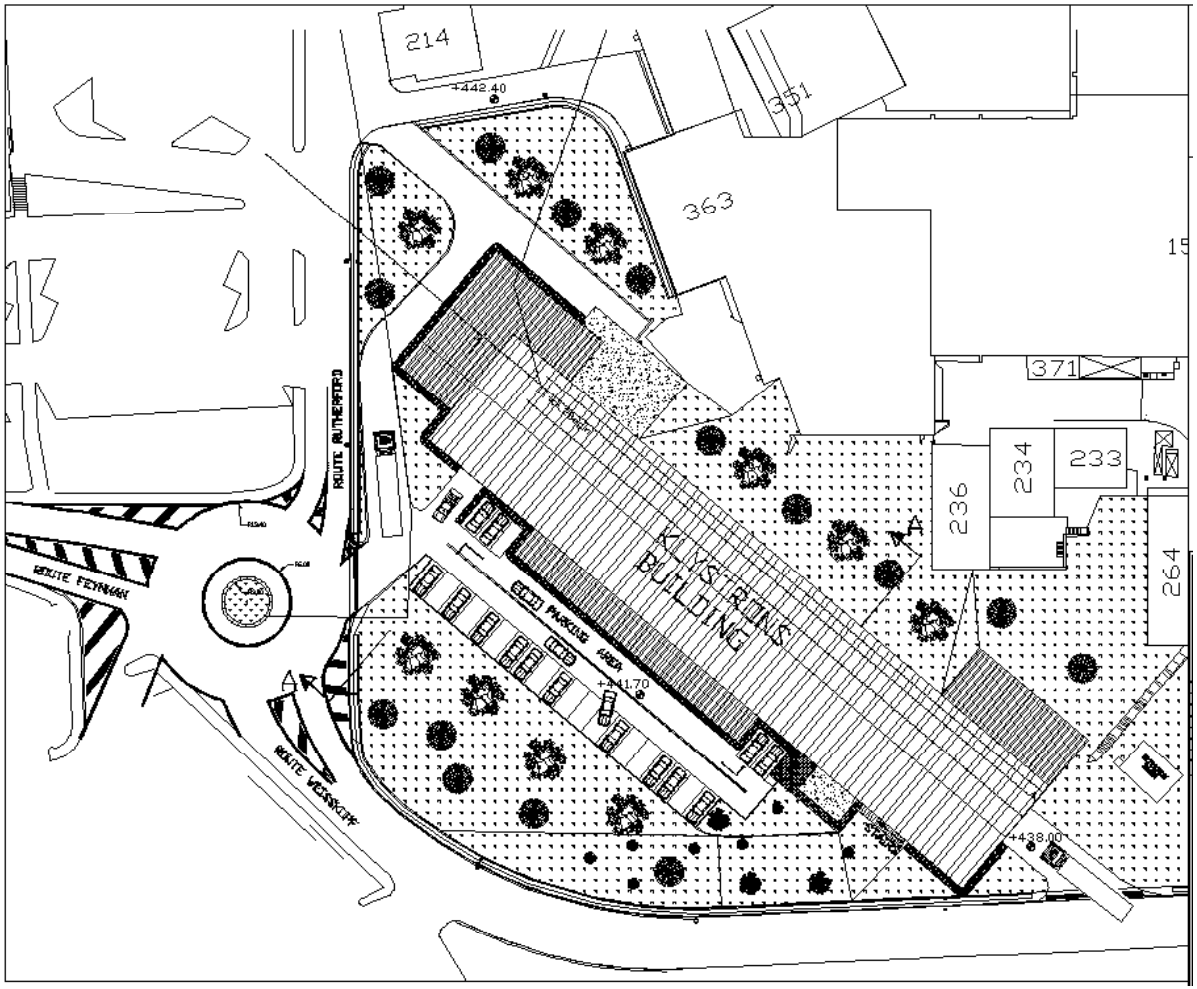




Emergency escape under the beam

2. Civil engineering

General layout (surface)

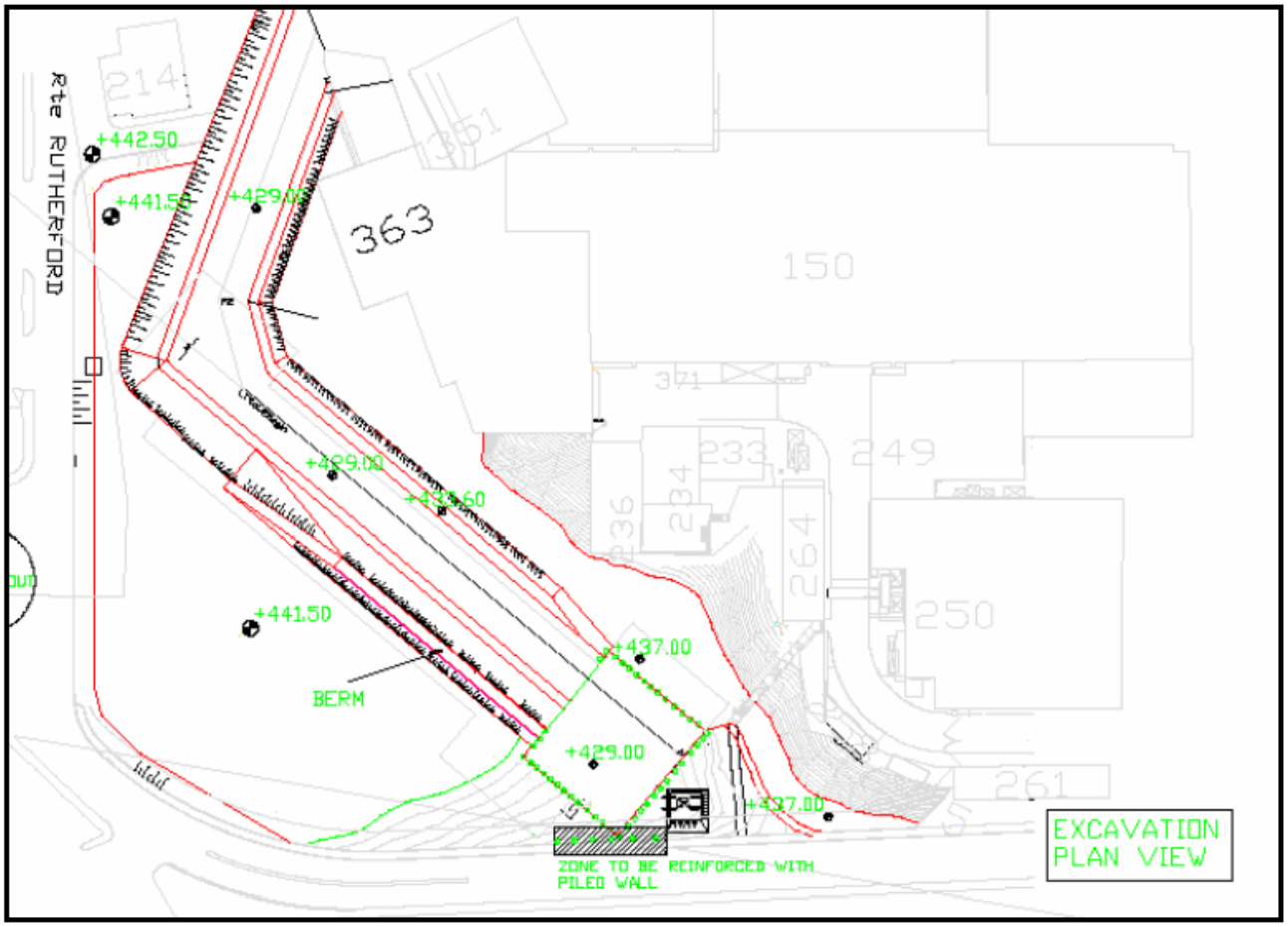


Surface buildings are similar to existing CERN buildings, i.e. steel frame with cladding.

Car parking, roads, surface water drainage and lanscaping are part of civil engineering works.

2. Civil engineering

Excavation

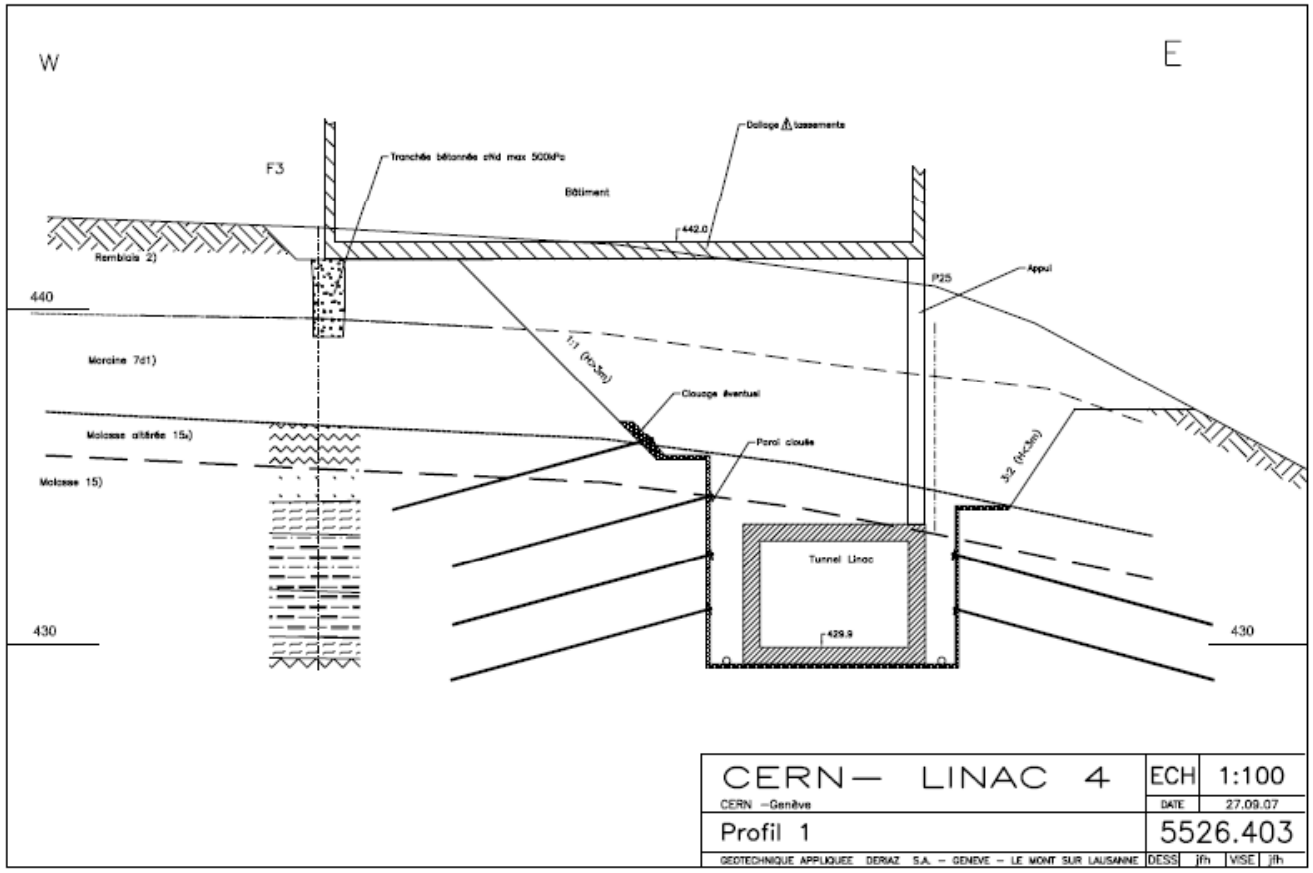


Conventional excavation with adequate slopes in the tunnel area, and piled wall in the south area.

Volume of excavation: 40,000 m3

2. Civil engineering

Excavation



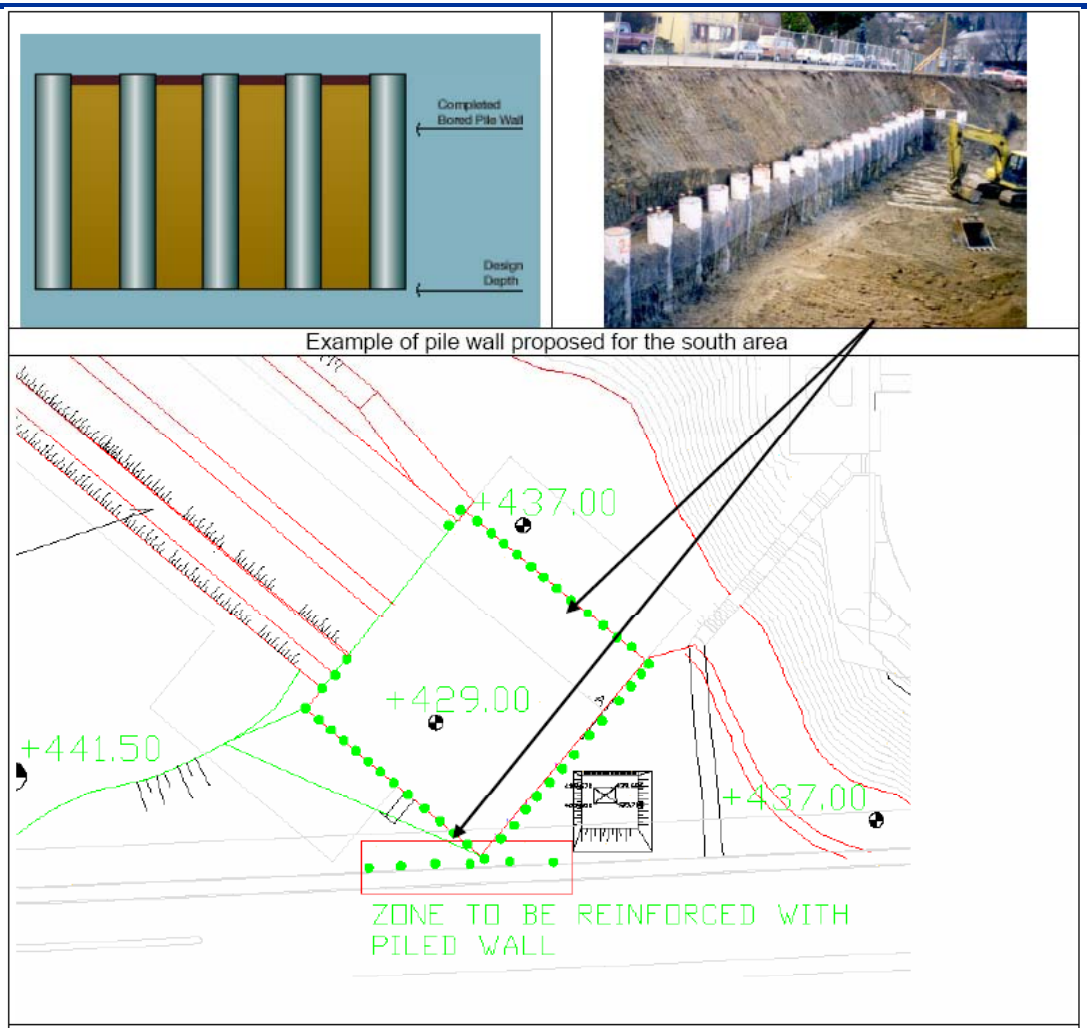
Typical cross section in the tunnel area:

-slope 1:1 or 3:2 for existing fill area and moraine

-vertical excavation in molasse with rock bolts

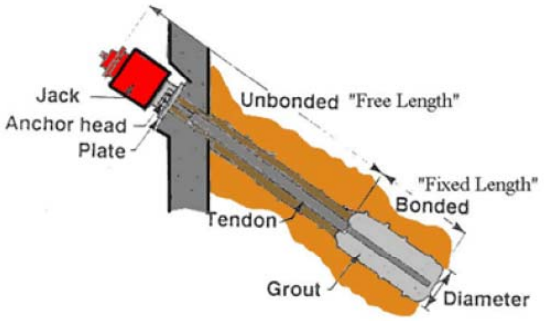
2. Civil engineering

Excavation



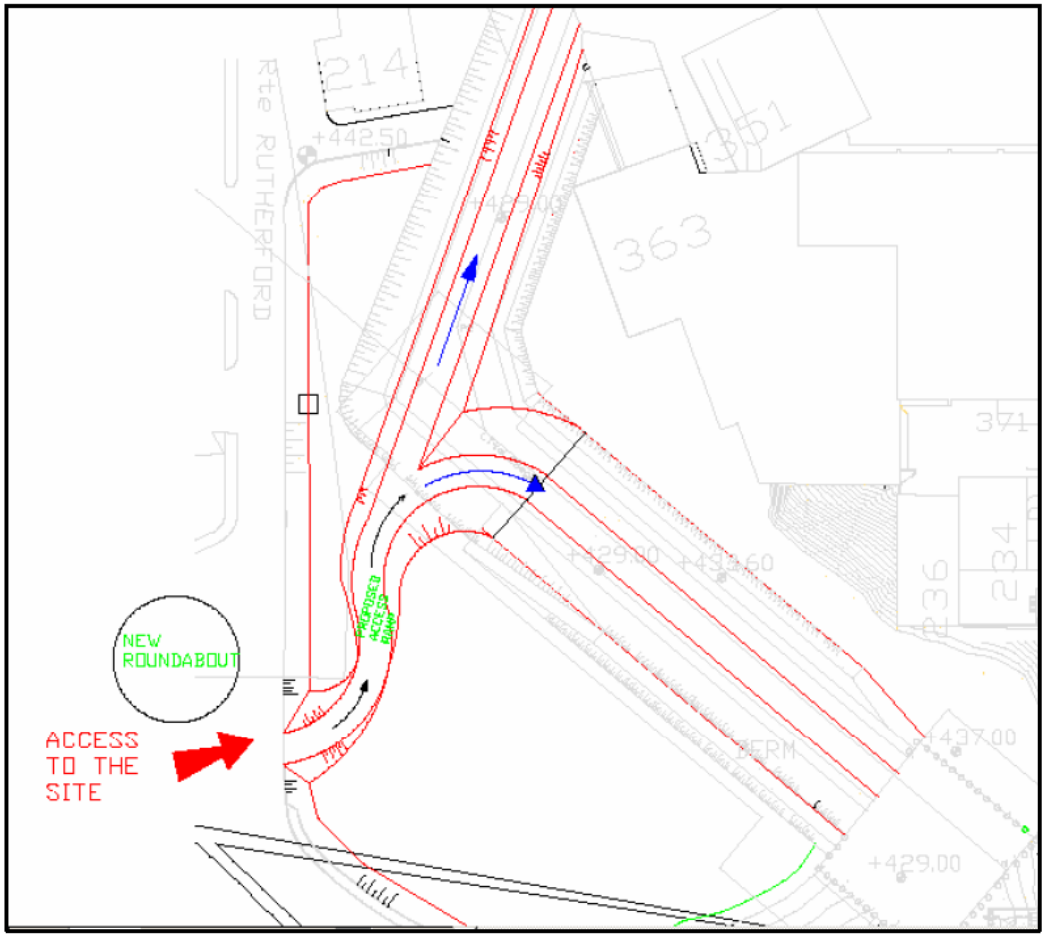
Example of pile wall proposed for the south area

Vertical piled wall in the south area, with piles 75 cm diameter and 11 m long separated 2 m and anchored with presstressed anchor bolts. The area between piles will be reinforced by shotcrete



2. Civil engineering

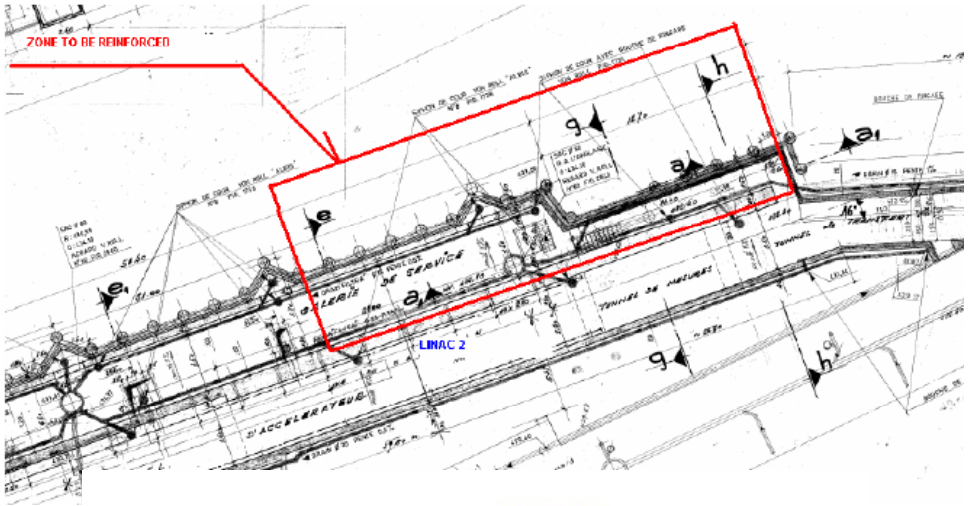
Excavation

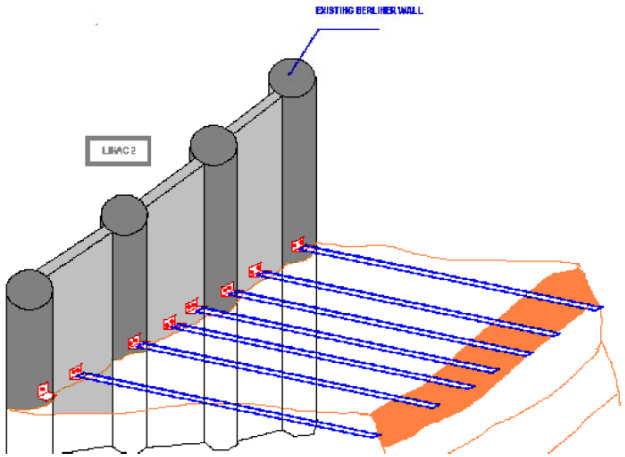


The excavation will be executed from the access road in two directions: towards South (linac 4 tunnel) and towards North-east (transfer line)

2. Civil engineering

Soil retention system for linac2 wall



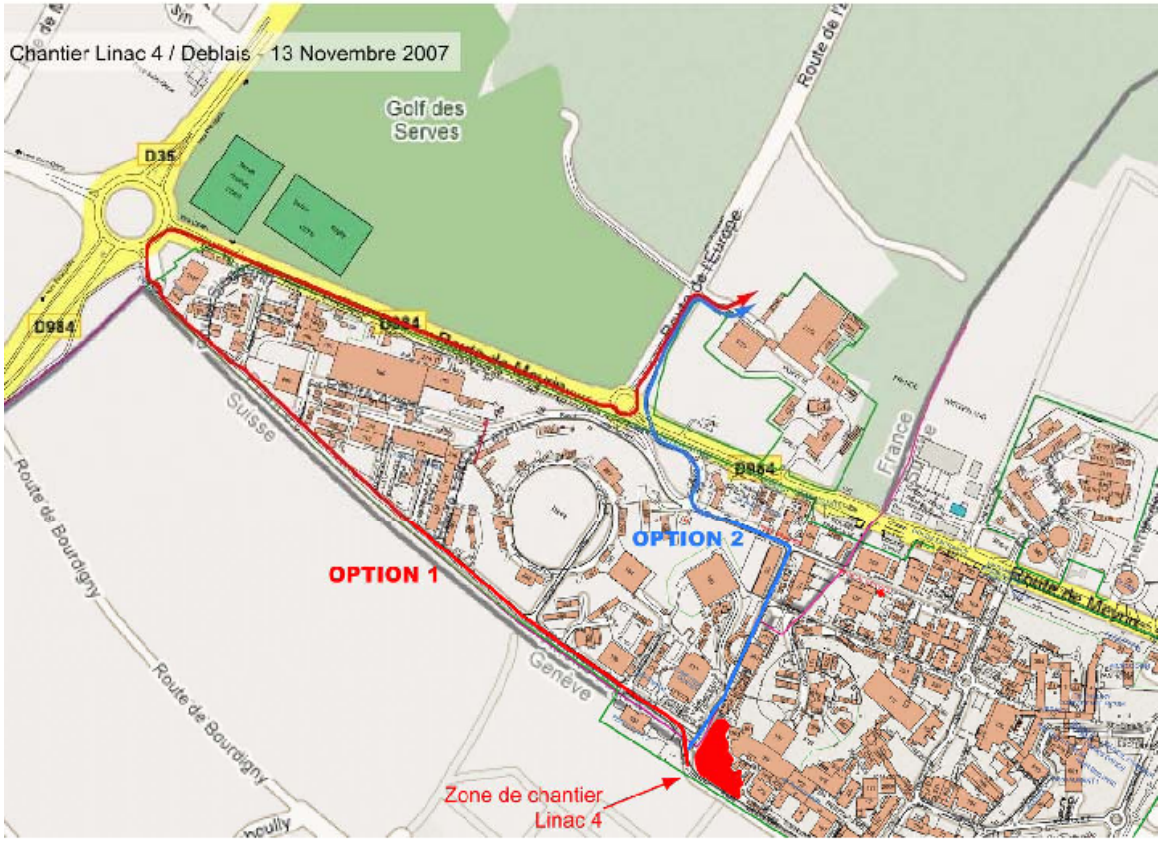


During the excavation process in the vicinity of the Linac2, several existing anchor bolts from the Linac2 wall will be removed and the wall will not be able to resist the earth pressure.

Therefore, for soil retention, reinforced earth methods will be used during filling works.

2. Civil engineering

Spoil Dump

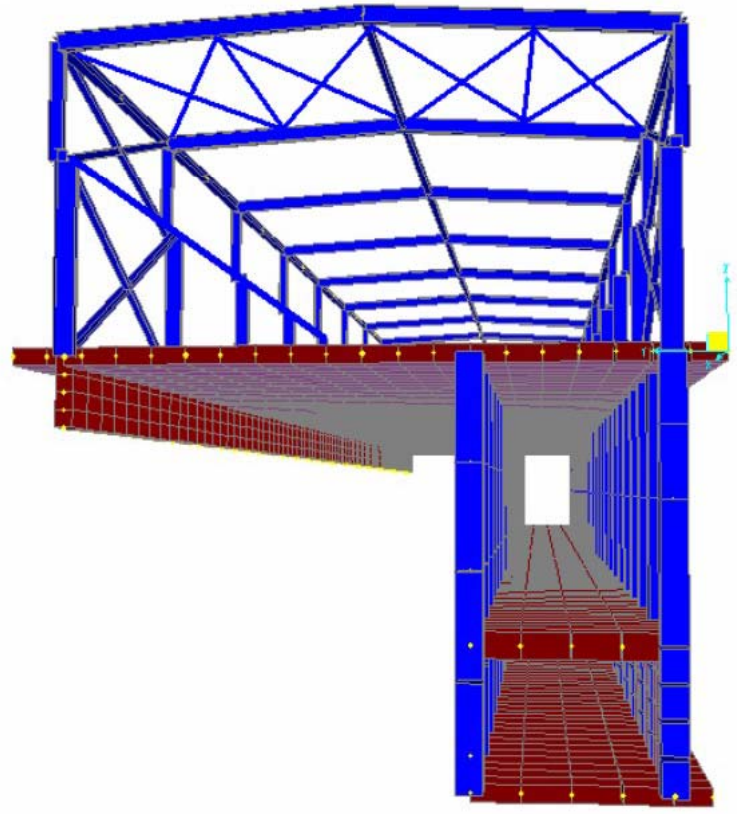


The spoil dump is located in France.

All spoil taken to the spoil dump shall be transported via CERN roads and through the tunnel « intersites »

2. Civil engineering

Foundation

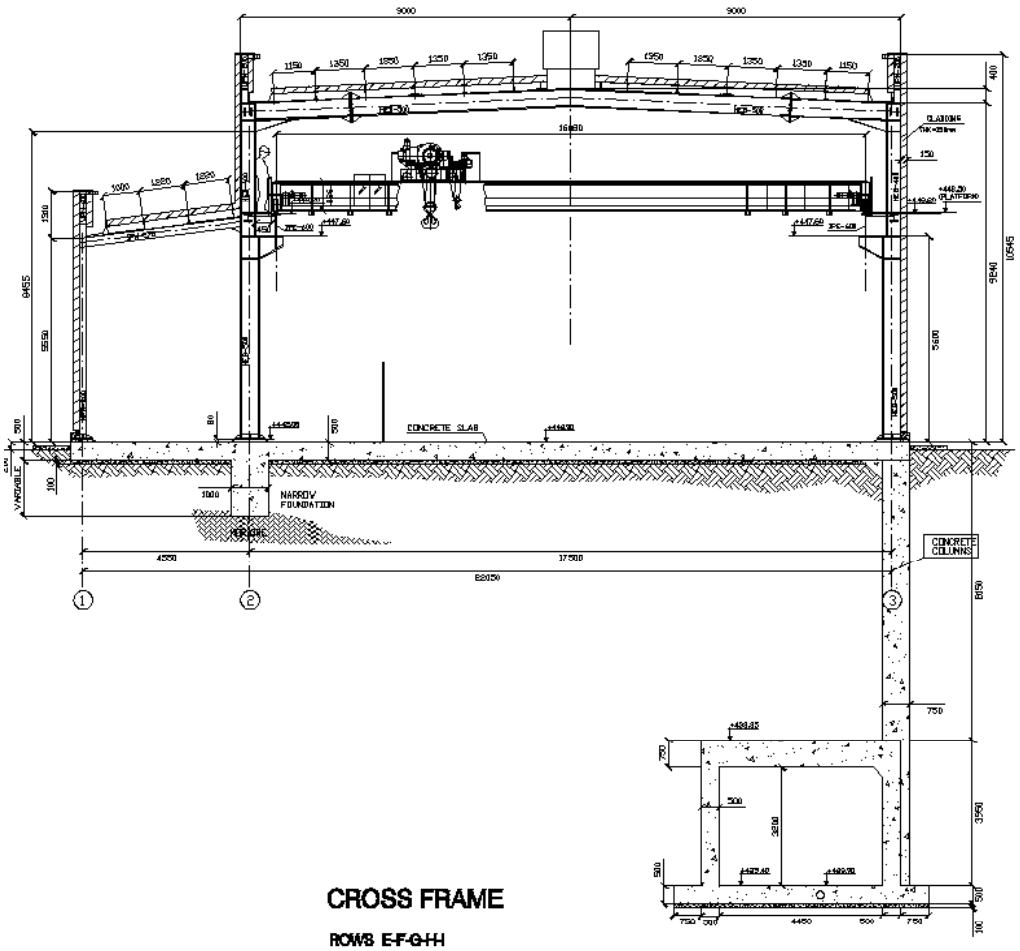


In order to reduce settlements between the buiding and the tunnel, the type of foundation adopted is:

Building slab supported by two alignment of vertical columns and by a longitudinal narrow strip foundation.

2. Civil engineering

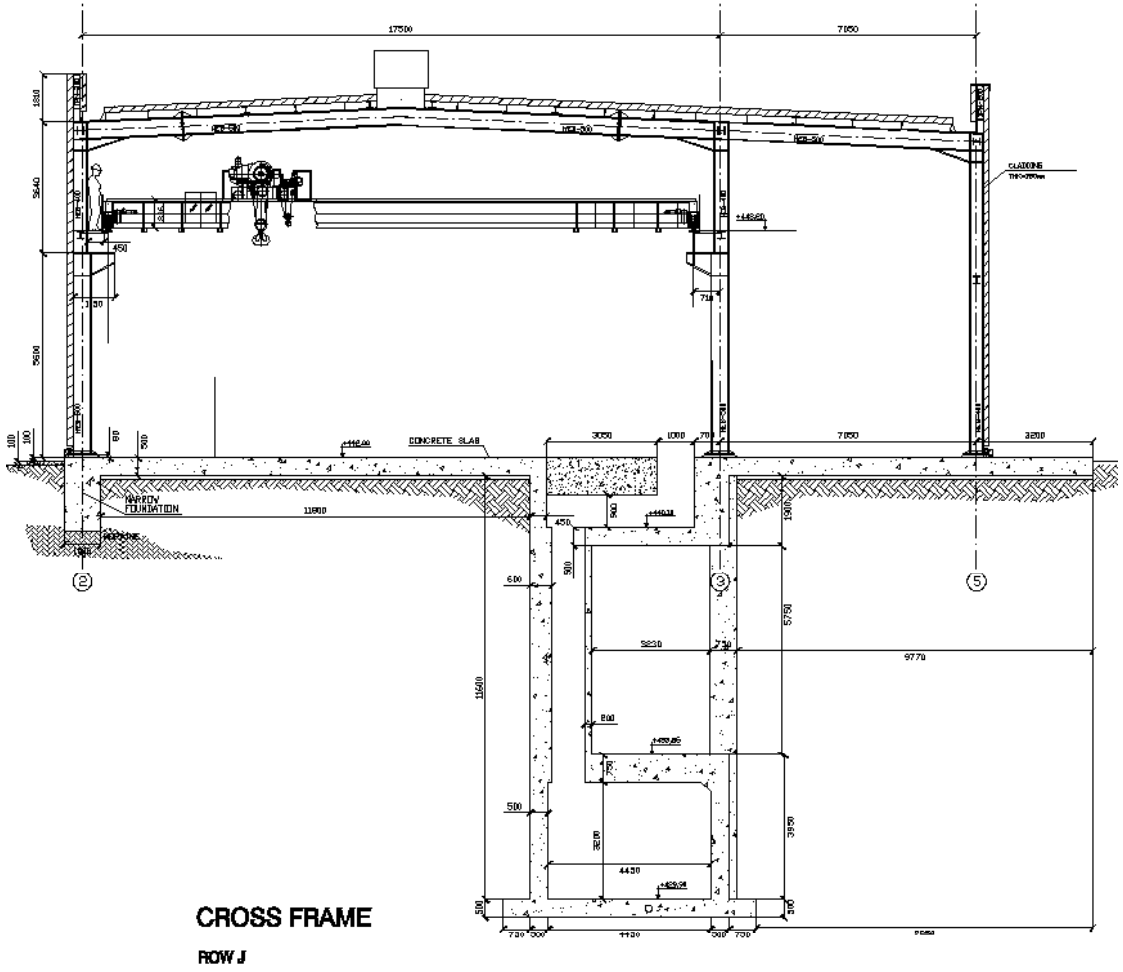
Typical cross section



Typical cross section in the « faraday cage » area

2. Civil engineering

Typical cross section



Typical cross section in the « ventilation room » area

3. Technical services

Ventilation

➢Klystron hall

- Air for the klystron hall supplied through duct network and air displacement grilles
- Slight overpressure to prevent air backflow from the tunnel

➢Access modules

-Access modules kept at a positive overpressure by mechanical supply of pre-treated fresh air

➢Zone Faraday I and zone IV

- AHUs working in recycling mode with a minimum of fresh air to ensure air renewal

➢Safe room and control room

-Considering the layout of the rooms and the uncertainty of the internal loads, the cooling in these areas will be achieved by the means of local post-treatment (fan-coils or split systems)

3. Technical services

Ventilation

➢ Tunnel, Transfer line

In machine mode:

- Flow-rates function of the heat loads in the tunnel.
- Tunnel and transfer line maintained at a lower pressure than the klystron.
- Possibility to work in recycling mode.

In access mode:

-Cross-section air velocity of 0.4 m/s in the tunnel.

-A minimum of pre-treated fresh air supplied to insure a renewal rate of the tunnel air

In Smoke extraction mode:

- When smoke is produced, stop of the ventilation system (supply and extraction) to avoid the risk of damaging filters and spreading activated smoke to the environment.
- Possibility to manually command the extraction of smoke. The extracted air is directly released to the atmosphere without filtration.
- The impact on the environment in case of smoke extraction (due to the possible activation of the smoke) will have to be evaluated by SC prior to deciding if the fire-brigade can start the unfiltered extraction of smoke.

3. Technical services

Cooling

FED49 will be used solely for the cooling of the Linac4 and Linac2 machines. Non Linac2-4 loads to be transferred to station ED-51 which will be refurbished.

Alternative solutions are being studied to minimize the modification of the existing demineralised water cooling stations.

Dedicated station foreseen for the cooling of the RFQ (demineralised water with an adjustable set point and an accurate temperature control (±0.2 K).

3. Technical services

Electricity

Three main sources will be used to distribute power to the LINAC 4 Complex:

Source nr 1, coming from ME*23 Electrical Substation, will be an 18 kV circuit breaker feeding a 2 MVA transformer for the TS/CV equipment. All equipment fed by source nr 1 will be installed by TS/CV.

Source nr 2, coming from ME*23 Electrical Substation, will be an 18 kV circuit breaker supplying a 2 MVA transformer, dedicated to feed the general distribution for LINAC 4. The source 2 will feed the general services, AB/PO equipments, AB/RF equipments, and UPS systems.

Source nr 3, coming from ME*23 Electrical Substation, will be a 630 Amps circuit breaker supplying a ESD switchboard. It will be dedicated for the electrical supply of safety systems used for the LINAC 4. The equipment fed by source nr 3 will include switchboards feeding safety systems (lighting, fire detection, etc…) and 48 V DC distribution.

3. Technical services

Other services

Handling and lifting Equipment:

Overhead traveling crane 10 tons

Two hoist for RFQ (1.5t) and for Transfer line (2t)

A 1 ton capacity personal and material lift in the low energy access structure

Transport & handling personnel for general services, machine and shielding installation

Access control, safety, interlocks

Access safety and control system

Automatic fire detection

Audible emergency evacuation system

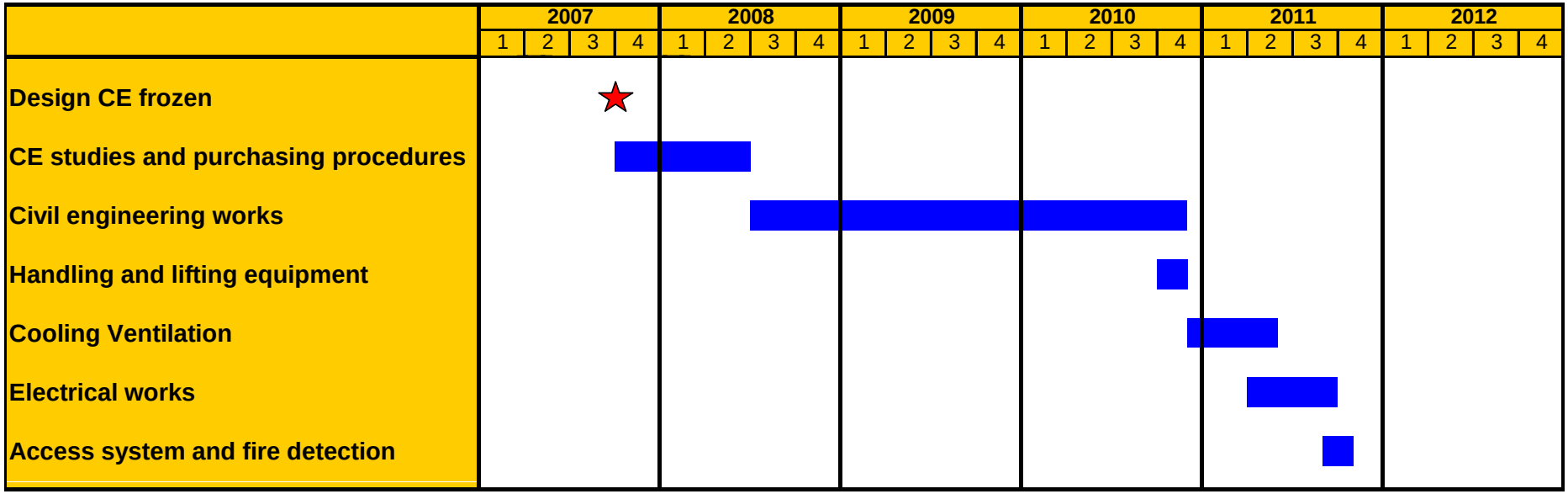
Survey

Geodetic reference network along Linac 4 to be established

Marking out and control measurements of installed infrastructure

4. TS schedule

TS PROVISIONAL PLANNING FOR LINAC 4



NOTA: Linac level = 429.9 m

A.Lopez 8/10/07

4. TS schedule

Civil engineering schedule

PLANNING GENIE CIVIL LINAC 4

ID	Nom de la tâche	Duration
1		
2	GENIE CIVIL	585 days
3	Installations de chantier, demolition reservoir et excavation de remblais	50 days
4	Excavation Linac & ligne de transfert en moraine	45 days
5	Excavation Linac & ligne de transfert en molasse (yc béton projeté et boulons)	95 days
6	Betonnage Linac et puits	110 days
7	Pose guides d'ondes et remblayage	90 days
8	Bétonnage ligne de transfert et remblayage	40 days
9	Bâtiment de surface	220 days
10	Aménagements extérieurs	40 days

5. TS Cost estimate October 2007

Civil engineering	**20,605,000**	**Kchf**
Heavy handling&transport	**816,000**	**Kchf**
Electricity	**3,150,300**	**Kchf**
Cooling/Ventilation	**4,893,000**	**Kchf**
Monitoring&Access	**380,000**	**Kchf**
Survey	**744,000**	**Kchf**
Total	**30,588,300**	**Kchf**
Contingency 15%	**4,588,245**	**Kchf**
GLOBAL TS	**35,176,545**	

Note: TS-MME not included (RFQ, design office, etc)

6. Status in January 2008

- Design for civil engineering frozen in January 2008 (following approval campaign launched on 21.12.2007)
- Design not yet fully approved by the Safety Commission
- Civil engineering market survey sent to firms in December 2007
- Civil engineering invitation to tender to be sent to firms in March 2008 (preliminary studies finished, tender documents on going)
- Adjudication foreseen in Finance Committee of June 2008 (or September 2008, taking into account present delays of the design)
- Start of civil engineering works in August 2008 (or October 2008!)
- Continuation of the studies and « integration » for linac 4 equipment and TS services during 2008