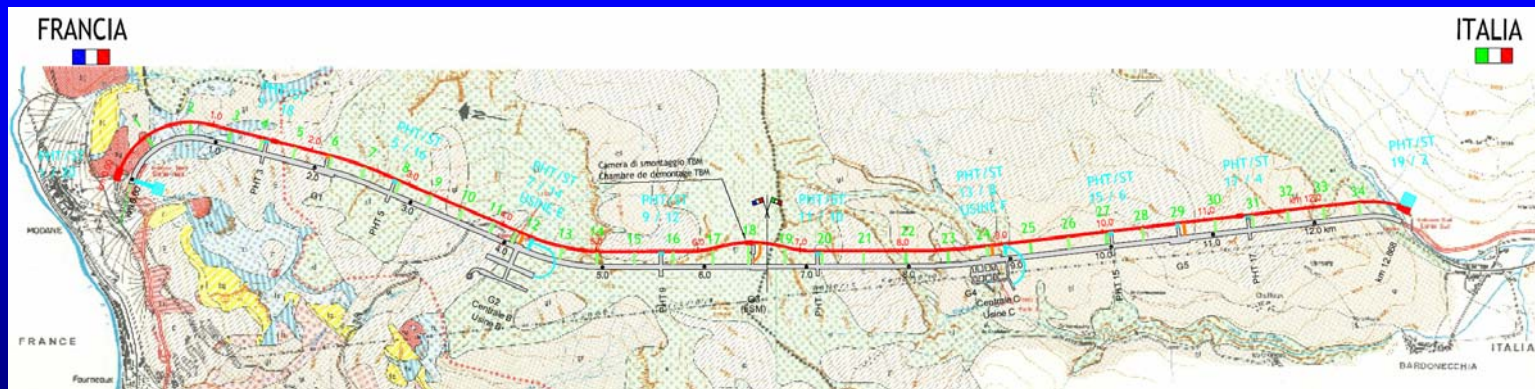


ILIAS-N2/LAGUNA technical meeting on laboratory expansions

*Technical aspects of the 50 000 m³ extension of
the LSM laboratory*

Paris 19.12.2006



M. Russo

The area of the project

- Actual acces to LSM from tunnel (garage 3 -> traffic interruption)
- Hall (10x10x30)+Hall "Germanium"
- Air, Water (clean and dirty), Radio, communications, electricity via tunnel

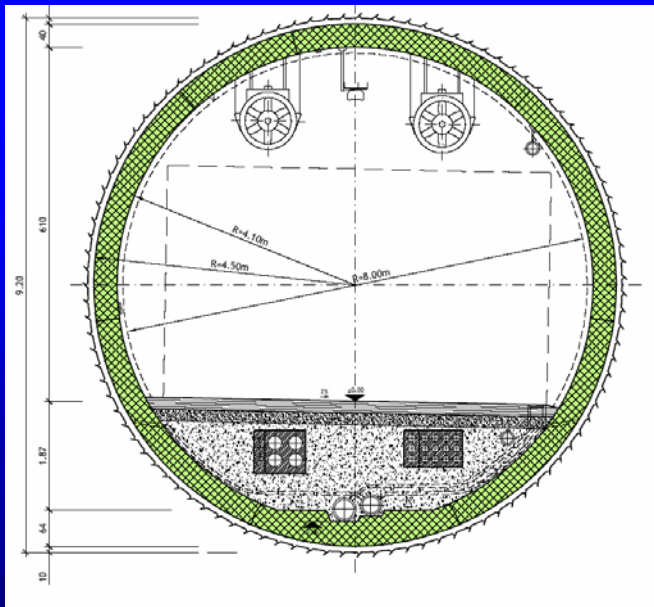


The On-Going Safety Tunnel Project

Frejus safety tunnel project:

Aims to raise safety level of Fréjus Motorway tunnel by (Governments requirements):

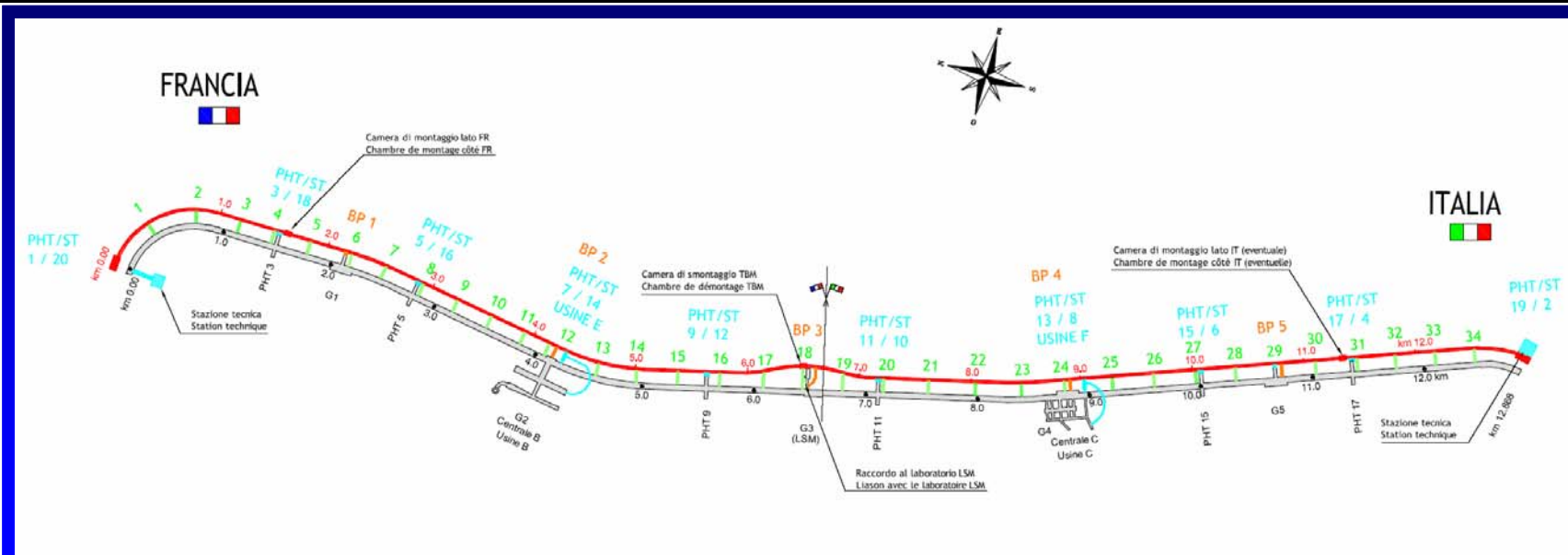
- Adding 34 new shelters (every max 400 m) for auto-rescue of users;
- Provide a safe issue for fire brigades for rescue purposes;
- Provide an alternative issue to attack and manage fires and accidents in tunnel;
- Provide new rooms for technical equipment renewals;
- Accede to LSM without interfering with tunnel operation;
- Possibility of maintenance of tunnel equipments not affecting Tunnel operation;
- Provide fast access in case of accident.



Frejus safety tunnel project 2006 (approved by Governments on 11.12.06):

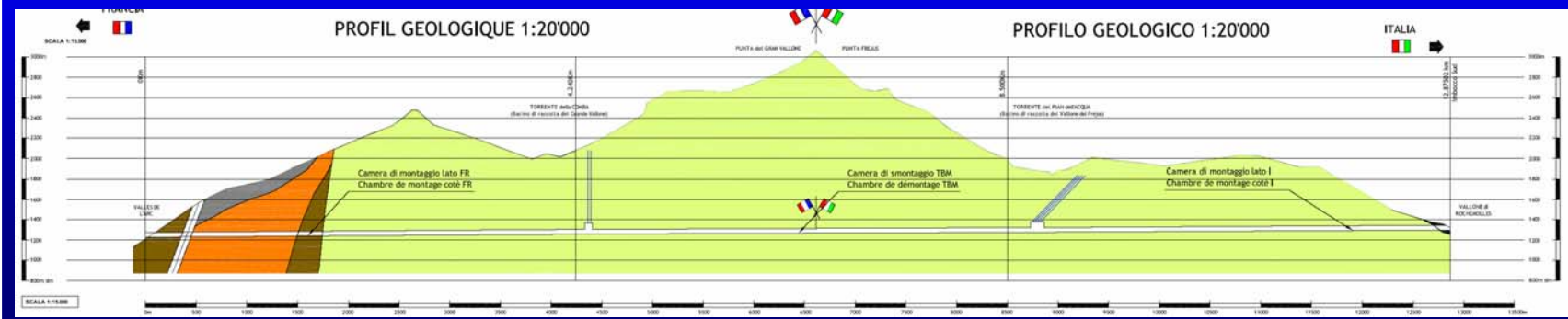
- Internal safety tunnel diameter 8.00 m
(clearance profile 6.6x4.0m)
- Tunnels distance: 50 m
- 34 shelters in cross adits
- 8 technical rooms (ST)
- 5 carriage cross-adits (bypass)
- Longitudinal ventilation of safety tunnel
- 2 underground ventilation plants

Plan view and profile (safety tunnel)

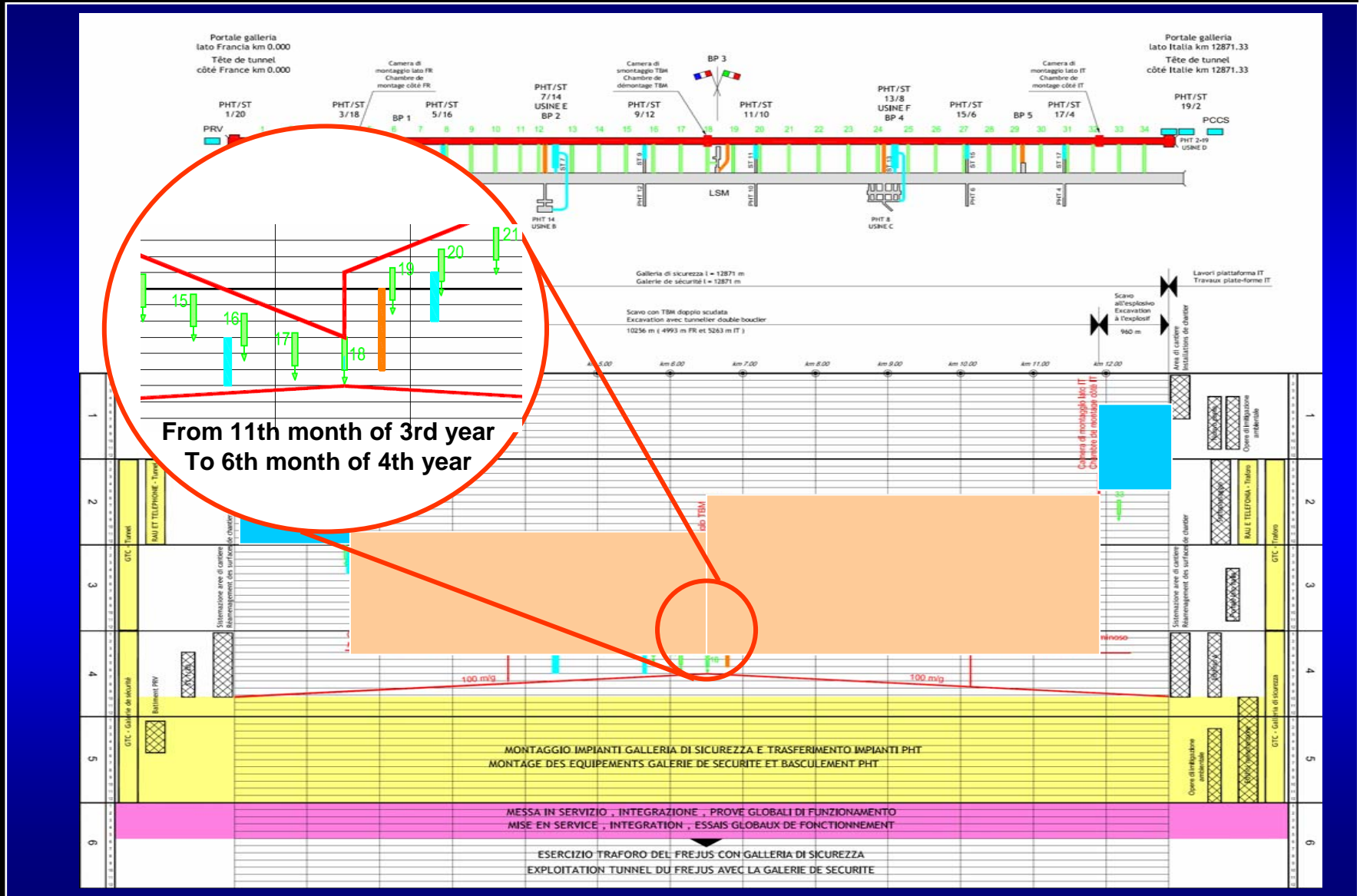


Safety to motorway tunnel distance: 50 m
Becomes 80 m in correspondence to LSM

Dist. shelters: av.370 m, max 420 m
Dist. ST: av.1430m, max 1800 m
Dist. by-pass: av.2145, max 2350m



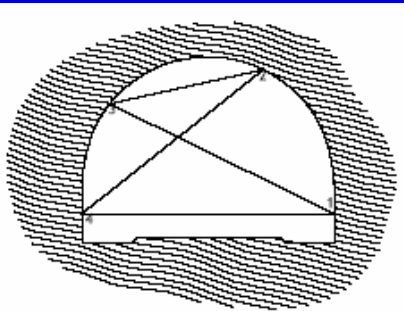
Planning of Safety Tunnel construction



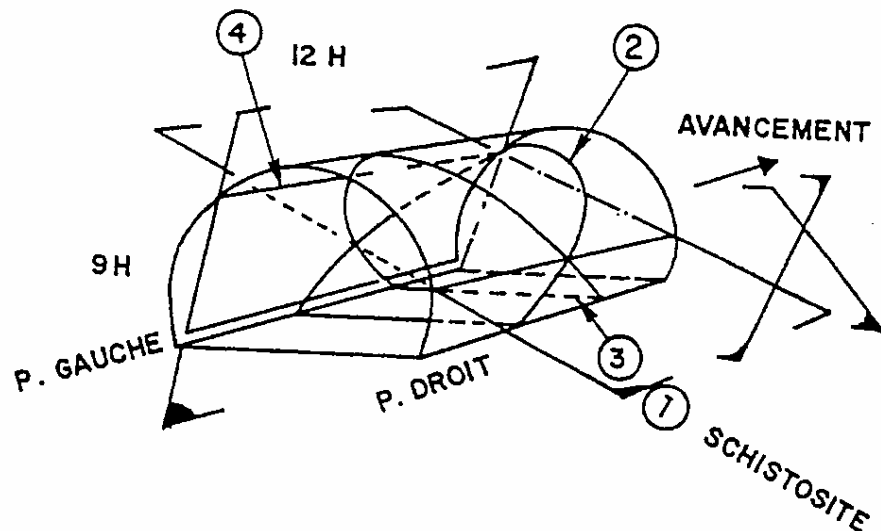
LSM Requirements and considerations

Future experiences (from 2011): large detectors (Hall A) or extremely low background environment (Hall B)

- 2 New Halls
- Total approximate volume 55'000 m³
- Hall A approximately 30'000 m³ (20x15x100 m or vault Ø40xh40)
- Hall B approximately 12'000 m³ (15x15x50 m) - Isolated from rock



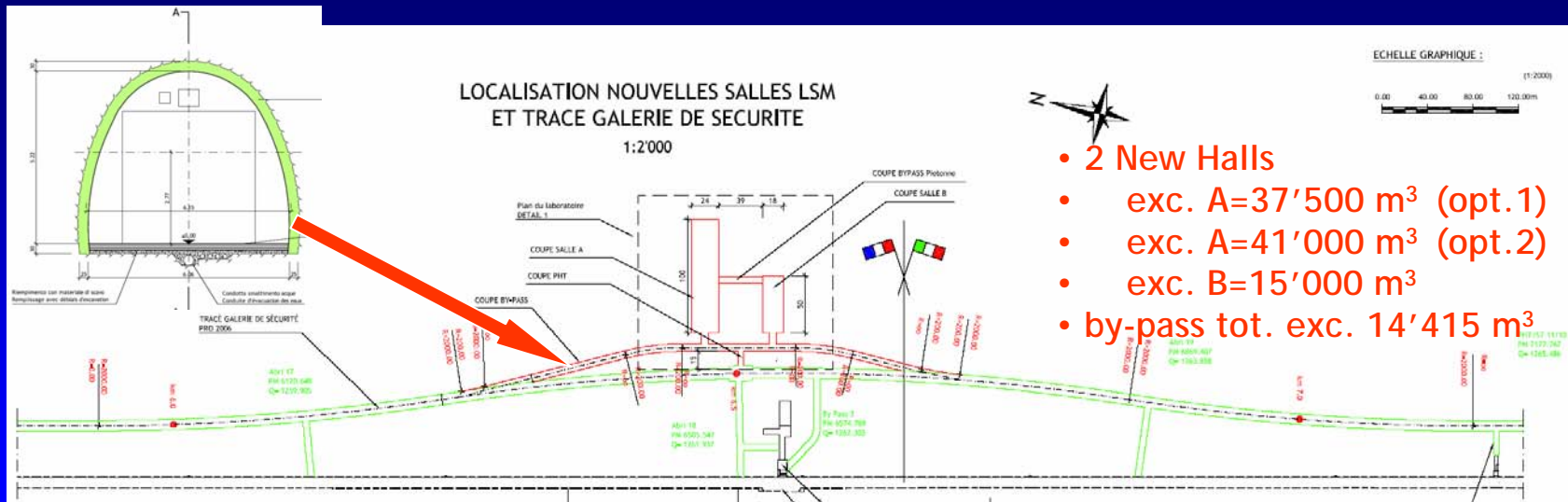
Geology



- Geology: Calcitic Schists
UCS (30-80 MPa)
- Overburden: about 1900 m
- Fractures 4 main systems
- Excavation profitable
orthogonally to actual Tunnel (ENE)
- Very little seepage (cracks filled)



Foreseen new laboratory rooms

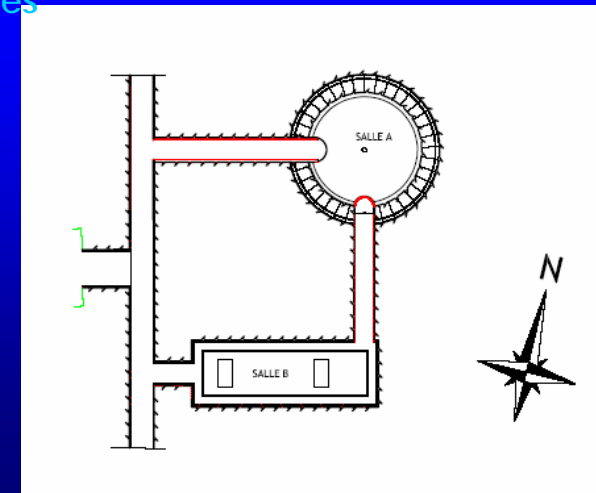
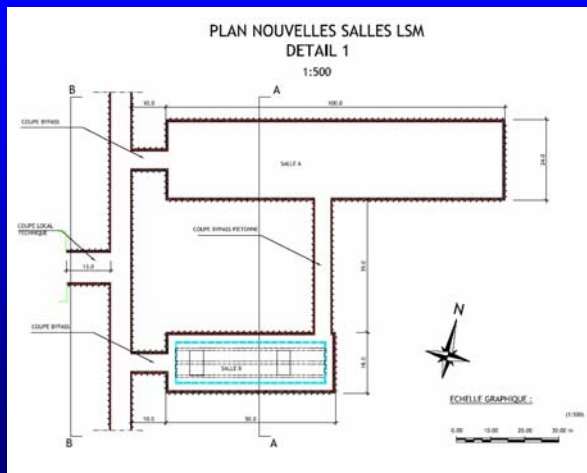


- 2 New Halls
- exc. A=37'500 m³ (opt.1)
- exc. A=41'000 m³ (opt.2)
- exc. B=15'000 m³
- by-pass tot. exc. 14'415 m³

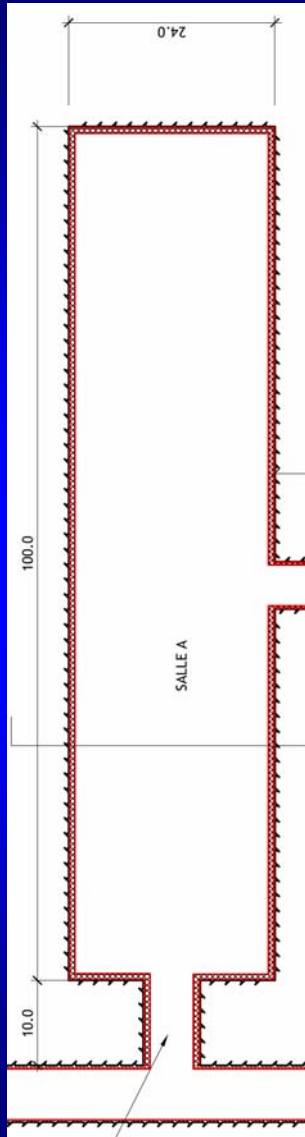
OPTION 1

- Alignment of Safety Tunnel kept
- No interruptions of LSM activities
- Flexibility for future upgrades
- Favourable orientation
- Major costs (bypass etc..)

OPTION 2

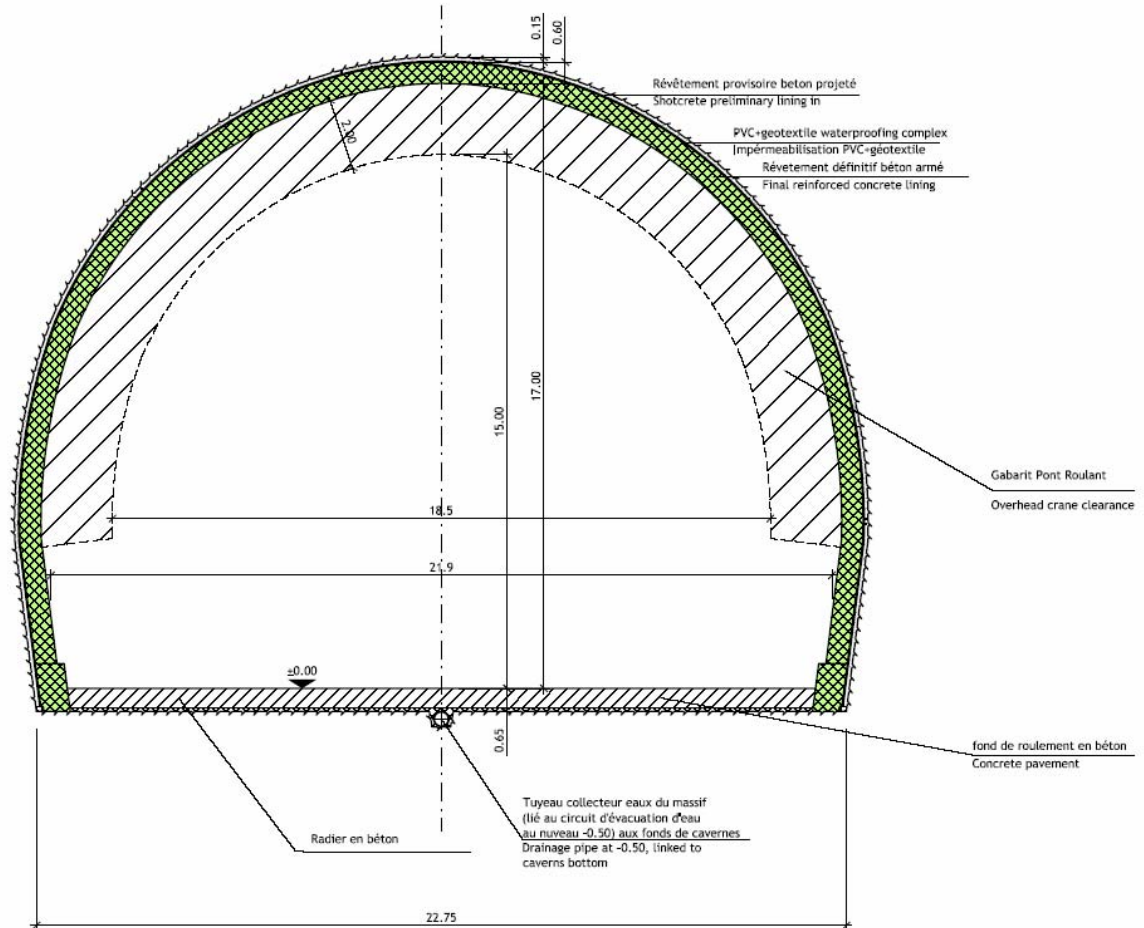


Hall A - Option 1

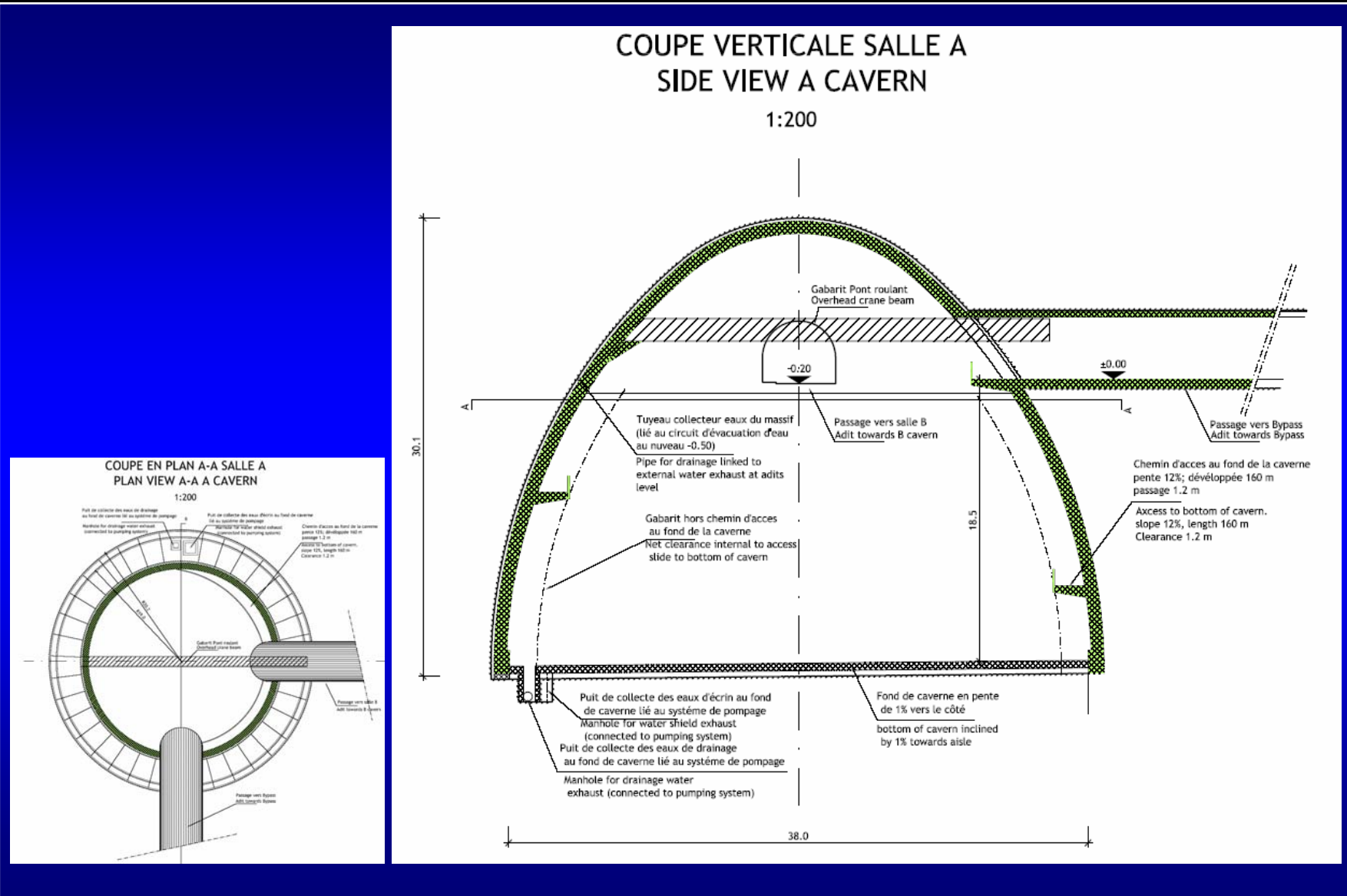


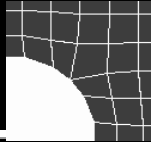
COUPE TYPE SALLE A
SECTION EXCAVÉE 375 m²
SECTION UTILE 320 m²
1:100

CAVERN A CROSS SECTION
EXCAVATED AREA 375 m²
INTERNAL CLEARANCE 320 m²
1:100

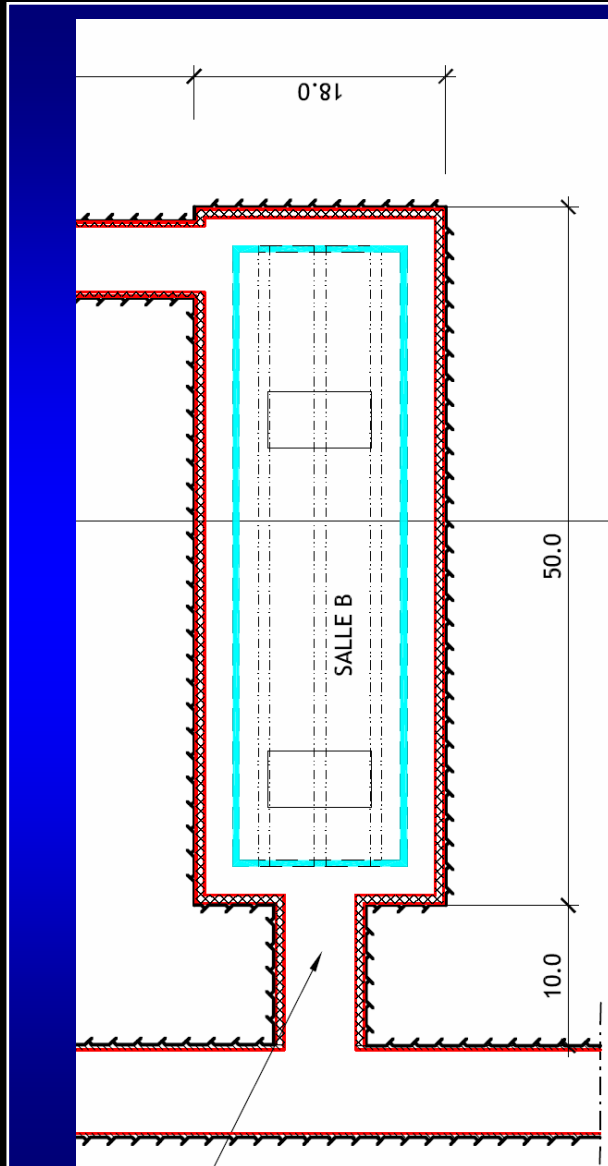


Hall A – Option 2





Hall B

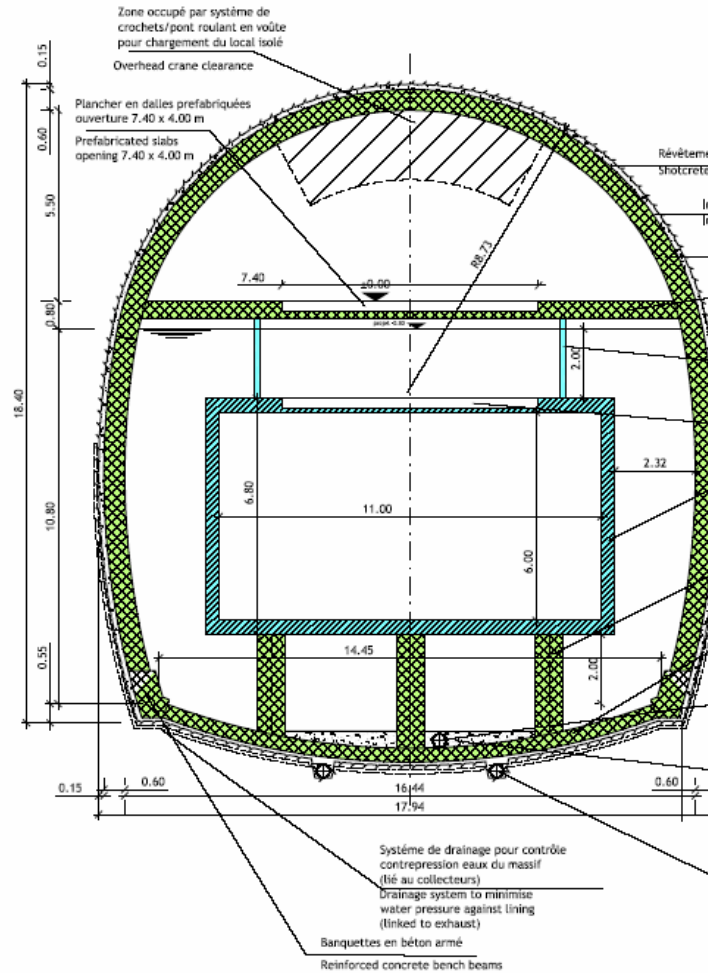


COUPE TYPE SALLE B

SECTION EXCAVÉE 300 m²

SECTION UTILE 255 m²

1:100



B CAVERN CROSS SECTION

EXCAVATED AREA 300 m²

INTERNAL CLEARANCE 255 m²

1:100

Révetement provisoire béton projeté
Shotcrete preliminary lining in

Imperméabilisation PVC-géotextile
Impermeabilisation PVC-geotextile

Révetement définitif béton armé
Final reinforced concrete lining

Plancher en béton armé
Reinforced concrete slab

Accès au local isolé pouvant être
noyé lors du déroulement des expériences
Shielded lab entrance that can be filled with
water when experiences are under development

Portail d'accès au local isolé en acier
respectant spécifications INZP3
Access as specifications INZP3

Local isolé parois en acier
respectant spécifications INZP3
Radiation shielded room
as by INZP3 specifications

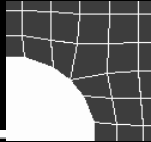
Poteaux d'ancrage du local isolé
continus sur les 48 m
Barres ancrées dans le rocher
Continuous pillars on 48 m
Anchoring bars in rock

Fond de caverne en
contrevoûte armée
Invert at cavern bottom

Tuyau en acier inox
pour vidange eau filtre (pompe)
Inox steel pipe to exhaust filtered water

Béton de remplissage
et régularisation
Lean concrete

Tuyau collecteur pour contrôle
contrepression eaux du massif
(lié au circuit d'évacuation d'eau
au niveau -0.50) aux fonds de cavernes
Drainage pipe at -0.50, linked to
exhaust



Technical rooms

COUPE TYPE LOCAL TECHNIQUE

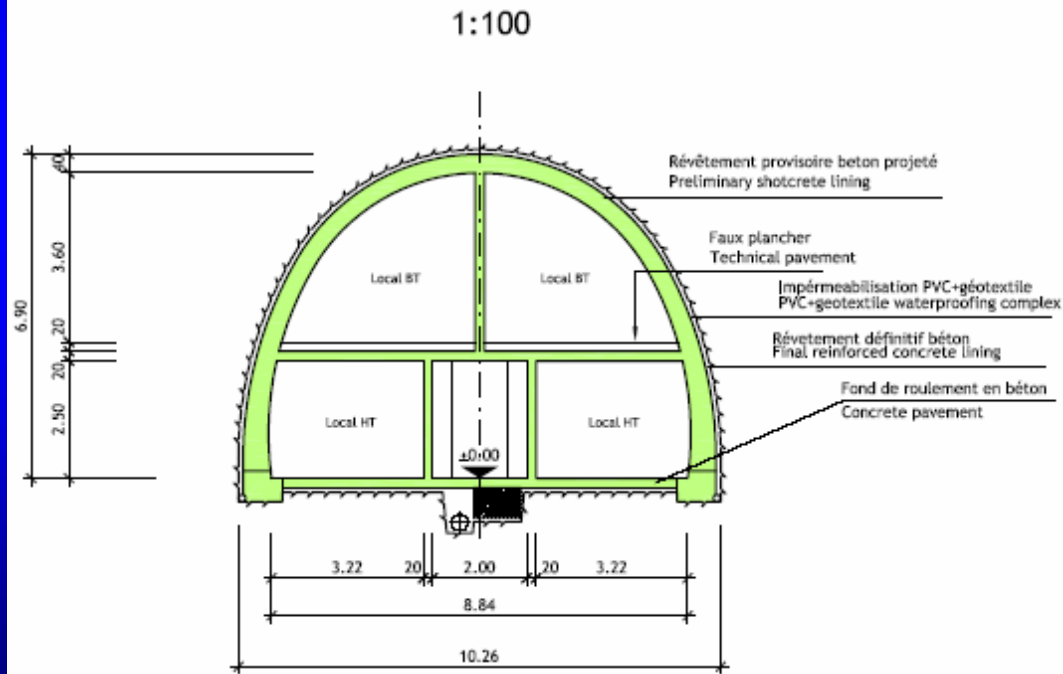
SECTION EXCAVÉE 62 m²

SECTION UTILE 43 m²

TECHNICAL ROOM

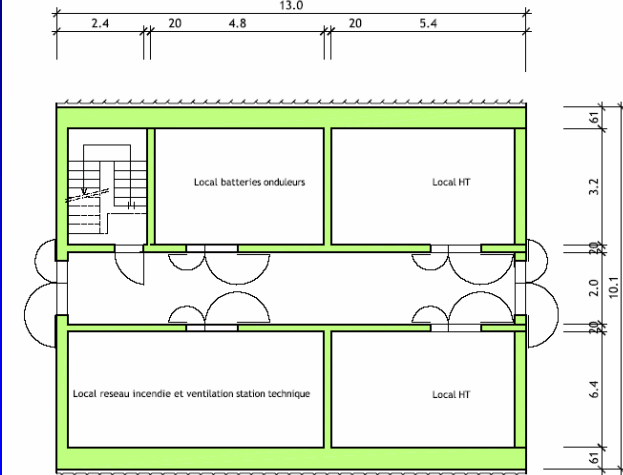
EXCAVATED X-SECTION 62 m²

INTERNAL CLEARANCE 43 m²



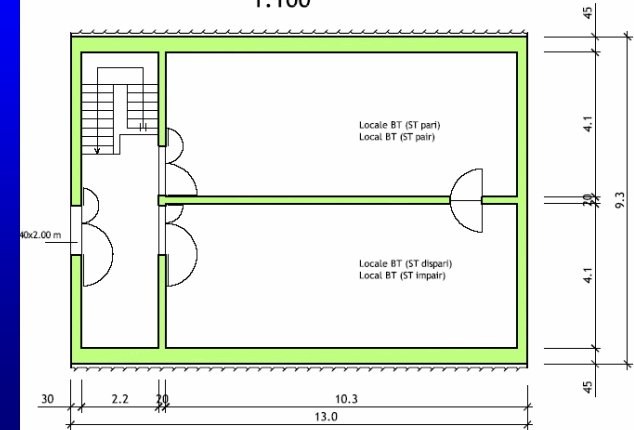
REZ DE CHAUSSEE

1:100

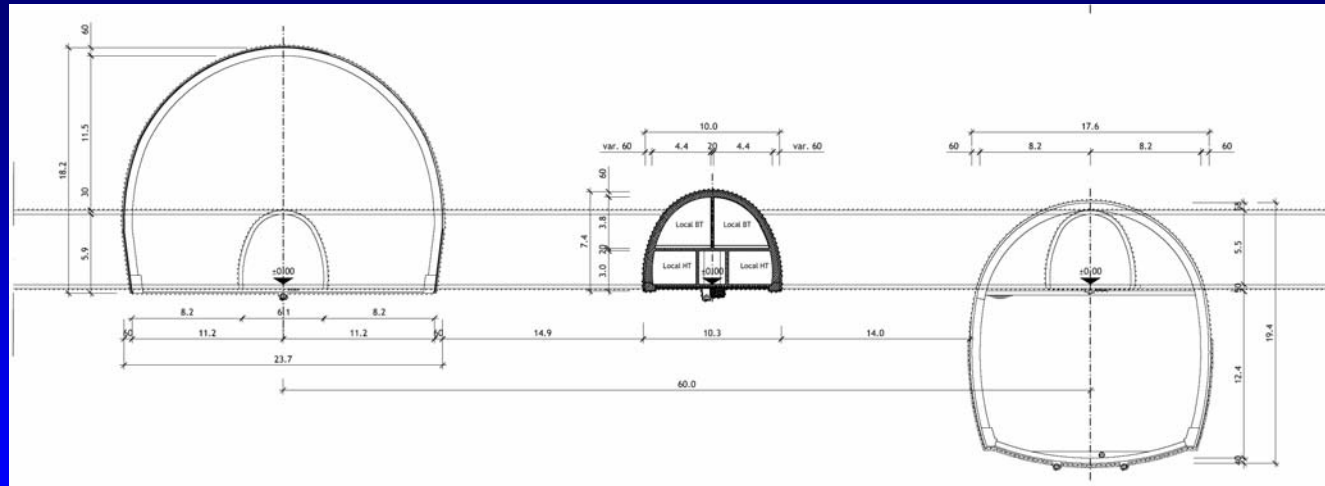


1ER ETAGE

1:100

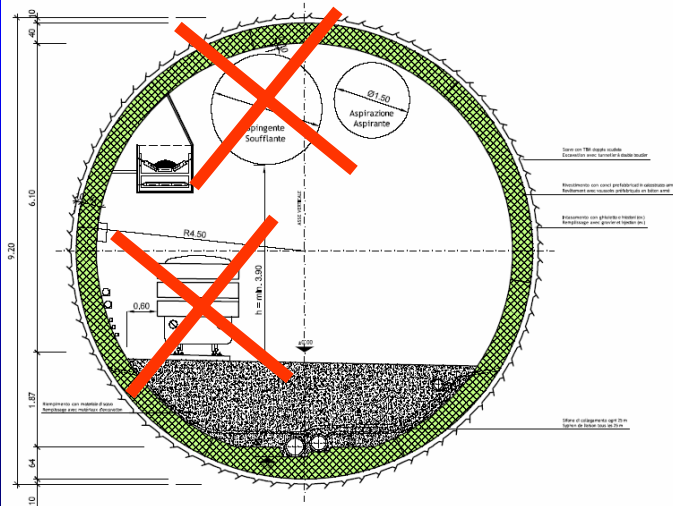


Construction and arrangement



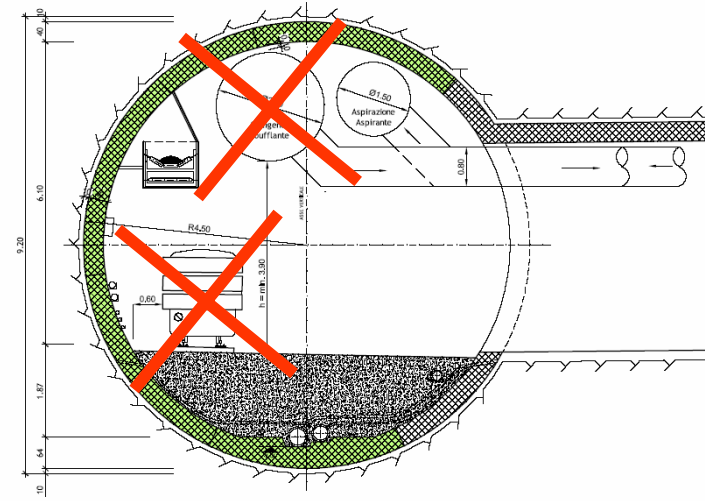
GALLERIA DI SICUREZZA - FASE CANTIERE
SEZIONE TIPO 1:50

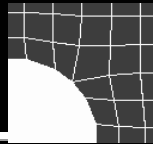
GALERIE DE SECURITE - PHASE CHANTIER
COUPE TYPE 1:50



GALLERIA DI SICUREZZA
SEZIONE INNESTO RIFUGIO
1:50

GALERIE DE SECURITE
COUPE JONCTION ABR1 1:50



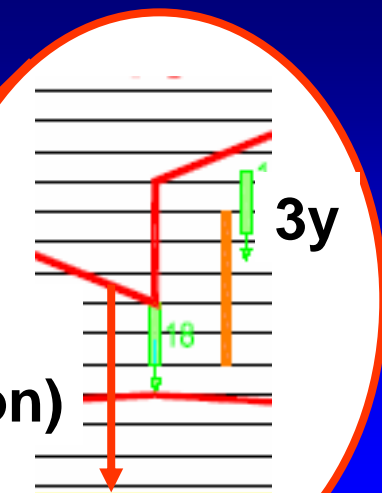
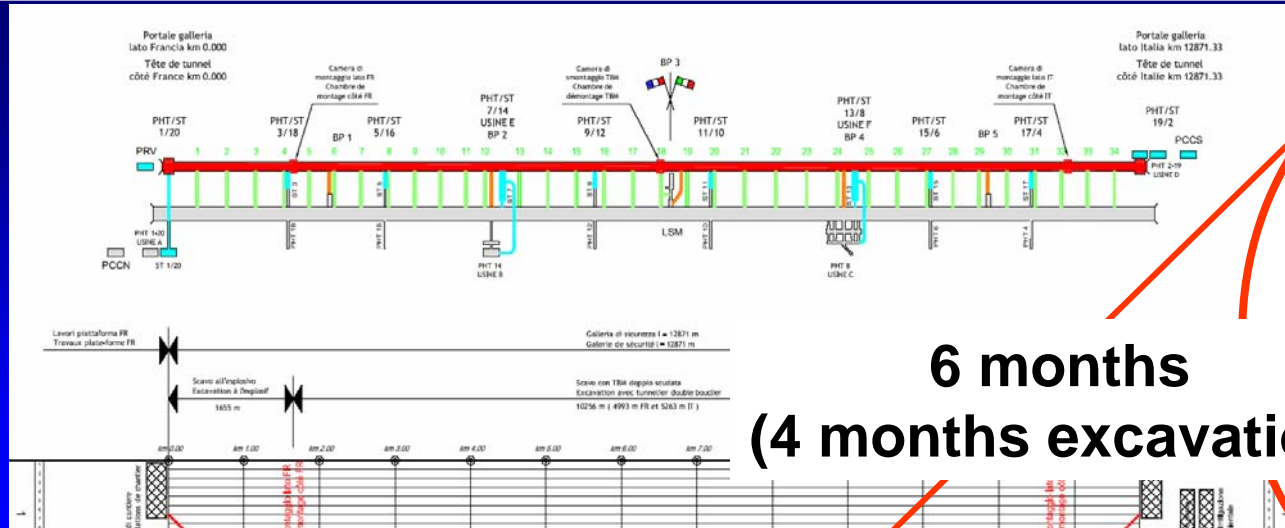


Equipments

- Ventilation:** New duct Ø1200 from underground B Powerhouse (P.K. 4+500)
- Air Conditioning:** Actually exchanges air-air future air-water 600 kW
- Electric supply:** Electric transformer 1600 kVA
- Lighting:** Av. 40 lux everywhere reinforced in few zones to 150 lux
- Communications:** Switch Gigabit with link to central management of safety tunnel
- Firefight/detect.:** By Safety Tunnel system and local detectors of smoke/temp.
- Doors/access:** By double door air-lock chambers
- Radio:** As in tunnel but can be switched on manually
- Telephone:** New PBX with VoIP as for safety tunnel

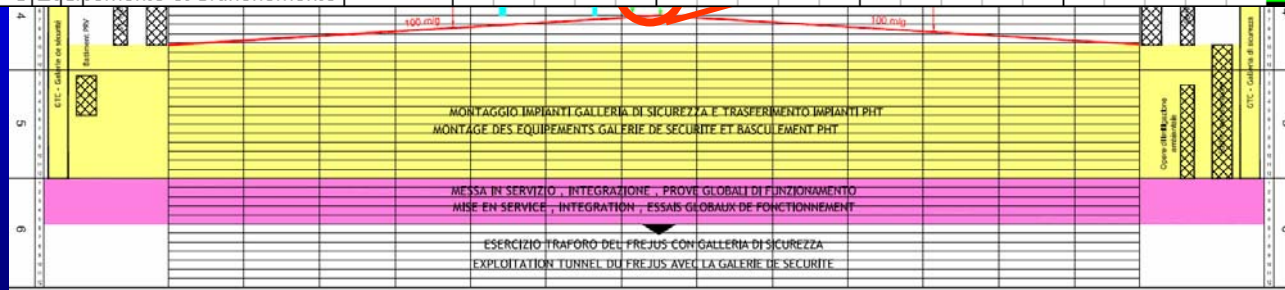
	Actually	Future
Volume of the laboratory	3'500 m3	30'000 m3 + 12'000 m3
Electrical Supply		
Power:	400 kVA	1'200 kVA
Installed Power:	315 kW	
Used Power:	200 kW	
UPS		60 kVA
Air conditioning and freezing:		
Power supplied	200 kW	600kW
Power absorbed	100 kW	
Ventilation:		
New air volume	6'000 m3/h	30'000 m3/h
Ventilation duct diameter	650 mm	1250 mm
Air speed in duct	5 m/s	8.5 m/s

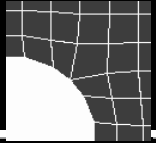
Planning of LSM extension



**6 months
(4 months excavation)**

Mois	Semaine	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30																														
		Activité																														
1	Excavation du bypass	16 sem	█																													
2	Excavation Accés et salle A	11 sem	█							█																						
3	Excavation Accés et salle B	5 sem	█					█																								
4	Excavation local technique	2 sem	█		█																											
5	Excavation bypass piétonne	1 sem	█																													
6	Gros oeuvre et bétonnage	15 sem	█											█																		
7	Installation du local isolé	3 sem	█																													
8	Equipements et branchements		█																													

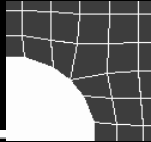




Next steps to proceed

Frejus safety tunnel project link:

- Procedure for linking to safety tunnel project (deadline May 2007)
- Complete design aspects (provide APS and APD or PRO, French procedure)
- Revise administrative authorizations (material to dispose increased 15%)
- Link for contractor's choice (Bid for tunnel of safety foreseen in 2008)
 Important if different construction's methods/engines are required
- 2011 construction of new halls
- 2012 start of foreseen experiments



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