



Access and safety issues

First ULISSE@LSM Workshop

30th of June 2008 Michel ZAMPAOLO, LSM technical manager



Content

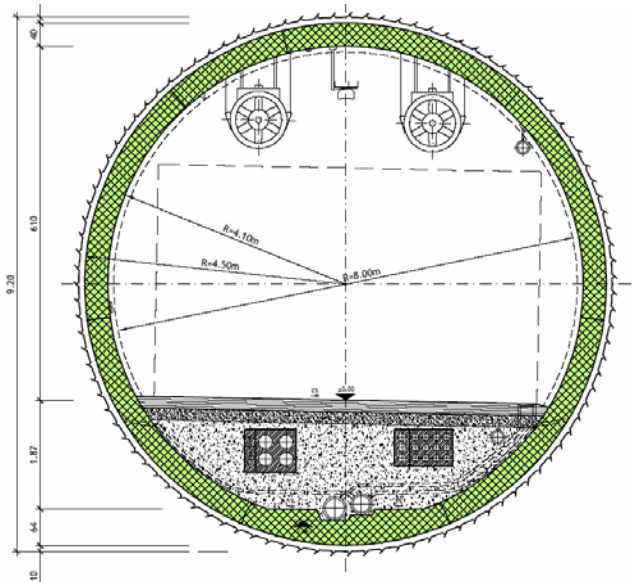
- What is the safety tunnel
- What could be the new laboratory
- Geological risks
- Joint operation with the tunnel
- Traffic risk assessment
- Access to the laboratory
- Management of risk coming from experiments

THE ON-GOING SAFETY TUNNEL PROJECT

Frejus safety tunnel project (safety tunnel to road tunnel):

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

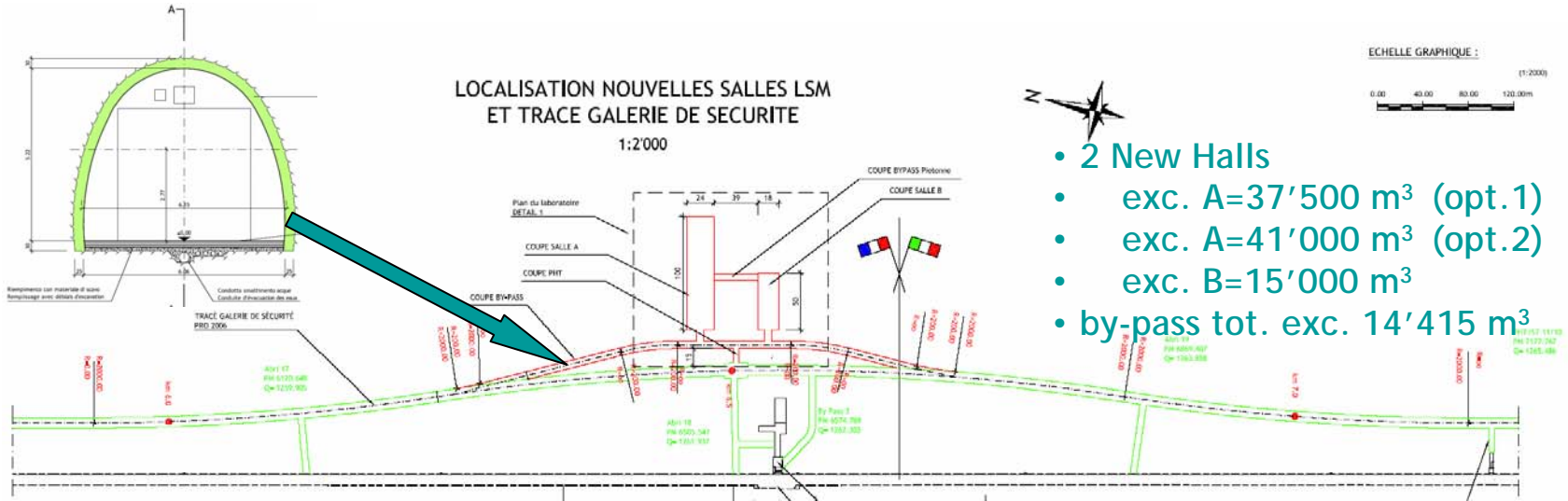
- Adding 34 new shelters (every max 400 m) for auto-rescue of users;
- Provide a safe issue for fire brigades for rescue purposes;
- Provide an alternative issue to attack and manage fires and accidents in tunnel;
- Provide new rooms for technical equipment renewals;
- Possibility of maintenance of tunnel 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)
- 5 carriage cross-adits (bypass)
- Longitudinal ventilation of safety tunnel
- 2 underground ventilation plants
- Portals energy supply up to 8 MW on each side

NEW LABORATORY ROOMS (60000 M3)

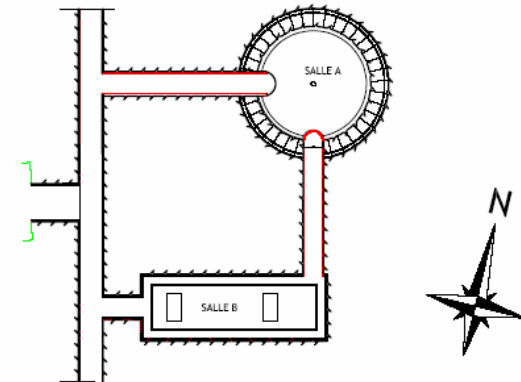
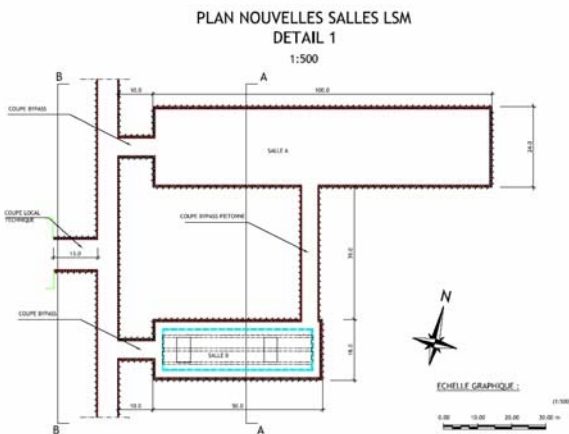


- 2 New Halls
- exc. A=37'500 m³ (opt.1)
- exc. A=41'000 m³ (opt.2)
- exc. B=15'000 m³
- by-pass tot. exc. 14'415 m³

OPTION 1

- Safety Tunnel not modified
- No interruptions of LSM activities
- Flexibility for future upgrades
- Favourable orientation
- Excavated volume may be accommodated at the Safety Tunnel Deposit (F side)

OPTION 2



THE MAIN UNDERGROUND PROJECTS IN AREA

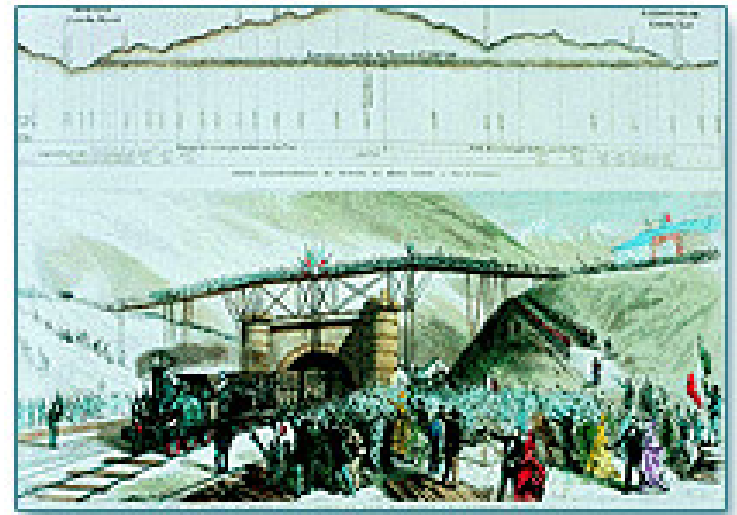
Historical tunnelling in the area since 1480 (Pertuis di Visio)

...existing Fréjus Railway tunnel (1857-1871) 12.2 km ...

...existing Fréjus Motorway tunnel (1975 -1978) , 12.8 km...

...Fréjus Road Tunnel safety tunnel, 12.8 km...

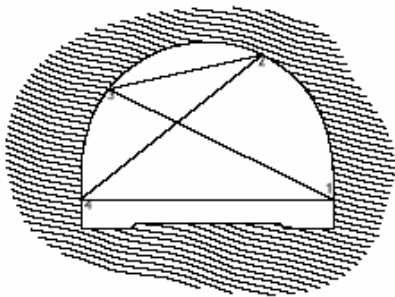
...Lyon-Turin Railway base tunnel, ~57 km



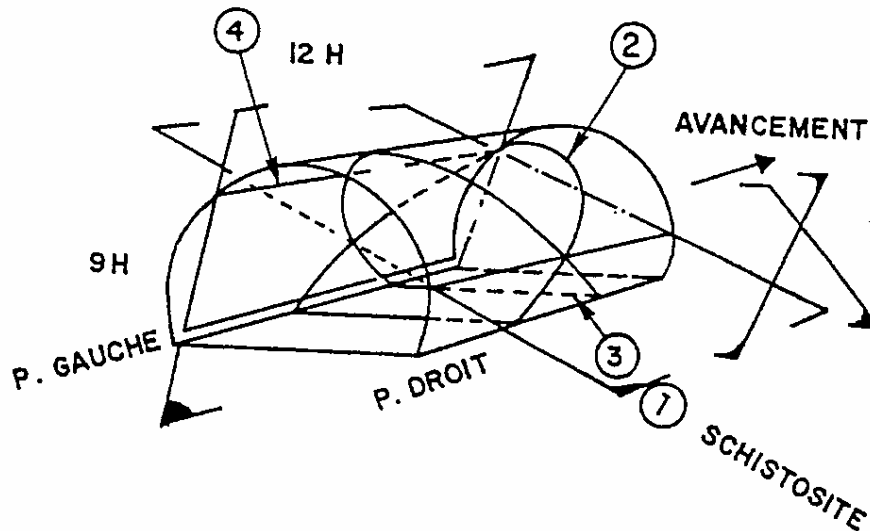
GEOTECHNICS AND EXCAVATION RESULTS

- Geology: Calcitic Schists UCS (30-80 MPa)
- Overburden: about 1800 m
- Fractures 4 main systems
- Excavation profitable orthogonally to actual Tunnel (ENE)
- Very little seepage (cracks filled)

Rock temperature around 30°



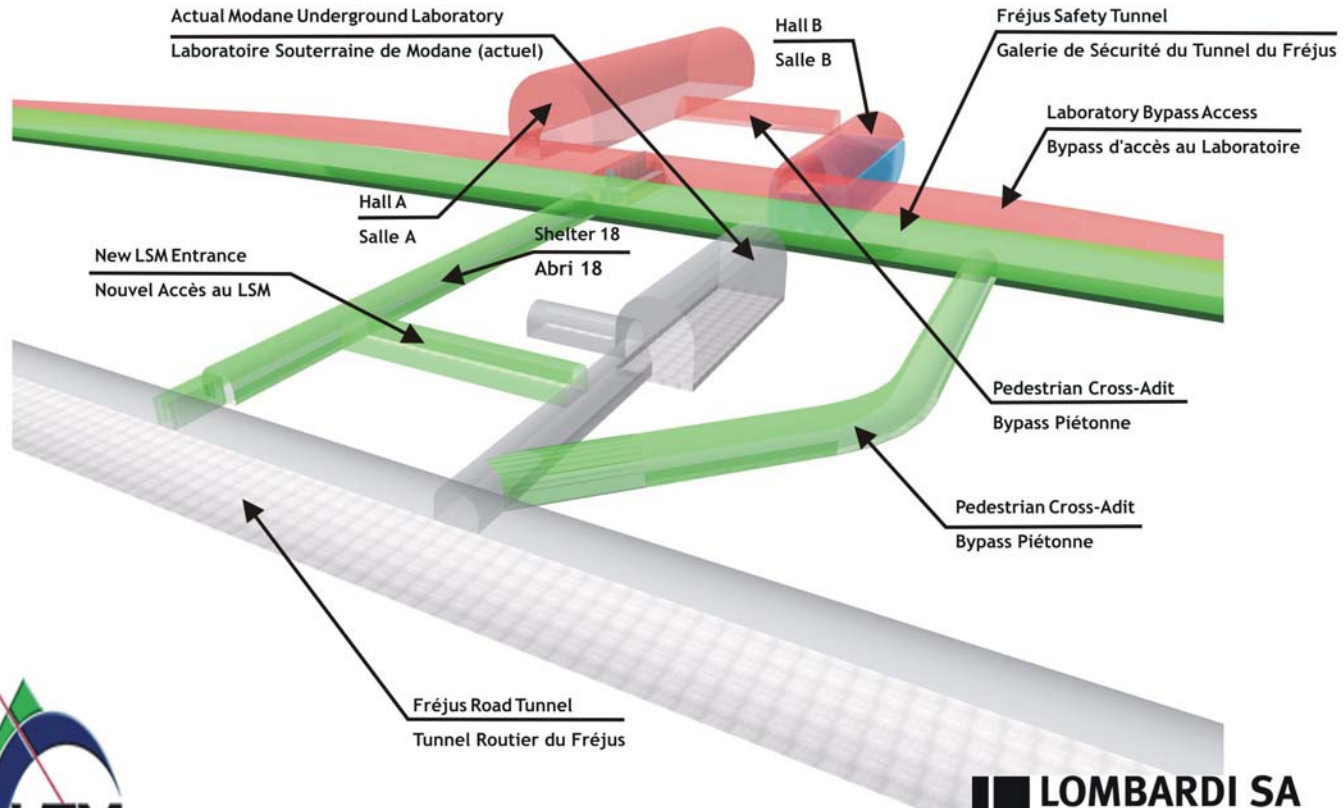
Geology



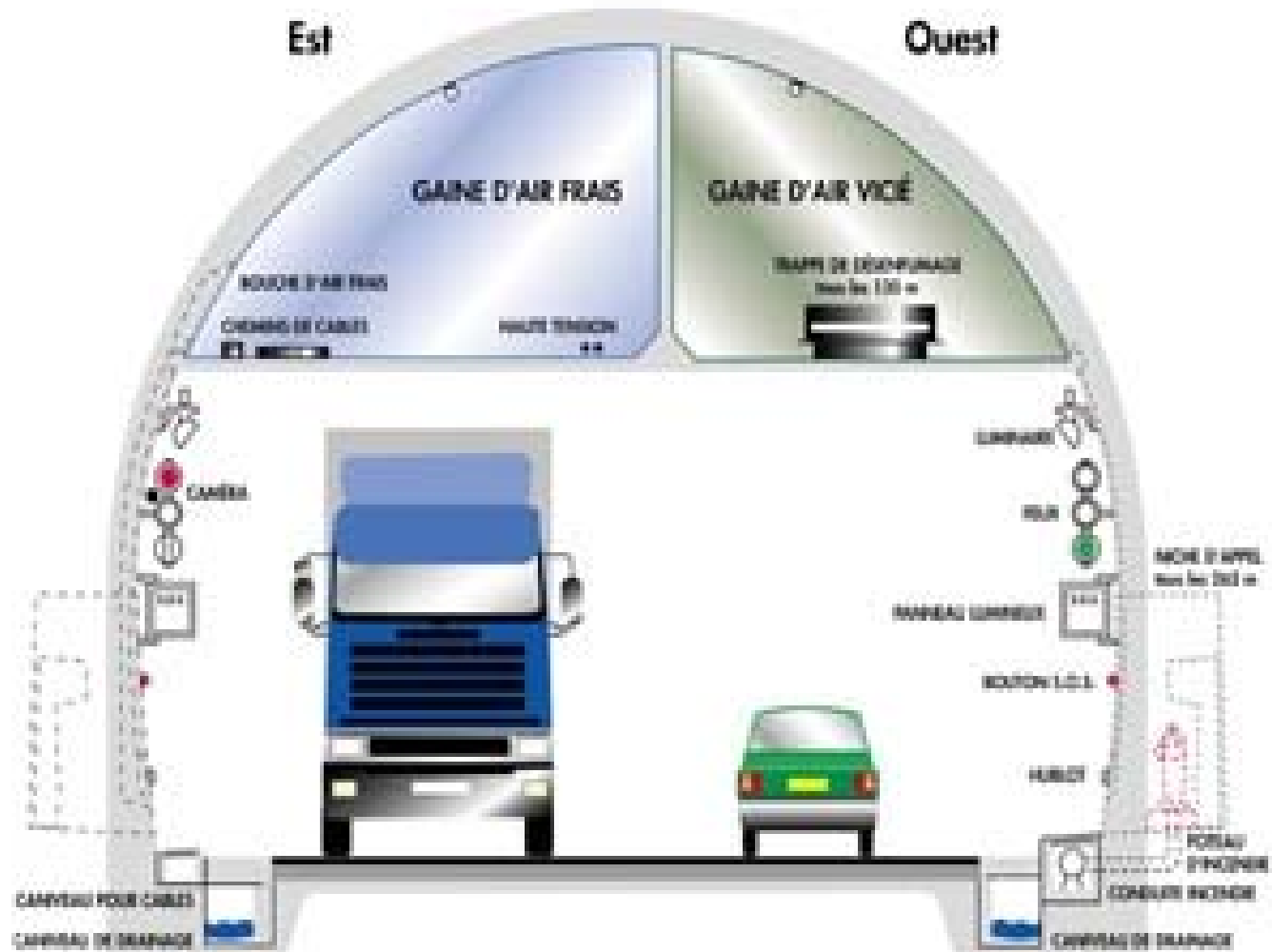
SAFETY TUNNEL AND EXTENSION

MODANE UNDERGROUND LABORATORY 60'000 m³ EXTENSION

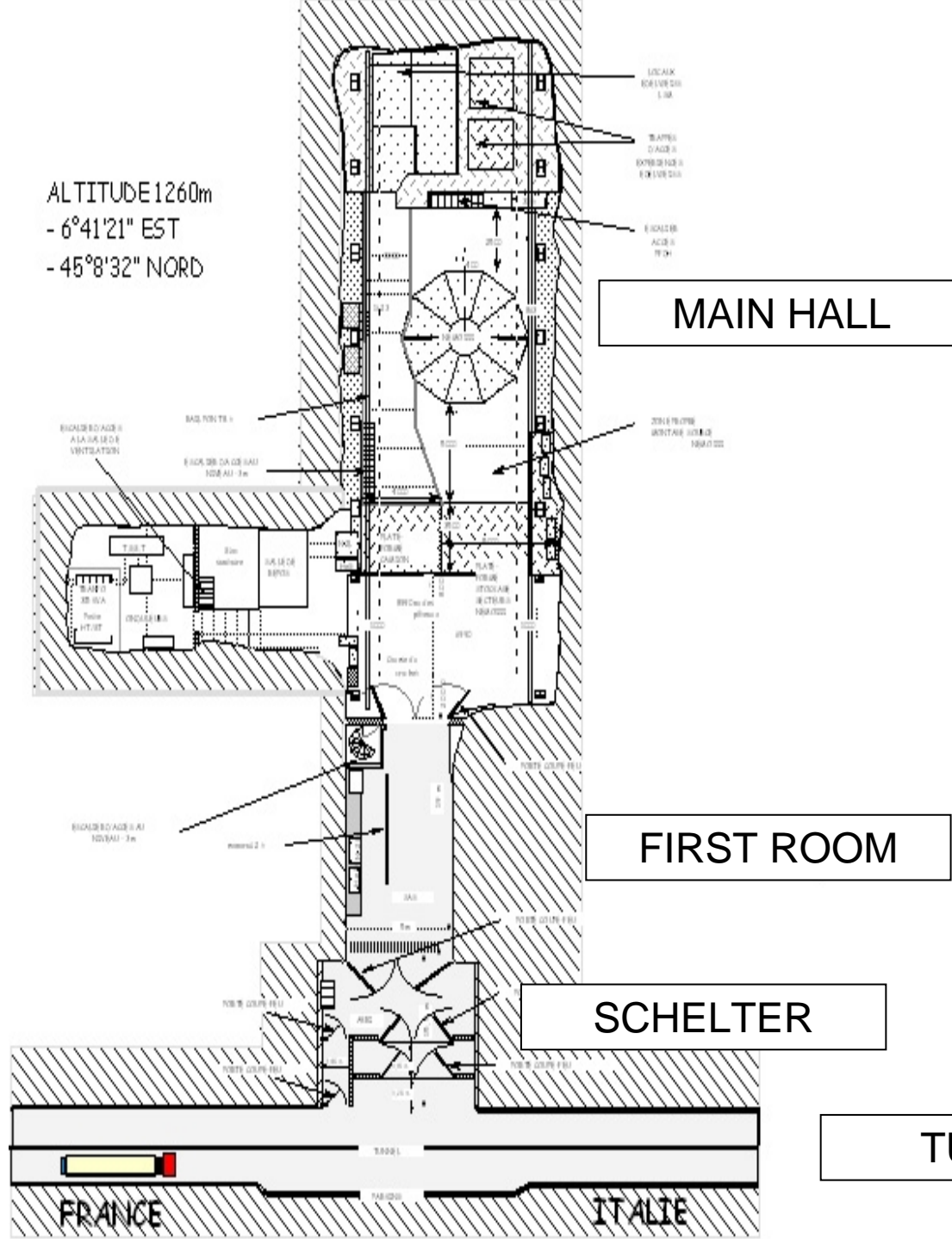
LABORATOIRE SOUTERRAINE DE MODANE AGRANDISSEMENT 60'000 m³



CROSS SECTION OF THE PRESENT TUNNEL



ALTITUDE 1260m
- 6°41'21" EST
- 45°8'32" NORD



MAIN HALL

FIRST ROOM

SCHELTER

TUNNEL

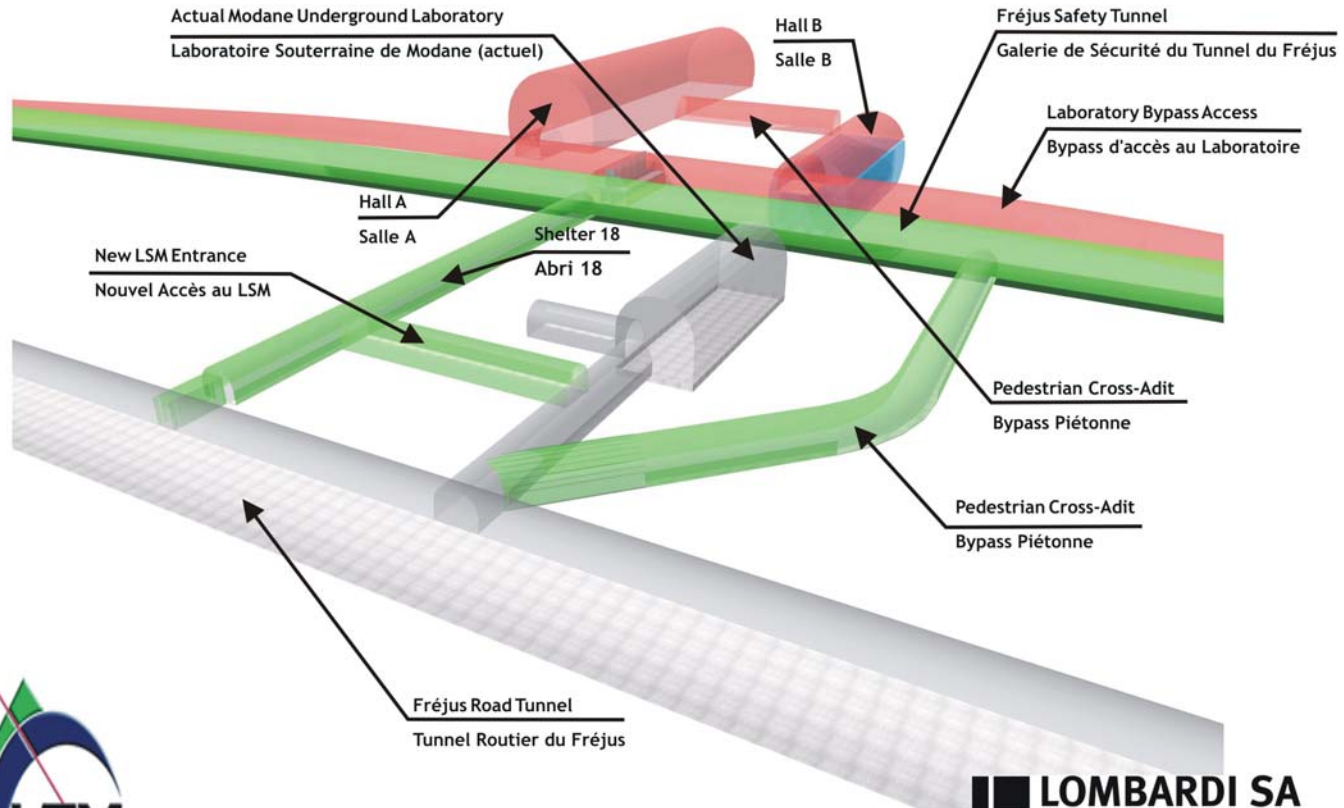
FRANCE

ITALIE

SAFETY TUNNEL AND EXTENSION

MODANE UNDERGROUND LABORATORY 60'000 m³ EXTENSION

LABORATOIRE SOUTERRAINE DE MODANE AGRANDISSEMENT 60'000 m³



JOINT OPERATION WITH THE TUNNEL

- **Excellent cooperation**
- **Ventilation separated from traffic tunnel**
- **Access to LSM without interferring with tunnel operation, by electrical cars**
- **No walking across the lanes of the road tunnel**
- **No need of firemen protection when entering the laboratory by truck**
- **Safety plan based on tunnel rescue team at 6 km**

Safety rules from experiments

- water level (neutron shielding) beneath the road level to avoid any risk of flooding
- All facilities are supplied through the new safety tunnel: no connections with traffic tunnel
- Safe design of experiments checked all along the project to prevent any risk
- Safety equipment tested in the present lab: early fire detection, air analysing, knowledge of number of people present at any time...
- LSM is involved in european program for improving safety in underground labs

FIRE DETECTION AND AIR ANALYSING



HEAT RECOVERY



- One loop 17km long
- Water temperature:
50°C
- available power
400kW

