269.8 Km to Turin from Lyon
70% in France 30% in Italy

81.1 km in Italy: only 10 Km to the surface of which 70% of areas already anthropised

Montcenis Base Tunnel: 57.5 km
45 km in France 12 km in Italy
The main work of this new railway line IS THE MONT CENIS BASE TUNNEL between Saint-Jean-de-Maurienne (France) and Susa (Italy).

The tunnel will be used by freight trains and freight shuttles running at 100 km/h and by high speed passenger trains operating at 220 km/h.
ABC BASE TUNNEL L = 57.5 km

A: 564 m above s.l.
B: 745 m above s.l.
C: 470 m above s.l.

Outdoor route
Tunnel Route

INTERNATIONAL STATION
SAINT MARTIN LA PORTE
LA PRAZ
MODANE
CHIOMONTE

STATES BORDER

INTERCONNECTION TUNNEL

INTERCONNECTION TUNNEL
**General Features**

- **Vehicles:**
  - HS passengers trains
  - Regional trains
  - Railway highway vehicles
  - Modalohr (inter-modal) railway highway vehicles
  - Freight trains

- **Operating speed of 220 km/h**
- **Axial load 25 tons/axle**
- **Electric drive system about 2x25 kV**
- **Signaling and control system is the ERTMS/ETCS**

**SECURITY FEATURES**

- **Two single-track tunnels**
- **Passenger shelter space amounts to 120 m²**
- **Connection branch every 333 m**
BI-TUBE TUNNEL (2 X 57.5 KM): 45 KM IN FR + 12 KM IN IT

Structure

Internal diam. 8.40 m
43 m² free air

THE MONT CENIS BASE TUNNEL

THE PROJECT
COMMUNICATION BRANCHES (EACH 333 M) : +- 170

- **Air supply shaft of Avriereux**
- **Air supply shaft of Val Clarea**
- **Loop lines**
- **Communication branches**

**THE MONT CENIS BASE TUNNEL**

- **Susa**
  - Italian gate of entry
  - Outside safety site
- **Turin**
- **La Maddalena**
  - Survey gallery
  - And safety site
- **Villarodin-Bourget / Modane**
  - Access tunnel and safety site
- **Saint-Julien-Montdenis**
  - Access tunnel
  - Outside safety site
- **Saint-Martin-la-Porte**
  - Access tunnel

**Typical section of the tunnel**
- Internal diam. 8.40 m
- 43 m³ free air

**25 to 40 m**
4 ROAD ACCESS TUNNELS

- Air supply shaft of Avrieux
- Loop lines
- Communication branches
- Saint-Martin-la-Porte Access tunnel
- Saint-Julien-Montdenis Access tunnel
- La Praz Access tunnel and safety site
- Air supply shaft of Val Clara
- Villarodin-Bourget / Modane Access tunnel and safety site
- Susa Italian gate of entry
- Outside safety site
- La Maddalena Survey gallery and safety site
- Turin
- Ventilation plant
The Base Tunnel: Structure

UNDERGROUND TECHNICAL AND SAFETY STATION

- Lyon
- Saint-Julien-Montdenis: Outside safety site
- Saint-Martin-la-Porte: Access tunnel
- La Praz: Access tunnel and safety site
- Air supply shaft of Avrieux
- Air supply shaft of Val Clareau
- Loop lines
- 7.9 km
- 9 km
- 12.2 km
- 15.2 km
- 13 km

Outlet Tunnels:
- Villarodin-Bourget / Modane: Access tunnel and safety site
- La Maddalena: Survey gallery and safety site
- Susa: Italian gate of entry, Outside safety site

Ventilation plant

Map of the area with labels for geographical locations.
THE MONT CENIS BASE TUNNEL

Structure

5 VENTILATION PLANTS
5 SAFETY SITES
(3 + 2 OUTSIDE)

Communication branches

Air supply shaft of Avrieux

Loop lines

Air supply shaft of Val Clairea

Susa
Italian gate of entry
Outside safety site

La Maddalena
Survey gallery and safety site

Villarodin-Bourget / Modane
Access tunnel and safety site

La Praz
Access tunnel

Saint-Martin-la-Porte
Access tunnel

Saint-Julien-Montdenis
Outside safety site

Ventilation plant

Lyon

Turin
The state of work

Access adit Saint Martin La Porte (2400 m)
From 2003 to 2010
DONE

Exploratory Tunnel (9000 m)
From 2014

Access adit Villarodin-Bourget / Modane (4000 m)
From 2002 to 2007
DONE

The «La Maddalena» Exploratory Tunnel
From 2012 to 2016
DONE

Access adit La Praz (2480 m)
From 2005 to 2009
DONE
€ 8,6 billions (euro 2012, constant prices)
cost sharing agreement concluded in 2012

**FINANCING OF THE MAIN WORK**
- 25%
- 40%
- 35%

**TIMING**
- **2016**
  - END OF STUDIES
- **2017**
  - PRELIMINARY WORKS
- **2018**
  - MAIN WORKS

= base tunnel
Planning

THE MONT CENIS BASE TUNNEL


STUDIES AND RECOGNITIONS

COMPULSORY PURCHASE PROCEDURE

CALL FOR TENDER - Civil engineering and Works

CIVIL WORKS

INSTALLATIONS

OPERATIONAL TESTING

1,9 Billions Euro

OPERATION START-UP
Protection and Valorization

- FULL-ROUND WATERPROOFING SYSTEM UP to a hydrostatic pressure of 10 bar

- EXPECTED RESIDUAL WATER FLOWS AT THE PORTALS ARE EXPLOITED for both drinking water and water to be used as a thermal resource

- LAYOUT OF THE INDUSTRIAL SITES FACTORS IN THE NEED TO MINIMIZE any interaction between the works and the surrounding environment (natural and urban)

- MATERIAL EXTRACTED FROM THE EXCAVATED ACCESS ADITS for reuse as construction materials: up to an estimated 65% to be reused within the works 42% of which as fill material and 23% as aggregate for concrete
In December 2015, TELT requested entry into the Global Compact and was admitted as a Public Organisation by committing to respect:

- **HUMAN RIGHTS**
- **LABOUR**
- **ENVIRONMENT**
- **ANTI-CORRUPTION**

**TELT CONCRETE INITIATIVES:**
- Suppliers selection criteria
- Special control measures
- ANTI-MAFIA Contracts Regulation

**TELT HAS ALSO AN INTERNAL ETHICAL REGULATION THAT APPLIES BOTH TO EMPLOYERS AND SUPPLIERS**
History of tunnels in the Alps

19th Century
2 front lines
13 years
1.3 m/d

20th Century
2 front lines
4.5 years
4 m/d

21st Century
1 front line
3.5 years
10 m/d
Comparison with the other Base Tunnels in the Alps

All the main railway tunnels which cross the Alps, as the Mont Cenis ARE REPLACED NOW BY A MODERN INFRASTRUCTURE, REALIZED AT A LOWER HEIGHT (Loetschberg, Gothard, Ceneri, Koralrn, Brenner, Semmering).
<table>
<thead>
<tr>
<th>UNIT COST (€/mln / km)</th>
<th>LENGTH (km)</th>
<th>COST (for each tube)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CENERI</td>
<td>15,4</td>
<td>83,8</td>
</tr>
<tr>
<td>BRENNER</td>
<td>55,0</td>
<td>83,7</td>
</tr>
<tr>
<td>MONT CENIS</td>
<td>57,50</td>
<td>86,0</td>
</tr>
<tr>
<td>LOETSCHBERG</td>
<td>35,0</td>
<td>87,0</td>
</tr>
<tr>
<td>GOTTHARD</td>
<td>57,0</td>
<td>90,3</td>
</tr>
</tbody>
</table>

The costs of the other base tunnels in Europe

Projects are equivalent from the economic point of view (parameter cost/km)

3 Funders:
Focus

The Gotthard Base Tunnel is a railway base tunnel through the Alps in Switzerland. It opened on 1 June 2016, and full service began on 11 December 2016. With a route length of **57.09 km it is currently the world's longest** and deepest traffic tunnel and the first flat, low-level route through the Alps.
GOTTHARD BASE TUNNEL

Overall view

- Temporary Access Tunnel Sedrun
- Multifunktional Place Faido
- Emergency Stop Places
- North Portal Erstfeld
- Temporary Access Tunnel Amsteg
- Multifunktional Place Sedrun
- Air supply shaft of Avrieux
- Air supply shaft of Val Clarea
- Communication branches
- Loop lines

BENCHMARKING:
- GOTTHARD MONT CENIS
- GOTTHARD BASE TUNNEL BENCH MARKING
# Comparison with Mont Cenis Base Tunnel

<table>
<thead>
<tr>
<th>Feature</th>
<th>GOTTHARD Base Tunnel</th>
<th>MONT CENIS Base Tunnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>57 km long</td>
<td>57.5 km long</td>
</tr>
<tr>
<td>Achievements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freight Trains</td>
<td>up to 2000 tons</td>
<td>up to 2000 tons with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>trains up to 750 meters long</td>
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<tr>
<td>Passenger Trains</td>
<td>up to 250 km/h</td>
<td>220 km/h</td>
</tr>
<tr>
<td></td>
<td>More than 200 Trains/ Day</td>
<td>More than 200 Trains/ Day</td>
</tr>
<tr>
<td>Costs</td>
<td>903 M€</td>
<td>863 M€</td>
</tr>
<tr>
<td>Method of Excavation</td>
<td>4 TBM and traditional</td>
<td>7 TBM and traditional</td>
</tr>
<tr>
<td>Implementation Period</td>
<td>From 1999-2016</td>
<td>From 2016-2029</td>
</tr>
</tbody>
</table>
Comparison with Mont Cenis Base Tunnel

GOTTHARD Base tunnel 57 km long

MONT CENIS Base tunnel 57,5 km long

THE PROJECT REASONS ARE THE SAME

• To Accelerate and develop the transport capacity in four of the most important economic regions in Europe.
• To protect the environment of the Alps by the modal shift from road to rail

DIFFERENT FINANCING SOURCES

Private and Public:
• The Heavy Goods Vehicle Charge (HGVC, 60 per cent of the funding)
• Mineral oil tax (10 per cent)
• VAT (30 per cent)

Only Public
• 40 % Europe
• 60% Italy and France (Italy 57,9% France 42,1%)