



# TUNNEL km 4.7 – 5.7

## Val d'Ultimo – Val di Non Road - Italy, 1995

### PROJECT CHARACTERISTICS

**Works:** last stretch of a road tunnel, horse shoe section, concrete lined.

**Purpose:** road tunnel

#### Dimensions:

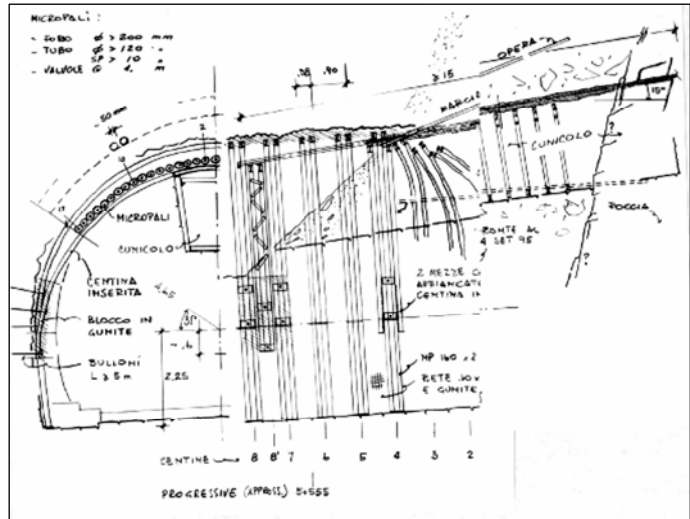
- Overall width: 9.3 m
- overall height: 6.9 m
- lining thickness: 0.4 m
- overall length: 1 500 m

#### Subsurface conditions:

- Faulted mica-schist in a philladic formation

#### Construction method:

- Faulted mica-schist in a philladic formation
- Areas of grouted micropiles, steel ribs and gunite, grouting of the crown and front
- Heading and bench excavation



### PROFESSIONAL SERVICES PERFORMED

Assistance during construction of the last section of the tunnel after a collapse at the excavation front.

*During the excavation of the last stretch of the 2nd tunnel for the road Ultimo - Proves, in the Eastern Italian Alps, a collapse of the front occurred, when crossing intensely tectonised and weathered rock.*

*The remedial works consisted of: stabilisation of the front with buttress fill, installation of 2 additional steel ribs, casting of a concrete slab over the collapsed front, execution of micropiles to create a continuous arch able to support the load of the overlying materials; silicate injections of collapsed materials and of the in situ rock in the crown area so as to allow a safe excavation preventing further collapses; excavation by heading and benching.*

*Geomechanical tests and analyses to re-classify the rock of the collapsed area and reassessment of all existing documentation.*

