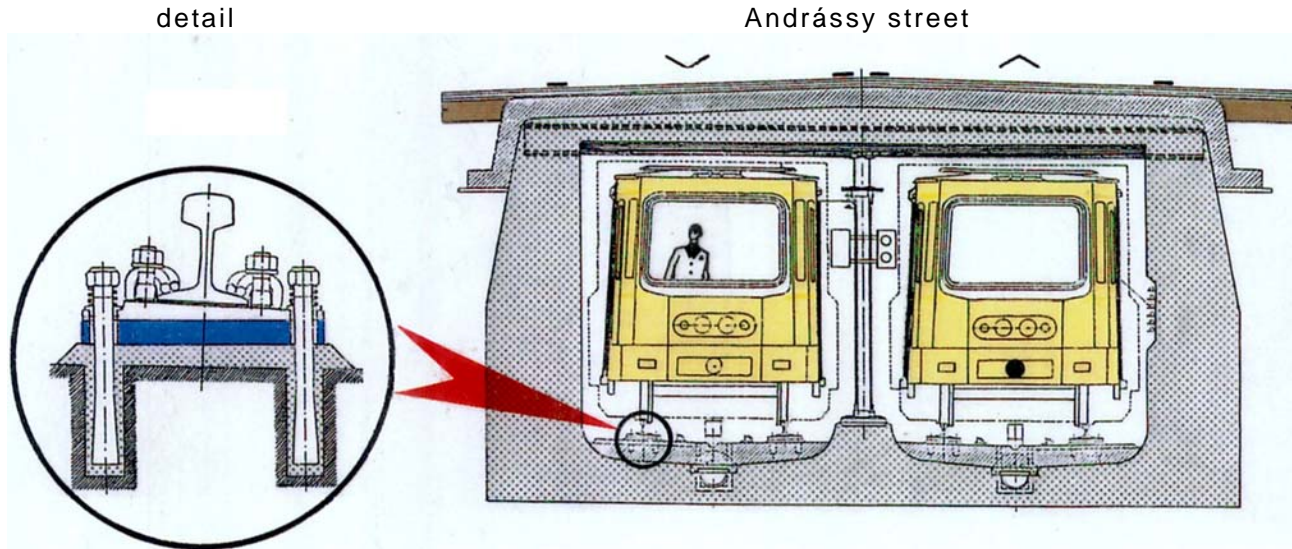


### PARTIAL REFURBISHMENT OF THE MILLENNIUM UNDERGROUND RAILWAY



**Client:**

Municipality of Budapest  
Budapest Transport Company

**Features:**

Length of projected refurbishment:  
2.5 km of double track line  
Number of points: 2 groups  
Number of reconstructed stations: 3

**Time of design:** 1993-1994

**Time of construction:** 1994-1995

**Services:**

- Land surveying
- Design for approval
- Tender document
- Working documents concerning
  - designs of track
  - superstructure
  - track connections

The first underground railway of Budapest, which was originally opened up to traffic in 1896, has a length of 4.4 km, including the initial 3.2 long section running in the original tunnel. In 1973 the former cross sleepers and crushed stone ballast were replaced with a glued superstructure along the first 677 m long section. In the second section, having a length of 2.5 km, the superstructure still includes 34.5 kg rails placed on timber sleepers and crushed-stone bed, where the drainage is ensured by drain slots in the concrete invert of the tunnel. Dust transferred by air and fine sand carried by groundwater has cemented the ballast and blocked most of the drain slots by the time of design. The worn-out superstructure had to be replaced, and a new drainage system had to be provided for.

The superstructure designed to have a lower natural frequency by means of polyurethane base plates fixed by gluing onto reinforced concrete slabs without any ballast of crushed stone on the one hand, and dimensioned hold-down springs on the other hand are to ensure a less noisy mode of operation in the tunnel.

An additional turnout junction was constructed parallel to the replacement of superstructure in order to make it possible that some of the underground railway can still be operated in events of accident or operating trouble.

The design work also included the total power supply of the line and the architectural design of three stations.