Construction of 1.1 km of tunnel, an underground station and 2 shafts

Under the framework of the Line B Underground project in Toulouse, Solétanche Bachy was awarded the works relating to Lot 3 as part of a Joint Venture. This involved carrying out works relating to the interconnection between Lines A and B (Jean Jaurès station), within a very dense urban area.

**Tunnels**

Five sections of tunnel were excavated using a CSM Bessac compressed air tunnel boring machine (excavation diameter: 5.28 m). The tunnels were of two types:

- **Tunnels with internal diameter of 4.915 m**
- **Tunnels with external diameter of 5.30 m (clad with concrete lining segments) 1,068 linear metres**
- **Diaphragm wall**
- **Earth moving**
- **Watertightness works**
- **Etanchéité : 8,000 m²**
- **Pipe roofing**

**Main Quantities:**

- Tunnel with an external diameter of 5.30 m (cladding using concrete lining segments): 1,068 linear metres
- Diaphragm wall: 4,915 m³
- Earth moving: 78,000 m³
- Watertightness works: 8,000 m³
- Etanchéité : 8,000 m²
- Pipe roofing: 750 m

**Client:** SMAT - SOCIÉTÉ DU MÉTRO DE L’AGGLOMÉRATION TOULOUSAINE - SMTC

**Engineer:** SYSTRA - TTE - INGEROP - SETI

**Contractors:** CARI (MAIN CONTACOR) - CSM BESSAC - SOLÉTANCHE BACHY BEC - URBINA DE TRAVAUX - MALET

**Controllers:** SOCOTEC - VERITAS - AINF

**Period of Works:** MAY 2001 - JUNE 2005
5.30m), comprising a total length of 1,068 m:
- 4 twin-tube tunnels for passing Line B through Jean Jaurès station,
- 1 tunnel for connecting Line B and Line A.

The path of the connection tunnel passed under various buildings and featured a curve with a radius of 95 m. The tunnel boring machine was specially designed to be disassembled and reassembled from the inside, thus removing the need to sink a shaft in a very dense area.

A 30m-long inlet gallery was also excavated, in divided sections, under the protection of pipe roofing. Temporary cladding consisting of metal arches and sprayed concrete was installed prior to application of the final cladding, which consisted of reinforced concrete placed using formwork.

**Shafts**

Two shafts were constructed using diaphragm walls and excavated beneath a slab (“top-down” method):
- the Victor Hugo shaft: 45 x 20m, depth: 23m,
- the Aubuisson shaft: 16.40 x 12.70m, depth: 28m.

The base of the Victor Hugo shaft was enlarged by an underpinning excavation operation (demolition of the diaphragm wall, excavation and underpinning after reinforcing by silicate grouting).

**Station**

Jean Jaurès station consists of two adjoining works constructed using diaphragm walls:
- the Line B station (an enclosed space that is 57m long, 24m wide and 17m deep),
- the Line A/Line B exchange area (an enclosed space that is 32m long, 37m wide and 17m deep).

The covering slab rests on a series of precast columns on barrettes which were then embedded in the final round columns supporting the station’s various floors. The works were excavated using a “top-down” method, with monitoring using real-time remote soundings.

The civil engineering works were particularly complex because, as what was involved was an interconnection station, one of the lines remained in operation while the works were in progress.