

## Transportation Tunnels – Mass Transit & Railway

No.	Project	Client	Type of Work	Contract Value (EUR)	Work Period	Job Description
1	<b>Metro Budapest 4th Line</b>  Budapest / Hungary	Louis Berger SAS	Design Expert Services	433,000	2007 -2009	The new line 4, Section 1 has a total length of 7.3 km and comprises 10 metro stations and running tunnels. Tunnels at Buda-side are in compact rock section at Pest-side are in soft sediments with high ground water. Length of station 80 m Length of running tunnels between 300 and 1,400 m., Excavation diameter 6.0 m
2	<b>Dulles Corridor Metrorail Project Extension</b>  Dulles / USA	Dulles Transit Partners, LLC	NATM Tunnel Design Review Expert Services	25,000	2008 – 2008	The Project is an extension of existing 171 km Metrorail system from current Orange Line to Washington Dulles International Airport. The DCMP consists of approx. 37.2 km of new rapid rail transit system with 11 stations. The project includes 2 approx. 518 m long tunnels to be excavated using NATM.
3	<b>Metro Bangkok Blue Line Extension</b>  Bangkok / Thailand	MRTA Mass Rapid Transit Authority  Bangkok / Thailand	Design & Expert Services	382,000	2007 - 2008	Extension of Blue Line of Metro Bangkok. Section contains 2 TBM running tunnels with a total length of 5 km, 2 Cut & Cover Stations and 2 stations to be built both in NATM and C&C. The section runs under the historic city centre of Bangkok in soft grounds and crosses several Klongs and River Chao Phraya.
4	<b>Extension of Dulles International Airport 3W</b>  Washington D.C. / USA	Atkinson Construction, Clark & Shea  Washington / USA	Geotechnic / Assistance Expert Services	350,000	2005 - 2007	The West Tunnels are constructed to facilitate automated people movers to connect main terminal with midfield Terminal 4 tunnels are driven from an excavation pit. 2 tunnels are running to the north and are 225 m long and 2 tunnels run in southern direction which are 90 m long. The south tunnels are connected by a cross passage. The final shape of the tunnels will be circular; they are constructed by NATM excavating a top heading and invert.
5	<b>Innerurban Railway Chicago Block 37</b>  Chicago / USA	Kiewit Construction Company  New Jersey / USA	Design Review, Expert Services	36,000	2005 - 2006	Design review for inner-urban construction, interface between old and new structure based on NATM-Technology. The Block 37 Project was designed to connect the Blue and Red Transit Lines in Chicago and Create an express Train Service that links O'Hare International and Midway Airports.
6	<b>Extension of Dulles International Airport WUBT</b>  Washington D.C. / USA	Kiewit Construction Company  New Jersey / USA	Monitoring Construction Supervision, Expert Services	374,080.58	2004 - 2005	The West Utility Building Tunnel is constructed to provide the midfield terminals with water, power and gas. The tunnel builds a connection between West Utility Building and Concourse A. The tunnel has a total length of about 340 m and is divided into 3 segments. Starting from a temporary ramp, tunnels were driven to north and south. The so called north heading has a length of approx. 150 m and south heading 150 m. From the south tunnel a 3rd part of the tunnel, the west heading, diverge from south heading and is approximately 40 m long.
7	<b>Innerurban Rail Project "East Side Access" (ESA)</b> Queens - Manhattan - Grand Central Station  New York / USA	Parsons Brinckerhoff Quade & Douglas New York / USA	Technical Assistance Expert Services	2,354,600	1999 - 2002	The Long Island Rail Road's East Side Access (ESA) Project will bring LIRR trains from Queens into Manhattan's Grand Central Terminal through a series of tunnels, numerous caverns and one platform station. Technical Assistance with regard to the application of NATM & TBM tunnels in various geological formations and sensitive urban environmental conditions. Total length of 6.6 km is split up in rock sections (2.3 km) and tunnels in soft ground (3.3 km).

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8	<b>Seattle Metro</b> Seattle / USA	Parsons Transportation Group	Tender Design Expert Services	268,304	2000 - 2001	Metro stations "First Hill", "Pacific Station" and "45th Street" and connection tunnels with NATM construction method. The tunnel runs partly through swell able clayey marl as well as sandy grounds. Total tunnel length 9.3 km, Cross section platform tunnels approx. 97 m <sup>2</sup> , Cross section running tunnels approx. 32 m <sup>2</sup> , Overburden 60 - 80 m
9	<b>MC 1B Metro Corridor</b> between Stations "ISBT" and "Central Secretariat" New Delhi / India	Sverdrup Corporation Costa Mesa, CA / USA	Tender Design Expert Services	65,186	2000 - 2000	Metro station "Chawri Bazar" constructed with NATM method and single track running tunnels in TBM construction method. The ground water level is 2 m below the surface. Total length 2 x 6,600 m, Inner diameter 5.6 m, Overburden betw. 10 and 20 m
10	<b>Metro Budapest 4th Line</b> Budapest / Hungary	Eurometro Budapest / Hungary	Design Review Expert Services	436,500	1998 - 2004	Concept study to identify needs for the next tunnel planning stages. The new line 4, Section 1 has a total length of 7.3 km and comprises 10 metro stations and running tunnels. The tunnels of Buda-side run through compact rock, the section of Pest-side runs through soft sediments with high ground water. Length of platform approx. 80 m, Length of running tunnels betw. 300 and 1,400 m, Excavation diameter 6.0 m.
11	<b>Tren Urbano "Minillas Extension"</b> San Juan / Puerto Rico	DMJM Daniel, Mann, Johnson&Mendenhall	Expert Services	58,367	1999 - 2000	Metro project consisting of 2 NATM stations „Minillas“ & „San Mateo“ as well as interchanges and running tunnels with a length of 1,600 m. Evaluation of NATM design with regard to construction practicability.
12	<b>Metro Lille Section F</b> Lille / France	Soletanche Entreprise Paris / France	Expert Services, Design Review	77,683	1994 -1995	Design review and expert services for tunnel lining installation. Assistance to construction management. Inner diameter of 6.80 m, segment thickness of 34 cm, length of section 2,240 m.
13	<b>Innerurban Railway Eole</b> Lot 35 B Paris / France	DG Construction Paris / France	Detailed design, Construction consultancy, Expert Services	206,150	1993 – 1994	Detailed design and FEM Analysis of precast segmental lining system for TBM-driven twin tubes in soft ground and mixed face. Overburden of approx. 20 – 30 m, inner diameter of 6.40 m, tunnel length of 2 x 1,670 m., driven with Poly Shield TBM.
14	<b>Innerurban Railway Tunnel Passante Milano</b> Milan / Italy	TrenItalia Italian Federal Railways Milan / Italy	Design Technical Assistance, Expert Services	31,500	1992 - 1992	Consultancy on structural design for the EPB-driven tunnels with one pass tunnel lining system. Length of 4,000 m, inner diameter of 6.90 m. World Premier of 'Connex' XXX segment contractors.
15	<b>Washington Metro Greenbelt Line Section E-004b-2</b> Washington DC / USA	Washington Metropolitan Area Transit Authority Washington DC / USA	Detailed design Specifications Expert Services	278,000	1992 – 1995	Detailed design of NATM single track tunnels and shafts in soft ground. Minimized influence to the surface. FEM Analysis for running tunnels, NATM Crossing enlarged cross section at "Farragut" shaft. Length of running tunnels 2 x 937 m, cross section of approx. 35 m <sup>2</sup> .

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16	<b>LA Metro "Red Line"</b> Los Angeles / USA	PB Parsons Brinckerhoff	Design Expert Services	663,750	1991 - 1992	4 metro stations to be constructed by NATM mined method Underneath Hollywood Boulevard soft ground near to exist buildings. Project was replaced by Cut & Cover Stations due to exaggerated contingency. • Hollywood / Highland, • Hollywood / Vine, • Hollywood / Western, • Vermont / Sunset.
17	<b>Metro Munich U1/S1</b>  Munich / Germany	U-Bahn Referat der Stadt München	Design & Construction Review, Expert Services	184,500	1989 - 1990	Metro Station Candidplatz in C&C method. Single track running tunnels constructed with NATM. Tunnels in soft ground (Clayey silts and silty sands) underneath river "Auer Mühlbach". Length compressed running tunnels 4 x 450 m , Cross section 36 m². Detailed design using shotcrete under air pressure.
18	<b>Washington Metro Greenbelt Line Section E-005</b>  Washington DC / USA	Washington Metropolitan Area Transit Authority  Washington DC / USA	Detailed design Specifications Expert Services	1,167,000	1986 - 1991	2 single track metro tunnels, 2 shafts and metro station "Fort Totten" in soft ground limited surface settlements and little ground water. Tunnel length 2 x 350 m, Excavation cross section 5.8m / 6.2 m, Shaft depth 25 m, Excavation cross section $\approx$ 10 m acc. 18 m/25 m, Station length 100 m, Excavation cross section 164 m²
19	<b>Metro Mexico</b> Line 7 & Line 3 South Mexiko D.F.	Sistema de Transporte Cloectivo Metro	Construction Assistance Expert Services	585,000	1981 - 1982	Line 7 is located in the West of Mexico City and has a length of approx. 13 km. It has a total of 10 stations, 1 constructed in open construction method and 9 constructed in mined construction method (NATM). Line 3 South is directed to the East and has a length of approx. 3,5 km; from the total of 3 stations 1 is constructed in open construction method and 2 are constructed in mined construction method. Both lines run through cohesive sandy clay with groundwater.
20	<b>Metro Munich</b> Lot 5/9-5  Theresienwiese / Germany	Arge U-Bahn München	Project Management & Construction Consultancy	756,000	1977 - 1981	Single track subway tunnels constructed both in TBM and NATM construction method as well as mined metro station "Theresienwiese". First-time implementation of universal ring in monocular construction. Prototype of mined station according to „Multiple Drift Method“. Total length of lot 2,500 m
21	<b>Subway Tunnel Königsallee Station "Berliner Platz"</b>  Bochum / Germany	City of Bochum Germany	Design Management	270,000	1973 - 1974	The subway tunnel Königsallee undercrosses the existing railway tracks of German Railways. NATM tunnel in mixed face / soft ground. Tunnel length approx. 300 m, excavated cross section 63m² - 78 m², overburden 3 – 8 m.