Railway Tunnel

Athens Attiko Metro

Extension of Line 3

Athens, Greece

Project
• Railway tunnel
• Construction shafts

Construction Cost
Total cost: approx. € 43.12 m.

Project Schedule
Design: 2002-2005
Construction: 2002-2006

Project Description
- Railway tunnel in urban environment
  Total length: 1890m
  Cross section: 67m²
- Five construction shafts
  Depth: 25-30m
  Cross section: 80-300m²

Method of tunnel excavation
NATM – Mechanical excavation

Final Lining
Reinforced concrete C20/25

Geology
Schists, alluvial deposits, man-made deposits
Ground water
Max. overburden: 18m

Our Services
• Detailed Final Geotechnical & Structural Design
• Supervision during construction
• Design jointly carried out by OMIKRON KAPPA CONSULTING & INGENIEURBURO EDR GmbH, Munich

Construction Details
• Special drainage measures
• Special grouting techniques

Client
J/V AKTOR S.A. – IMPREGILO S.p.A.
Metro station

**Athens Attiko Metro**

Eleonas station building

Athens, Greece

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**Project**
Metro Station building

**Construction Cost**
Total cost: approx. € 6 m.

**Project Schedule**
Planning and design: 2004
Construction: 2003-2005

**Project Description**
Width: 30m
Length: 40m
Depth: 34m

**Our Services**
- Detailed Final Geotechnical, Structural & Architectural Design
- Supervision during construction
- Design jointly carried out by OMIKRON KAPPA CONSULTING & INGENIEURBURO EDR GmbH, Munich

**Client**
J/V AKTOR S.A. – IMPREGILO S.p.A.
Metro Station
Athens Attiko Metro
Elliniko Station
Athens, Greece

Project
Metro Station Bit and Metro Building
Athens Attiko Metro, Extension of line 2 to Elliniko

Construction Cost
Total cost: approx. € 21 m.

Project Schedule
Design: 2006-2007
Construction: 2006-2009

Project Description
Main Station (including ventilation and detonation shafts)
Length: 123m
Width: 17m – 28m
Depth: 25m – 28m
5 final levels: Foundation Level / Platform Level / Ticket Issue Level / EM Level / Roof Level

Station’s East Entrance
Length: 15m
Width: 9m
Depth: 26,5m

Station’s Access Tunnel
Length: 3,5m
Cross Section: 44m² - 55m²
Effective Cross Section: 25 m²

Construction Method
Main Station and East Entrance:
• Excavation & Reinvestment (Cut & Cover)
• Retaining Structures of Open Excavation: reinforced concrete shaftpiles, prestressed anchors, gunite, structural tissue.

Station’s Access Tunnel
Top Down Excavation - NATM Excavation

Final Lining
Reinforced concrete C30/37, B500c

Geology
• Debris, clastic deposits, neogene deposits (siltstones, conglomerates, marlys limestones)
• Access Tunnel Height Overburden: 10m

Our Services
• Geotechnical Evaluation
• Final Detailed Geotechnical and Structural Design

Client
J/V AKTOR SA – SIEMENS AG – VINCI CONSTRUCTION GRANDS PROJECTS

Station’s construction works
Metro Station

Athens Attiko Metro
Argiroupoli Station
Athens, Greece

Project
Metro Station Bit and Metro Building
Athens Attiko Metro, Extension of line 2 to Elliniko

Construction Cost
Total cost: approx. € 21 m.

Project Schedule
Design: 2006-2007
Construction: 2006-2009

Project Description
Main Station (including ventilation and detonation shafts)
Length: 123m
Width: 19m – 28m
Depth: 21m – 24.5m
5 final levels: Foundation Level / Platform Level /
Ticket issue Level / EM Level / Roof Level

Station’s East Entrance
Length: 43m
Width: 4m-8m
Depth: 2.0m-14m

Station’s Access Tunnel
Length: 52m
Cross Section: 44m² - 55m²
Effective Cross Section: 25 m²

Construction Method
Main Station and East Entrance:
• Excavation & Reinvestment (Cut & Cover)
• Retaining Structures of Open Excavation: reinforced concrete shaftpiles, prestressed anchors, gunite, structural tissue.

Station’s Access Tunnel
Top Down Excavation - NATM Excavation

Final Lining
Reinforced concrete C30/37, B500c

Geology
• Debris, Athenian Schists
• Access Tunnel Height Overburden: 6m-7m
• Existence of common utility network

Our Services
• Geotechnical Evaluation
• Final Detailed Geotechnical and Structural Design

Client
J/V AKTOR S.A. – SIEMENS AG – VINCI CONSTRUCTION GRANDS PROJECTS
Metro Station

Athens Attiko Metro
Sourmena Shaft
Athens, Greece

Project
Shaft for the launch of TBM machine
Athens Attiko Metro, Extension of line 2 to Elliniko

Construction Cost
Total cost: approx. €5 m.

Project Schedule
Design: 2006
Construction: 2006

Project Description
Retaining Structures of Open Excavation
- Length: 74.50m
- Width: 16m – 18m
- Depth: 25.4m
Final Lining consisting of the following levels:
- Foundation Slate Level
- Two in between slates with openings
- Top Slate Level

Construction Method
- Excavation & Reinvestment (Cut & Cover)
- Retaining Structures of Open Excavation: reinforced concrete shaftpiles, prestressed anchors, gunite, structural tissue.
- Final lining at the NW section of the shaft, dimensioning 20m x 14.35m, consisting of reinforced concrete C30/37 and B500c
- Reinvestment of the rest, after the completion of the TBM assembly and real works

Geology
- Debris,
- Clastic Deposits
- Existence of common utility network inside the excavation
- Existence of middle pedestal at the exiting bridge at 7m distance of the WE side of the shaft

Our Services
- Geotechnical Evaluation
- Final Detailed Geotechnical and Structural Design

Client
J/V AKTOR S.A. – SIEMENS AG – VINCI CONSTRUCTION GRANDS PROJECTS

Shaft construction works
TBM assembly
Metro Station

Athens Attiko Metro

Elliniko Shaft

Athens, Greece

Project
Railway Tunnel Ventilation Shaft and TBM relocation shaft
Athens Attiko Metro, Extension of line 2 to Elliniko

Construction Cost
Total cost: approx. € 2.2 m.

Project Schedule
Design: 2006-2007
Construction: 2007-2009

Project Description
Retaining Structures of Open Excavation with rectangular cross section
Length: 22m
Width: 16m
Depth: 25.5m

Final Lining consisting of the following levels:
• Foundation Slate Level
• Two in between slates with openings
• Top Slate Level

Construction Method
• Excavation & Reinvestment (Cut & Cover)
• Retaining Structures of Open Excavation: reinforced concrete shaftpiles, prestressed anchors, gunite, structural tissue.

Final Lining:
Reinforced concrete C30/37 and B500c

Geology
• Debris,
• Athenian Schist

Our Services
• Geotechnical Evaluation
• Final Detailed Geotechnical and Structural Design

Client
J/V AKTOR S.A. - SIEMENS AG – VINCI CONSTRUCTION GRANDS PROJECTS
Railway Tunnel

Athens Attiko Metro

Extension of line 2

Athens, Greece

Project
Railway Tunnel

Construction Cost
Total cost: approx. € 84,5 m.

Project Schedule
Design: 2006-2007
Construction: 2007-2009

Project Description
Urban Tunnel
Length: 4,593m
Cross Section: double track with diameter 9,48m

Excavation Method
Mechanical Excavation with the ERB - TBM (Earth Pressure Balance - Tunnel Boring Machine)

Final Lining
Pre-engineered elements with concrete C40/50 and B500c

Geology
- Debris, clastic deposits, neogene deposits (siltstones, conglomerates, sandstones, marly limestones, alpine deposits (marly limestones, athenian schists)
- Underground water table
- Overburden Height: 10m – 18m

Our Services
- Geotechnical Evaluation
- Final Detailed Design of the final lining
- Final Detailed Design for the ERB – TBM advance

Client
J/V AKTOR S.A. – SIEMENS AG – VINCI CONSTRUCTION GRANDS PROJECTS

TBM assembly

TBM’s digging out at Elliniko station
Metro Station

**Athens Attiko Metro**

**Agios Antonios station**

Athens, Greece

**Project**
Metro station building pit
Retaining structures of the west blast shaft

**Construction Cost**
Total cost: approx. € 10 m.

**Project Schedule**
Design: 2002
Construction: 2002-2004

**Project Description**
- Pile anchored wall retaining structure
- Station building pit
  - Max. Width: 75m
  - Max. Length: 150m
  - Max. Depth: 19,3m
- West blast shaft
  - Length: 26m
  - Max. Width: 14,1m
  - Max. Depth: 14,5m

**Construction Method**
- Pile anchored wall retaining structure
- Top down construction

**Geology**
Alluvial deposits, man-made deposits
Ground water
Archaeological findings

**Our Services**
- Detailed Final Geotechnical & Structural Design
- Design jointly carried out by OMIKRON KAPPA CONSULTING & INGENIEURBURO EDR GmbH, Munich

**Construction Details**
- Construction of secant piles in the regions of the building pits over the tunnel portals and near the existing buildings
- Pile walls anchoring with one to six rows of prestressed anchors
- Construction of Berlin walls in the perimeter of the building pits due to safety reasons

**Client**
C. I. KALOGRITSAS S.A.
Metro station

Athens Attiko Metro

Eleonas station

Athens, Greece

Project
Metro Station Building Pit

Construction Cost
Total cost: approx. €12.7 m.

Project Schedule
Design: 2003
Construction: 2003-2004

Project Description
Pile anchored wall retaining structure
Width: 30m
Length: 40m
Depth: 34m

Construction Method
• Pile anchored wall retaining structure
• Top down construction

Geology
Alluvial deposits, man-made deposits
Ground water
Archaeological findings

Our Services
• Detailed Final Geotechnical & Structural Designs
• Supervision during construction
• Design jointly carried out by OMIKRON KAPPA CONSULTING & INGENIEURBURO EDR GmbH, Munich

Client
J/V AKTOR S.A. – IMPREGILO S.p.A.