Using AEC Collection in Design Phase of Metro Project: Case Study

Mete BAYKIR
President

Cihan KAYHAN
R&D Director

Serhat KAŞ
BIM Manager
• About Yuksel Proje
• R&D Center
• BIM uses with AEC Collection
• Istanbul Rail System Design Services (AEC Excellence Award Winner)
• Umraniye-Atasehir-Goztepe Metro Line (AEC Excellence Award Winner)
About Yuksel Proje
History

1978
- First overseas project: Riyadh-Gassim Transmission Line, Saudi Arabia

1984
- First Construction Supervision Project: Garrapata-Gerade Highway, Turkey

1987
- First metro supervision services: Taksim-4 Levent Metro Line

1992
- First waste water treatment plant services: Izmir Waste Water Treatment Plant Project, Turkey

1996
- First Immersed Tube Tunnel Project: Marmaray Project, Istanbul

2001
- First established office in Asia: Kabul, Afghanistan

2002
- First Design Project in Europe: Sofia, Bulgaria

2006
- First Smart Building Supervision Project: Zorlu Center, Istanbul

2008
- 3rd Bosporus Bridge & North Marmara Motorway Supervision Project, Turkey

2009
- First R&D Center of the Sector

2013
- AEC Excellence Awards Winner: Yusel Proje

2015
- Yusel Proje Ranked 203rd at the ENR Top 225 International Design Firms

2016
- Yusel Proje Ranked 207th at the ENR Top 225 International Design Firms

2017
- Turkey Export Champion in the Field of Consultancy

2018
- 7 projects in 1 year: Yusel Proje India

2019
- Second established office in Asia: India

- First PPP (BOT) Supervision Project: Osmangazi Bridge&Duznli-Izmir Motorway, Turkey
Yuksel Proje With Numbers

YEARS OF EXPERIENCE: 41

NUMBER OF EMPLOYEES: 1200+
Services & Expertise

TRANSPORTATION
- Motorways and State Highways
- Bridges & Viaducts
- Railways
- Tunnels
- Metro & LRTS & Tram
- Marine Structures
- Airports

OIL, GAS, ENERGY
- Solid Waste Storage & Incineration Plants
- Natural Gas and Crude Oil Pipelines
- Natural Gas Storage Facilities
- Power Plants

WATER
- Water Transmission Lines
- Drainage and Waste Water Networks
- Water and Waste Water Treatment Plants

BUILDINGS
- Smart Buildings
- Industrial Facilities
- Mass Housing
- Education, Sports and Health Facilities

GEOLOGICAL & GEOTECHNICAL ENGINEERING
- Geotechnical Engineering
- Geological Engineering
- Soil Investigation Laboratory

DESIGN

PROJECT MANAGEMENT & CONSTRUCTION SUPERVISION
R&D Center
R&D Center

- **TOTAL R&D PERSONNEL**: 110
- **NUMBER OF PROJECTS**: 40
- **M.SC. & PhD EDUCATION**: 50
- **TRAINING, SEMINAR, CONFERENCE & EXHIBITION**: 102
- **COOPERATION WITH UNIVERSITIES**: 15
- **DESIGN REGISTRATION**: 10
- **NATIONAL AND INTERNATIONAL ARTICLES/PAPERS/BOOKS**: 34
- **INTERNATIONAL AWARDS**: 5
<table>
<thead>
<tr>
<th>BIM</th>
<th>DESIGN</th>
<th>SOFTWARE DEVELOPMENT</th>
<th>ENGINEERING ANALYSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Design Authoring                                                   • Concept Design                                      • Rapid In-House Software Development                   • Advanced Radio Capacity Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Phase Planning                                                     • Interior Design                                      • Cloud Based Custom ERP Solutions                      • High-Low Voltage Simulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cost Estimation                                                    • Artwork Design                                       • CAD Automation Software Development                   • Electrical Selectivity Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Existing Conditions Modeling                                      • Rendering                                            • BIM Support Tools                                      • Traction Power Simulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Engineering Analyses                                               • Animation                                             • Over 2500 Active Users (Including Supervisors And Subcontractors) • Acoustical Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Construction System Design                                         • VR&amp;AR                                                • Custom Software Solutions For Project Management       • CCTV Visualization Simulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Design Documents                                                   • Phase Planning                                         • Advanced Lighting Simulation                           • Advanced Lighting Simulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Design Review                                                      • Cost Estimation                                       • Vibration Analysis                                     • Pedestrian Dynamic Simulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Site Utilization Planning                                          • Existing Conditions Modeling                        • Pedestrian Dynamic Simulation                          • Fire Evacuation Simulation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Record Modelling                                                   • Engineering Analyses                                 • Fire Evacuation Simulation                             • CFD Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Construction System Design                          • Site Utilization Planning                             • Signalling System Design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Design Documents                                      • Record Modelling                                      • Tunnel Ventilation Simulation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Awards

- Istanbul Rail System Design Services
- Umraniye-Atasehir Goztepe Metro
- Cendere Viaduct
- Kurkoy Metro Station
- Cendere Viaduct
BIM Uses Yuksel Proje
Building Information Modeling
Design Authoring
3D Coordination
Engineering Analysis
Drawings Generation
Phase Planning
Existing Condition Modeling
Sample Projects
Sanal Gerçeklik (Virtual Reality)
Istanbul Rail System Design Services – Phase 1
ISTANBUL RAIL SYSTEM DESIGN SERVICES
PHASE 1

16 KM ROUTE
11 STATIONS
12 LINE STRUCTURES
100+ MODELS

Connection with 5 Different Metro Lines
Sustainable and Aesthetic Design
TBM / NATM Tunnels, Cross-Passages
Architecture, Structure, Plumbing, Electrical etc.
Objectives of the Project

- Smart Transportation
- Building Information Modeling
- Value Engineering
- Sustainable Design
- Aesthetic Design
- Innovative Approaches
- Cloud Based Collaboration
Umraniye-Atasehir-Goztepe Metro Line
From Umraniye to Goztepe total length of the project is 13 kilometers.

There are 11 stations:
- 4 Cut & Cover Stations
- 7 Tunnel Stations

4 TBMs will be used for the excavation of the main line.

Total Length of Tunnels:
- TBM Tunnels: 18.8km
- NATM Tunnels: 16.5km
Importance of the Project

• Part of the Istanbul underground metro line network
• Integration with 4 other rail systems:
  o Marmaray Commuter Railway
  o Uskudar-Umraniye-Cekmekoy-Sancaktepe Metro Line
  o Kadikoy-Kartal-Tavsantepe Metro Line
  o Kadikoy-Sultanbeyli Metro Line (In Planning Stage)
• Connection to Istanbul International Financial Center
• Total Capacity of 44,400 pphpd
Challenges of the Project

- Station locations in densely populated areas
- Working in close proximity to historical buildings
- Traffic issues during construction phase
BIM USES

- Design Authoring
- 3D Coordination
- Existing Condition Modeling
- Cost Estimation
- Phase Planning
- Site Utilization Planning
- Lighting Analysis
- Mechanical Analysis
- Structural Analysis
- Construction System Design
Benefits of BIM Use in the Design Stage

- **Time Saved**: 20%
- **Cost Saved**: 10%
- **Increase Quality**: 25%

Faster, smarter, better