

# ROADS AND MOTORWAYS

COMPANY PROFILE AND  
STATEMENT OF CAPABILITIES 2024

## CONTENTS

|   |           |
|---|-----------|
| <b>1 COMPANY PROFILE .....</b>                | <b>2</b>  |
| <b>ABOUT TECHNITAL .....</b>                  | <b>2</b>  |
| <i>Description.....</i>                       | <i>2</i>  |
| <i>Services.....</i>                          | <i>2</i>  |
| <i>Quality control.....</i>                   | <i>4</i>  |
| <i>Code of Ethics .....</i>                   | <i>4</i>  |
| <i>Sectors of Specialization.....</i>         | <i>5</i>  |
| <b>2 OUR EXPERIENCE .....</b>                 | <b>6</b>  |
| <b>EXPERIENCE IN ROADS AND MOTORWAYS.....</b> | <b>6</b>  |
| <b>APPENDIX A – COMPANY’S EXPERIENCE.....</b> | <b>37</b> |
| <b>MOTORWAYS</b>                              |           |
| <b>ROADS</b>                                  |           |
| <b>URBAN ROADS</b>                            |           |

# 1 Company Profile

## About TECHNITAL

### *Description*

TECHNITAL is a private joint stock company established more than 50 years ago (in 1964) and is one of the oldest engineering consultancy companies in Italy. Thanks to its high level of expertise, its dynamic nature and versatility, management autonomy and efficiency and its sophisticated hardware equipment and software libraries, the Company has been awarded large scale international and national projects by major public and private entities and by international funding organizations.

TECHNITAL's headquarters are situated in Verona, Italy. The organization abroad includes 15 between branches and subsidiaries in Algeria, Armenia, Benin, Bosnia & Herzegovina, Croatia, Georgia, Iraq, Kenya, Kosovo, Qatar, Tanzania, Trinidad & Tobago, Tunisia, Uruguay and Zambia and a number of local offices which is continuously changing according to the on-going international projects (at the moment there are 4 local site offices).

### *Services*

TECHNITAL is a dynamic company working in the fields of transport infrastructure (roads and motorways, railways, inland waterways, urban transport, ports and airports), hydraulics (water treatment and desalination plants, dams, aqueducts, sewerage systems, waste water treatment), marine and coastal engineering, environment, energy (incineration and waste-to-energy plants, hydroelectric plants, solar plants, biogas plants), waste treatment (recycling plants, dump sites), buildings, architecture and urban planning.

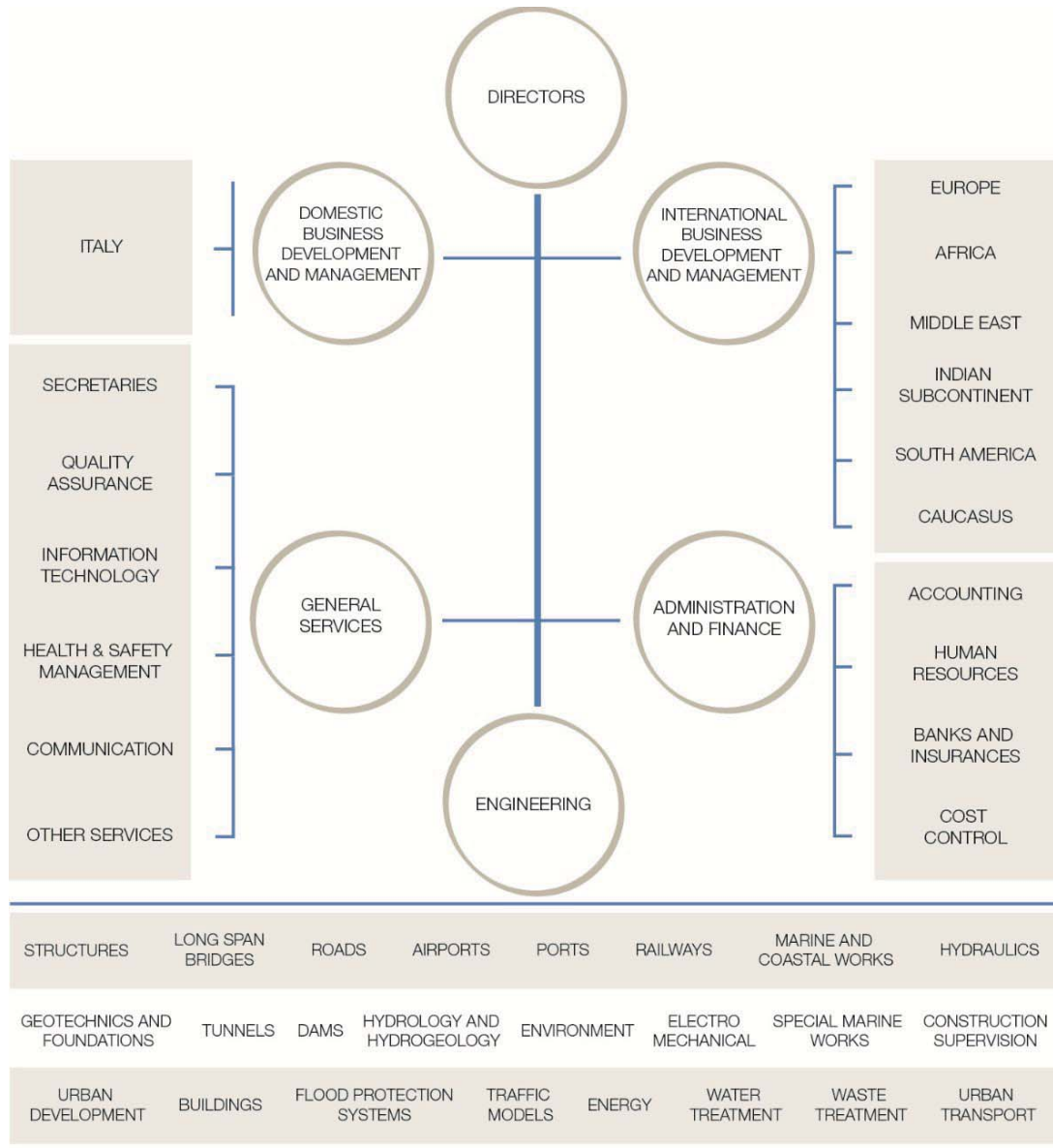
The company covers the full range of services, from planning and feasibility studies through to detailed design, works supervision and technical assistance:

- project management
- planning and economic-financial evaluation of investments
- feasibility studies and technical-economic evaluations
- all levels of design
- environmental impact assessment and studies
- traffic studies
- procurement and assistance with tenders
- construction supervision, quality assurance, testing and commissioning
- co-ordination and supervision of research and laboratory tests
- development of hydrodynamic and hydrogeological analysis and simulations
- development and application of analysis methods and computer modelling.

TECHNITAL has worked in several countries world-wide: Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Australia, Austria, Bahamas, Benin, Bolivia, Bosnia & Herzegovina, Brazil, Bulgaria, Burkina Faso, Burundi, Cayman Islands, Colombia, Croatia, Cuba, Cyprus, Czech Republic, Democratic Republic of the Congo, Denmark, Djibouti, Dominican Republic, Egypt, Ethiopia, Georgia, Germany, Ghana, Greece, Guatemala, Hungary, India, Iraq, Italy, Jordan, Kenya, Kosovo, Libya, Madagascar, Malawi, Malaysia, Mali, Mauritania, Monaco, Montenegro, Mozambique, Nicaragua, Niger, Norway, Panama, Peru, Poland, Qatar, Republic of Haiti, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Slovenia, Somalia, Spain, Sudan, Syria, Tanzania, Togo, Trinidad & Tobago, Turkey, Uganda, Ukraine, U.A.E., United Kingdom, U.S.A., Uruguay, Venezuela, Yemen, Zambia.

*Organization and staffing*

TECHNITAL's multidisciplinary staff is organized according to the following chart:



TECHNITAL's multidisciplinary staff includes about 250 professional employees covering the various aspects of the engineering services: Transport, Hydraulics, Geotechnical, Marine & Coastal, Environmental Studies & Territorial Analysis, Structures, Electronic Data Processing & Systems Analysis, Quantity Surveying & Cost Estimation, Electromechanics, BIM/CAD/CAE, Works Supervision, etc.

The above staff is integrated by consultants and specialists, both Italian and foreign. Seeking support and advice from colleagues, scientists, and academics all over the world is part of TECHNITAL's policy of excellence.

Given the firm's considerable international experience, TECHNITAL's staff is proficient in the use of international engineering standards (BS, ASTM, AASHTO, ASME, API and the like) and contract conditions (FIDIC and others).

### *Quality control*

TECHNITAL's activity is ISO 9001:2015 Quality System Management certified. The company is also certified ISO 14001: 2015 Environmental Quality Management, ISO 45001:2018 Occupational Health and Safety Management System and SA 8000:2014 Social Accountability Management System.

TECHNITAL has developed a company policy regarding quality control which is constantly being updated and applied, taking into account the costs to be sustained to achieve the objectives of quality and maximum benefit for both the Company and the Client. Thanks to its Quality Control System, TECHNITAL is capable of guaranteeing the quality of its services and of ensuring the Client that these services satisfy the required quality standards.

### *Code of Ethics*

Ethical and responsible decision making is very important for the company in terms of risk management and in order to keep actions within the ethical and legal boundaries.

For that reason, the company is adopting a Code of Ethics (available from the web site of the company) and conduct for its Executives and Directors and for all the Employees able to fulfil requirements for responsible decision taking. Such code aims at reducing the possibility of stepping outside behavioral limits set by the company.

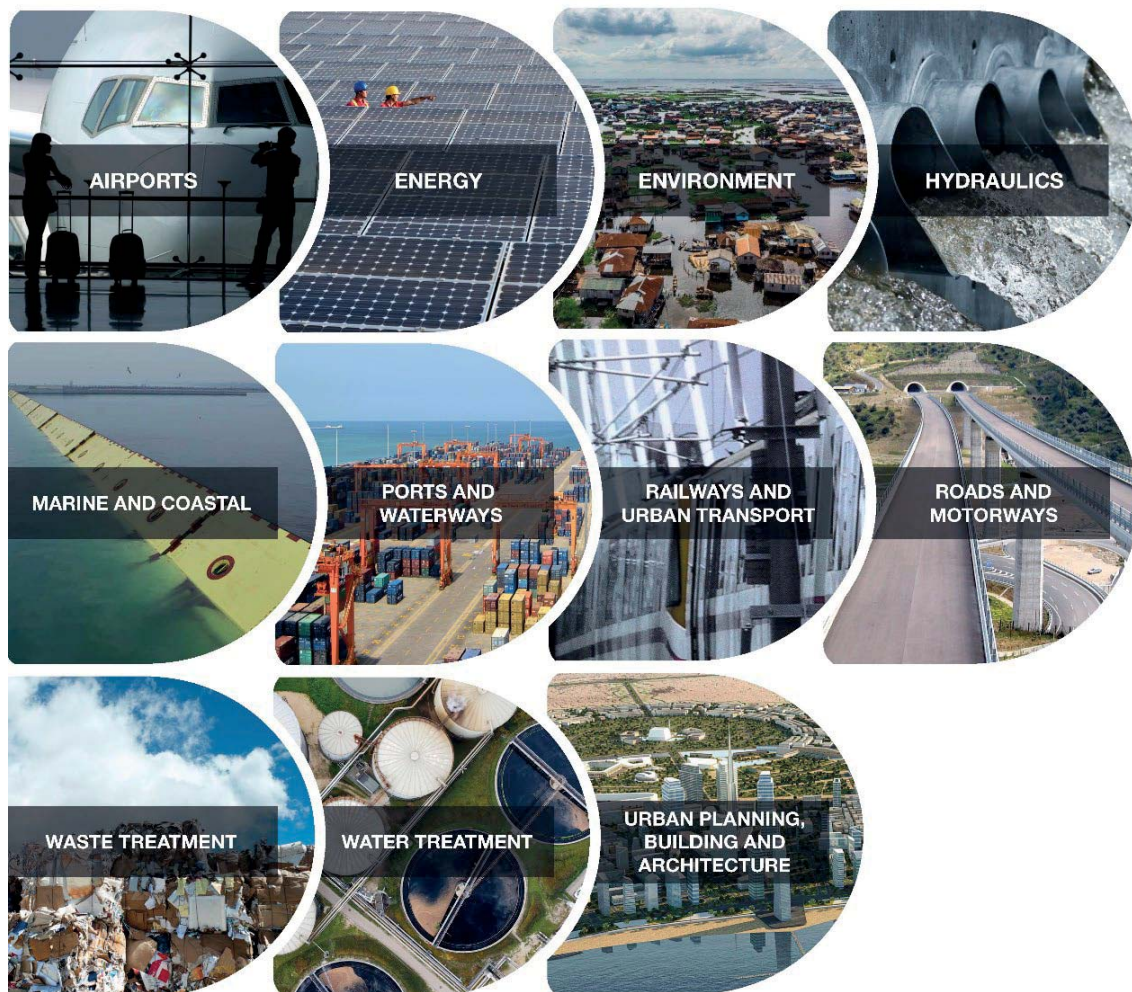
The Code of Ethics the company is adopting also meets the Organization, Management and Control Model pursuant to Italian Legislative Decree n. 231/2001.

*Sectors of Specialization*

TECHNITAL provides high-quality consultancy services in different areas of specialization: Roads and Motorways, Railways and Urban Transport, Airports, Ports and Waterways, Marine and Coastal Engineering, Environmental Engineering, Urban Planning, Buildings and Architecture, Hydraulic Engineering, Water Treatment, Waste Treatment, Energy.

In each of these sectors, TECHNITAL provides innovative project solutions to Government Agencies, International Financial Institutions and Private Sector Organizations.

Services provided by TECHNITAL include master plans, feasibility studies, techno-economical evaluations, traffic studies, mathematical and physical modeling, all phases of design from concept to detailed design, environmental impact studies and monitoring plans, tender document preparation and assistance in the procurement of works, construction supervision.



## 2 Our Experience

### Experience in Roads and Motorways

TECHNITAL has been operating in the field of roads and motorways since the 1960's, and this sector has always played a prominent role in the Company's activities. The long experience acquired has allowed the progressive development of planning, research and study methods which have led to the steady improvement in the quality of the product with considerable benefits to costs and performance times.

Road and motorway engineering is a multi-disciplinary sector which incorporates many aspects from infrastructure (alignment design, intersections, bridges, viaducts, geotechnics, tunnels, pavement, hydraulics) to technological systems (traffic lights, telecommunications, toll systems, traffic control and management systems, traffic safety systems), and includes operational and functional elements such as maintenance. Projects belonging to this category relate to both new roads and the upgrading/updating of existing ones.

TECHNITAL's national and international experience covers a comprehensive range of road design and works supervision from highways to motorways and toll roads, to local and urban roads, and also includes large scale transportation planning and traffic studies.

In approaching the design of a road or a motorway, the first step is to consider the environment in which the infrastructure will be located, evaluating the design options from a broader point of view. Any negative effects are thus identified and measures to mitigate them are sought in accordance with a philosophy of "integrated design".

This methodological approach is clearly represented in several designs of road and motorway carried out by the company. One example is afforded by the **182 Km Messina-Palermo Motorway (Italy)**: the design activities followed a methodology which made it possible to define the functional characteristics of the different alignment components, and to identify the effects on different environmental features. Thanks to mapping techniques which allow the global and sectorial consideration of environmental aspects, the analysis of the territorial system, mobility, and the instruments for urban and territorial planning, it has been possible to develop a process of design optimisation based on the definition of alternative intervention hypotheses, more or less equivalent from the technical and operational point of view, until the other determining parameters are introduced. This has enabled the development of design criteria which satisfy both the functional/construction requirements and the environmental/landscaping aspects, such as the introduction of long span viaducts to reduce the barrier effect. The company has also carried out the supervision of construction works for infrastructure (viaducts No. 141, total length 35 km; tunnels No. 83, total length 58 km; interchanges No. 21) and technological systems.



Messina-Palermo Motorway – Italy

Among the motorway projects carried out, it is worth mentioning the **Consulting Services for supervision of Works on Construction of motorway on Corridor Vc, section 2 Donja Gracanica – Zenica tunnel** in Bosnia and Herzegovina. The section begins at the exit of the tunnel Zenica and ends at the entrance to the tunnel Pečuj with a length of 3.85 km, of which ~500+440 m in tunnel, ~130+100 m in viaduct and 136m of bridge.





Double carriageways viaducts – Bosnia and Herzegovina

Internationally, TECHNITAL has carried out several important projects, such as the **Construction Supervision of the Toll Motorway Salem-Ulundurpet (136 Km) in India**, whose scope is the widening of the existing 2-lane highway to 4/6 lane dual carriageway highway and its Operation and Maintenance on BOT basis.



Salem-Ulundurpet motorway - India



East-West Motorway - Algeria

Moreover, the company is currently implating the contract for **Supervision of Works of the Penetrating Motorway (31 Km) Linking the Port of Skikda to the East-West Motorway** in Algeria.

In Poland the company implemented the contract for **Design and widening of N.R. 8 to express road parameters on the section Piotrkow Trybunalski - Rawa Mazowiecka (61,2 km)**. The design road section starts at the boundary of the County of Rawa Mazowiecka, from km 324+772 to km 379+110 and ends at Rawa I Interchange, at the crossing with the axis of provincial road No. 725, at km 386+000 of National Road No.8. The design section of National Road no. 8 includes two railway crossings: at Km 328+200 over the Warsaw–Katowice line, and at Km 354+725, over the Koluszki – Radom line.



Piotrkow Trybunalski - Rawa Mazowiecka - Poland

In Albania the company has carried out the project for **Supervision of Construction of Levan – Tepelene Road**. The project comprises the supervision of the construction and upgrading of the section of highway from Levan (near Fier) to Tepelene in southern Albania. The project road is a link in the national North-South corridor from Han I Hotit, on the Albanian/Montenegro border, to Kakavija, on the Albanian/Greece border.



In Italy is of relevance the recent project related to the **Preliminary and Detailed Design of the Mestre (Venice) Motorway Bypass**, of a total length of 32 Km with three toll barriers, including 10 km of cut and cover tunnels, 4 viaducts and 15 bridges.



Mestre By-Pass Motorway - Italy

Among the single-carriageway road projects, the company has carried out the **Feasibility Study, Detailed Design and Construction Supervision of the Road Links to Doraleh Oil Terminal** in Djibouti. The road links are designed to handle the heavy traffic generated by the Oil Terminal near the port of Djibouti.



Road links to Doraleh Oil Terminal - Djibouti

An interesting case project of a complex interchange carried out, is the **Supervision of construction works of Industrial Interchange in Doha**, consisting of a 4-level interchange with pre-stressed slab bridges.



Industrial Interchange, Doha - Qatar

In Dubai, the company has carried out the consulting services for bridge superstructure design for the **Comprehensive Improvements of the Parallel Roads**. The project regards two parallel elevated roads with decks constructed with segmental techniques, with variable spans and total length of the bridge of 4.2 km.

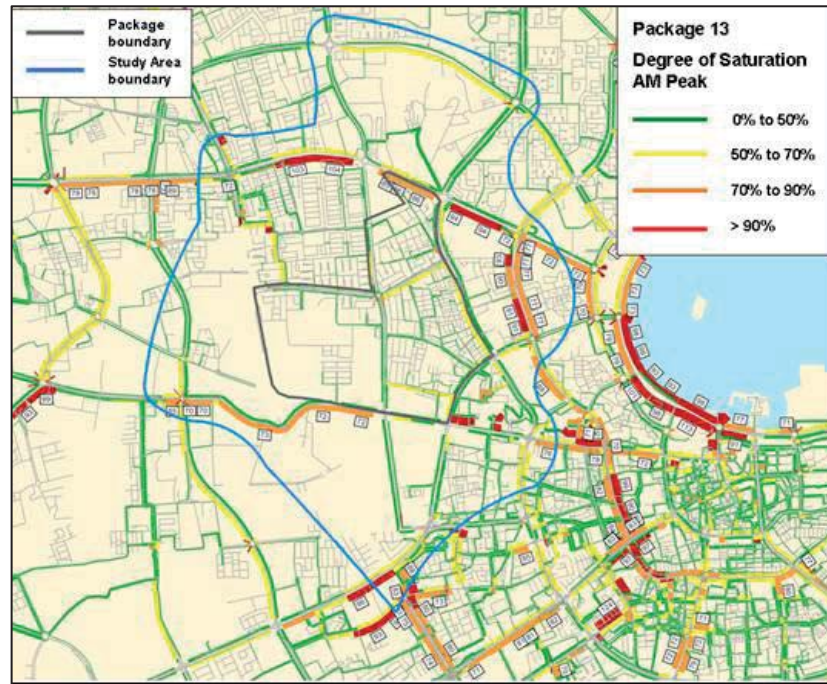


Parallel Roads superstructures – Dubai

Transportation studies for roads and motorways infrastructure design are the key element for assessing the infrastructure according to its use and collective function. These studies take place before the alignment is selected, when the work is conceived and planned and/or after the characteristics of the infrastructure are set out in order to assess both its impact on the roadway structure as a consequence of the territorial change and the achievement of set goals.

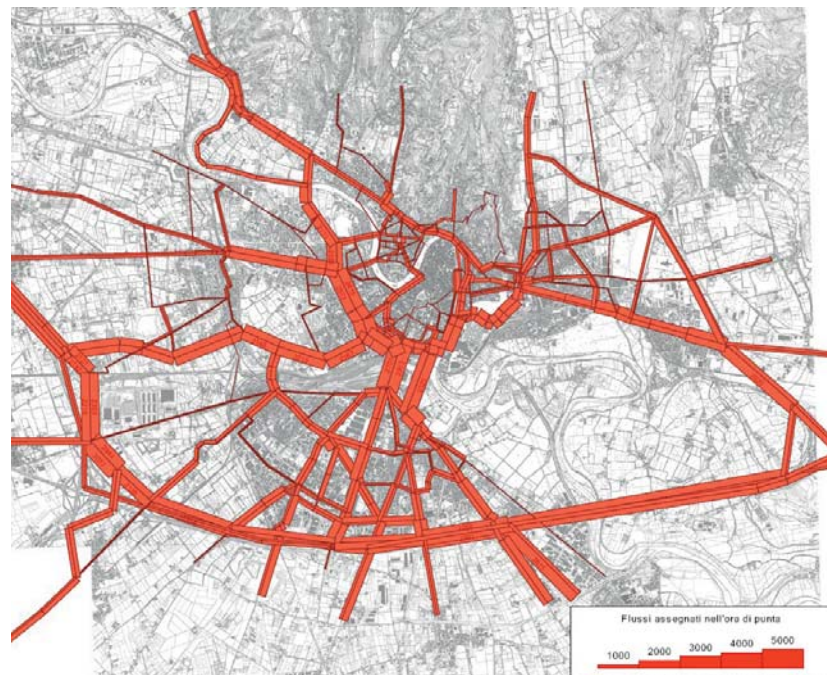
TECHNITAL carries out transportation studies at the preliminary level and for the reassessment of already selected hypothesis and layouts, using specific and constantly updated software.

An interesting case study is the **Concept Design of Roads and Infrastructures in Qatar**, regarding the full design of eight packages, i.e. urban areas, of Doha, the capital of Qatar, with a surface of 30 Km<sup>2</sup> each and a total length of roads equal to approximately 385 Km. The project includes among others: the implementation of strategic and micro simulation models (Sub-Area Models of the more complex Transportation Master Plan model) for a 20-year extension, traffic study and traffic performance analysis, pavement and materials study, EIA, design of roads and infrastructures.



Traffic Model for 8 Packages Transportation Study, network degree of saturation – Qatar

A transport study is a tool that gives also support to roads and highways infrastructures projects to be realised under a financing project (partial or total financing of the works by private organizations).

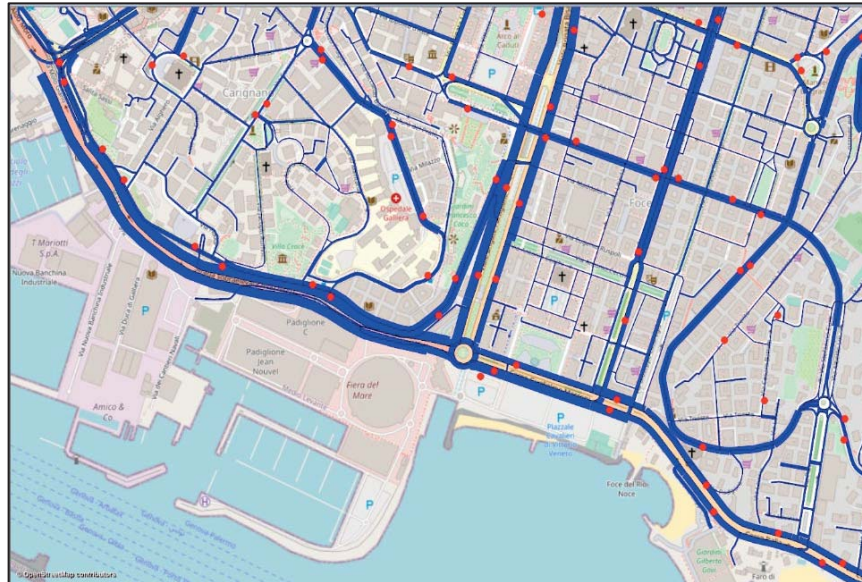


Torricelle Project - Traffic assignment model

Technital is also versed in promoting Project Financing initiatives through studies and projects as for instance the **Preliminary design including pre-feasibility, traffic study, EIA, legal, economic-financial analyses for the Torricelle Project (Italy)**. The Project regards the design, construction and management by concession contract in Project Financing form, of the Link Road to complete the northern Ring Road System of Verona city, including a tunnel of 4.3 km.

Also, in this case a strategic transport model and micro simulation models have been implemented, analysing many scenarios for 20 years of extension time.

Traffic modelling tools have been also adopted for the development of the design for the “**New Trolley Bus System of Genoa**”. The project is for about 48,0 km of lines along the city and the modelling tools have been used for the analysing the urban road networks under different scenarios of interventions in addition to the scenario without intervention to be used as a reference. Besides the logistics, parking, stops, the project had to analysis the effects on the private traffic of the introduction of the new public transport system.



Genoa Trolley Bus System - Traffic multimodal macrosimulation



Genoa Trolley Bus System - Traffic microsimulation of a urban road junction

Other significant projects include:

- ↳ Consulting Services for supervision of Works on Construction of motorway on Corridor Vc, section 2 Donja Gračanica – Zenica tunnel in Bosnia and

- Herzegovina
  - } Supervision of works along 31 Km of the penetrating highway linking the port of Skikda to the East-West motorway in Algeria
  - } Widening to Express road of the National Road No.8 in the section Piotrków Trybunalski–Rawa Mazowiecka (61 km) in Poland;
  - } Pedemontana Lombarda Motorway (87 km) in Italy;
  - } Umm Bab to Salwa Dual Carriageway Road (37 km) in Qatar;
  - } Syracuse-Gela Motorway (133 km) in Sicily in Italy;
  - } Kokkinotrimithia-Astromeritis Highway (25 km) in Cyprus;
  - } Anatolian Motorway Istanbul-Ankara: Gumusova–Gerede section in Turkey;
  - } Reconstruction of Kampala-Mbarara Road (212 km) in Uganda;
  - } Urban Roads in Doha Industrial Area and Pavement Management System in Qatar;
  - } State highway SS77 “Val di Chienti” (35 km) in Italy;
  - } Technical Supervision of the LRNIP-AF Year 2 roads rehabilitation works in Armenia;
  - } Rehabilitation of the 90 km section of the Pan-American Highway, Muhan – El Rama in Nicaragua, financed by the World Bank.

Services provided by TECHNITAL include:

1. Consulting
  - } Master Plan
  - } Traffic studies
  - } Technical-economic feasibility studies
  - } Financial analyses
  - } Socio-economic analyses
  - } Transport system planning
2. Design
  - } All phases of design from preliminary up to construction design
  - } Preliminary and final design of technological systems
  - } Pavement management systems
  - } Technical specifications, contracts, construction planning, cost estimates
  - } Environmental impact studies
  - } Tender documents preparation
3. Supervision
  - } Construction management and supervision
  - } Technical assistance during tender stage
  - } Works supervision
  - } Coordination and supervision of research and laboratory tests
  - } Environmental monitoring

For the execution of the different activities within the roads and motorways sector, characterised by a high degree of interdisciplinary and specialisation, TECHNITAL has at its disposal a team of experts in numerous fields, and innovative and avant-garde computer software.

Full details of the main projects executed are given in the following tables and related project sheets.



TABLE A – COMPANY'S EXPERIENCE (For titles in **bold** type see project sheets in Appendix A)

| PROJECT  | CLIENT   | PERIOD  |         | ACTIVITIES  | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|--|---------|---------|---|-----------------------|--------------------|
|  |  | FROM    | TO      |   |                       |                    |
| <b>MOTORWAYS</b>   |  |         |         |   |                       |                    |
| Technical assistance to the PIU of the Public Company Motorways for sections on Corridor Vc: Tunnel Kvanj-Buna and Tarčin-Konjic - Bosnia and Herzegovina          | JP Autoceste FBiH  | 05/2021 | Ongoing | Technical Assistance during construction                                | 747,980               | 164,000,000        |
| Construction of the Connecting Road between Al Zubair and Al Faw Grand Port – Iraq   | Ministry of Transport of the Republic of Iraq (GCPI)         | 12/2020 | Ongoing | Works Supervision   | 6,758,000             | 358,568,983        |
| By-pass of Colle Isarco, (between Km 513.30 and Km 514.70) along SS12 of the Brennero- Italy   | Autonomous Province of Bolzano                               | 04/2019 | Ongoing | Preliminary Design, Final and Detailed design                           | 839,784               | 24,500,000         |
| <b>Supervision of works along 31 Km of the penetrating highway linking the port of Skikda to the East-West motorway – Algeria</b>                                  | ANA (Agence Nationale des Autoroutes)                        | 08/2015 | Ongoing | Works Supervision   | 7,440,000             | 220,000,000        |
| <b>Consulting Services for supervision of Works on Construction of motorway on Corridor Vc, section 2 Donja Gracanica – Zenica tunnel - Bosnia and Herzegovina</b> | PC Motorways of the Federation of Bosnia and Herzegovina Ltd | 11/2018 | Ongoing | Works Supervision   | 2,623,025             | 67,866,680         |
| Data Collection, Primary Visual Inspections and Determination of the State of Preservation of Bridges and Viaducts on the A20 Messina - Palermo Highway- Italy     | Sicilian Motorways Consortium                                | 09/2022 | 03/2023 | Visual inspection (VT), compilation of inspection sheets, GIS database. | 408,379               | n.a.               |

| PROJECT  | CLIENT  | PERIOD  |         | ACTIVITIES  | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|---|---------|---------|---|-----------------------|--------------------|
|  |   | FROM    | TO      |   |                       |                    |
| Preliminary, final and detailed design of the new interchanges of Ali Terme on the A18 Messina - Catania Highway, Monforte San Giorgio and Capo d'Orlando on the A20 Messina - Palermo Highway - Italy | Sicilian Motorway Consortium for Ministry of Public Works | 01/2005 | 10/2022 | EIA, Preliminary Design, Final and Detailed design. | 1,550,000             | 100,000,000        |
| <b>Road axis between Marche and Umbria regions and Quadrilateral of internal roads: completion of State Highway SS 77 of "Val di Chienti"</b>  | Val Di Chienti S.C.p.A.                                   | 04/2006 | 05/2022 | Final and Detailed Design, Works Supervision        | 33,000,000            | 918,910,500        |
| Preliminary Design and FEED of the Connecting Road Al Faw - Um Qasr - Iraq   | Ministry of Transport of the Republic of Iraq (GCPI)      | 04/2019 | 12/2020 | Preliminary Design, FEED and Tender Documents       | 1,260,000             | 495,000,000        |
| Regional Highway Integration of The Transpadano System Director Cremona - Mantova - Cremona - South Mantova Section - Italy  | Stradivaria S.p.A.  | 04/2020 | 08/2020 | Detailed Design                                     | 1,820,000             | 625,763,765        |
| Widening of A4 motorway: construction of a third lane in the stretch Gonars - Villesse - Italy   | LAQUATTRO Società Consortile a r.l.                       | 05/2018 | 11/2019 | Detailed Design                                     | 680,873               | 43,417,510         |
| <b>Technical Supervision of the LRNIP-AF Year 2 roads rehabilitation works - Armenia</b>   | Transport Project Implementation Organization (TPIO)      | 03/2018 | 06/2019 | Works Supervision                                   | 970,569               | 16,233,710         |
| Motorway A31 Valdastico North (Lot 1): Detailed design of lot 1 Piovene Rocchette - Valle dell'Astico in BIM   | Autostrada Brescia - Verona - Vicenza - Padova            | 04/2018 | 12/2018 | Detailed Design                                     | 450,000               | 1,148,845,054      |

| PROJECT   | CLIENT  | PERIOD  |         | ACTIVITIES  | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|---|---|---------|---------|---|-----------------------|--------------------|
|   |   | FROM    | TO      |   |                       |                    |
| Motorway A31 Valdastico North (Lot 2): Feasibility study of the road corridor Astico Valley- Valsugana - Adige Valley   | Autostrada Brescia – Verona – Vicenza – Padova            | 02/2018 | 07/2018 | Feasibility Study   | 1,491,500             | 2,216,603,000      |
| <b>Upgrade and modernization works from Kp 153 + 400 to Kp 173 + 900 of the Salerno-Reggio Calabria– Italy</b>  | Italsarc  | 04/2013 | 06/2018 | Detailed Design, Works Supervision  | 11,500,000            | 417,369,463        |
| Widening to 3 <sup>rd</sup> lane of the A4 motorway –Section Gonars–Palmanova junction – Italy  | LAQUATTRO Società Consortile s.r.l.                       | 12/2016 | 09/2017 | Detailed Design   | 458,254               | 54,047,610         |
| <b>Design of Motorway A31 Valdastico North – Italy</b>  | Autostrada Brescia – Verona – Vicenza – Padova            | 02/2011 | 08/2017 | Preliminary and Detailed Design, EIA                                      | 22,532,000            | 1,768,672,000      |
| Doubling of RN1 between Chiffa and Berroughia (53 km) – Algeria   | IN.CO. S.p.A.   | 05/2014 | 10/2016 | Validation of Design and Works  | 1,338,012             | 800,000,000        |
| <b>Widening to 3rd lane of the A4 motorway – Section bridge over the River Tagliamento - Gonars and section new Palmanova junction, bypass national road 352– Italy</b> | TILIAVENTUM S.c.ar.l.                                     | 06/2012 | 05/2016 | Final and Detailed Design   | 5,191,352             | 289,761,446        |
| <b>Syracuse - Gela motorway Sicily – Italy:</b>   | Sicilian Motorway Consortium for Ministry of Public Works | 02/1998 | 10/2015 | Preliminary and Detailed Design, EIA, Tender Documents, Works Supervision | 142,280,900           | 1,359,158,000      |
| ▪ Rosolini-Modica Section (Lots 6-7-8), 20.1 Km   |   | 11/2001 | 10/2015 | Design, Works Supervision   | 20,763,245            | 159,115,300        |
| ▪ Ragusa-Gela Section (Lots 12-13-14-15-16), 47.5 Km  |   | 03/2006 | 10/2015 | Detailed Design   | 85,190,000            | 1,320,700,000      |

| PROJECT  | CLIENT  | PERIOD  |         | ACTIVITIES  | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|---|---------|---------|---|-----------------------|--------------------|
|  |   | FROM    | TO      |   |                       |                    |
| <ul style="list-style-type: none"> <li>▪ Cassibile- Rosolini Section (Lots 3-4-5), 30.5 km</li> <li>▪ Modica-Ragusa Section (Lots 9-10-11), 23.5 Km</li> </ul>                                 |   | 10/2000 | 10/2015 | Works Supervision   | 11,584,396            | 236,416,252        |
|  |   | 10/2003 | 01/2015 | Detailed Design   | 24,462,157            | 705,300,000        |
| Tender Design Services for The Fehmarnbelt Fixed LINK – Contract Tus & Tun – Production Facilities – Denmark - Germany   | JV Salini Impregilo – Samsung C&T Corporation – Bunte | 10/2013 | 12/2015 | Tender Design   | 292,000               | 150,000,000        |
| Comprehensive Improvements on the Parallel Roads - Bridge Superstructure – Dubai   | Salini S.p.A.   | 11/2007 | 12/2013 | Consultancy service for bridge superstructure design      | 1,400,300             | 703,000,000        |
| Detailed design of the new road axis "Salerno Porta Ovest"–Italy   | Tecnis, Cogip & Pavesi                                | 10/2012 | 09/2013 | Detailed Design   | 1,900,000             | 109,000,000        |
| <b>Widening and strengthening of Salem-Ulundurpet section (136 km) of NH 68 in the State of Tamil Nadu – India</b>   | National Highways Authority of India                  | 05/2008 | 08/2013 | Works Supervision   | 1,825,400             | 149,372,000        |
| <b>Design and widening of National Road no. 8 to the parameters of an express road in the section of Piotrków Trybunalski – Rawa Mazowiecka from km 324+772 to km 386+000 (62 Km) – Poland</b> | General Directorate of National Roads and Motorways   | 09/2009 | 09/2012 | Detailed Design, Technical Assistance during Construction | 10,309,188            | 345,350,090        |
| Bergamo Southern Bypass: Lot 1, Phase I, Section II - From Treviolo to Paladina – Italy  | Province of Bergamo                                   | 12/2008 | 03/2012 | Final Design  | 555,519               | 26,432,000         |
| <b>Eastern Bypass of Milan (T.E.E.M.) – Italy</b>  | Concessioni Autostrade Lombarde                       | 07/2009 | 08/2011 | Final Design, EIA   | 29,847,581            | 172,439,300        |

| PROJECT  | CLIENT   | PERIOD  |         | ACTIVITIES   | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|--|---------|---------|--|-----------------------|--------------------|
|  |  | FROM    | TO      |  |                       |                    |
| Industrial Interchange, Doha Expressway "D" Ring Road, Doha (ERC 1400/D20/S2) – Qatar  | Ministry of Municipal Affairs & Agriculture -PWA – Roads Affairs       | 08/2006 | 03/2011 | Works Supervision  | 5,367,000             | 150,000,000        |
| Pedemontana Lombarda Highway (1 <sup>st</sup> part) – Lombardy – Italy   | Pedelombarda General Contractor (Impregilo-Astaldi-Pizzarotti-Itinera) | 09/2008 | 11/2010 | Final and Detailed Design Technical Assistance during Construction | 19,600,000            | 742,957,200        |
| Doubling of the carriageway and upgrading of road paving on section of State Highway SS 640 "of Porto Empedocle" (33 Km) – Sicily, Italy | Province of Agrigento  | 07/2005 | 11/2009 | Final Design, EIA  | 5,396,000             | 711,057,000        |
| "Pedemontana Lombarda" motorway – 2 <sup>nd</sup> part - Lombardy, Italy   | Autostrada Pedemontana S.p.A.  | 06/2008 | 04/2009 | Final Design, EIA  | 28,186,000            | 3,567,463,652      |
| Messina-Palermo motorway- (181.3 km) Sicily, Italy: Completion lots (65.8 km)  | Sicilian Motorways Consortium  | 11/1983 | 03/2009 | Detailed Design, EIA, Tender Documents, Works Supervision          | 59,446,912            | 1,117,461,646      |
| ▪ S. Stefano di Camastra - Castelbuono Section (20.5 km)   |  | 01/1998 | 09/2003 |  | 39,343,000            | 471,521,500        |
| ▪ Caronia - S. Stefano di Camastra Section (20.8 km)   |  | 10/1991 | 05/2002 |  | 25,882,000            | 504,401,270        |
| ▪ Torrente Furiano – Caronia Section (10.6 km)   |  | 02/1992 | 01/1998 |  | 11,374,000            | 199,879,000        |
| ▪ Cefalù - Castelbuono Section (8.9 km)  |  | 04/1984 | 12/1995 |  | 18,124,000            | 264,931,000        |
| ▪ Sant'Agata di Militello - Torrente Furiano Section (7.1 km)  |  | 04/1989 | 12/1992 |  | 6,822,000             | 98,620,000         |
| ▪ Rocca di Caprileone - Sant'Agata di Militello Section (4,9 km)   |  | 11/1983 | 12/1991 |  | 3,780,000             | 51,718,000         |

| PROJECT   | CLIENT  | PERIOD  |         | ACTIVITIES                                 | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|---|---|---------|---------|--|-----------------------|--------------------|
|   |   | FROM    | TO      |  |                       |                    |
| Works to complete the northern ring road system of Verona: Torricelle tunnel – Italy  | Municipality of Verona  | 01/2008 | 02/2009 | Feasibility Study, Preliminary Design, EIA | 7,300,000             | 303,510,00         |
| Highway “Pedemontana Veneta” (95 km) - Italy  | Pedemontana Veneta S.p.A.   | 06/2004 | 12/2008 | Preliminary Design, EIA                    | 3,077,900             | 1,418,000,000      |
| Regional motorway for the “Completion of the Trans-Po valley network”: Cremona-Mantova South section (54.9 Km) – Italy  | Autostrade Centropadane S.p.A.  | 12/2007 | 05/2008 | Final Design                               | 4,000,000             | 550,000,000        |
| Construction of 3 <sup>rd</sup> lane for the A4 Motorway - Lot Quarto d’Altino – San Donà di Piave: Bridge over the Piave River and adaptation of structures – Veneto region, Italy | Autovie Venete S.p.A.   | 10/2007 | 04/2008 | Preliminary and Final Design               | 1,628,200             | 117,660,600        |
| A4 Motorway Variant – Mestre Bypass (32.5 km) – Italy   | Emergency commission for traffic and mobility in the municipality of Mestre | 01/2004 | 12/2007 | Final and Detailed Design, EIA             | 21,713,800            | 509,813,000        |
| Regional motorway “Medio Padana Veneta” Nogara (Verona)-Adriatic Sea – Italy  | Confederazione Autostradale S.p.A.  | 06/2004 | 12/2006 | Preliminary Design                         | 2,780,000             | 998,527,900        |
| Upgrading of the south bypass of Brescia and construction of the 3 <sup>rd</sup> lane (1st lot) – Italy   | Province of Brescia   | 09/2005 | 06/2006 | Detailed Design                            | 558,900               | 51,047,900         |
| Construction supervision of Al Gharrafa (Immigration) Interchange –Qatar  | Ministry of Municipal Affairs & Agriculture                                 | 10/2002 | 08/2005 | Works Supervision                          | 2,369,500             | 44,257,000         |

| PROJECT  | CLIENT   | PERIOD  |         | ACTIVITIES  | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|--|---------|---------|---|-----------------------|--------------------|
|  |  | FROM    | TO      |   |                       |                    |
| Motorway link between the cities of Milan and Brescia - Italy  | S.d.P. Brebemi S.p.A.  | 03/2004 | 07/2005 | Preliminary and Final Design                              | 7,306,300             | 1,167,058,300      |
| Control and supervision of works for the construction of 3 urban roads ("Rocades Urbaines") – Djibouti   | Délégation UE pour le Ministère du Transport                   | 11/2003 | 04/2005 | Works Supervision   | 679,000               | 27,000,000         |
| Valtrompia Motorway (42 km) –Italy   | Autostrada Brescia-Verona-Vicenza-Padova S.p.A.                | 03/2000 | 04/2005 | Final and Detailed Design, EIA                            | 13,000,000            | 785,919,200        |
| Doubling of the Carriageway and Upgrading of Road Paving on Section of State Highway SS 640 "Di Porto Empedocle" (34km) from Km 9+800 to Km 44+000 – Italy | Province of Agrigento  | 07/2002 | 11/2004 | Final Design, EIA   | 3,072,919             | 429,100,000        |
| Umm Bab to Salwa Dual Carriageway Road (37 km) – Qatar   | Qatar Petroleum (QP)   | 05/2002 | 07/2003 | Detailed Design, Tender Documents                         | 350,000               | 40,000,000         |
| Kokkinotrimithia-Astromeritis Highway (25 km) – Cyprus   | Ministry of Transport  | 12/2000 | 12/2002 | Detailed Design, EIA, Tender Documents, Works Supervision | 890,000               | 40,000,000         |
| Anatolian Motorway Istanbul-Ankara: Gumusova – Gereede section – Turkey  | Astaldi-Bayindir AS J.V.                                       | 12/2000 | 12/2002 | Detailed design   | 1,179,300             | 80,000,000         |
| Salerno-Reggio Calabria Motorway, Italy  | A.N.A.S. (State Highway Authority) – General Directorate, Rome | 12/1998 | 12/2000 | Detailed Design   | 2,428,900             | 170,430,800        |
| <b>ROADS</b>   |  |         |         |   |                       |                    |
| Investigation and detailed design of upgrading of various bridges and tunnels in the regions of Valle d'Aosta, Piedmont and Liguria - Italy                | ANAS S.p.A.  | 10/2023 | Ongoing | Detailed Design, Structural Investigations                | 4,000,000             | 47,100,000         |

| PROJECT  | CLIENT   | PERIOD  |         | ACTIVITIES   | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|--|---------|---------|--|-----------------------|--------------------|
|  |  | FROM    | TO      |  |                       |                    |
| Framework contract for final and detailed design services for road maintenance works - Italy   | ANAS S.p.A.  | 12/2022 | Ongoing | Detailed design  | 318,228               | n.a.               |
| Final and detailed design, geological study and safety coordination during the design phase, of the works for the modernisation of provincial roads connecting S.S. 115 and S.S. 118 serving the 'Strada Mare-Monti' - Italy | Sicily Region  | 12/2022 | Ongoing | Final and Detailed Design  | 1,709,289             | 62,100,000         |
| Road connection from the interchange of Montalto Uffugo to the National Road SS 660 Jonica – Italy   | Calabria Region  | 03/2022 | Ongoing | Detailed Design and Work Supervision   | 700,482               | 20,000,000         |
| Road connection from the National Road SS 660 Jonica to the Sanctuary of Madonna di Polsi – Italy  | Calabria Region  | 03/2022 | Ongoing | Detailed Design and Work Supervision   | 611,010               | 13,800,000         |
| Road connection from Mileto junction and Paravati – Italy  | Calabria Region  | 03/2022 | Ongoing | Detailed Design and Work Supervision   | 527,607               | 14,000,000         |
| Construction Supervision for Regional Roads Project – Kosovo   | Ministry of Environment, Spatial Planning and Infrastructure (MESPI) | 10/2021 | Ongoing | Design Review and Work Supervision   | 895,760               | 22,000,000         |
| Local Roads Reconstructions and Upgrade Project – Sustainable Roads Asset and Inventory Management – Montenegro  | Transport Administration   | 09/2021 | Ongoing | Development of RAMS, Financing Strategy, Road Maintenance Manual and Standards | 343,500               | n.a..              |
| Upgrading of the Provincial Road SP141 delle Saline: lot 2 - section 1 and 2 - Italy   | Province of Foggia   | 02/2021 | Ongoing | Detailed Design  | 211,753               | 6,670,341          |
| DG 55-17, Rago Viaduct North and South - Italy   | ANAS S.p.A.  | 01/2021 | Ongoing | Final and Detailed Design  | 703,869               | 45,000,000         |



| PROJECT  | CLIENT   | PERIOD  |         | ACTIVITIES  | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|--|---------|---------|---|-----------------------|--------------------|
|  |  | FROM    | TO      |   |                       |                    |
| Final and detailed design of the Mondovì bypass connecting national road SS28 dir-564 and the highway A6 Turin-Savona toll gate – Italy  | ANAS S.p.A.  | 11/2019 | Ongoing | Final and Detailed Design, EIA  | 1,332,214             | 127,700,000        |
| Rehabilitation of Montebello Tunnel in Trieste - Italy   | Municipality of Trieste                              | 11/2018 | Ongoing | Detailed Design, Works Supervision  | 737,633               | 12,752,482         |
| <b>Consulting services for the design of the sub-structures for the prefabricated steel Acrow panel bridges in Eastern province – Zambia</b><br>20 Bridges                       | Republic of Zambia - Road Development Agency (RDA)   | 05/2016 | Ongoing | Preliminary and Detailed Design, EIA, Tender Documents, Works Supervision | 1,183,669             | 23,100,000         |
| Detailed design and works supervision of the road links between the state highway s.s.115 Comiso-Vittoria section, the new airport of Comiso and s.s. 514 Ragusa-Catania – Italy | Libero Consorzio di Ragusa                           | 03/2015 | Ongoing | Detailed Design, Works Supervision  | 1,131,740             | 21,112,402         |
| Enhancement and upgrading works on State Road 3bis in the section from km 203+00 to km 208+00 – Italy  | ANAS S.p.A.  | 05/2022 | 03/2024 | Detailed design   | 318,229               | 11,795,000         |
| <b>Recovery and development of the port and the related accessibility infrastructure and for the intermodal connection of the Cristoforo Colombo Airport in Genova - Italy</b>   | Impresa Pizzarotti & C. S.p.A.                       | 02/2020 | 08/2023 | Final and Detailed Design   | 6,181,405             | 129,045,517        |
| <b>Preliminary design, FEED and Works Supervision for the Construction of the Port Entrance Roads for "Al Faw Grand Port" - Iraq</b>   | Ministry of Transport of the Republic of Iraq (GCPI) | 08/2019 | 03/2023 | Preliminary design, FEED, Tender Documents and Work Supervision           | 2,070,000             | 58,648,380         |

| PROJECT   | CLIENT   | PERIOD  |         | ACTIVITIES   | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|---|--|---------|---------|--|-----------------------|--------------------|
|   |  | FROM    | TO      |  |                       |                    |
| Khor Al Zubair immersed tunnel – Design review and supervision of works for the construction of the prefabrication yard - Iraq  | Ministry of Transport of the Republic of Iraq (GCPI) | 12/2019 | 02/2023 | FEED, Contract Document, Works Supervision             | 2,230,000             | 76,000,000         |
| DG 55-17, Stupino Viaduct North and South – Italy   | ANAS S.p.A.  | 09/2020 | 05/2022 | Detailed Design  | 393,722               | 50,783,000         |
| Construction of the bridge and related approaches At Mbeshsha across Lukulu River in Kasama District of Northern Province - Zambia  | Road Development Agency (RDA) - Republic Of Zambia   | 05/2020 | 05/2021 | Detailed Design, Preparation of Tender Documents       | 120,693               | 1,350,000          |
| Highway SS52 Carnica - San Lorenzo Tunnel - Italy   | ANAS S.p.A.  | 09/2018 | 05/2021 | Detailed Design  | 421,000               | 15,337,000         |
| Upgrading SP46 "Ispica-Pozzallo", for the section between the Syracuse-Gela motorway and the port of Pozzallo in Sicily – Italy   | Libero Consorzio Comunale di Ragusa                  | 05/2008 | 05/2021 | Preliminary and Detailed Design, Works Supervision     | 467,045               | 21,065,559         |
| Logistic platform Città di Castello - San Giustino – Italy  | Umbria Region  | 09/2014 | 10/2020 | Works Supervision                                      | 452,848               | 14,539,715         |
| Consulting services for the design of the sub-structures for the prefabricated steel acrow panel bridges in Lusaka, Central, Muchinga, Northern, Luapula and Eastern Provinces– Zambia<br>111 Bridges | Republic of Zambia - Road Development Agency (RDA)   | 05/2015 | 04/2019 | Preliminary and Detailed Design, EIA, Tender Documents | 2,800,800             | 141,000,000        |
| <b>Supervision of Construction of Levan (Nier Fier) Tepelene Road – Albania</b>   | EC Delegation in Albania                             | 01/2008 | 12/2018 | Works Supervision                                      | 7,763,136             | 88,568,170         |
| NR-16 "Adriatica": widening to 4 lanes of Falconara junction with NR- 76 at Baraccola village – Italy   | A.N.A.S. S.p.A.                                      | 04/2011 | 06/2018 | Detailed Design  | 600,000               | 154,634,110        |

| PROJECT  | CLIENT  | PERIOD  |         | ACTIVITIES                                      | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|---|---------|---------|---|-----------------------|--------------------|
|  |   | FROM    | TO      |   |                       |                    |
| RN9 – Consultancy services for the Detail Design of a road stretch of 9 km in Tadjoura - Djibouti  | Ministry of Equipment and Transports of Djibouti            | 09/2016 | 12/2017 | Detailed Design                                 | 220,995               | 11,000,000         |
| Crossing overpass on the road Aurelia for the link between the multipurpose platform and the back areas - Municipality of Vado - Italy                         | Savona Port Authority, Grandi Lavori Fincosit               | 03/2014 | 10/2016 | Detailed Design                                 | 482,754               | 18,385,048         |
| Road link between the Florence-Siena motorway junction (Poggibonsi) and the Florence-Pisa-Livorno highway (Empoli). stretch Empoli – Castelfiorentino) – Italy | Provincia di Firenze  | 05/1998 | 09/2016 | Detailed and Final Design, Works Supervision    | 2,221,176             | 54,615,675         |
| Rehabilitation of RN9, from RN1 to Tadjoura in Republic of Djibouti  | Ministry of Public Works & Transport - Republic of Djibouti | 02/2016 | 07/2016 | Concept and Preliminary Design                  | 175,000               | 102,291,980        |
| Work Supervision of the 14 Provincial Road Link – Italy  | Sicilian Motorways Consortium                               | 08/2010 | 04/2015 | Works Supervision                               | 450,000               | 14,043,120         |
| <b>S.S. 27 Gran San Bernardo – Rehabilitation works between Etroubles and the highway junction for the San Bernardo tunnel – Italy</b>                         | Lauro S.p.A.  | 08/2008 | 12/2014 | Detailed Design, Assistance during Construction | 1,852,814             | 111,252,852        |
| Link road SP 19 - Italy  | Sicilian Motorways Consortium                               | 02/2012 | 07/2014 | Works Supervision                               | 500,000               | n.a.               |
| S.P. 349 – Completion Amendment Thiene - 2nd lot - South Bypass Road - Via Maestri del Lavoro – Italy  | Schio Municipality  | 12/2008 | 12/2013 | Detailed Design, Works Supervision              | 433,476               | 8,292,673          |
| New S.S. 28 “del Col di Nava” motorway between Pieve di Teco and Ormea – Italy   | Liguria Region, Piedmont Region                             | 12/2010 | 06/2013 | Feasibility Study, Final Design, EIA            | 2,087,000             | 233,367,354        |

| PROJECT   | CLIENT                                 | PERIOD  |         | ACTIVITIES                            | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|---|--|---------|---------|---------------------------------------|-----------------------|--------------------|
|   |  | FROM    | TO      |                                       |                       |                    |
| Southern Ring Road in Pordenone between S.S. 13 State Road and A28 motorway - Italy   | Autovie Venete S.p.A.                  | 09/2008 | 02/2013 | Preliminary and Final Design, EIA     | 561,743               | 22,411,227         |
| Maxilot n°1 - State Highway 77 "Val di Chienti" - section Collesentino II – Pontelatrive - Italy  | Val di Chienti SCPA                    | 11/2006 | 12/2012 | Works Supervision                     | 330,000               | 33,371,100         |
| <b>Reconstruction of priority sections on the Kampala-Mbarara Road - Northern Corridor – Uganda</b>   | Ministry of Works and Transport        | 01/2008 | 08/2012 | Tender Assistance, Works Supervision  | 6,888,866             | 162,042,788        |
| <ul style="list-style-type: none"> <li>▪ <i>Package A:</i> Busega-Nsangi (11.5 km) and Kamengo-Lukaya (51.6 km)</li> <li>▪ <i>Package B:</i> Masaka- Mbarara (149 km)</li> </ul>                        | Uganda National Roads Authority (UNRA) | 01/2009 | 08/2012 |                                       | 2,946,355             |                    |
|   | Road Agency Formation Unit (RAFU)      | 01/2008 | 08/2012 |                                       | 3,942,511             |                    |
| S.S. Pontebbana – Upheaveals caused by the floods of 29 August 2009 – restoration interventions of roads surface from km 173+000 to km 214+000 and tunnel variant from km 186+000 to km 187+000 – Italy | Vidoni S.p.A.                          | 01/2009 | 07/2012 | Detailed Design, Technical Assistance | 1,015,266             | 46,000,000         |
| <b>Rehabilitation works of Section II of the road Pajaro Negro- San Carlos (63.4 km) - Nicaragua</b>  | Ministry of Transport (fin. IDB)       | 12/2009 | 04/2012 | Works Supervision                     | 759,600               | 21,102,600         |
| <b>Cagliari – Pula section of the new S.S. 195 "Sulcitana": lots 1 &amp; 3 and the related "south work", Sardinia – Italy</b>   | Grandi Lavori Fincosit S.p.A.          | 10/2009 | 12/2011 | Detailed Design                       | 1,171,700             | 88,415,291         |

| PROJECT  | CLIENT   | PERIOD  |         | ACTIVITIES   | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|--|---------|---------|--|-----------------------|--------------------|
|  |  | FROM    | TO      |  |                       |                    |
| New Alignment of Former National Road n. 472 "Bergamina" between Arzago d'Adda and Casirate d'Adda – Italy   | Province of Bergamo  | 10/2008 | 07/2010 | Final Design   | 265,000               | 9,450,000          |
| Road link between motorway Piovone Rocchette tollgate and the SS350 at Schiri (municipality of Velo d'Astico – Vicenza) – Italy  | Autostrada Brescia-Verona-Vicenza-Padova S.p.A.                    | 11/2004 | 03/2010 | Preliminary and Detailed Design  | 3,051,300             | 95,900,000         |
| <b>Hol Hol – Ali Sabieh Road – Djibouti</b>  | Djibouti Port Authority  | 06/2007 | 09/2008 | Detailed Design, Tender Documents                                      | 200,000               | 65,000,000         |
| <b>Supervision of rehabilitation of the road Sébaco-Matagalpa (24.7 km) – Nicaragua</b>  | Ministry of Transport (fin. IDB)                                   | 11/2006 | 05/2008 | Works Supervision  | 746,200               | 19,674,400         |
| <b>Road links to new oil terminal at Doraleh – Djibouti</b>  | Dubai Ports International, Djibouti Ports & Free Zone Authority    | 06/2004 | 11/2007 | Preliminary and Detailed Design, Contract Documents, Works Supervision | 660,000               | 12,500,000         |
| <b>Reconstruction of road infrastructures damaged by Hurricane Jeanne - Dominican Republic</b>   | ONFED – Oficina del Ordenador de los Fondos Europeos de Desarrollo | 07/2006 | 04/2007 | EIA, Detailed Design, Tender Documents                                 | 530,700               | 20,000,000         |
| Upgrading, consolidation and safety implementation for the State highway S.S. 549 "di Macugnaga" Verbano-Cusio-Ossola, Piedmont – Italy  | ARES – Regional Road Agency  | 04/2004 | 02/2007 | Preliminary, Final, and Detailed Design, EIA                           | 1,255,300             | 27,218,900         |
| Modernization of the Ragusa – Catania link (State highways S.S. 514 "di Chiaromonte" and S.S. 194 "Ragusana") between the interchanges with S.S. 114 and S.S.115 - Sicily, Italy | ANAS (State Highways Authority) – General Directorate, Rome        | 07/2003 | 11/2006 | Preliminary Design, EIA  | 1,688,000             | 888,124,500        |

| PROJECT   | CLIENT  | PERIOD  |         | ACTIVITIES   | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|---|---|---------|---------|--|-----------------------|--------------------|
|   |   | FROM    | TO      |  |                       |                    |
| Reconstruction and rehabilitation of infrastructures in the south-east region of the Dominican Republic | EU Framework  | 06/2005 | 08/2005 | Detailed Design                                      | 95,000                | 6,730,000          |
| Road link between the Ionian and the Tyrrhenian Seas: S. Piero Patti – Francavilla di Sicilia - Italy   | Province of Messina   | 11/2004 | 01/2005 | Preliminary Design, EIA                              | 1,121,000             | 275,166,000        |
| Supervision of the Works for Border Crossing Orasje - Bosnia & Herzegovina                              | Ministry of Civil Affairs and Communications                | 11/2002 | 06/2004 | Works Supervision                                    | 175,300               | 3,100,000          |
| State Highway SS 38 – Morbegno Variant (19.5 km) – Valtellina – Itay                                    | Lombardy Region (Milan), Italy                              | 11/2001 | 02/2004 | Detailed Design, EIA                                 | 3,840,000             | 449,540,000        |
| Supply of design for Karakaj Border Crossing Point - Bosnia & Herzegovina                               | Ministry of Civil Affairs and Communications                | 02/2003 | 12/2003 | Preliminary and Detailed Design, Tender Assistance   | 188,500               | 3,200,000          |
| Reconstruction of the road Muhan – El Rama (90 km), Nicaragua   | Ministerio de Transporte e Infraestructura – (fin. WB)      | 07/1999 | 12/2003 | Detailed Design, Tender Documents, Works Supervision | 1,730,100             | 30,000,000         |
| Design of the Border Crossings Kamensko and Gorica - Bosnia & Herzegovina                               | Ministry of Civil Affairs and Communications                | 08/2002 | 12/2002 | Preliminary and Detailed Design                      | 148,100               | 6,500,000          |
| “Marble Road” – Tuscany, Italy  | Municipality of Carrara                                     | 03/2001 | 10/2002 | Final and Detailed Design, EIA                       | 2,324,000             | 103,243,200        |
| Doha Industrial area, Rock Quarry to Wukhair main road, Doha - Qatar                                    | Ministry of Municipal Affairs & Agriculture                 | 12/2001 | 09/2002 | Detailed Design                                      | 119,200               | 4,900,000          |
| Emergency Road Repair Project – Albania   | Ministry of Transport - General Roads Directorate (fin. WB) | 03/2001 | 02/2002 | Detailed Design, Tender Documents                    | 122,000               | 4,500,000          |

| PROJECT  | CLIENT  | PERIOD  |         | ACTIVITIES  | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|---|---------|---------|---|-----------------------|--------------------|
|  |   | FROM    | TO      |   |                       |                    |
| <b>Reconstruction of Jasenovac Bridge – Bosnia &amp; Herzegovina</b>                                     | Ministry of Civil Affairs & Communications - EU Framework | 12/2000 | 05/2001 | Detailed Design, Tender Documents, Tender Assistance                      | 150,000               | 3,500,000          |
| Calore Salernitano valley road – Italy   | Alburni Mountain Community                                | 05/1999 | 09/2000 | Preliminary and Detailed Design, EIA                                      | 852,100               | 32,020,300         |
| <b>Certaldo variant of State Highway S.S. 429 of the Val d'Elsa: section Poggibonsi – Empoli - Italy</b> | Provincial government of Florence                         | 11/1999 | 07/2000 | Detailed Design, EIA  | 258,200               | 72,820,500         |
| <b>Arusha-Dodoma Road (430 km) - Tanzania</b>  | Tanzanian Ministry of Works (fin. Italian Government)     | 06/1982 | 03/1984 | Feasibility Study, Preliminary and Detailed Design, EIA, Tender Documents | 995,700               | 70,238,100         |
| <b>URBAN ROADS</b>   |   |         |         |   |                       |                    |
| Urban road section former SS 114 Targia (National Road) inside the municipality of Syracuse - Italy      | Municipality of Syracuse                                  | 12/2023 | Ongoing | Detailed design, Works Supervision  | 307,119               | 39,838,009         |
| Framework contract for implementation of measures related to mobility including cycling – Italy          | INVITALIA   | 01/2023 | Ongoing | Preliminary design, Detailed design and Works supervision                 | 2,820,493             | 55,108,562         |
| Road link between the waterfront of Reitano, the SS113 and the junction A20 - Italy                      | Consorzio Tirreno Ecosviluppo 2000                        | 07/2019 | Ongoing | Preliminary and Detailed Design   | 360,000               | 10,500,000         |
| Engineering Design Services related to Infrastructure Development for Phase 1 Konza Techno City – Kenya  | ICM S.p.A.  | 10/2018 | Ongoing | Works Supervision   | 927,785               | 82,816,014         |

| PROJECT  | CLIENT   | PERIOD  |         | ACTIVITIES  | COST OF SERVICES<br>€ | COST OF WORKS<br>€            |
|--|--|---------|---------|---|-----------------------|-------------------------------|
|  |  | FROM    | TO      |   |                       |                               |
| Completion of the new Montecchio Maggiore motorway tollbooth and of the links with the urban road network – Italy  | Autostrada Brescia – Verona – Vicenza – Padova     | 04/2016 | Ongoing | Detailed Design, Technical Assistance, Works Supervision              | 1,514,900             | 63,105,603                    |
| Upgrade of the Paullese road between SP Paullese and the streets of Moro and Gela in San Donato – Italy  | Province of Milan                                  | 11/2013 | Ongoing | Feasibility Study, Preliminary and Detailed Design                    | 530,000               | 36,934,000                    |
| <b>Bikeway "Tirrenica" - Italy</b>   | Tuscany Region                                     | 05/2021 | 02/2024 | Preliminary and Detailed design                                       | 859,957               | 52,000,000                    |
| Traffic impact Assessment (TIA) for the construction phases of the high-speed rail line (AV/AC) at Montecchio – Vicenza - Italy  | IRICAVDUE  | 02/2022 | 12/2022 | Traffic impact Assessment study                                       | 62,000                | 2,700,000                     |
| Engineering Design Services related to Infrastructure Development for Phase 1 Konza Techno City – Kenya  | Delma UK (ICM Group)                               | 08/2018 | 08/2022 | Concept, Preliminary, Detailed design                                 | 1,635,750             | 82,816,014                    |
| Preliminary design of the "Adriatic" Tourist Bikeway Chioggia-Gargano - Italy  | Marche Region                                      | 06/2020 | 02/2021 | Preliminary design  | 493,853               | 263,000,000                   |
| Vado Ligure harbour basin - detailed design of the new municipal road system in the Molo 8.44 shopping centre and S16 areas - Italy  | The Western Ligurian Sea Port Authority            | 10/2020 | 01/2021 | Detailed design   | 152,087               | 16,081,598                    |
| Consulting services for the technical-economic study, detailed engineering design and tender document preparation for the construction of a bridge across Chibombe river along U15 in Chongwe district of Lusaka Province – Zambia | Republic of Zambia - Road Development Agency (RDA) | 09/2015 | 05/2018 | Preliminary and Detailed Design, Tender Documents, Works Supervision. | 473,977               | Confidential – to be tendered |



| PROJECT   | CLIENT   | PERIOD  |         | ACTIVITIES                           | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|---|--|---------|---------|--------------------------------------|-----------------------|--------------------|
|   |  | FROM    | TO      |                                      |                       |                    |
| <b>Preparation of preliminary design for "Improvement of the communication link between islands Uznam and Wolin in Świnoujście" - Poland</b>                          | Municipality of Świnoujście                                      | 01/2015 | 09/2016 | Preliminary Design, Tender Documents | 515,000               | n.a.               |
| Consultancy Services for the Detailed Engineering Design of the Road from Atomic Jct. to Ofankor - Ghana  | Infracos Soc. Coop.r.l.  | 12/2015 | 03/2016 | Revision of the Detailed Design      | 35,000                | 78,219,830         |
| Master Plan and feasibility study for the improvement and rehabilitation of urban roads of the city of Djibouti   | Ministry of Equipment and Transport - Republic of Djibouti       | 04/2014 | 03/2016 | Master Plan, Feasibility Study       | 195,000               | n.a.               |
| <b>Development of Roads in Bani Hajer - Zone 51 – Doha, Qatar</b>   | Public Works Authority, Road Affairs Department                  | 02/2009 | 07/2014 | Works Supervision                    | 4,728,640             | 141,331,000        |
| Post Contract Consultancy Services (General & Site Supervision and Quantity Surveying) for Total Infrastructure Works (Phase 2/ Package 5) inside Barzan Camp – Qatar | Private Engineering Office                                       | 04/2012 | 02/2014 | Works Supervision                    | 2,345,000             | 56,645,254         |
| Design Update of Zone 40 Design & Quantity Surveying Consultancy Services - Qatar   | PWA - Infrastructure Affairs                                     | 04/2011 | 05/2014 | Concept Design, EIA                  | 740,000               | 53,084,235         |
| Salerno Western Gate 1st Lot – 2nd Section - A3 Naples – Salerno- Italy   | Tecnis, Cogip and Pavesi   | 10/2012 | 09/2013 | Detailed and Final Design            | 1,712,318             | 104,277,390        |
| <b>Development of roads in North Khalifa &amp; Markhiya - Qatar</b>   | Ministry of Municipal Affairs & Agriculture -PWA – Roads Affairs | 05/2009 | 02/2012 | Works Supervision                    | 1,490,600             | 32,022,500         |

| PROJECT  | CLIENT  | PERIOD  |         | ACTIVITIES           | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|---|---------|---------|----------------------|-----------------------|--------------------|
|  |   | FROM    | TO      |                      |                       |                    |
| Concept Designs of Roads and Infrastructure- Phase 2 (UPDA/TAC/T/04/08-09) – Qatar   | Urban Planning & Development Authority (UPDA)                     | 04/2009 | 12/2011 | Concept Design, EIA  | 6,164,300             | 1,550,000,000      |
| Civil works contracts in the Municipality of Tirana: Supervision of construction of Tirana Middle Ring Road and reconstruction and widening of Lana Bridge - Albania | Municipality of Tirana (fin. WB)                                  | 11/2006 | 05/2011 | Works Supervision    | 686,600               | 15,500,000         |
| Industrial Interchange, Doha Expressway "D" Ring Road, Doha (ERC 1400/D20/S2) - Qatar  | Ministry of Municipal Affairs & Agriculture -PWA – Roads Affairs  | 08/2006 | 03/2011 | Works Supervision    | 5,367,000             | 150,000,000        |
| Local and Municipal Road Design and Construction Supervision Advisor - Georgia   | Municipal Development Fund of Georgia                             | 01/2011 | 03/2011 | Technical Assistance | 48,500                | n.a.               |
| Cultural Heritage, Tourism and Urban Development (CHTUD): Supervision of construction of works to revitalize the historic cores of Jerash, Karak and Madaba - Jordan | Ministry of Tourism and Antiquities (MoTA)                        | 06/2008 | 12/2010 | Works Supervision    | 2,120,000             | 22,400,000         |
| West Bay Project: Road and Infrastructure Works at Tower Zone - Area 60 North (ESC 1400/D3/S1) - Qatar   | Ministry of Municipal Affairs & Agriculture - PWA – Roads Affairs | 09/2005 | 12/2009 | Works Supervision    | 3,699,200             | 34,200,000         |
| Services for Umm Birka Road from Zubara Interchange to Al Slailiyah (ERC 0725/S5)- Qatar   | Ministry of Municipal Affairs & Agriculture -PWA – Roads Affairs  | 08/2005 | 12/2009 | Works Supervision    | 1,606,250             | 24,800,000         |

| PROJECT  | CLIENT   | PERIOD  |         | ACTIVITIES   | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|--|---------|---------|--|-----------------------|--------------------|
|  |  | FROM    | TO      |  |                       |                    |
| Engineering consultancy services for reconstruction of roads and landscaping in Dukhan Field – Qatar   | Qatar Petroleum Engineering Dept. (Onshore)  | 12/2005 | 08/2007 | Detailed Design, Tender Documents                                | 178,100               | 2,500,000          |
| <b>Cultural Heritage, Tourism and Urban Development (CHTUD): Revitalisation of the historic cores of Jerash, Karak and Madaba - Jordan</b>                     | Ministry of Tourism and Antiquities (MoTA)   | 05/2006 | 02/2007 | Urban Planning, Traffic Study, Detailed Design, Tender Documents | 600,000               | 18,000,000         |
| Development of Road Infrastructure in Thakira - urban roads of 282 ha. area - Qatar  | Ministry of Municipal Affairs & Agriculture  | 08/2004 | 07/2006 | Preliminary and Detailed Design, Tender Documents                | 350,000               | 15,000,000         |
| <b>Rehabilitation of Urban Roads – Rue 26, Rue des Salines, Boulevard Charles de Gaulle – and parking area for heavy vehicles near the Dry Port - Djibouti</b> | European Commission (Framework Lot 2) for <i>Ministère de l'Équipement et des Transports</i> | 10/2005 | 02/2006 | Feasibility Study, Preliminary and Detailed Design               | 141,700               | 3,600,000          |
| <b>Al Gharrafa (Immigration) Interchange – Doha, Qatar</b>   | Ministry of Municipal Affairs & Agriculture  | 10/2002 | 08/2005 | Works Supervision  | 2,369,500             | 44,257,000         |
| RIW at Al Oyoun Street & adjacent Roads – Al Rayyan - Qatar  | Ministry of Municipal Affairs & Agriculture  | 02/2004 | 06/2005 | Works Supervision  | 100,000               | 2,500,000          |
| <b>Control and Supervision of Urban Roads - “Rocades urbaines” (12 km) - Djibouti</b>  | Délégation UE pour le Ministère du Transport   | 11/2003 | 04/2005 | Works Supervision  | 679,000               | 27,000,000         |
| <b>Al Udaid Military Base – Infrastructures - Qatar</b>  | Rizzani De Eccher (Main Contractor)  | 11/2003 | 12/2004 | Master Plan, Detailed Design                                     | 972,800               | 60,830,000         |

| PROJECT   | CLIENT   | PERIOD  |         | ACTIVITIES   | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|---|--|---------|---------|--|-----------------------|--------------------|
|   |  | FROM    | TO      |  |                       |                    |
| <b>Design of Roads in Doha Industrial Area and Pavement Management System - Qatar</b> | Ministry of Municipal Affairs & Agriculture  | 12/2001 | 05/2004 | Detailed Design                                    | 808,000               | 66,900,000         |
| Design of Roads in Wakrah, Area WM2 & Road C - Qatar                                  | Ministry of Municipal Affairs & Agriculture  | 03/2002 | 04/2004 | Detailed Design, Tender Documents                  | 290,880               | 21,912,100         |
| Roads in Masaieed Industrial Area (50 km) - Qatar                                     | Qatar Petroleum (QP)   | 12/2002 | 12/2003 | Detailed Design, Tender Documents                  | 410,000               | 50,000,000         |
| Al Jasasyiah Street – Doha, Qatar   | Ministry of Municipal Affairs & Agriculture  | 10/2001 | 09/2003 | Detailed Design, Works Supervision                 | 239,700               | 1,716,400          |
| <b>Sub-harbour tunnel in the port of Genoa - Italy</b>                                | Tunnel di Genova S.p.A. (JV Genoa Port Authority- Genoa Municipality -Cassa Depositi e Prestiti) | 02/2003 | 06/2003 | Preliminary Design                                 | 2,663,300             | 295,870,000        |
| Supervision of Road Works in RIW-West of Madinat Al Shamal - Qatar                    | Ministry of Municipal Affairs & Agriculture  | 02/2002 | 02/2003 | Works Supervision                                  | 280,000               | 4,900,000          |
| Umm Salal Phase I - Doha, Qatar   | Ministry of Municipal Affairs & Agriculture  | 10/2001 | 05/2002 | Preliminary and Detailed Design, Tender Documents  | 830,000               | 214,550,000        |
| Al Rawabi and Al Muntaza Signal Control – Doha, Qatar                                 | Ministry of Municipal Affairs & Agriculture  | 08/2001 | 02/2002 | Works Supervision                                  | 411,000               | 7,520,000          |
| <b>Infrastructure Development Programme - Montenegro</b>                              | European Commission – OBNOVA Programme   | 06/2000 | 11/2001 | Technical and Tender Assistance, Works Supervision | 321,250               | 6,000,000          |

| PROJECT  | CLIENT   | PERIOD  |         | ACTIVITIES                                 | COST OF SERVICES<br>€ | COST OF WORKS<br>€ |
|--|--|---------|---------|--|-----------------------|--------------------|
|  |  | FROM    | TO      |  |                       |                    |
| Port accesses and Infrastructures serving the Traffic Crossing the Strait of Messina - Italy | Municipality of Villa San Giovanni (Province of Reggio Calabria) | 03/1996 | 12/1998 | Preliminary and Detailed Design, EIA       | 252,000               | 22,569,000         |
| Urban Bypass - Túnel vial Cerros Orientales - Bogotá – Colombia                              | Spie Batignolles (France)  | 05/1995 | 01/1996 | Feasibility Study, Preliminary Design, EIA | 1,032,900             | 247,899,300        |

## Appendix A – Company’s Experience

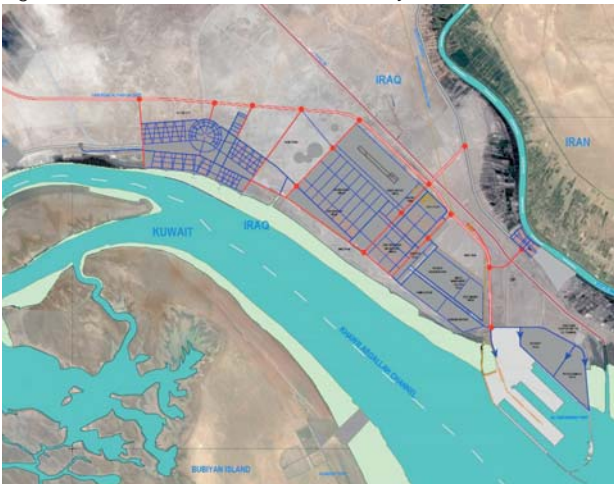
## Motorways

# WORK SUPERVISION FOR THE CONSTRUCTION OF THE CONNECTING ROAD BETWEEN AL ZUBAIR AND AL FAW GRAND PORT

|                    |  |
|--------------------|--|
| Location:          | Basrah Governorate - Iraq                                    |
| Client:            | Ministry of Transport - General Company Ports of Iraq (GCPI) |
| Services:          | Works Supervision  |
| Period:            | 12/2020 – ongoing  |
| Construction cost: | about € 358,568,983  |

## Project Description:

The project of the so-called Connecting Road, a new roadway between Al Faw and Um Qasr, is set in a wider planning and territorial context, i.e. the Al Faw Peninsula Master Plan, based on the decision to create a new seaport in the country, with a remarkable operational capacity. It is expected that in the next 30 years the goods transferred through this seaport will be about 100 million t/y; once completely terminated, its infrastructure will be capable of handling 300 million t/y of goods. The new port needs a high standard roadway connection.



The project of the Connecting Road is located on the southern area of Iraq, Governorate of Basra, at the mouth of the Shat Al Arab River. The new road will connect the new (under construction) port of Al Faw to Um Qasr and the urban settlement of Safwan, close the Kuwait border.

The road develops for a length of about 62 Km, crossing the Khawr Abdallah channel by means of an underground tunnel (under separated design) for about 2 Km.

The new road will be provided with two lanes per direction, with a Right of Way for a possible upgrade to three lanes, in the future.

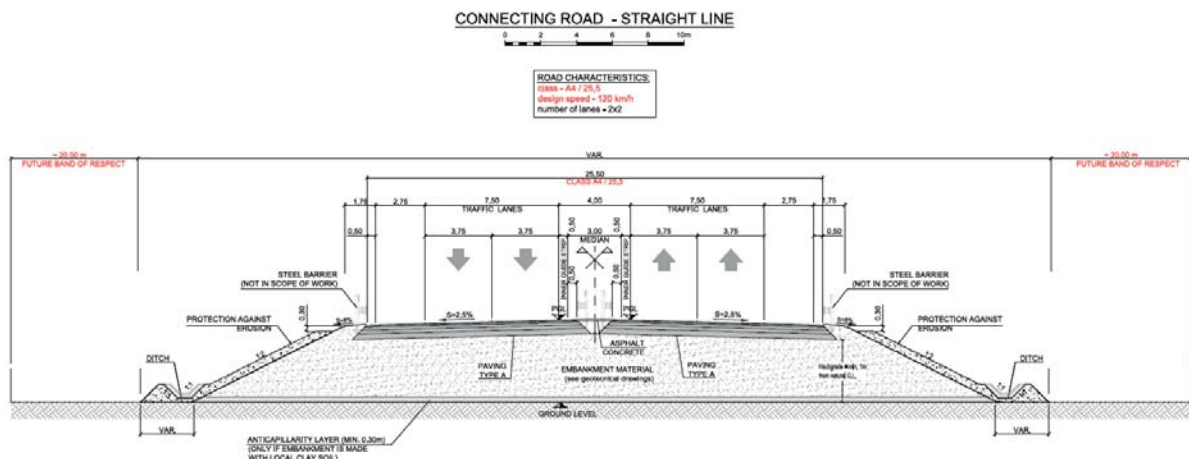
The new road has been simulated with a strategic traffic model and included in the Al Faw Peninsula Transportation Master Plan, as the backbone of the private mobility and goods flows.

The Al Faw Peninsula territory, crossed by the connecting road, is quite homogenous, desert and flat: no great interferences nor significant level variations are present. The selected path (among alternatives) runs outside the (new, huge) industrial area on the north side with junctions with the new city and the several industrial areas.



The relevant technical problem consists of the bad characteristics of the ground, investigated by a large set of soil surveys. The soil conditions are represented by deposits of loose-to-medium cohesion less soil (with or without some soft cohesive layers), or of predominantly soft-to-firm cohesive soil. To avoid excessive settlements a maximum of 5m height of embankments has been considered while a minimum of 1 m height has been considered to ensure the correct water disposal.

Embankments have been protected against water by using a protection layer made of local clay soil, stabilized with binder (3% of quicklime or equivalent) and in order to ensure capillary cut-off,



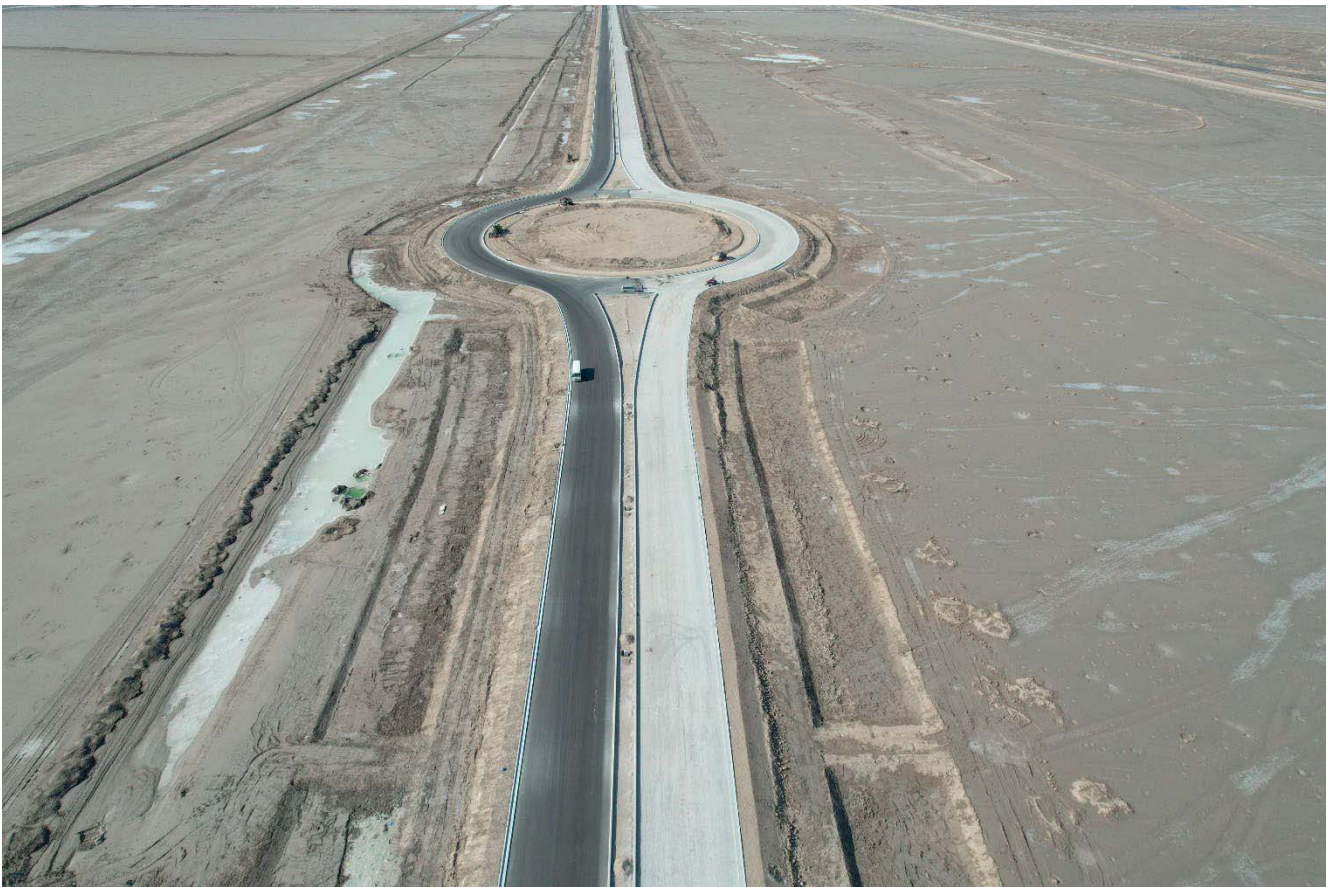


a layer of granular material shall be placed in between the ground level and the embankment itself (anticapillarity layer).

Along the Connecting Road three kind of structure are planned: two overpasses (simply supported concrete beams and continuous steel beams), for an extension of about 1.2 km and an immersed tunnel to underpass the Khawr Abdallah channel.

Two different drainage system are implemented depending on the kind of cross section considered: a straight road or curved road. In the first case, the water flows to both the external side of the paved surface, flows through the open chute drain and then reach

the compluvium flowing in the ditches, placed road side, on the base of the embankment. In the second case, all lanes have the same cross slope so the flow of the higher lane is taken by the ditches in the median and collected by a pipe to the compluvium while on the lowest lane the flow follow the scheme of the first case. The water will be conducted by the ditches in evaporation ponding areas; in the future, before reaching ponding areas the water will be treated in already planned treatment tanks



# SUPERVISION OF WORKS OF THE PENETRATING MOTORWAY (31 KM) LINKING THE PORT OF SKIKDA TO THE EAST-WEST MOTORWAY

|                    |  |
|--------------------|--|
| Location:          | Province of Costantine - Algeria         |
| Client:            | ANA (National Roads Authority – Algeria) |
| Services:          | Design Review and Works Supervision      |
| Period:            | 08/2015 – ongoing                        |
| Construction cost: | about € 220,000,000                      |

## Project Description:

The project concerns the construction of the new 3 x 2 carriageway motorway stretching north-south over 31 Km to link the port of Skikda on the Mediterranean Sea to the East-West motorway which crosses all the Algerian territory running from the Tunisian border up to the Moroccan border.

The alignment starts from the industrial zone located east of the town of Skikda and runs southbound along the valley of the wadi Saf-Saf up to the interchange with the East-West motorway near El Harrouch.

No. 5 grade separated interchanges are designed to link the new motorway to the towns located along the route and to the local road network: Skikda, Beni Bechir, Ramdane Djamel, Salah Bouchaour, El Harrouch.

The project includes the construction of 35 bridges with length ranging from 12 to 161 m, and 2 viaducts with length 202 m and 282 m respectively (3043 m total length of bridge/viaducts, with an overall surface of 87.617 m<sup>2</sup>).

The bridge structural type is simply supported beam bridge, with prefabricated r.c. prestressed beams joined through prefabricated r.c. slabs. The two viaducts are steel concrete composite beam type.

The piers have a circular cross section, either with direct or piled foundations according to the local geological conditions. Earthworks are remarkable too: 9.7 million m<sup>3</sup> of embankment and 1 million m<sup>3</sup> of excavation.

The first section of the alignment near Skikda runs through a zone characterized by the presence of various constraints, namely wadi Saf-Saf, existing roads and railways, oil and gas pipelines, high voltage power lines, public water supply and sewerage systems.

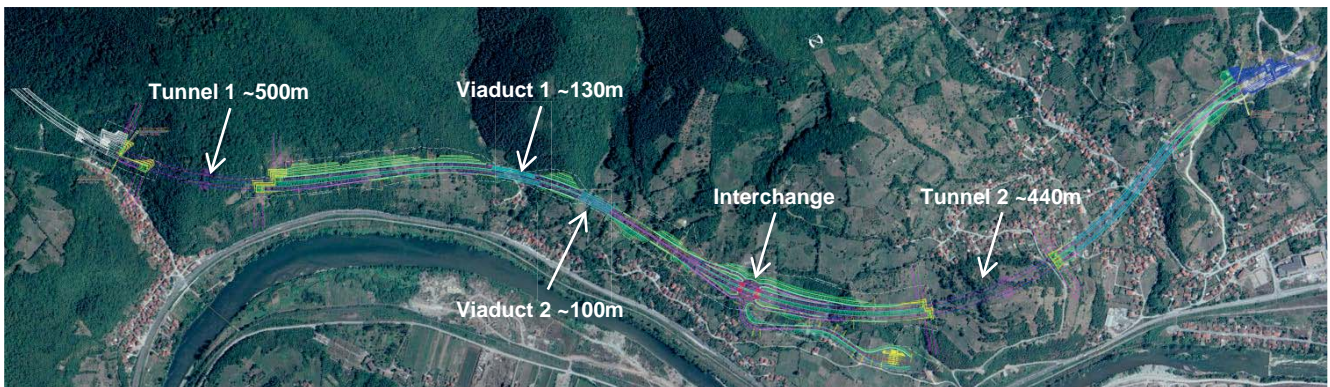
Road alignment is designed according to the ICTAAL 2000 French Standard for L2 category with a design speed of 110 Km/h.



# CONSULTING SERVICES FOR SUPERVISION OF WORKS ON CONSTRUCTION OF MOTORWAY ON CORRIDOR VC, SECTION 2 DONJA GRACANICA-ZENICA TUNNEL

|                    |  |
|--------------------|--|
| Location:          | Donja Gracanica – Zenica, Bosnia   |
| Client:            | PC Motorways of the Federation of Bosnia and Herzegovina Ltd   |
| Services:          | Design Review, General Supervision and Site Supervision (yellow FIDIC General Conditions of Contract) and Quantity surveying |
| Period:            | 11/2018 – Ongoing  |
| Construction cost: | € 67,000,000   |

## Project Description:



The whole Corridor Vc motorway runs through Bosnia and Herzegovina in the length of approximately 335 km and is divided into four lots. On Lot 2 of Corridor Vc, at the section between Doboij and Zenica lies this subsection: tunnel Zenica - Zenica north interchange – Donja Gračanica (tunnel Pečuj) with a length of 3.85 km. The section starts with the exit from the tunnel Zenica and ends at the entrance to the tunnel Pečuj and it consists of two subsections.

In the whole section are present two double barrel tunnels (~5m radius), two double carriageways viaducts and one bridge over the Bosna river.

The design speed is 120 km/h, down to 100 km/h in tunnels. Driving and overtaking lane are 2x3.75m, with an emergency lane width of 2.5m.

Marginal strip is 0.5 m, and on the side of emergency lane 0.25 m and enters the width of the emergency lane. The width of the shoulders is 1.5 m. Central reserve is a minimum of 4 m wide.

The works comprise the construction of all roads/bridges/tunnels/infrastructure works including the following:

- Local road re-alignments, closures, rehabilitations
- Earthworks, Cut and Embankments
- Bridge
- Retaining walls
- Tunneling and slopes protection
- Road Pavements
- Drainage, Culverts, Water protection works
- Toll Stations and associated pavements, buildings
- Utilities (relocation and new works), Lighting
- Steel/Concrete Safety Barriers
- Road Marking and Signing
- Geotechnical works (investigation, piling works, etc.)
- Environmental works and Fencing
- Electrical and Mechanical Works

In particular the works comprise:

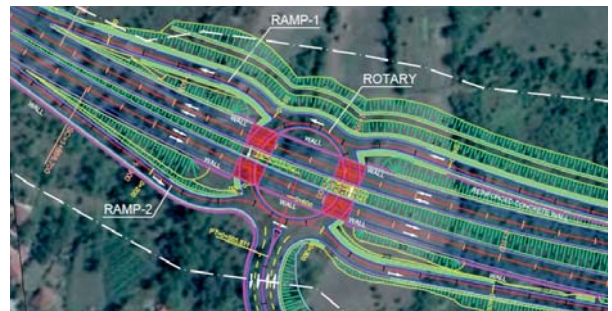
- 3.85 km of roads (of which ~500+440 m in tunnel, ~130+100 m in viaduct and 136m of bridge);
- 100.000 m<sup>2</sup> of road pavement.

- An interchange with roundabout (~ 80 m diameter);
- About 1,2 km of connecting roads with the toll station and existing viability;
- 120.000 m<sup>3</sup> of excavations;

The services provided by TECHNITAL included:

- a. General supervision, including review of preliminary and main design and the proposal of any necessary alterations
- b. BIM modelling verification
- c. Site supervision, including traffic maintenance plans, reviewing and assessing the Contractor's work, preparing all necessary reports, cost estimates, variation orders, certificates, etc.
- d. Quality Assurance, including monitoring of laboratory activities, checking the Contractors' materials and equipment, etc.
- e. Post-Contract Quantity Surveying including monthly checks on works completed, monthly schedules and evaluations, records of materials deliveries, plant and manpower, etc.
- f. Project Management, including dealing with claims and outstanding works during the construction contract maintenance period.

The consultant undertakes the assignment with a team of about 35 professionals for a contract period of 30 months (+ 24 months DNP), finally supported by other specialists from the main office.



The Contract is administered in accordance to the FIDIC Rules (Yellow Book), first of application in the Federation of Bosnia and Herzegovina.

The Consultant's Resident Engineer has assumed the role of "Team Leader – Supervision Coordinator", the Roads Department of the Ministry being the "Engineer".

# ROAD AXIS BETWEEN MARCHES AND UMBRIA REGIONS AND QUADRILATERAL OF INTERNAL ROADS: COMPLETION OF STATE HIGHWAY SS 77 "VAL DI CHIENTI"

|                    |  |
|--------------------|--|
| Location:          | Marche and Umbria Region, Italy  |
| Client:            | Val di Chienti SCpA  |
| Services:          | Final and Detailed Design, Works Supervision, Environmental impact monitoring, safety plan for 4 lane dual carriageway highway |
| Period:            | 04/2006 – 05/2022  |
| Construction cost: | € 918,910,500  |

## Project Description:

The project concerns the completion of a road network across Umbria and Marche Regions, in the Provinces of Perugia and Macerata, for a total of 93 km, including a 38.7 km-long dual-carriageway fast highway and 54.3 km of extra-urban roads.

The B category roads have a design speed 120 km/h, 2 carriageways each with 2 lanes 3.75 m width + shoulders 1.75 m right / 0.50 m left, and (minimum) 2.5 m wide traffic island. The C category roads have a design speed 100 km/h, with a single carriageway with variable width.

The main axis is the State Road SS 77 between Foligno and Pontelatrate (34.7 km long), consisting of 23 km in twin tunnels (2 separate tubes for the carriageways, 35 m inter-axis), 9.4 km on embankment (maximum height around 10m), 2.4 km on viaducts. The road includes four (2-level) interchanges.

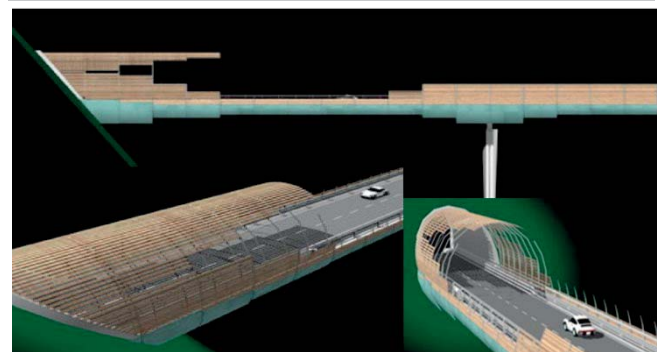
Long tunnels, up to 4 km long, are required, having a cross-sectional area of 120 m<sup>2</sup> and an internal width around 12 m. The tunnel design includes mechanical and electrical installations (lighting, fire-fighting, forced ventilation, safety equipments signs, monitoring, communication system, etc.).

Viaducts are composed of precast concrete girders (shorter spans, up to 36 m) or composite steel-concrete decks (longer spans, variable up to 80 m). The maximum pier height is around 30 m, with foundations generally on piles or shafts, due to the unfavourable soil conditions and the high seismicity of the site.

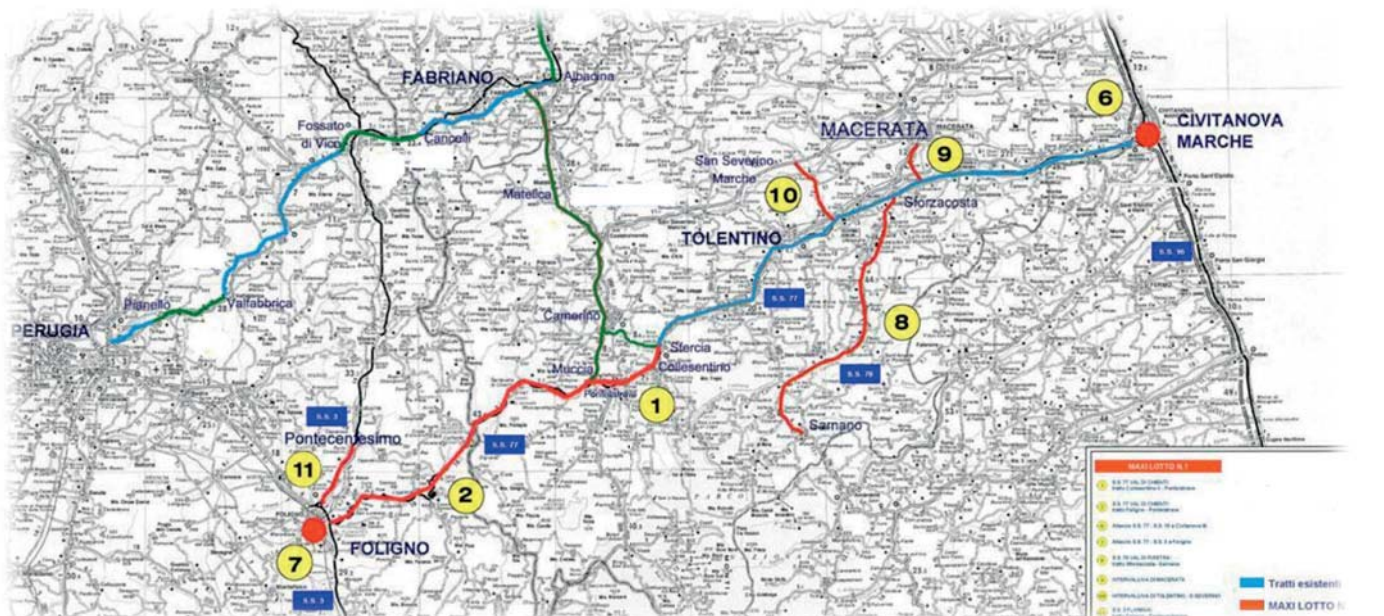
The contract includes the following activities:

- Design of major and minor structures (viaducts, tunnels, retaining structures etc.) in seismic area
- Design of mechanical and electrical installations
- Environmental impact monitoring
- Design of geological/geotechnical survey

## Tunnel entrances and viaduct structures



## Muccia viaduct and lower level road



# TECHNICAL SUPERVISION OF THE LRNIP-AF YEAR 2 ROADS REHABILITATION WORKS

|                    |  |
|--------------------|--|
| Location:          | Republic of Armenia  |
| Client:            | Transport Project Implementation Organization (TPIO) Ministry of Transport, Com. and Inf. Tec. of RA |
| Services:          | Technical Supervision of roads rehabilitation works to ensure compliance with contract requirement   |
| Period:            | 03/2018 – 06/2019  |
| Construction cost: | € 16,233,710   |

## Project Description:

The Republic of Armenia has received a loan from the World Bank (WB) toward the cost of the Lifeline Roads Network Improvement Project.

The Project consist of ten (10) sections for road rehabilitation civil works (In total approx. 61.5 km roads) located in various regions of Republic of Armenia and includes the following main construction activities:

- Demolition old structure and old utilities
- Earthworks: Roadway common and rock excavation, embankment, ramp and side ditches
- Granular Sub base and Shoulder
- Pavement works: hot asphalt concrete pavement, base and wearing coarse, cold recycling base layer with cement addition
- Drainage: Metal culvert, box culvert and drainage structures, reconditioning old structure, spillway gullies and concrete ditches, minor conc. structure, manholes, inlet and catch basin

- Road Furniture: Barrier, guard rail, hand rail, side walk, curb, post, road marking, post and bus station
- Bridge and structure: demolition, formworks, reinforcing and concrete work, expansion joint, waterproofing, gabion wall, rockfall protection with mesh
- Street lighting and electrical work utility relocation services

Each road section has an individually allocated period for the completion of the civil works and the Defect Liability Period ( DPL ) is 12 months for each of the sections of the civil works.

### Main details:

|                           |                        |
|---------------------------|------------------------|
| Total length              | 61.5 km                |
| Earthwork excavation      | 198.830 m <sup>3</sup> |
| Earthwork embankment      | 43.234 m <sup>3</sup>  |
| Pavement                  | 388.926 m <sup>2</sup> |
| Drainage chute            | 17.921 ml              |
| Drainage metallic culvert | 4.295 ml               |
| Guard Rail                | 20.129 ml              |
| Protection mesh           | 5.820 m <sup>2</sup>   |



# UPGRADE AND MODERNIZATION WORKS FROM KM 153 + 400 TO KM 173 + 900 OF THE SALERNO-REGGIO CALABRIA - ITALY

|                    |  |
|--------------------|--|
| Location:          | Regione Calabria, province of Cosenza  |
| Client:            | Contracting Authority: ANAS S.p.A – General Contractor: ITALSARC SOCIETÀ CONSORTILE PER AZIONI   |
| Services:          | Detailed design, Safety coordination during design, Environmental monitoring; Works supervision, environmental responsibility and safety coordination during execution |
| Period:            | 04/2013-05/2014 (Detailed Design); 07/2014 – 06/2018 (Works Supervision)   |
| Construction cost: | about € 417,369,463  |

## Project Description:

The A3 Salerno – Reggio Calabria Motorway is the main road connecting Sicily and the other Southern Italian regions on the Tyrrhenian sea to the European motorway system. The works for such infrastructure ended on 1972 by as time went by the motorway proved to be unsuitable to meet the growing traffic and to grant the proper security level to users.

Technital S.p.A., the leader of the design team with a percentage of 46.024%, was appointed to carry out the detailed design to upgrade and to modernize to 1/a type of rules CNR/80 as for Maxilot 3°- Part 2<sup>a</sup> from km 153+400 to km 173+900 of the Salerno – Reggio Calabria Motorway. While during works supervision TECHNITAL S.p.A was a member of the association with a percentage of 23%.



It is an upgrading and modernization intervention which is carried out partly in its surface and partly as variant for a total length of about 19.6 km. Design speed 140 km/h. Speed limit 110 km/h - 130 km/h.

The new motorway design has been very complex because of the peculiar morphological and geomorphological features of the areas crossed by the motorway. It is high seismic risk mountain area.

Starting from the current road evaluation and by deepening the issues of the Final Design approved, improvements have been studied so that following the new investigations carried out and in compliance with the provisions of law in force the liaison geometry

and functionality have been improved, whereas at the same time environmental and construction site aspects have not been disregarded.

Detailed design foresees different works. In particular, along the whole road length there will be about 7,800 m tunnels (no 6 twin bore tunnel of which 4 are new and 2 are bore tunnels. The longest tunnels are “Jannello” and “Mormanno” tunnels which are more than 2,300 m long) and 3,000 m viaducts (n. 10 mixed steel-concrete viaducts). The longest viaduct is “Viadotto Italia”, which is more than 1,100 m long. For such viaduct no intervention of large span sections is foreseen with the initial and final approach sections on new deck, whereas substructures will be partly new and partly the existing ones). The outstanding motorway length, which is less than 45% of the total development, will be in embankment or trench.



Aspects concerning the works construction sites and environmental impacts have been very important for design.

As it is the update of a road which is already in service, an in-depth study has been carried out for the purpose of the environmental restoration of the sections to be disposed. All the areas to be disposed along the road alignment will go through renaturation thanks to the viaducts and the existing tunnel entries demolition.



Viaduct Pineta - L= 175 m



**Viaduct Janello ~ L= 595 m**

Moreover, taking into account the limits imposed by Client as for the circulation restrictions during the 5 mobility periods (keeping the circulation in two lanes in each direction of travel, or, in exceptional cases, 2+1 lanes for the direction of travel, by giving priority from time to time to the mobility direction), an in-depth study has been necessary. Therefore all the construction site activities have been organized in order to limit inconveniences for circulation and to minimize the being subject to the road management, by diverting traffic on a single carriageway on the project section interfering

with the existing road, only and exclusively outside the mobility period.

With reference to the earthworks, it is worth mentioning that the material from excavations is equal to 3,088,782 m<sup>3</sup> (of which: material used for filling 1,000,898 m<sup>3</sup>; material for the formation of embankments 511,090 m<sup>3</sup>; aggregates for concrete 1,547,600m<sup>3</sup>). Material from demolition 126,285 m<sup>3</sup> (to be re-used for filling).



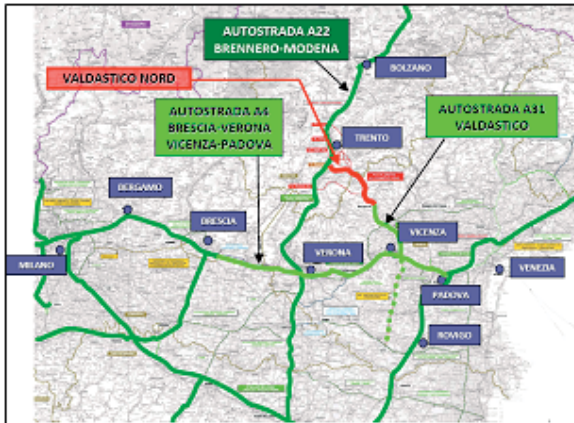
**Viaduct Mancuso - L= 253 m**

# DESIGN OF MOTORWAY A31 VALDASTICO NORTH

|                    |  |
|--------------------|--|
| Location:          | Northern Italy - Italy   |
| Client:            | Autostrada Brescia – Verona – Vicenza – Padova   |
| Services:          | Preliminary Design including an in-depth alternatives study, carried out also by mean of a strategic traffic model, calibrated on the basis of an extensive traffic survey, Environmental Impact Study and Detailed Design |
| Period:            | 02/2011 – 09/2011 (EIA and Preliminary Design) – 0/2017 (Detailed Design)  |
| Construction cost: | about € 1,148,845,054  |

## Project Description:

The currently operating A31 motorway connects the A4 motorway (which is part of the European Lisbon-Kiev corridor V) with the northern part of the Province of Vicenza (length approximately 39,1 km). The project on subject is aiming to continue on north direction (about 40 additional km) to connect to the A22 and ease transportation of goods and people in the northern part of Italy.



The contract signed by consortium RAETIA was for a preliminary and detailed design of about 40 km of Motorway. Once the preliminary design was finalized, the Client asked to focus for the main design just on the first part of the stretch (20km).

### Consortium shares:

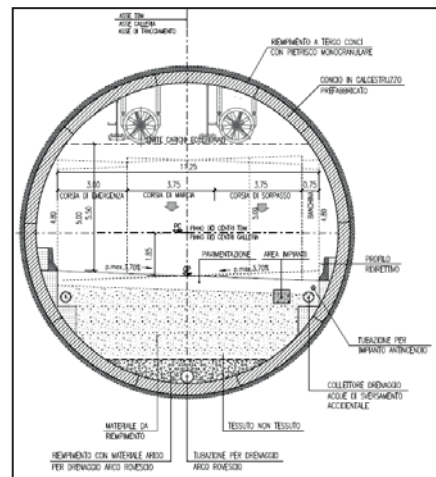
- A. Preliminary design – 40km of motorway (Technital 60%)
- B. Main design 1 LOT – 20km of motorway (Technital spa 30%)

The RAETIA CONSORTIUM led by Technital spa, duly performed and successfully completed the preliminary design and environmental impact study of the entire A31 Valdastico North Motorway of 40 km stretch and in 2017 concluded the main design of the first requested 20 km of motorway and approved by the client.

The orographic characteristics of the territory crossed by this motorway section, and the geometry of the motorway, combined with the requirement to respect the environment have necessitated lengthy sections of the alignment underground. The preferred solution (selected among a range of five alternative options, duly technically and economically analysed) foresees with eight natural tunnels of lengths ranging between 700 m and 15,100 m, all double tube one-way tunnels with a roadway of the same dimensions and

characteristics as in the open: 11.25 m paved width with two 3.75 m wide lanes, a 0.75 m wide left embankment and a 3.00 m hard shoulder. All underground works exceeding 1,000 m in length have pedestrian and vehicular cross connections at 300 meter and 900 m distances respectively. The geometric shape of the tube has, in the event of traditional excavation with polycentric cross-section, an intrados radius equal to 6.55 m for the cap and the piers and a 13.50 m radius for the invert. In the event of mechanical excavation with a perfectly circular cross-section there is obviously only one intrados radius which is equal to 6.50 m.

The pass tunnel is undoubtedly the most important work both for the complexity of its structural and plant works and for its challenging cost and construction times. This structure, once completed, will in fact be the **longest motorway tunnel in Europe (15.1 km)**. For the purpose of reducing construction times, given its great length, it has been decided to have it, unlike all the other tunnels, excavated mechanically with a full cross-section size cutter. Construction envisages the use of two cutters, starting from the Trent side towards the Veneto side, to excavate the tunnels on the rise.



The tunnel design from the safety standpoint complied with Legislative Decree 264/2006 "Implementing directive 2004/54/EC regarding the safety of tunnels in the trans-European motorway network".





# CONSTRUCTION OF THE 3RD LANE OF THE A4 - NEW SECTION - BRIDGE OVER THE RIVER TAGLIAMENTO (KP 63 + 300) - GONARS (KP 89 + 000), NEW PALMANOVA JUNCTION AND BYPASS SS 352-1ST LOT

|                    |  |
|--------------------|--|
| Location:          | Veneto and Friuli Venezia Giulia Regions (Italy) |
| Client:            | TILIAVENTUM S.c.ar.l                             |
| Services:          | Final and Detailed design                        |
| Period:            | 06/2012 – 05/2016                                |
| Construction cost: | € 289,761,446                                    |

## Project Description:

The motorway lot concerned by the design provides for the enlargement of the motorway's cross section from 2+2 road lanes to 3+3 driving lanes of 3,75m and emergency lanes of 3,00m. It develops between the historical points of the A4 Motorway Km 63+300 and Km 89+000, with the exception of a short intermediate section which is already set for 3+3 lanes and for which the repositioning of the safety barriers and the paving resurfacing are foreseen. The design speed is 140 km/h, while the speed limit is 90 km/h - 130 km/h.



The cross section's enlargement has required a detailed study of the construction phases and the setting-up of the construction site to ensure that vehicles can travel along the 2+2 lanes motorway as long as the building site is working.

Concerning the works related to the reconstruction of the hydraulic and road crossing's works, the bridge on the Tagliamento river (L=1,520m) is one of the most significant construction. It is made up of a double prestressed reinforced concrete deck and it has 20 spans (84.4 m maximum span) in order to reduce the piles number in the river area.



The two other main items along the motorway axis are the 110 m long bridge on the Stella river and the 90 m long bridge on the Cormor canal. Both of

the them have a mixed steel-concrete deck structure.

According to the project all the crossing flyovers will be redesigned so that their spans are compatible with new motorway section. There will be 9 flyovers. All of them will have a mixed steel-concrete deck structure and they will have three spans. The main central span will be between 45 and 51 m long.

The project also foresees that along the motorway S. Giorgio Nogaro interchange and its related plants will be updated.

Special works for the collection of the platform's water are foreseen in order to obtain a closed system and to avoid dangerous spills in the natural recipients' network. The project provides for 47 gathering basins (lagooning) and water treatment basins. Waters are canalised through a system of waterproof ditches for each of which the bottom and the discharge depths have been studied.



The design is completed by the updating of all the motorway plants with the laying of a new optical fiber network and new electronic variable-message signs. Important interventions of naturalistic engineering are expected in order to correctly include the works into the territory. Amongst others, trees and plants, bridges' decks and noise protection barriers have been studied. Noise barriers are provided with a height of 3.00 m, 3.50 m, 4.00 m. Moreover, multipurpose safety and acoustic barriers with a height between 3.00 m and 3.50 m are also foreseen.



In addition to the intervention on the motorway axis, the contract also provides for the design of compensative works such as the variant of the No 352 Regional Road (overall length of approximately 2.5 km). Along the road there will be a cut-and-cover tunnel and the relevant entrance works. As the works concern the ground-water level they are made up of a road section entirely below the water table and built in a long waterproof tank. There will also be a flyover and an elevated pedestrian bridge so that the cycle and pedestrian path is not interrupted.

This design complies with existing EU standards.

# SYRACUSE-GELA MOTORWAY

|                    |   |
|--------------------|---|
| Location:          | Sicily, Italy   |
| Client:            | Sicilian Motorways Consortium (Messina) for ANAS (State Highway Authority)                                  |
| Services:          | Preliminary and Detailed Design; Environmental Impact Assessment Study; Tender Documents; Works Supervision |
| Period:            | 02/1998 – 10/2015   |
| Construction cost: | € 1,359,158,000   |

## Project Description:

The Syracuse - Gela motorway (133 km) is an important link in the national and regional road network, promoting the economic development of eastern Sicily (tourism, agriculture and the mining industry) as well as offering a rapid outlet for the industrial centres of Syracuse, Ragusa and Gela.



The original design was drawn up by TECHNITAL in the years 1970-73 but construction was interrupted in 1975 because of the freezing of financing in the motorway sector. As a result of this interruption, only the first two lots of the motorway (i.e. the 9.5 km section Syracuse-Cassibile) were completed. Funds became available again for the financing of the Syracuse-Gela motorway in 1998.

Due to the long lapse between the approval of the original design in 1973 and the resumption of the project in 1998, TECHNITAL was charged with the complete revision of the project in conformity with new legislation, standards and techniques.



TECHNITAL's contract concerns the entire design process not only for the various motorway lots but also for the motorway exits and toll-plazas with the related buildings and offices, parking and maintenance facilities, lighting, ventilation and telecontrol installations. In relation to all these works, TECHNITAL is also responsible for the preparation of the Tender Documents and Construction Supervision.

## Environmental Impact Assessment

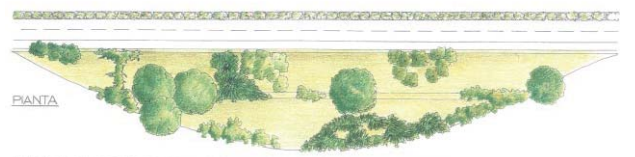


The new legislation and standards have required an Environmental Impact Assessment Study for the entire motorway. This study was not approved until 2001. The new construction technologies and standards called for the complete re-design of the motorway, which thanks to the EIA must also guarantee the utmost respect for the environment and optimize the environmental placement of the infrastructures.

SCARPATA IN RILEVATO



VISTA DA VALLE



PIANTA

SCALE: 1:1000 (PIANTA); 1:1000 (VISTA DA VALLE); 1:1000 (SCARPATA IN RILEVATO)

## Main structures

The structural design of Syracuse-Gela Motorway required particular attention not only in relation to the high landscape/environmental value of the territory crossed, but also for its location in a high seismic risk area.



In particular, lighter long-span viaducts (45-95 m) have been adopted, the reduced number of piers also facilitating the crossing of difficult terrain.

The motorway includes 15 viaducts for a total length of 6,600 m - among which *Scardina* (629 m), *Salvia* (1530 m), *Ippari* (413 m), *Dirillo 1* (992 m), *Dirillo 2* (722 m), *Valle Torta* (575 m) and *Priolo* (575 m), as well as 44 overpasses and numerous minor bridges.

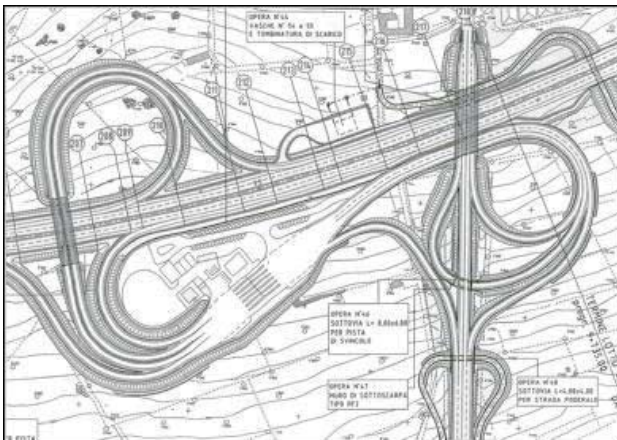
The alignment also includes 17 double-tube tunnels for a total length of 16,700 m. Almost all of them are over 500 m long.

The main tunnels are *Mandriavecchia* (916 m), *Scioli* (1,430 m), *Cozzo Truncafila* (1,000 m), *Caddame* (2,130 m), *Occhipinti* (1,968 m), *Miccichè* (1,502), *Giumente* (1,448 m), *Pian del Lupo* (1,117 m), and *Panzanella* (965 m).



Motorway characteristics:

- total length: 133 km
- design speed: 110-140 km
- lanes (per carriageway): n° 2 plus emergency stopping lane
- width of lanes: 3.75 m  
(3 m emergency lane)
- width of median strip: 4 m
- total width of road formation: 27 m
- interchanges: n° 13



# SYRACUSE-GELA MOTORWAY: ROSOLINI - MODICA SECTION (20.1 KM)

|                    |  |
|--------------------|--|
| Location:          | Sicily, Italy  |
| Client:            | Sicilian Motorways Consortium (Messina) for ANAS (State Highway Authority)                                 |
| Services:          | Updating of Detailed Design and Environmental Impact Assessment Study; Tender Documents; Works Supervision |
| Period:            | 11/2001 – 12/2010 (design) and 11/2001 – 10/2015 (Works Supervision)                                       |
| Construction cost: | € 159,115,300  |

## Project Description:

The Syracuse - Gela motorway (133 km) is an important link in the national and regional road network, promoting the economic development of eastern Sicily (tourism, agriculture and the mining industry) as well as offering a rapid outlet for the industrial centres of Syracuse, Ragusa and Gela.



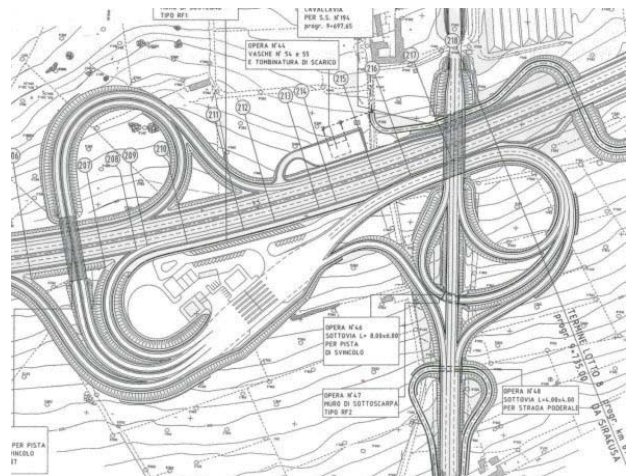
The original design was drawn up by TECHNITAL in the years 1970-73 but construction was interrupted in 1975 because of the freezing of financing in the motorway sector. As a result of this interruption, only the first two lots of the motorway (i.e. the 9.5 km section Syracuse-Cassibile) were completed. Funds became available again for the financing of the Syracuse-Gela motorway in 1998 through EU Cohesion Funds.

Due to the long lapse between the approval of the original design in 1973 and the resumption of the project in 1998, TECHNITAL was charged with the complete revision of the project in conformity with new legislation, standards and techniques.

- The design speed of the whole motorway was established at 110 to 140 km/hour. The platform is composed of two carriageways which are separated by a 4 m. median. Each carriageway has two 3.75 m. lanes, plus a 3 m. emergency lane on the right and a 0.70 m. shoulder on the left. The Project also included the reconstruction/rehabilitation of existing roads connecting the Interchanges with the local road network.
- The design of the Motorway required particular attention not only on account of the high landscape/ environmental value of the territory crossed, but also for its location in a high earthquake risk zone. Special care was therefore taken in the design of the structures. In particular, lighter long-span viaducts have been adopted, the reduced number of piers also facilitating the crossing of difficult terrain.
- The section includes the **Mandria Vecchia tunnel (820 m)**, with separate barrels for each carriageway (two 3.75 m. lanes, plus a 3 m. emergency lane on the right and a 0.70 m. shoulder on the left).



- The main structures of the section Rosolini-Modica also include the **Scardina viaduct (629.2 m)** and the **Salvia viaduct (1530.7 m)**. Both viaducts, which have decks made of prefabricated pre-stressed r.c. caissons, have intermediate spans of 54 m and lateral spans of 44.60 m. The works also include three 31 m span bridges and three underpasses of 15-17.60 m span, as well as the 13 overpasses consisting of two 31 m spans. The project also includes all the road works; the hydraulic works (numerous box culverts and other works to control the water courses, drainage works for surface runoff, etc.); the toll station buildings, (toll gates and offices); road signalling and signage; lighting, tunnel ventilation, and remote control and safety installations; as well as all the landscaping work to mitigate the environmental impact.



# SYRACUSE-GELA MOTORWAY - CASSIBILE - ROSOLINI SECTION (30.5 KM)

|                    |  |
|--------------------|--|
| Location:          | Sicily, Italy  |
| Client:            | Sicilian Motorways Consortium (Messina) for ANAS (State Highway Authority)                                 |
| Services:          | Updating of Detailed Design and Environmental Impact Assessment Study; Tender Documents; Works Supervision |
| Period:            | 10/2000 – 12/2003 (Design) and 12/2001 – 06/2015 (Works Supervision)                                       |
| Construction cost: | € 236,416,252  |

## Project Description:

The Syracuse - Gela motorway (133 km) is an important link in the national and regional road network, promoting the economic development of eastern Sicily (tourism, agriculture and the mining industry) as well as offering a rapid outlet for the industrial centres of Syracuse, Ragusa and Gela.



The original design was drawn up by TECHNITAL in the years 1970-73 but construction was interrupted in 1975 because of the freezing of financing in the motorway sector. As a result of this interruption, only the first two lots of the motorway (i.e. the 9.5 km section Syracuse-Cassibile) were completed. Funds became available again for the financing of the Syracuse-Gela motorway in 1998 through EU Cohesion Funds.

Due to the long lapse between the approval of the original design in 1973 and the resumption of the project in 1998, TECHNITAL was charged with the complete revision of the project in conformity with new legislation, standards and techniques.

The design speed was established at 110 to 140 km/hour. The platform is composed of two carriageways which are separated by a 4 m. median. Each carriageway has two 3.75 m. lanes and a 3 m. emergency lane. The Project also included the reconstruction/rehabilitation of existing roads connecting the Interchanges with the local road network.

The design of the Motorway required particular attention not only on account of the high landscape / environmental value of the territory crossed, but also for its location in a high earthquake risk zone.



Special care was therefore taken in the design of the structures. In particular, lighter long-span viaducts (54 and 95 m) have been adopted, the reduced number of piers also facilitating the crossing of difficult terrain.



The main structures of this section of motorway include: the Cozzo Inferno tunnel (388 m), and 5 major viaducts: Cassibile (285 m), Noto (385 m), Gioi (413 m), Inferno (521 m) and Tellaro (575 m). All viaducts have decks made of prefabricated r.c. caissons and have 54 m spans (except for the Cassibile viaduct which has 95 m spans). This motorway section also includes 12 major bridges, 6 overpasses and two underpasses, as well as 82 box culverts, 47 gulleys and other drainage works. Further major structures, including 6 viaducts of more than 600 m in length (one is 4.4 km long) are foreseen on the remaining section of motorway. **This motorway section, whose total construction cost was € 213,814,363**, has been financed by the Italian Government and the EU (Cohesion Funds). Due to the difficulty of the works and their high costs, the works were divided in several lots of average cost of approx. € 15 million and awarded to different Contractors

TECHNITAL's contract concerns not only the motorway itself but also the motorway exits and toll-gates with the related buildings and offices, parking and maintenance facilities, lighting, ventilation and telecontrol installations.

The Syracuse - Gela motorway (131 km) is an important link in the national and regional road network, promoting the economic development of eastern Sicily (tourism, agriculture and the mining industry) as well as offering a rapid outlet for the industrial centres of Syracuse, Ragusa and Gela.



# CONSTRUCTION SUPERVISION FOR WIDENING AND STRENGTHENING OF THE SALEM- ULUNDURPET SECTION (136 KM) OF NH68

|                    |  |
|--------------------|--|
| Location:          | State of Tamil Nadu, India   |
| Client:            | National Highway Authority of India (NHAI)   |
| Services:          | Works Supervision, management and monitoring of highway widening and upgrading works |
| Period:            | 05/2008 – 08/2013  |
| Construction cost: | € 149,372,000  |

## Project Description:



Under the National Highways Development Program (NHDP) Phase IIIA, the Government of India through National Highways Authority of India (NHAI) under the nodal Ministry of Shipping, Roads & Highways (MoSRT&H) intends to enhance the traffic capacity and safety for efficient transportation of goods and passenger traffic on heavily trafficked National Highway sections. The aim of the project is the widening the existing 2-lane highways to 4/6 lane dual carriageway highways, including strengthening of the existing 2-lanes on Build, Operate and Transfer (BOT) basis.

The broad scope of work for the Project Highway includes widening and strengthening of existing two lanes of the relevant section of National Highway and its Operation and Maintenance (O&M) on BOT basis.

The work also includes the provision of realignment and bypasses, besides the widening of existing bridges and culverts and construction of new bridges and culverts for new carriageway.



The contract awarded to TECHNITAL, in association with Quest Engineering Consultants Plc of Allahbad (India), regards the Salem-Ulundurpet highway (km 0.313 – 136.357) of NH 68 in the State of Tamil Nadu.



Besides the Road works (rehabilitation of existing 2-lane and a new carriageway), therefore, the scope of work includes a Fee Collection system, with buildings and related structures, hardware and software, Communication systems, Administration and Maintenance Depots, Rest Areas and Fuel and Service facilities.

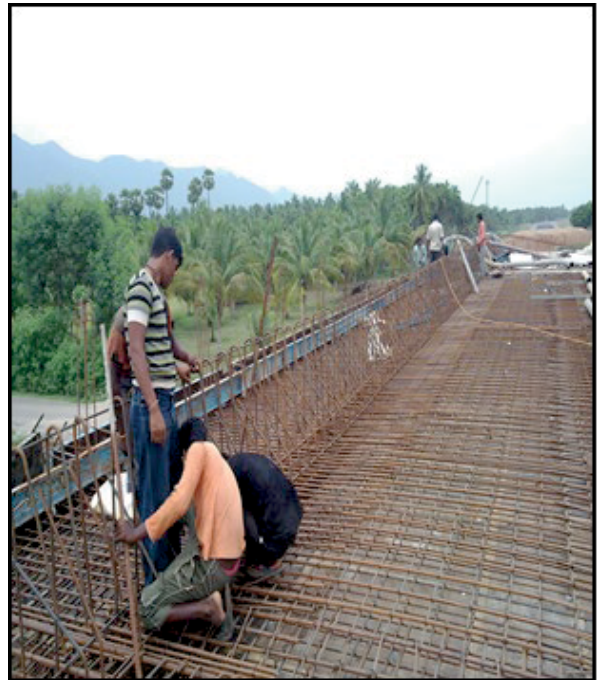
The Works also included the Lighting system, Interchanges, Bridges, Service Roads, Lay-bys, Bus bays, Traffic safety, and environmental works.

The services under the contract include:

- (i) independent review of the design activities, design review during construction, quality assurance and quality control tests and operation and maintenance of the project on behalf of both NHAI and Concessionaire so as to ensure compliance with the provisions of Concession Agreement;



- (ii) reporting to NHAI on the Financial, Technical and physical progress of implementation aspects of the project;
- (iii) in case of disputes, assistance to the parties to reach an amicable settlement.



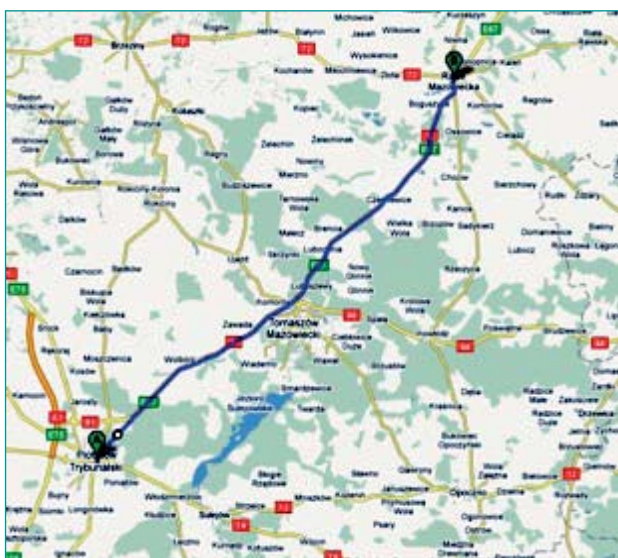
# DESIGN AND WIDENING OF NATIONAL ROAD NO. 8 TO THE PARAMETERS OF AN EXPRESS ROAD ON SECTION PIOTRKÓW TRYBUNALSKI - RAWA MAZOWIECKA (61,2 KM)

|                    |   |
|--------------------|---|
| Location:          | Poland  |
| Client:            | General Directorate of National Roads and Motorways – Łódź department               |
| Services:          | Detailed Design and construction drawings; technical assistance during construction |
| Period:            | 09/2009 – 09/2010 (Design) 09/2012 (Assistance During Construction)                 |
| Construction cost: | € 345,350,090   |

## Project Description:

The contract is part of the Design & Build project (according to FIDIC Yellow Book) for an express road section of 61.2 km to be realized in 3 lots:

- Lot 1: Km 324+772.00 - Km 346+803.80
- Lot 2: Km 346+803.80 - Km 356+700.00
- Lot 3: Km 356+700.00 - Km 386+000.00.



The section of National Road no.8 in question is located in the province of Łódź. The road alignment passes through the built-up areas of Raków, Rakowiec, Mieszce, Polichno, Wolbórz, Tomaszów Mazowiecki, Lubochnia, Olszowiec, Emilianów, Czerniewice, Wólka Jagielczyńska, Zubki Duże, Podkolnice, Podlas, Rawa Mazowiecka, for which bypasses are envisaged.

The existing road has a double carriageway section, with two lanes in each direction, divided by a median strip and flanked on the outside by a hard shoulder. All except two of the present interchanges are single level crossings. The present road has a road formation width of  $\approx 2 \times 9.50\text{m}$ , a median strip of  $\approx 4.0\text{m}$ , and hard shoulders of 1.5 m - 2.0 m.

The design road section starts at the boundary of the County of Rawa Mazowiecka, from km 324+772 to km 379+110 and ends at Rawa I Interchange, at the crossing with the axis of provincial road No. 725, at km 386+000 of National Road No.8.

For most of the route the new express road will follow the existing alignment. The stretch between Km 361+200 and Km 365+300 will be completely re-designed (new variant alignment).

The design section of National Road no. 8 includes two railway crossings: at Km 328+200 over the Warsaw-Katowice line, and at Km 354+725, over the Koluszki – Radom line.

The widely varied open terrain crossed by road alignment includes fields, meadows and large tracts of forest. The alignment also crosses several streams and rivers, as well as a number natural and archeological reserves.



Since the bearing capacity of the existing road structures is grossly inadequate for safe and efficient operation, the design envisages their total demolition and replacement with new ones. These include 27 viaducts, 16 bridges, 5 underpasses, 4 animal crossings, 6 pedestrian subways and 1 overpass. The new structures will have decks of r.c. or p.r.c. beams, slabs cast in-situ and pre-cast bearings. The design also includes 14 interchanges, and the review of the existing utilities location and drainage works.

The contract includes the design and construction of concrete paving along the entire express road section, except for the stretch between Km 334+600 and km 346+750 which requires only the rehabilitation of the existing paving (cracks, potholes, mechanical faults, expansion joints, etc.). The paving will be made with Class C35/45 (B45) cement with 0/16 mm grain size.





# FINAL DESIGN AND ENVIRONMENTAL IMPACT ASSESSMENT FOR THE EXTERNAL EASTERN BYPASS OF MILAN (T.E.E.M.)

|                    |   |
|--------------------|---|
| Location:          | Lombardy – Northern Italy   |
| Client:            | Concessioni Autostrade Lombarde   |
| Services:          | Final design (developed from the Preliminary Design published on 16 June 2003) EIA and additional survey activities (geognostic surveys). |
| Period:            | 07/2009 – 08/2011   |
| Construction cost: | € 172,439,300   |

## Project Description:

Consorzio Tangenziale Engineering, CTE, which was established by the companies TECHNITAL S.p.A., SPEA - Ingegneria Europea S.p.A., S.I.N.A S.p.A., Milano Serravalle Engineering S.r.l, Pro.lter.-S.r.l., GIRPA Progetti S.p.A, was appointed as shareholder of Tangenziale Esterna S.p.A., to draw up the Final Design, the Environmental Impact Assessment and the additional survey activities which were necessary for the CIPE (Interministerial Committee for the Economic Planning) final approval and which are preparatory for the construction phase.



The Final Design, which was developed from the Preliminary Design published on 16 June 2003, revised in 2004 by accepting the CIPE requirements – CIPE resolution No. 95 dated 29 July 2005 and the resolutions of the Supervising Committee of the Program Agreement (Collegio di Vigilanza dell'Accordo di Programma), deals with a main alignment of approximately 32 km of road with a motorway toll section between A1 Milan-Bologna motorway east of Melegnano and A4 Milan-Venice motorway east of Agrate. It deals also with 38 km of connecting works and 15 km of enlargement of local roads. The main axis is marked by a typical section corresponding to A Category (Ministerial Decree 5/11/2011) – Motorways in suburban area having three lanes for each direction (L=3.75m) and emergency lane (L=3.00m), 4.20 m traffic divider, for a total motorway platform length of 32.70 m. There will be No. 6 junctions linking the ordinary toll road network (Pessano to Bornago junction, Gessate / Gorgonzola junction, Pozzuolo Martesana junction, Liscate junction, Paullo junction, Vizzolo Predabissi junction) and No. 3 motorway interconnections (A1, A4 and Bre.Be.Mi Brescia – Bergamo - Milan).



The project aims at solving the nearly permanent congestion of the current bypass network around Milan, which is marked every day

by 170,000 vehicle traffic in the busiest sections. As a matter of fact the Milan Eastern Bypass, whose average daily traffic is supposed to reach about 70,000 vehicles at full performance, meets the need to distribute the long distance traffic by linking A1 motorway (Melegnano) and A4 (Agrate Brianza) and by dividing long distance traffic from the traffic going towards Milan's area.



There are many major structures since road alignment is developed for 1.2 km in artificial tunnel, for 7.3 km in cut below the water table and for 1.9 km in viaduct. In particular, the following main structures are foreseen:

- the artificial A4 motorway tunnel has a length of 67m allowing the External Eastern Milan Bypass to pass under the A4 motorway. A precast box-section tunnel is pushed with hydraulic jacks under the existing motorway next to a temporary detour of A4 motorway due to schedule and motorway traffic circulation;
- the Villorese artificial tunnel of a length of 100m, allowing the External Eastern Milan Bypass to pass under Villorese channel. It will be carried out by temporarily stopping the channel;
- the Gessate artificial tunnel of a length of 100m, allowing the External Eastern Milan Bypass to pass under MM2 underground. The precast box-section tunnel will be pushed with hydraulic jacks under the underground without stopping the service;
- the Martesana artificial tunnel of a length of 440m, allowing the External Eastern Milan Bypass to pass under the Martesana canal. It will be designed according to Milan typical section and it will temporarily divert the canal;
- the underpass below the four-track Milan-Venice railway line of a length of 50m, allowing the External Eastern Milan Bypass to pass under the railway line. The precast box-section underpass will be pushed in place without stopping the service;
- the bridge on the Molgora river made up of mixed steel/reinforced concrete structure and length of 20+45+20m;
- the bridge on Muzza I canal made up of mixed steel/reinforced concrete structure and length of 22+55+22m;

- the bridge on Muzza II canal made up of mixed steel/reinforced concrete structure and length of 22+55+22m;
- the artificial tunnel of Cologno of the length of 455m designed according to Milan typical section. It is foreseen to mitigate the impact of the new bypass on the houses near Madonnina di Dresano and Cologno di Casalmajocco;
- the viaduct on Lambro river made up of a mixed structure. It has a 1.6 km long orthotropic slab section whose maximum span is 160m.



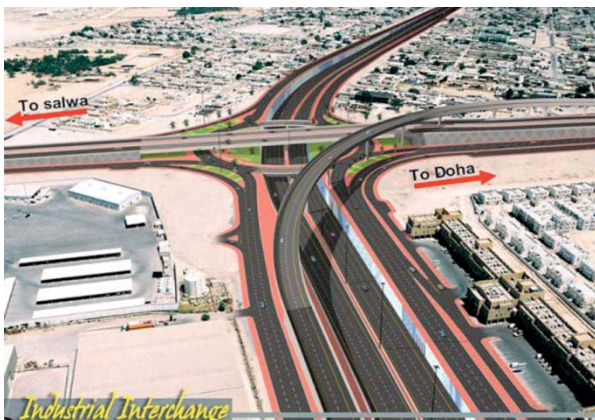
The latter has been chosen to solve the issue of the section between Via Emilia (SS9) and the Melegnano entrance into A1 motorway. Such section is marked by many constraints and interferences which heavily affect the morphological, altimetric and road course features: in addition to the need to meet the local and provincial road network (SP17) and the presence of an artificial landfill hill, it is necessary to overcome the two railway lines (historical and high speed lines) which run one beside the other and it is necessary to cross in a very oblique way the Lambro river bed. After many studies and proposals the adopted solutions foresees viaducts placed side by side, two for the External Eastern Milan Bypass and one of the next new road link between SS9 and SP17. Each with regular spans of 70 m and wide spans of 110 m to cross tracks and the Lambro river – whose maximum span is 160 m as indicated above. As there are three structures to be carried out at a very small distance, it is obvious that the number and distribution of piles have arisen many problems as far as the way to deal with the intervention from the point of view of the visual, aesthetic and landscape impact. This is why the central piles geometry has proved to be very important. Their fork shape has made such piles distinctive features in terms of composition and appearance. Such attention concerning the integration into the territory crossed by the structures has been adopted for the whole intervention. It foresees 900,000 sqm of environmental and landscape mitigation among which there are 20 km of sound absorbing barriers and dunes, afforestation and landscape valorization, overpasses for the purpose of reorganizing the road and rural network, more than 30 km of cycle paths (new projects or existing networks updating), and 120 irrigation works.

# SUPERVISION OF CONSTRUCTION OF INDUSTRIAL INTERCHANGE, DOHA

|                    |  |
|--------------------|--|
| Location:          | Doha, Qatar  |
| Client:            | Ministry of Municipal Affairs & Agriculture - Roads Affairs Department                                 |
| Services:          | General Supervision and Site Supervision (FIDIC General Conditions of Contract) and Quantity surveying |
| Period:            | 08/2006 - 03/2011  |
| Construction cost: | € 150,000,000  |

## Project Description:

The project works are located in Doha city and consist in the upgrading to a 4-level interchange of the existing Salwa Road/East Industrial Road/Al Furosiya Street Junction, otherwise known as the "Industrial Roundabout".



The works comprise the construction of all roads/ bridges / underpass/ infrastructure works including the following:

- Site clearance
- Fencing and Safety barriers
- Surface drainage
- approx. 400,000 m<sup>3</sup> of earthworks
- Granular sub base
- 300,000 m<sup>2</sup> of asphalt paving
- Kerbing works, footpaths, and paved areas
- Traffic signs and road markings
- Sewerage
- Storm water pump station
- Public utility services: provision for future services, diversions and protection of existing services (including full networks for water works, electricity works, street lighting, and public telephone works
- Landscaping and irrigation/hardscape
- Bridges and underpass structure
- Intelligent transportation system.

In particular the works comprised

- ✓ 24 km of roads (12 km of 3- lane carriageways, 4 km of 2-lane carriageways and 8 km of single lane carriageways);
- ✓ 60.000 m<sup>3</sup> of concrete structures, including 4 post compressed bridges:
  - Salwa Bridge: 2 span bridge over 7 resting points (total length 248 m);
  - Viaduct for dedicated left turn (from Salwa Road to East Industrial Road): single span bridge over 12 supports (total length 630 m);
  - 2 single spans over 3 supports (total length 52 m).
- ✓ an underpass excavated to a depth of -11 m, with a cross section of 25.5 m to accommodate the 2 carriageways and retaining walls of reinforced concrete.

The contract also included:

- the procurement and construction of 8.5 km micro-tunnel with an internal diameter of 2.4 m made using TBM (Tunnel Boring Machine);

- laying of over 9000 m of pipes of different diameters along the various utility corridors;
- the procurement and installation of street lighting system, and of 4 high detection systems and CCTV system for surveillance and monitoring purposes;
- the procurement and installation of single unit New Jersey type Safety Barriers (each unit 6 m long, pre-cast and laid on foundation);
- construction of sidewalks paved with p.c. blocks (minimum width 2.5 m).



The services provided by TECHNITAL included:

- a. General supervision, including design checks and the proposal of any necessary alterations to the design
- b. Site supervision, including traffic maintenance plans, reviewing and assessing the Contractor's work, preparing all necessary reports, records, cost estimates, variation orders, certificates, etc.
- c. Quality Assurance, including monitoring of laboratory test activities, checking the Contractors' materials and equipment, etc.
- d. Post-Contract Quantity Surveying including monthly checks on works completed, monthly schedules and evaluations, records of materials deliveries, plant and manpower, etc.
- e. Project Management, including dealing with claims and outstanding works during the construction contract maintenance period.

The Contract was administered in accordance to the FIDIC Rules (Red Book). The Consultant's Resident Engineer has assumed the



role of "Engineer's Representative, the "Engineer" role being kept by the Director of Roads Department of the Ministry.

# PEDEMONTANA LOMBARDA HIGHWAY (1<sup>st</sup> PART)

|                    |   |
|--------------------|---|
| Location:          | Lombardy Region, Italy  |
| Client:            | <i>Pedelombarda</i> (General Contractor – Association of <i>Impregilo, Astaldi, Pizzarotti, Itinera</i> )       |
| Services:          | Final design, Execution study, Project general coordination, Technical assistance during the construction phase |
| Period:            | 09/2008 – 11/2010   |
| Construction cost: | € 742,957,200   |

## Project Description:



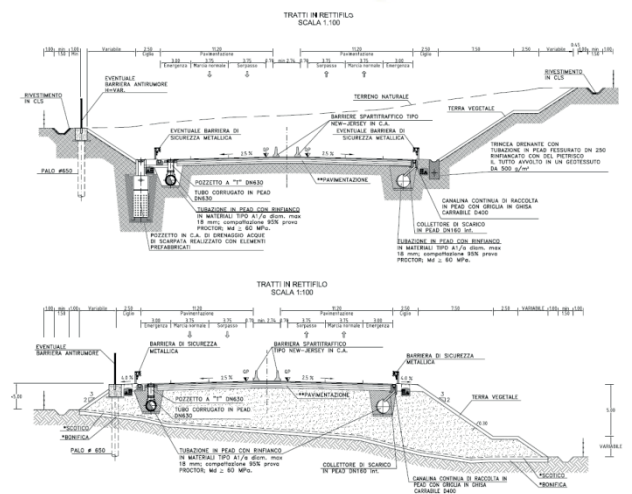
Olona viaduct rendering

The Pedemontana highway project will increase the accessibility in the west-east direction across the central section of the Po river plain, by-passing the Milan metropolitan area at its north side, between Milan and Varese, Como and Bergamo, at foot of Italian Alps.

The project awarded to Technital (leader of the association) and divided into 1st part and 2nd part includes (main axis, without interchange ramps): 67 km of new highway, the Varese and Como motorway links 20 km, local road connections 70 km.

The contract for the 1st part of the project includes Section A (14.6 km main axis), the 1st lot of the Varese Tangenziale (4.8 km) and the 1st lot of the Como Tangenziale (2.4 km). A multi-lane free flow toll system will be installed.

The design speed of the new highway is 140 km/h (120 km/h for the Varese and Como motorway links). The highway cross section is of 2 carriageways, each with two lanes plus an emergency lane.



In this 1st part of the project Technital was in charge of the general coordination of the entire design (civil works, equipment & environmental works, land expropriation) and carried out the civil works design (without tunnel structures) for Section A and local road connections (18 km additional length)

Along Section A four two-level interchanges are located, with existing highways Milano-Varese (west side) and Milano-Como-Chiasso (east side) and with local roads.

Section A has the following characteristics with respect to ground level: Cutting 5.5 km / Embankment 5.2 km / Tunnel 3.4 km (natural 0.4 km artificial 3.0 km) / Viaduct & bridges 0.3 km.

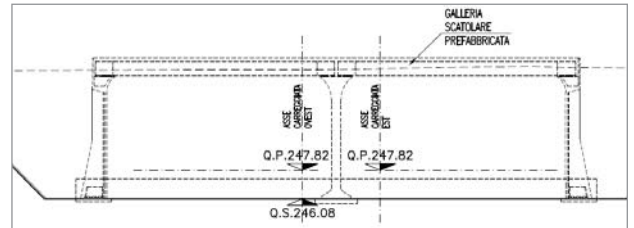
*Olna* viaduct is the main structure: 234 m long, 4 spans 55+62+62+55 m, 2 steel beams 2.8 m height.



*West interchange*

Along Section A, a maintenance centre has been located, provided by winter emergency intervention facilities, as well as a service station with recreational and accommodation facilities (hotel, restaurant).

The artificial tunnels will be realised mainly by means of prefabricated structure, to save construction time.



The drainage system has been designed with the aim of preventing rain water or spilt polluted water from staying on the road pavement. Works include continuous collecting pipes on both sides of carriageway and water treatment tanks, as well as laminating pools and lateral canals, to avoid any increase of the local river peak flows.

Single span crossovers will maintain the continuity of the interrupted local roads.

Tunnel safety has been assured by fire protection equipment as well as emergency, signalling, TV, etc.



# DOUBLING OF THE CARRIAGEWAY AND UPGRADING OF ROAD PAVING ON SECTION OF STATE HIGHWAY S.S. 640 OF PORTO EMPEDOCLE (33 Km)

|                    |   |
|--------------------|---|
| Location:          | Sicily Region, Italy  |
| Client:            | ANAS S.p.A.   |
| Services:          | Final Design and EIA Study; Topographic survey; geological-geotechnical consultancy |
| Period:            | 07/2005 – 11/2009   |
| Construction cost: | € 711,057,000   |

## Project Description:

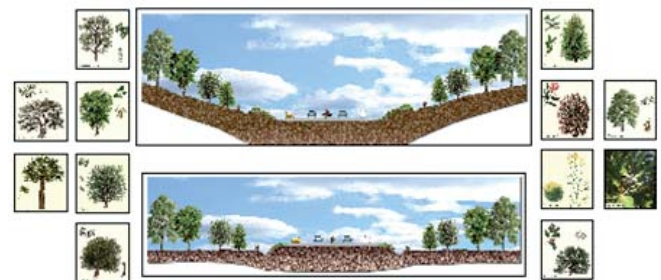
The project concerned the upgrading to 4 lanes of a section of the State highway S.S. 640 in the Province of Caltanissetta and Enna. The contract concerned a section of 33 km (out of the total 77 km of the entire highway between Agrigento and Caltanissetta), from KP 44+000, in the district of Grottarossa to KP 74+300 at the interchange with A19 Palermo-Catania Motorway, crossing the municipal territories Canicatti, Serradifalco and Caltanissetta.

The project for the upgrading of the S.S. 640 includes:

- execution of 15 double-carriageway viaducts on the main trunk; the type of decks chosen for the longer span viaducts (40 – 70 m), is that of composite steel and concrete structure.
- execution of 4 double-carriageway tunnels, one of them, "Galleria Caltanissetta" (4 km in length) shall be excavated by a Tunnel Boring Machine (TBM method).

The services (contract value € 5,396,000) were performed by TECHNITAL (lead company) in temporary association with Delta Ingegneria srl – Infratec srl – Progin SpA – S.I.S. srl.

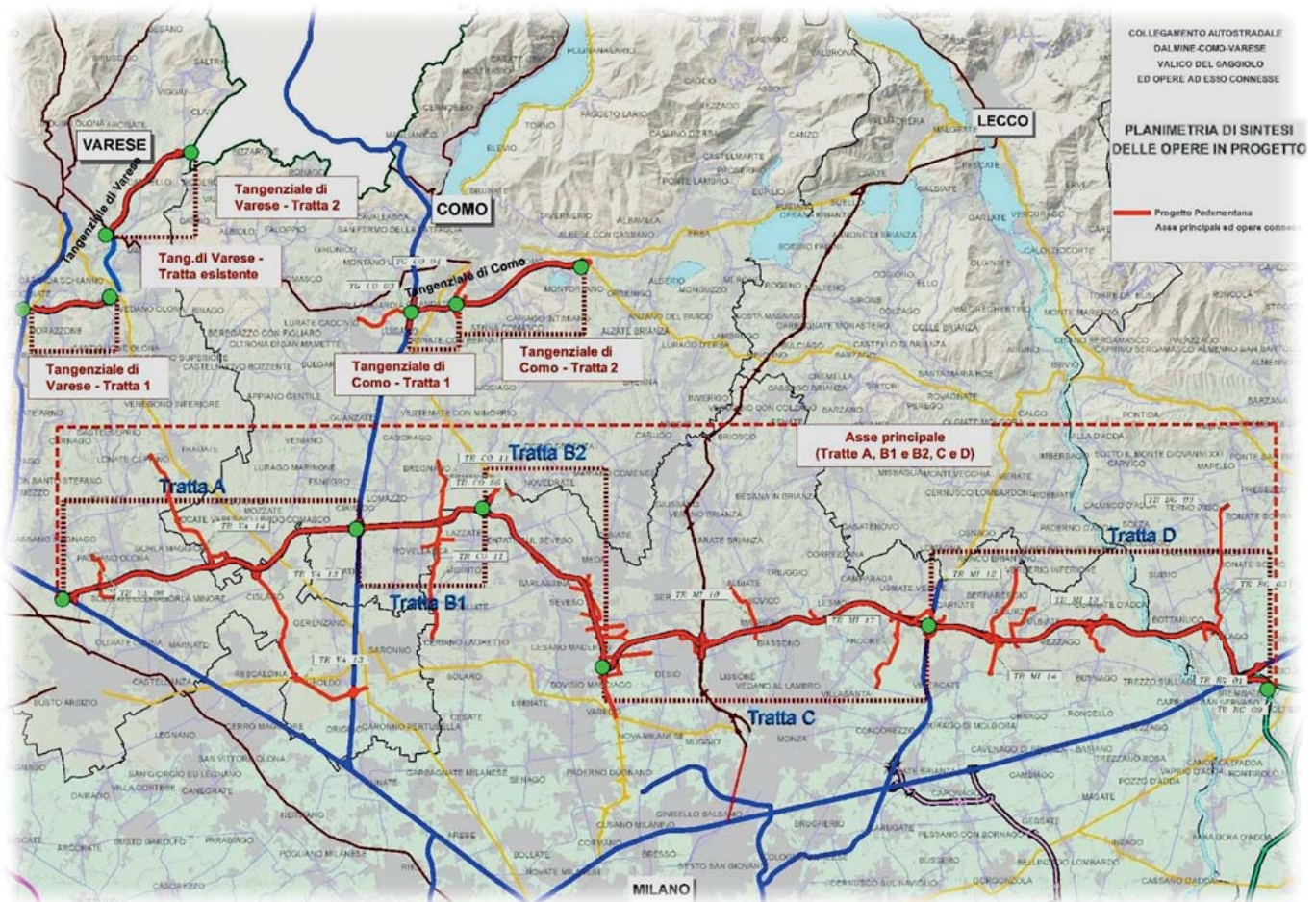
The total value of the works designed by TECHNITAL amounted to € 115.7 million, of which € 35.4 million for concrete structures, € 69,9 million for tunnels and 10,4 million for technological systems.



# PEDEMONTANA LOMBARDA HIGHWAY (2<sup>nd</sup> PART)

|                    |  |
|--------------------|--|
| Location:          | Lombardy Region, Italy   |
| Client:            | Autostrada Pedemontana Lombarda  |
| Services:          | Final Design, Environmental Impact Study (52.4 km long road alignment) |
| Period:            | 06/2008 – 04/2009  |
| Construction cost: | € 3,567,463,652  |

## Project Description:

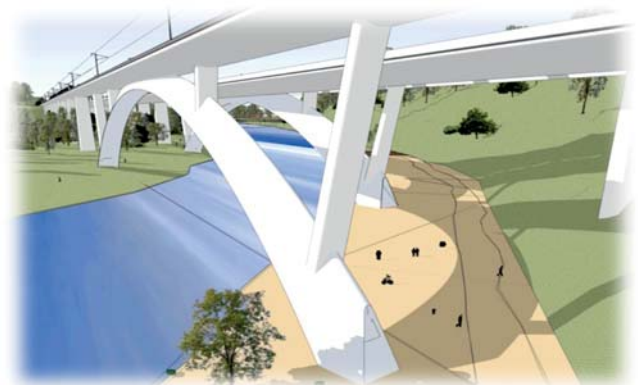


The *Pedemontana Lombarda* motorway is a road system with a total length of approximately 157 kilometers of which 67 kilometers of highways, 20 kilometers of ring roads and 70 kilometers of local roads. The Italian Consortium for Lombardy Infrastructures, composed of the companies Technital S.p.A. (Representative/Group leader), with a percentage equal to 33% of the assignment, Idrosse, Cirpa, Errevia, Proginvest, SPM, ETS, has been assigned the task of drawing up the Final Project of sections B1, B2, C, D, second lot of the Como motorway link and second lot of the Varese motorway link.

The alignment of the infrastructure is classified as an urban highway, category A, by Ministerial Decree No. 6792 dated November 5<sup>th</sup>, 2001.

Section B1, starting from the West, has a roadbed composed of two lanes in each direction plus an emergency lane and is primarily below grade. After about 7.5 kilometers it connects to the Provincial Road formerly State Road No. 35 in the municipality of

Lezzano sul Seveso. The Lazzate interchange and the junction with Provincial Road formerly State Road No. 35 are located in this section.



In section B2 the alignment crosses the terrain of the former “dei Giovi” State Highway for about 9.5 km up to the municipality of Cesano Maderno following a north-south route. The roadbed continues with two lanes plus emergency lane in both directions until the municipality of Meda where it widens to three lanes plus emergency lane in each direction (Lentate sul Seveso and Barrucana) and one complete interchange at Meda along the section. The section is primarily in cutting and has approximately 2.5 km of artificial tunnels..



Section C proceeds to the east for approximately 16.5 kilometers, connecting with the eastern bypass road (A51) in the municipality of Vimercate. The Cesano Maderno, Desio, Macherio, Arcore interchanges and the junction with the eastern bypass road are located in the section.

The roadbed is composed of three lanes plus emergency lane in each direction up to and including the Arcore interchange. The section is in cutting and has approximately 6.5 km of artificial tunnels.

The infrastructure of the section with three lanes plus emergency lane in each direction is about 18.5 kilometers long.

Section D proceeds to the east and connects with the A4 highway after about 18.5 km. The section, which has an equal percentage in cutting and on embankment, includes the Bellusco and Cornate d'Adda interchanges and the toll barriers at Filago and Osio Sotto. The alignment crosses over the Adda river on a 760 m long viaduct and also includes three service stations in the municipalities of Mozzate, Desio and Bellusco plus an operations/management headquarters in the municipality of Desio and the maintenance center and snow station in the municipality of Grandate, necessary to meet the management and operating requirements of the infrastructure. The infrastructure also includes an extensive system of “ancillary” works and “local roads” to improve connections with main and secondary ordinary road network.





# MESSINA – PALERMO MOTORWAY

|                    |   |
|--------------------|---|
| Location:          | Sicily, Italy   |
| Client:            | Sicilian Motorways Consortium (Messina) for ANAS (State Highway Authority)  |
| Services:          | Feasibility Study, Preliminary and Detailed Design; Environmental Impact Assessment Study; Tender Documents; Construction Supervision |
| Period:            | 11/1983 – 05/2009   |
| Construction cost: | € 1,117,461,646   |

## Project Description:



The Messina-Palermo motorway with the code E90, is the southernmost extension of the European international road network. The authority of the Consortium and therefore the services performed by Technital concern the approximately 220 km. stretch between Messina and Buonfornello where it joins the Catania-Palermo Motorway. Since the origin of the project way back in 1967, Technital had been awarded the contract for all the engineering services, not only for the civil works but also for the electromechanical installations and telecontrol system. The motorway construction took place in an initial period between 1969 and 1975, when the sections Messina-Rocca di Capri Leone (97,7 km.) and Buonfornello-Cefalù (17.8 km.) were built, followed by a long pause of approximately 8 years between 1975 and 1983 due to the block on financing to the motorway sector (Law no. 492 of 1975). With the resumption of financing, sanctioned by Law no. 531 of August 12, 1982, the remaining lots could be contracted out (65.8 km).

In 1983, Technital contract was renewed for the updating of the Detailed Design (the original design had been completed in 1977), Tender Documents and Construction Supervision. The various lots were contracted out and have been completed.

### Main design criteria

Despite having been constructed over different periods of time, the motorway has always maintained the same project standard. The project speed was set at 80 km/h in areas of high accident risk, 100 km/h in areas of average accident risk, and 120 km/h in level areas. The platform is composed of two carriageways which are separated by a median strip of variable width of no less than 3 metres.

The horizontal and vertical layout of the carriageways is normally parallel or coplanar, save for the stretches in which they are totally separate due to the presence of viaducts, tunnels, or particularly steep terrain. Each carriageway has two 3.75 m. lanes, a 2.5 m. shoulder lane and a 0.75 m. grass verge which is flanked by a 12.50 m. ditch in sections in cuttings. The grass verge is substituted with a 0.50 m. curb in tunnels. The horizontal layout was studied to permit maximum reduction of rectilinear stretches

and instead has a curved alignment which is better suited to the characteristics of the land and also makes for safer driving.

The vertical layout foresees maximum longitudinal gradients of 4% in ascent and 4.5% in descent. These values are reduced to 2.5% in tunnels for short stretches, and to 1.5% in longer stretches.



In addition to the main structures (viaducts, bridges, overpasses), almost all of which attest to a considerable design complexity, the various ground consolidation works, retaining walls, hydraulic crossing structures, etc., the project also includes 21 interchanges, lighting systems for tunnels and interchanges, ventilation and security systems in tunnels, and toll collection stations and toll booths.

Furthermore, the entire motorway alignment is in a highly seismic area, so all the structures were designed to resist earthquakes. Although some earthquakes have occurred after the construction, none of the motorway structures has registered any damage.

It should also be taken into consideration that because of the long time lapse between the approval of the original Detailed Design in 1977 and the various periods during which construction took place on the different motorway stretches from 1983 onwards, an in-

depth study of the original project became necessary, in order to adapt it to more recent technical standards, to the environmental restraints which had emerged in the meantime and to the use of the most modern construction technologies which could guarantee the utmost respect for the environment and improve the environmental sustainability of the infrastructures.



In particular, it should be pointed out that the original project was conceived as a product of "integrated planning" in which environmental themes played an essential role in making optimal project decisions. It therefore embodied the more ample and generic environmental criteria and was not limited to the mere mimesis of the works and planning architectural masking interventions, by development of a thorough knowledge of the various and more significant environmental components involved.

The revision of the original project highlighted the existence of some important problems of more recent origin which were connected with both the geo-morphological situation of the land and the new territorial restraints.

Particular attention was therefore paid to everything which could have affected the location of the turn-offs and exits on which the stretch depended, and by successively proceeding in the analysis of the interaction between project and environment. Therefore, those areas of the territory with the most adverse environmental characteristics were identified and, based on the results of the previous analyses, supported by the thematic mapping, photo-interpretation studies, on-site explorations, and specific targeted surveys, the possible interactions with the project and the most suitable corrective measures for eliminating or alleviating any sort of conflict with the various types of restraints were identified.

#### Long span viaducts

The most significant effect of this new approach was the complete revision of the original viaduct typology, using a new structure in pre-stressed concrete with long spans (90 – 110 m). Major viaducts include: *Buzza* (1101 m), *Caronia* (634 m), *Tusa* (820 m), *Pollina* (1152,50 m), *Malpertugio* (672 m) and *Carbone* (540 m) 433 m).

Thanks to new viaduct typology with long spans, more formal in appearance and narrower in size, it was possible to eliminate the barrier effect. Furthermore, the reduced number of piers was also particularly advantageous, especially in geographically difficult situations which required severity in scaling foundations.



#### Tunnels



The design of the Messina-Palermo motorway includes numerous tunnels, some highly complex, in order to overcome the difficult morphological and geological pattern of the area. TECHNITAL was responsible for the final design and works supervision of more tunnels of considerable importance which have required complex and sophisticated design and construction methodologies. Moreover, the design has included ventilation, lighting, safety and remote-controlled tolling systems.

The main tunnels are: *Telegrafo* (1580 m), *Tindari* (2143 m), *Capo Calavà* (3,178 m), *Petraro* (3,372 m), *Cipolla* (1,475 m), and *Capo d'Orlando* (2,000 m), *Caronia* (1938 m), *Piana* (2,590 m), *Tusa* (2,078 m), *Piano Paradiso* (2,825 m), and *Cozzo Minneria* (2,409 m). In total, 79 double-tube tunnels have been built, for a total length of some 59 km (32% of the entire motorway alignment).

#### Geological and geotechnical investigations

During preparation of the motorway designs, TECHNITAL conducted all the geological and geotechnical alignment studies and surveys, including aerial photographic geological study, definition of the geotechnical properties of the foundation soils and slopes affected by the excavations, planning of the foundation and slope stabilization works, organization and supervision of the laboratory for materials testing during construction.

# MESSINA – PALERMO MOTORWAY: SANTO STEFANO DI CAMASTRA - CASTELBUONO SECTION (20.5 km)

|                    |  |                                 |  |
|--------------------|--|---------------------------------|--|
| Location:          | Sicily, Italy  |                                 |  |
| Client:            | Sicilian Motorways Consortium (Messina) for ANAS (State Highway Authority) |                                 |  |
| Services:          | Detailed Design; Tender Documents; Construction Supervision                |                                 |  |
| Period:            | 01/1998 – 07/2001 (design)   | 05/1998 – 09/2003 (supervision) |  |
| Construction cost: | € 471,521,500  |                                 |  |

## Project Description:

The Messina-Palermo motorway with the code E90, is the southernmost extension of the European international road network. The original design was performed by TECHNITAL nearly 4 decades ago and half of the motorway was built between 1969 and 1975. There followed a period of suspension of funding in the motorway sector of 8 years and construction did not resume until 1983.

In 1983, the Technital's contract was renewed for the updating of the Detailed Design, Tender Documents and Construction Supervision. The various lots were contracted out and have been completed. The motorway was officially opened in December 2004 *although some tunnel lots were still under construction.*

The project concerns a 20.5 km section of four-lane, double carriageway motorway crossing northern Sicily, connecting the following towns and villages: Santo Stefano di Camastra, Torremuzza, S. Maria di Palati, Castel di Tusa, Milianni, Pollina, Finale and Castelbuono.

This section is divided into 12 lots, among which lot 28 (1660.73 m), lot 29 (2179.53 m), and lot 30-1° (1060.15 m) consisting entirely of natural tunnels.



The design speed was established at 80 km/h in areas of high accident risk, 100 km/h in areas of average accident risk, and 120 km/h in level areas. The platform is composed of two carriageways which are separated by a median strip of not less than 3 m. Each carriageway has two 3.75 m. lanes, a 2.5 m. shoulder lane. The Project also included the reconstruction/rehabilitation of existing roads connecting the Interchanges with the local road network.

The alignment runs in mountainous areas with very difficult geomorphological conditions. The section includes 13% bridges and viaducts, 62% tunnels and 25% open cuts and embankments. The project includes following main twin barrel tunnels:

| Lot       | Tunnel  | Length  |
|-----------|---------|---------|
| 27bis-1&2 | Colonna | 1,509 m |
| 27ter     | Piana   | 2,590 m |

|                         |                |          |
|-------------------------|----------------|----------|
| 28, 28bis               | Guardia        | 1,324 m  |
| 29                      | Tusa           | 2,078 m  |
| 29quater, 30-1, 30ter-2 | Piano Paradiso | 2,825 m  |
| 30bis                   | Torre Finale   | 1,110 m. |
| 30ter-1 & 2             | Cozzo Minneria | 2,504 m  |



*Piana tunnel under construction*



*Cozzo Minneria tunnel under construction*

The viaducts are designed to cope with the local morphology and environmental requirements, with spans of length up to 110 m. and piers up to 90 m. in height. Among them, the longest is Pollina Viaduct, of 1,006 m.

In addition to the main structures, almost all of which attest to a considerable design complexity, and the various ground consolidation works, retaining walls, hydraulic crossing structures, etc., the project also included interchanges, lighting systems for tunnels and interchanges, ventilation and security systems in tunnels, toll collection stations and toll booths, and the reconstruction or rehabilitation of existing roads connecting the Interchanges with the local road network.

TECHNITAL also conducted all the geological and geotechnical alignment studies and surveys, including the aerial photographic geological study, the definition of the geotechnical properties of the foundation soils and slopes affected by the excavations, the planning of the foundation and slope stabilization works and the organization and supervision of the laboratory for materials testing during construction.



The services provided by TECHNITAL included:

- Preliminary Design;
- Detailed Design;
- Construction Supervision;
- Technical Assistance to the State Administration during Tendering, Contracts negotiations and Final Handing Over of the Works.

The Construction Supervision was carried out in accordance with the relevant Italian Code that is based on the FIDIC rules and regulations (Red Book).

TECHNITAL has assumed the role of the "Engineer" and its Resident Engineers the one of "Engineer's Representative".



*Piano Paradiso tunnel*

# MESSINA – PALERMO MOTORWAY: CARONIA – S. STEFANO DI CAMASTRA (20.8 km)

|                    |   |                                 |
|--------------------|---|---------------------------------|
| Location:          | Sicily, Italy   |                                 |
| Client:            | Sicilian Motorways Consortium (Messina) for ANAS (State Highway Authority)                            |                                 |
| Services:          | Detailed Design and Environmental Impact Assessment Study; Tender Documents; Construction Supervision |                                 |
| Period:            | 10/1991 – 09/1996 (design)  | 09/1996 – 05/2002 (supervision) |
| Construction cost: | € 504,401,270   |                                 |

## Project Description:



The Messina-Palermo motorway with the code E90, is the southernmost extension of the European international road network. The original design was performed by TECHNITAL nearly 4 decades ago and half of the motorway was built between 1969 and 1975. There followed a period of suspension of funding in the motorway sector of 8 years and construction did not resume until 1983.

In 1983, Technital's contract was renewed for the updating of the Detailed Design, Tender Documents and Construction Supervision. The various lots were contracted out and have been completed. The motorway was officially opened in December 2004 *although some tunnel lots were still under construction.*

The project concerns a 20.8 km section of four-lane, double carriageway motorway crossing northern Sicily, connecting the following towns and villages: Caronia, Canneto, Marafò and Santo Stefano di Camastra.

**This section is divided into 6 lots, among which lot 25 bis (1746.71 m), including one natural tunnel of 975 m and one viaduct of 634 m, and lot 26 bis (1990.18 m) including 4 artificial tunnels (total length of 634.50 m) and one viaduct of 406 m.**

The design speed was established at 80 km/h in areas of high accident risk, 100 km/h in areas of average accident risk, and 120 km/h in level areas. The platform consists of two carriageways which are separated by a median strip of not less than 3 m. Each carriageway has two 3.75 m. lanes, and a 2.5 m. shoulder lane.



The alignment runs in mountainous areas with very difficult geomorphological conditions. In fact, the section includes 25% bridges and viaducts, **52% tunnels** and only 23% open cuts and embankments.

The section includes **the following natural twin barrel tunnels:**

| Lot      | Tunnel  | Length  |
|----------|---------|---------|
| 25-1 & 2 | Caronia | 1,955 m |

|        |             |         |
|--------|-------------|---------|
| 25 bis | Pagliarotto | 1,055 m |
| 26     | Portale     | 680 m   |
| 27-2   | S.Stefano   | 1,595 m |

The section also includes (Lot 26bis) **4 artificial tunnels**: Contura (213 m), S. Venera (131 m), Gamimmari (185 m) and Serra Acuta (133 m).

The viaducts are designed to cope with the local morphology and environmental requirements, with spans of length up to 110 m. and piers up to 90 m. in height. Among them, the longest is Caronia Viaduct, of 800 m.

In addition to the main structures, almost all of which attest to a considerable design complexity, and the various ground consolidation works, retaining walls, hydraulic crossing structures, etc., **the project also included** interchanges, **lighting systems for tunnels** and interchanges, **ventilation and security systems in tunnels**, toll collection stations and toll booths, and the reconstruction or rehabilitation of existing roads connecting the Interchanges with the local road network.



TECHNITAL also conducted all the geological and geotechnical alignment studies and surveys, including the aerial photographic geological study, the definition of the geotechnical properties of the foundation soils and slopes affected by the excavations, the planning of the foundation and slope stabilization works and the organization and supervision of the laboratory for materials testing during construction.

The services provided by TECHNITAL included:

- Preliminary Design;
- Detailed Design;
- Environmental Impact Assessment
- **Construction Supervision;**
- **Technital Assistance to the State Administration** during Tendering, Contracts negotiations and Final Handing Over of the Works.

The Construction Supervision was carried out in accordance with the relevant Italian Code that is based on the FIDIC rules and regulations (Red Book).

TECHNITAL has assumed the role of the "Engineer" and its Resident Engineers the one of "Engineer's Representative".



# MESSINA - PALERMO MOTORWAY: SECTION TORRENTE FURIANO - CARONIA (10.6 KM)

|                    |  |
|--------------------|--|
| Location:          | Sicily Region, Italy   |
| Client:            | Sicilian Motorways Consortium  |
| Services:          | Final design, including environmental impact assessment, and works supervision of 10.6 km motorway section (including long span viaducts, dual carriageway tunnels, interchanges and connections to the local road network). |
| Period:            | 02/1992 – 01/1998  |
| Construction cost: | € 199,879,000  |

## Project Description:



The entire Messina Palermo motorway (approximately 181.6 km). Has been under construction intermittently since 1967. Between 1967 and 1975, the sections Messina-Rocca di Caprileone (96.6 km.) and Buonfornello-Cefalu' (17.8 km.) were built. Since construction resumed in 1983 the remaining sections of the motorway have been contracted out and the final lots, in the section between S. Stefano di Camastra and Castelbuono, are under construction. In 1998, 140.3 km of the highway was opened to traffic, and construction was scheduled to be completed in 2001-2002.

The design speed was set at 80 km/h in areas of high accident risk, 100 km/h in areas of average accident risk, and 120 km/h in level areas. The platform is composed of two carriageways which are separated by a median strip of variable width of no less than 3 meters. Each carriageway has two 3.75 m. lanes, a 2.5 m. shoulder lane and a 0.75 m. grass verge which is flanked by a 12.50 m. ditch in sections in cuttings. The grass verge is substituted with a 0.50 m. curb in tunnels. In addition to the various ground consolidation works, retaining walls, hydraulic crossing structures, etc., the project also included lighting systems for tunnels and interchanges, ventilation and security systems in tunnels, and toll collection stations and toll booths.

The major structures in this motorway section include the following **11 viaducts**, 2 of which over 500 m long.

|   |            |                   |
|---|------------|-------------------|
| - | Ramosa     | 217.60m + 147.60m |
| - | Caporale   | 131.40m + 104m    |
| - | Lauro      | 2 X 357.60m       |
| - | Periano    | 2 X 287.60m       |
| - | Pirra      | 217.60m + 147.60m |
| - | Di Giorgio | 2 X 105m          |
| - | Ficuzza    | 2 X 147.60m       |

|   |            |              |
|---|------------|--------------|
| - | Fontanazza | 2 X 601.40m  |
| - | Buza       | 2 X 1101.40m |
| - | Pagliaro   | 2 X 357.60m  |
| - | Chiappe    | 2 X 147.60m  |

Special mention is made of two viaducts:

- **Buza Viaduct**, which is composed of *two parallel 1101.40 m long bridges* with 12 spans of 100m each. The deck structure is composed of prefabricated post-tensioned segments. Piers vary in height from 6.0 m to 60.0 m. The foundation shafts for the 26 piers have diameters varying from 8.5 to 12.5 m and a maximum depth of 40 m.
- **Fontanazza Viaduct** is composed of *two parallel 601.40 m long bridges*, with 7 spans each (5 of 100 m and 2 of 50.7 m). The deck structure is composed of prefabricated post-tensioned segments. Piers vary in height from 6.0 m to 26.5 m. The foundation shafts for the 16 piers have diameters varying from 8.5 to 10.5 m and a maximum depth of 26 m.



# WORKS TO COMPLETE THE NORTHERN RING ROAD SYSTEM OF VERONA: TORRICELLE TUNNEL

|                    |   |
|--------------------|---|
| Location:          | Verona, Italy   |
| Client:            | Municipality of Verona  |
| Services:          | Preliminary design including pre-feasibility EIA, legal, economic-financial analyses (under Project Financing). |
| Period:            | 01/2008 – 02/2009   |
| Construction cost: | € 303,510,000   |

## Project Description:

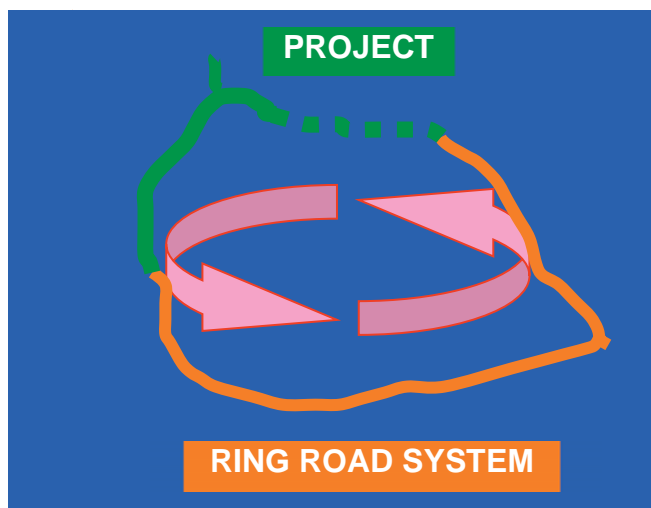
The Project regards the design, construction and management by concession contract in Project Financing form, of the Link Road to complete the northern Ring Road System of Verona city, including a tunnel of 4.3 km called the 'Torricelle Tunnel'.

The new infrastructure arises from the need to guarantee both the function of a ring road for the benefit of extra-urban traffic, which today passes through the city centre, by directly connecting the valleys of 'Valpolicella' (west) and 'Valpantena' (east), and the more strictly 'urban' function of providing a direct connection between the east (via Fincato) and west sides of the city (via Cà di Cozzi, public hospital and the historic centre of the town).



The principal objectives of the works are the following:

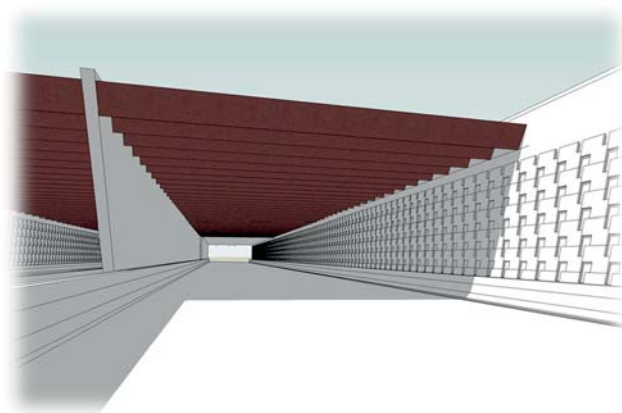
- Close the ring road system of Verona;
- Decrease the pass through traffic inside the city;
- Create a functional urban connection between the east and west sides of the city;



- Make a ring distribution system of traffic as in many other similar European cities;
- Guarantee the synergy with other major infrastructure projects planned.

The total length of the connection between the north and west sides of Verona is 13 km. The new alignment starts from the end of the existing eastern bypass and ends at the interchange with the southern bypass near the 'Verona North' tollgate of the A22 motorway. The new road has two lanes in each direction. It bypasses the 'Torricelle' hills with a tunnel of 4.3 km, crosses over the Adige River, by means of a new, architecturally important bridge (225 m) and curves towards the southwest, mostly in cutting, to close the extra-urban ring road system.

To complete the functionality of the work, and also to create a north-west axis, there is a short link road of 1 km to the national highway S.S.12 "Del Brennero", to the west of the city.



The project foresees the use of innovative methods of environmental mitigation and protection, as well as alternative sources of energy:

- The fumes from the tunnel will be filtered by ventilation systems using modern electrostatic filters;
- Noise pollution will be attenuated by acoustic barriers and entrance filters to reduce noise (and light) disturbance;
- Photovoltaic panels will be used to clad the surfaces and service buildings;
- Stormwater draining from the road formation will be filtered through special sedimentation and de-oiling tanks.

The works will be completed with some facilities to serve the road users, namely a car park for 1300 vehicles, a parking area for 150 heavy vehicles, equipped with facilities for both the vehicles and road users, as well as two service areas with fuel, bar and restaurant services.

*The successive phases of the project development include the final design and EIA, the detailed construction design and the supervision of the works (engineering services for a further €19.3 million).*



# «PEDEMONTANA VENETA» HIGHWAY (95 KM)

|                    |  |
|--------------------|--|
| Location:          | Veneto Region, Italy                             |
| Client:            | Società Pedemontana Veneta S.p.A./ Consorzio CPS |
| Services:          | Preliminary Design; EIA and mitigation measures. |
| Period:            | 06/2004 – 12/2008                                |
| Construction cost: | € 1,418,000,000                                  |

## Project Description:



The toll highway “Pedemontana Veneta” represents the last axis completing the motorway network formed by the grand trunk roads “A4 Brescia - Padova”, “A31 Valdastico” and “A27 Venezia – Belluno” stretching across the Italian Provinces of Treviso and Vicenza.

The preliminary design is based on previous design proposals sharing the same common concept of dividing the foothill road network into two separate systems with different functions. However, the present design introduces a new scenario involving a viable interchange linking the two systems that are actually one single regional highway network serving the traffic of the entire foothill territory of Veneto.

The project of the toll highway “Pedemontana Veneta” consist of two sections:

1. “Montecchio Maggiore to Montecchio Precalcino (Loc. Contrà Longa)” crosses the Province of Vicenza from the new connection with the A4 motorway at the town of Montecchio to the interchange with the new State highway SS 246 up to the junction with the A31 motoway at the town of Thiene;
2. “Montecchio Precalcino to Spresiano (Loc. Contrà Longa)” links the A31 motorway at the town of Thiene with the A27 motorway at the town of Spresiano.

The double priority of an infrastructure of adequate capacity and size but at the same time very sustainable and such to ensure maximum compatibility with both the man-made environment, and the fine natural landscape features of the areas concerned, greatly conditioned the final layout and the design work, which aimed at lessening the rigidity and impact of inevitably bulky works even before the definition of the required project impact mitigation measures.

### Works Length:

94.9 km of dual carriageway (2+2 lanes) motorway

37.5 km of motorway links and connecting roads.



# REGIONAL MOTORWAY FOR THE “COMPLETION OF THE TRANS-PO VALLEY NETWORK” (54.9 km)

|                    |  |
|--------------------|--|
| Location:          | Cremona - Mantova south section, Lombardy Region , Italy |
| Client:            | Autostrade Centropadane S.p.A.                           |
| Services:          | Final Design   |
| Period:            | 12/2007 – 05/2008  |
| Construction cost: | € 550,000,000  |

## Project Description:

The route across the Po plain from Turin to Venice and on via the Mestre bypass to Trieste, Slovenia, Croatia and main eastern European road network, is served principally by the A4 motorway.

To increase the capacity of this route which is currently close to collapse in several sections and in any case not able to offer a satisfactory service for large parts of the day, the creation of an alternative itinerary is envisaged both by the National Transport Plan, and by the Regional plans for priority works of Piedmont, Lombardy and Veneto regions.

The idea of a Trans-Po valley route derived from the plans for regional motorways such as the Cremona-Mantova in Lombardy, with its natural continuation in the Veneto identified in the Medio Padana Veneta Nogara – Adriatico Motorway.

In this context TECHNITAL was entrusted with the Final Design of Mantova section with regards the roadway and related complementary structures, including connections to the local and secondary road network, the definition of safety barriers and road signalling, the structural design of the of the complementary works and culverts of the entire motoway stretch and of the related road links.

From the technical point of view, the work consists of a closed motorway with 5 toll stations: with the A21 at Cremona, Pieve S. Giacomo, Piadena, Marcaria Virgilio, and with the A22 near the present interchange of Mantova South.



The total length of the motorway is approximately 59.4 km divided into two sections, one in the Province of Cremona called the Cremona-Tornata section (interconnection with the Tyrrhenium-Brenner West link) of 29.6 km and the other in the Province of Mantova called the Marcaria (interconnection with the Tyrrhenium-Brenner East) – Mantova South of 29.8 km.

The road platform is 26.5 m wide corresponding to Type A – Extra-urban Motorways as per Ministerial Decree "Functional and geometrical standards for road construction".



# CONSTRUCTION OF 3<sup>RD</sup> LANE FOR THE A4 MOTORWAY

|                    |  |
|--------------------|--|
| Location:          | Lot Quarto D'altino - S. Dona' Di Piave , Veneto Region, Italy |
| Client:            | Autovie Venete S.p.A.  |
| Services:          | Preliminary and Final design                                   |
| Period:            | 10/2007 – 04/2008  |
| Construction cost: | € 117,660,600  |

## Project Description:

The project concerns the structures for the new 3rd lane of the A4 motorway, in the section Quarto d'Altino (KP 10+950) - San Donà di Piave (KP 29+500), including the bridge over the Piave river and the adaptation (widening and re-building) of all the other structures, excluding the flyovers. In particular, the contract awarded to TECHNITAL included the preliminary and final designs of the bridge over the Piave river and the final design of all the other main structures of the motorway section in question, foremost among which the bridge over the Sile river.

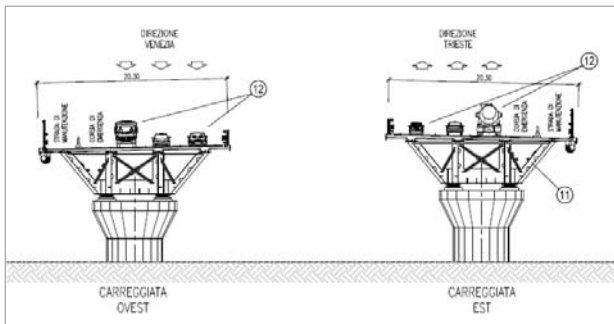


New 3rd lane of the A4 motorway – location map

### Piave river bridge

The structure consists of two separate bridges, one for each direction of travel. The bridge carriageway for the eastbound traffic, in the direction of Trieste (see following figure), has a total of 7 spans: 5 central spans of 106.5 m each plus two lateral spans of 70.0 m, for a total length of 672.5 m. The bridge carriageway for the westbound traffic, in the direction of Venice, has a total of 8 spans as follows: 1 of 70.0 m + 2 of 106.5 m + 2 of 86.0 m + 2 of 106.5 m + 1 of 70.0 m for a total length of 738.0 m.

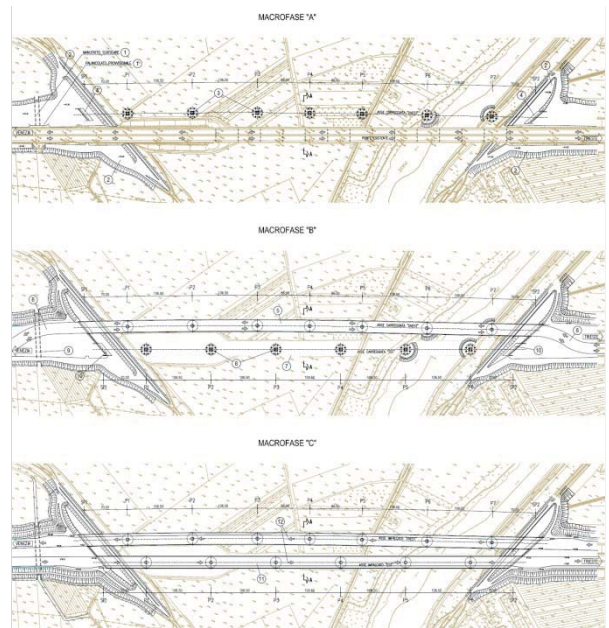
The decks of both bridges (see figure) are made of mixed steel-concrete structure with steel beams varying in height from 4.5 m on the piers to 2.8 m on the spans and the abutments.



Cross section of the bridge

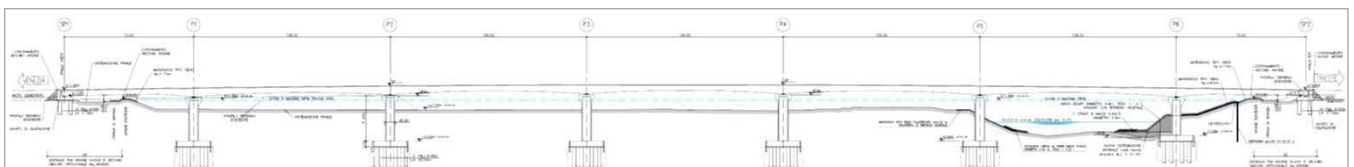
The bridge piers are hollow and have a circular cross section, with an external diameter of 5.6 m and 0.6 m thick walls. The foundations are the deep type consisting of a circular plinth with a diameter of 18 m resting on 12 piles of 1800 mm diameter.

The contract was carried out in association with Idroesse Infrastrutture, Coopprogetti, Studio Matidi, and Ipros Engineering. TECHNITAL was the lead company in the association and the firm's share of the contract amounted to 28%. The value of the works designed by TECHNITAL was € 32,945,000.



Construction phases

### Longitudinal section of the bridge (eastbound)



# A4 MOTORWAY VARIANT: MESTRE MOTORWAY BYPASS (32.5 Km)

|                    |  |
|--------------------|--|
| Location:          | Mestre, Veneto Region, Italy                                   |
| Client:            | Special Commissar for the Mestre Traffic Circulation Emergency |
| Services:          | Final and Detailed Designs, EIA Study                          |
| Period:            | 01/2004 - 12/2007  |
| Construction cost: | € 509,813,000  |

## Project Description:



The Preliminary Design was drawn up by the Regione Veneto in 1997. Subsequently TECHNITAL was charged with the execution of the final and detailed designs of a section of motorway to connect the two existing sections of the A4 motorway (Turin-Trieste), at present divided by the Mestre bypass.

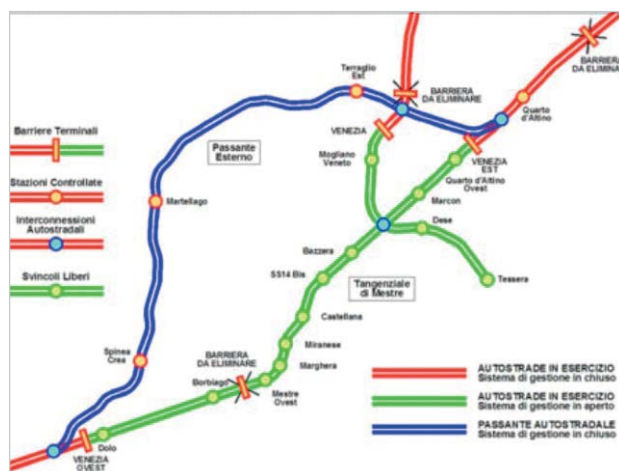
The alignment runs from the A4 at the Dolo toll barrier, passing through Spinea, Martellago and Preganziol, to link up with the A4 again at the Quarto d'Altino toll barrier, with an intermediate section along the A27 motorway Mestre-Belluno, north of the Mogliano Veneto barrier, for a total length of 32.3 km. It is a dual carriageway motorway with 3 lanes each way, 3.75 m in width, and an emergency lane 3 m wide. The cross section is therefore of Category A for extra-urban motorways, with a total width of 32.5 m. The new motorway stretch envisages 3 intermediate toll barriers (at Spinea, Mogliano, and one between Preganziol and Casale sul Sile).

Veneto Region, and in particular the provinces of Padua, Treviso and Trieste, the project involved other important works affecting the secondary road network and aimed at re-organizing and improving circulation in general.

The Special Commission for Environmental Impact Assessment of the Ministry of the Environment and the Ministry for the Public Patrimony both issued a series of specifications and recommendations in relation to the Preliminary Design, which were incorporated into the formal approval by CIPE on instruction from the Ministry of Infrastructure and Transport. The final design prepared by TECHNITAL therefore included a detailed study of these new requisites and also developed new themes not previously discussed.

For the environmental impact study, one of the most important elements was the study of the direct and indirect effects of the motorway on the hydrographical and reclamation systems of the basins crossed. It also included the verification of the innovative criteria for re-naturalizing the water courses and reconstructing wetlands to serve as filters for the ecosystem and dissipate floods. The main objectives were:

- to ensure the continuity of the runoff of the surface waters of the minor and underground network;
- to define suitable protected corridors for animal crossing near all water courses affected by the motorway bypass; to design the green works flanking the motorway to mitigate and filter the visual impact ;
- to design the motorway toll barriers allowing for the subsequent introduction of innovative toll collection systems; define appropriate mitigation measures to reduce noise;
- evaluate the concentrations of nitrogen oxides and related considerations on the delimiting barriers;
- draw up an Environmental Monitoring Plan, designed to be a tool for analysing the evolution of the environmental quality of the territory crossed by the motorway bypass.



The most significant works are the 8 sections in cuttings, seven of which covered, for a total of 10.5 km, four viaducts for over 1.5 km, fifteen river crossings with single-span bridges, thirteen overpasses and nineteen underpasses. The hydraulic works are considerable, in relation to the highly varied territory crossed. Besides these motorway works, affecting the urban areas of the

Special attention was paid to the final design of the variation of horizontal and vertical alignment in the municipalities of Salzano and Martellago, a stretch of little more than 4 km, where it had to be moved further south-east to limit the interference with the SIC (Sites of Communal Interest) "former Quarry of Villetta di Salzano",

closer to the municipality of Martellago. The new alignment was located in a fairly narrow corridor bounded by this site and the existing buildings, practically on the edge of the area itself. Specific environmental impact studies were carried out for the protection of the flora and fauna of the SIC and ZPS (Special Protected Zones). On the basis of the methodology proposed by the Veneto Region the following 4 levels of evaluation were to be carried out at depth: Level I (screening, also in relation to the setting up of construction sites; Level II (suitable evaluation of the incidence of the project on the integrity of the site), Level III (evaluation of the alternative solutions) and Level IV (compensating measures). A special evaluation study was made with regard to the built-up areas, which are more heavily affected with respect to the preceding alignment solution for the motorway.



# UPGRADING OF THE SOUTHERN BYPASS OF BRESCIA AND CONSTRUCTION OF THE THIRD LANE

|                    |                                |
|--------------------|--------------------------------|
| Location:          | Brescia, Lomardy Region, Italy |
| Client:            | Province of Brescia            |
| Services:          | Detailed Design of the 1st lot |
| Period:            | 09/2005 - 06/2006              |
| Construction cost: | € 51,047,900                   |

## Project Description:

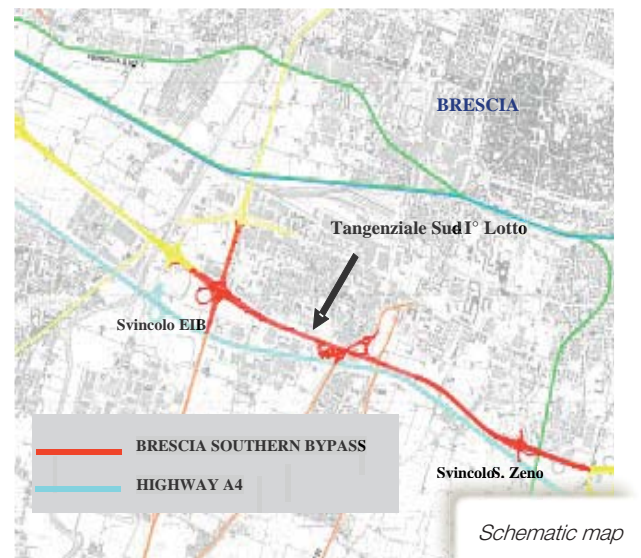
The stretch taken into consideration of the Southern Bypass (ex S.S. 11) is about 4.7 km long, from the intersection with the Western Bypass of Brescia to the motorway toll gate of *Brescia Centro* of the A4. At the moment it consists of a double carriageway, with two lanes for each direction and no emergency lane, separated by a single row of New Jersey type barrier. The inadequate dimensions of the present infrastructure cause serious traffic problems, which in the peak traffic times can reach near paralysis or at least heavy congestions. The inadequate width plus the insufficient number of feeder lanes at the junctions determines dangerous situations for the users that need to be eliminated by structural interventions.



The detailed design of upgrading and increasing the capacity of the highway envisages structural interventions to solve the critical present situation, such as: the realisation of the 3rd lane and of the emergency lane, the upgrading of the central and lateral guardrails, the creation of adequate feeder lanes, the reconstruction of the main structures and crossing structures, the realisation of a new three-level junction with the West Bypass.

Special attention has been paid to the construction aspects related to the phasing of the construction works. Thanks to the contacts with the contractor, it has been possible to optimize the choices of the technologies, trying to minimize the time of construction.

The setting up of the construction site of the different structures and of the road works has been studied in detail, preparing suitable tables describing all the site solutions and the sequence of the construction works and of the provisional road networks required from time to time.



In particular, for the launching of the beams of the viaducts and the flyovers, and for the demolition of the existing structures, it was decided to work during the night hours, to reduce the interferences with traffic.

# CONSTRUCTION SUPERVISION OF AL GHARRAFA (IMMIGRATION) INTERCHANGE

|                    |   |
|--------------------|---|
| Location:          | Doha, Qatar   |
| Client:            | Ministry of Municipal Affairs & Agriculture - Roads Department  |
| Services:          | Site Supervision and Post-contract Quantity Surveying, including Project Management services along with and in coordination with the Site Monitoring/Supervision Services |
| Period:            | 10/2002 - 08/2005   |
| Construction cost: | € 44,257,000  |

## Project Description:

The project is located in Doha City at the intersection of Shamal Road, Khalifa Street and Luqta Street in the vicinity of the Immigration Roundabout.



The works comprise the supervision of the construction of all roads / bridges / underpass / infrastructure works.

In particular, the works consisted of:

- ✓ 2 interchanges, one 3-level interchange and one 2-level interchange. The 3-level interchange is located at the junction between Al Shamal Road / Khalifa Street and 22nd February Street / Al Luqta Street, while the 2 level interchange is located at the junction between Al Luqta Street / Al Markhiya Street / Al Beday Street.



- ✓ 11 km of 3- lane dual carriageway roads;
- ✓ 5 bridges to serve all levels.
  - Al Shamal Flyover: 7 span bridge over 8 supports for a total length of 404 m, post-stressed over the central spans; and
  - 4 single span bridges over 3 supports for a total length of 104 m.



- ✓ an underpass along Khalifa St./Luqta Road excavated to a depth of -11 m, with a cross section of 25.5 m to accommodate the 2 carriageways and retaining walls of reinforced concrete.
- ✓ ancillary works including:
  - replacement /relocation of high voltage cables between Al-Gharrafa Substation and Al-Gharrafa South and Al Sowaidi Substations respectively,
  - construction of road signaling and pavement marking,
  - landscaping,
  - street lighting,
  - irrigation ducts,
  - diversion and/or protection of services such as Electricity, Water, Q-Tel, Sewerage, Storm drainage etc.



The Project was considered particularly difficult because of the following main aspects:

- Very tight construction schedule,
- Location of the works in a densely inhabited and traffic congested area,

- Interference with many underground utilities that have to be diverted/relocated,
- Installation of H.V. cables and large diameter pipes requiring a long procurement time.

The Project was initially awarded to the Contractor on a lump sum basis for an amount of Q.Rls 175,000,000.00 (One Hundred Seventy Five Million Qatari Riyals). During contract negotiations, the Scope of Works has been increased to include the construction of an underpass along Al Al-Hanna-Al Beday Streets.

*The total revised contract amount is Q.Rls 188,093,619 (€ 44.25 million).*



The Services awarded to TECHNITAL included:

- Construction Supervision;
- TA during Maintenance Period and Final Handing Over of the Works.

The Contract was administrated in accordance with the FIDIC Rules and the Red Book.

The Consultant's Resident Engineer has assumed the role of "Engineer's Representative, the "Engineer" role being kept by the Director of Roads Department of the Ministry.

The Consultant provided a team of 22 qualified engineers covering the following positions:

- 1 Resident Engineer
- 2 Assistant Resident Engineer
- 1 Materials Engineer
- 1 Electrical Engineer
- 2 Quantity Surveyors
- 1 Planning Engineer
- 3 Surveyors
- 9 Site Inspectors
- 1 Engineering technician
- 1 CAD Operator.



The Contract foresaw the completion of all the works in a period of 16 months starting from 15/10/02.





# CONTROL AND SUPERVISION OF WORKS FOR THE CONSTRUCTION OF 3 URBAN ROADS (“ROCADES URBAINES”)

|                    |   |
|--------------------|---|
| Location:          | Djibouti  |
| Client:            | Ministère de l'Équipement et des Transports   |
| Services:          | Geotechnical investigations and tests, Topographic surveys, Construction Site and Contract Management, Quality Control and general Monitoring of Construction |
| Period:            | 11/2003 – 04/2005   |
| Construction cost: | € 27,000,000  |

## Project Description:

The project concerns the monitoring and supervision of the construction works for the rehabilitation of three major road sections in Djibouti: *Route de Venise*, *Rue Nelson Mandela* and the section of the RN1 crossing Balbala.



The works consist in:

- The reinforcement of the 4-lane, dual carriageway “*Rocade de Venise*” between the intersection with state highway RN 1, near the port entrance, and the *Italie* bridge over the Ambouli wadi (roughly 5.3 km). The road was built in 1993 but has been badly damaged by the increasing heavy traffic.
- The reconstruction of the Avenue Nelson Mandela (1.8 km) which links, to the south of the city of Djibouti, the RN 1 (at the Ambouli roundabout) and the RN 2 (at the CDE level crossing), serving the Ambouli and Djebel districts.
- The reconstruction of the crossing of the Balbala district by RN 1, the main artery of the national road network, for a section of approximately 4 km.

The supervision team consists of 3 expatriate staff:

- Team leader /Resident Engineer responsible for the coordination and liaison with the Client
- Geotechnical Engineer to supervise to the laboratory technicians
- Site Engineer to supervise the topographic survey, the earthworks, road and restoration works.

This expatriate team is supported by local staff: consisting of 3 surveyors and 4 laboratory technicians.

The project, which is carried out on behalf of the Government of Djibouti under the auspices of the European Commission (FED), includes the following control and supervision services:

- Control of the setting up of the construction sites
- Control and approval of the Contractor’s work schedules, plans and topographic instruments
- Checking and installation of the equipment
- Quality control of the construction material

- Control and assistance with construction site organization and operation
- Execution of the geotechnical laboratory tests
- Issuing of service orders, certificates and monthly progress reports
- Control of the temporary detour works
- Monitoring of the construction costs and payments
- Technical assistance to the Administration and quantity surveying of the works
- Liaison between the Contractor and the Client for all matters concerning the contract
- Control and restoration to their original state of the borrow areas, work camps, access roads, etc. according to the environmental protection clauses
- Final Handover of the works and drawing up of the Final Report.



# VALTROMPIA MOTORWAY (42 Km)

|                    |   |
|--------------------|---|
| Location:          | Lombardy, Italy   |
| Client:            | Autostrada Brescia – Verona – Vicenza - Padova S.p.A.                 |
| Services:          | Final and Detailed Design, Environmental Impact Study and Safety Plan |
| Period:            | 03/2000 – 04/2005   |
| Construction cost: | € 785,919,200   |

## Project Description:



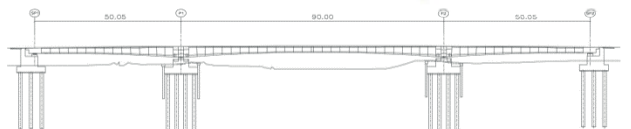
*Concesio toll station*

Technital has been awarded the contract for the Final and Detailed designs, environmental impact study and safety plan for the motorway link (42 km) between the A4 (Milan-Venice) motorway and Valtrompia, including tunnels, viaducts, interchanges, special structures, and lighting, ventilation, safety and toll installations.

One of the major structures on the motorway is the viaduct over the Mella river. The Mella South bridge is 147.6 m long with 3 spans: a central span of 70 m across the river bed and two lateral spans of 38.8 m. The Mella North bridge is 191 m long with 3 spans: a central span of 90 m across the river bed and two lateral spans of 50.5 m.



*Mella South Bridge*

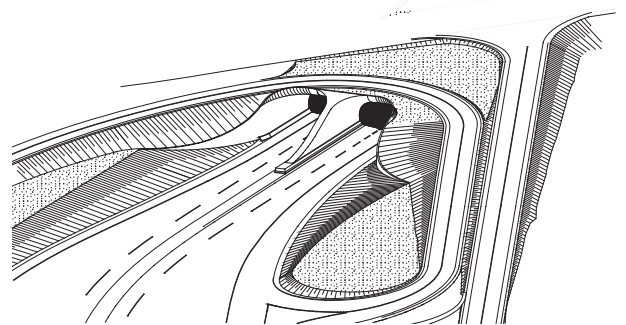


Owing to the traffic forecast (some 26,000 vehicles/day through the Concesio tollgate) the sections between Ospitaletto or Brescia West and the branching of the motorway to Sarezzo and Lumezzane will have a four-lane divided carriageway and a design speed of 80-100 km/h.

The sections north of this branch, on the other hand, in view of the traffic forecasts and the morphological constraints, will have a single two-lane carriageway and the same design speed of 80-100 km/h. An additional slow lane will be added for heavy vehicles for the ascending section between the Sarezzo turnoff and the locality of S. Apollonio.



*Villa Carcina tunnel*



Technital is responsible for the project management on behalf of the temporary association Technital - Spea Ingegneria S.p.A. - S.I.N.A. Società Iniziative Nazionali Autostradali S.p.A. - Tecnic S.p.A. and Rocksoil S.p.A. As the leading company of the group Technital's share amounts to 45% of the total contract value.



*Valgobbia viaduct*

# UMM BAB TO SALWA DUAL CARRIAGEWAY ROAD (37 km)

|                    |  |
|--------------------|--|
| Location:          | Qatar  |
| Client:            | Qatar Petroleum (QP)   |
| Services:          | Detailed Design of road catering to QP installations and at the same time establishing an optimized link to the Doha-Salwa road. |
| Period:            | 05/2002 – 07/2003  |
| Construction cost: | € 40,000,000   |

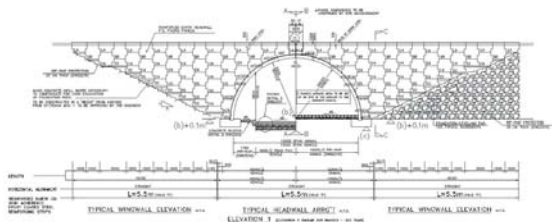
## Project Description:

The work area comprises of existing road between Umm Bab roundabout and Salwa road, which is approximately 37 km.

The objective of the project scheme is to provide a safe and reliable road that serves the needs of Dukhan Township and the various QP facilities in the Umm Bab, Jaleha and Diyab areas.

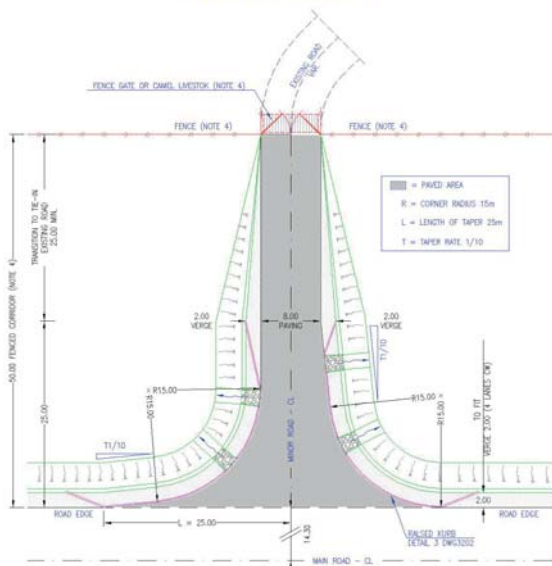
The services are carried out in three stages:

- Stage I: Sketch design stage
- Stage II: Preliminary design stage
- Stage III: Detailed design stage



Head Wall Elevation

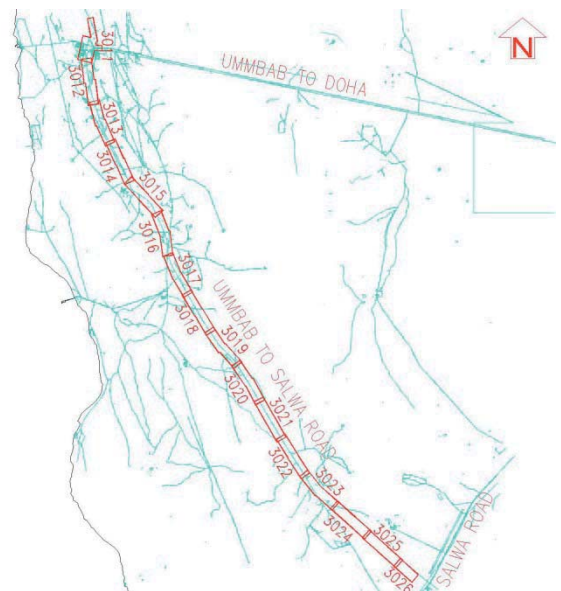
TYPICAL SIMPLE T-JUNCTION SCALE: 1:200



Typical T- Junction



LOCATION PLAN



Road Portion Subdivision

# KOKKINOTRIMITHIA – ASTROMERITIS HIGHWAY

|                    |   |
|--------------------|---|
| Location:          | Cyprus  |
| Client:            | Ministry of Transport   |
| Services:          | Detailed Design, Environmental Impact Assessment Study, Tender Documents, Technical Assistance during tendering and construction. |
| Period:            | 12/2000 – 12/2002   |
| Construction cost: | € 40,000,000  |

## Project Description:

The project highway is the prosecution of the existing Anthoupolis – Kokkinotrimithia highway, to reach the towns of Astromeritis and Troodos. The total length of the highway, including the link to Troodos, is 25.7 km with about 4.5 km of 2-lane link roads.



The contract, in fact, also includes the design of the three link roads:

- Akaki link: a 2 lane road from Deneia – Kokkinotrimithia interchange to the existing road, (2.5 Km)
- Peristerona link: a 2 lane road from exit from Avlona - Astromeritis interchange (1.7 Km)
- Troodos link: a 4 lane road from exit from Katokopia - Astromeritis interchange (6.4 Km)



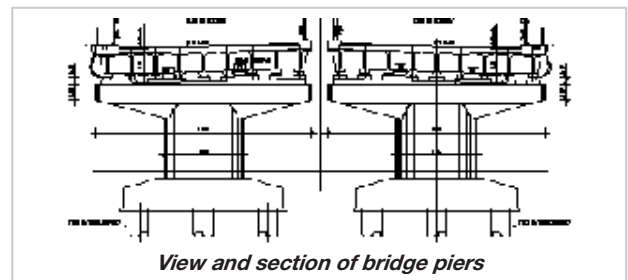
The project highway runs over a generally flat to slightly rolling terrain, mainly constituted of calcareous sedimentary rock and recent alluvial soils, quite densely inhabited and with scarce vegetation, with the exception of the last part of the main

alignment and the majority of the link to Troodos which cross an orange orchard.



In total the following main structures envisaged:

- 9 interchanges
- several bridges
- 5-7 underpasses/overpasses.



The typical cross section includes two 3.5 m. lanes per carriageway, 2.5 m. paved shoulders and narrow median delimited by guard rails or New Jersey type concrete barriers.



# ANATOLIAN MOTORWAY

|                    |  |
|--------------------|--|
| Location:          | Gumusova-Gerede Section, Turkey  |
| Client:            | Astaldi-Bayindir AS J.V.   |
| Services:          | Detailed Design of 2 viaducts; Seismic isolation system design & dynamic analyses for 3 viaducts; Hydraulic design & Riverbed training. Design supervision. Assistance during construction |
| Period:            | 12/2000 – 12/2002  |
| Construction cost: | € 80,000,000   |

## Project Description:



TECHNITAL has been awarded a contract by the contractors Astaldi-Bayindir AS J.V. responsible for the construction of the Gumusova-Gerede section (Stretch 2D) of the Anatolian motorway (Istanbul-Ankara) regarding the structural design of 3 viaducts across River Arsarsuyu and related seismic isolation system.

In particular the activities entrusted to TECHNITAL include :

- Final and detailed design of 2 viaducts in a seismic area: Viaduct 2 (length 1200 m), Viaduct 3 (400m), including the design of seismic isolation system and dynamic analyses of a further viaduct, Viaduct 4 (700m), in accordance with the American AASHTO standards .

- Hydraulic design & riverbed training: In this case the tasks include the preliminary and final design of hydraulic works along the motorway alignment (approx. 4 km) and the training of Arsarsuyu river and its tributaries.
- Assistance to the Client during construction and supervision of the whole design.



# SALERNO-REGGIO CALABRIA MOTORWAY UPGRADING

|                    |   |
|--------------------|---|
| Location:          | Italy                                     |
| Client:            | A.N.A.S. (State Highway Authority) – Rome |
| Services:          | Preliminary and Detailed Design           |
| Period:            | 12/1998 – 12/2000                         |
| Construction cost: | € 170,430,800                             |

## Project Description:

The contracts awarded to TECHNITAL include the Preliminary and Detailed Design of the works to improve two stretches of the A3 motorway Salerno - Reggio Calabria (KP 60+500-64+500 and KP 2+500-8+000), for a total of 9.5 km, including 3 viaducts and 2 tunnels.

The Salerno - Reggio Calabria motorway was built in the nineteen-sixties according to design criteria and traffic requirements which are totally superseded. The new project includes the upgrading of the motorway paving and the improvement and capacity increase of the interchange for the branch motorway to Avellino in view of the new motorway standards and traffic volumes.

The works foreseen include :

- widening of the motorway from its present 19.10 m to 32 m, including 3 lanes for each carriageway, 2 shoulders of 3 m and a 2.6 m wide traffic island (according to the road level, ditches and slope protection)
- enlargement of the Avellino interchange (6-lane double carriageway, with a section of 27 m)
- related drainage works (lateral gutters or grassy banks)
- improvement of the horizontal and vertical alignment
- new 67 cm thick pavement with sound-absorbent self-draining wear course to improve road safety and reduce the noise level
- viaducts, tunnels, flyovers, pedestrian overpass
- environmental impact study and related mitigation measures
- location and layout of the construction sites.



## Roads

# CONSULTING SERVICES FOR THE DESIGN AND SUPERVISION OF THE SUB-STRUCTURES FOR THE PREFABRICATED STEEL ACROW PANEL BRIDGES IN EASTERN PROVINCE

|                    |  |
|--------------------|--|
| Location:          | EASTERN Province - Zambia (Zambia)   |
| Client:            | Republic of Zambia - Road Development Agency (RDA)   |
| Services:          | Preliminary and Detailed Engineering Design of the sub-structures, Environmental Project Brief, preparation of Bidding Documents; Terms of Reference for the Supervision of the bridge sub structures construction and bridge component assembly to optimal, cost-effective and economically justified standards. Works Supervision. |
| Period:            | 05/2016 – ongoing  |
| Construction cost: | € 23.100.021   |

## Project Description:

The project's objective is the development of Consulting Services for the Design of the Sub-structures, assembly and installation of Prefabricated **20** Steel ACROW Panel Bridges in the Eastern Province, Zambia, for a total bridge surface of about **4'600 m<sup>2</sup>**.

The project is supported by the Government of the Republic of Zambia through the Road Development Agency (RDA) in the context of the Road Sector Investment Programme (Road SIP). The Road Development Agency (RDA) has embarked on a project of constructing 20 bridges in the peri-urban and rural parts of the Eastern Province of the country. This is aimed at improving transportation and accessibility to these areas for socio-economic prosperity.

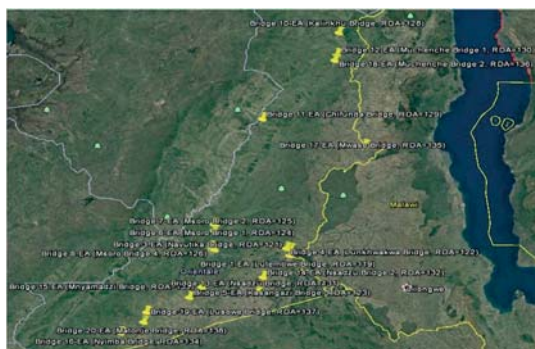


Location of the Eastern Province in Zambia and subdivision in Districts

The initiative is part of the Road Sector Investment Programme (RoadSIP) being implemented country wide. The key objective of RoadSIP is to construct, maintain, rehabilitate and improve or upgrade the Core Road Network (CRN) which has been defined by the RoadSIP II as the minimum network required to spur economic development in Zambia. Once implemented, the project will bring about improved accessibility, lower transport costs, reduced travel time leading to overall poverty reduction through job creation and enhanced agricultural/marketing activities.

The scope of the works, based on preliminary surveys done in the year 2013, is summarized here below:

Design of sub-structures for n. **20** bridges, with a total length L = 750 m, and a maximum span length L = 60.96 m



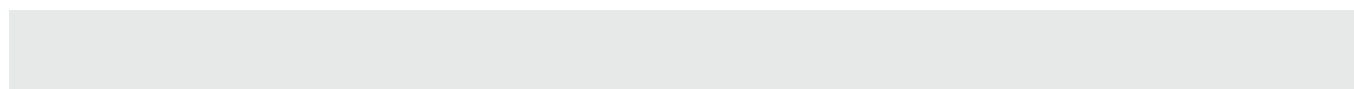
Location of the 20 Bridges in Eastern Province



Example of the location of a Bridge: the Navutika Bridge



Image of an ACROW Bridge





# RECOVERY AND DEVELOPMENT OF THE PORT AND THE RELATED ACCESSIBILITY INFRASTRUCTURE AND FOR THE INTERMODAL CONNECTION OF THE CRISTOFORO COLOMBO AIRPORT IN GENOA

|                    |                                |
|--------------------|--------------------------------|
| Location:          | Genoa, Italy                   |
| Client:            | Impresa Pizzarotti & C. S.p.A. |
| Services:          | Detailed Design                |
| Period:            | 02/2020 – 08/2023              |
| Construction cost: | € 129,045,517                  |

## Project Description:



The project envisages the construction of road works within the Port of Genoa, with the extension of the Port Sopraelevata to cross the Polcevera river and the construction of a new access gate to the port area. The intervention is completed with the construction of new viaducts that allow the road system to overcome the interference with the port areas and consequently to help the rapid movement of goods towards the port gates to the major motorway system.

The service includes the drafting of the final and the detailed design, as well as participation in project approvals such as the Public Consultation.

The road system includes sections with four lanes, two in each direction, and is mostly on viaduct. A road system outside the port area is planned to improve the connection of the main road system with the Cristoforo Colombo airport area. The length of the elevated road system in the port area is about 4.2 km and includes new viaducts and the seismic upgrading of the existing elevated road system. It is worth to notice the new bridge over the Polcevera river, two levels arch tied bridge.

The reorganization of the road system at the quayside level is related to the new configuration that the entire port road system will take: the level road system has a development of about 3.8 km, includes two-way and single-way road systems, as well as intersections that, where possible, have been organized with traffic

circle circulation. Specifically, the project consists of several "works" as follows:

- WORK A: Extension of the port causeway: the aim of the work is to extend the port causeway from the right bank to the left bank of the Polcevera stream (with the crossing of the stream with Work F). It is a mixed steel-concrete viaduct with an overall length of about 1,250 m. In addition to the main viaduct there are the ramps that allow the mutual connections between the elevated part and the level of the port quays.
- WORK B: Modernization of the port causeway and San Benigno / Ethiopia connection: the work involves the seismic upgrading of the existing port causeway for a section of about 1,000 m with the resurfacing of the entire infrastructure part (pavements, safety barriers and lighting system), the demolition and reconstruction of the viaduct connecting the causeway to the S. Benigno junction with a mixed steel-concrete viaduct about 185 m long. The work is completed with the widening of the elevated trestle for the construction of a new elevated port gate.
- WORK C: San Benigno - Calata Bettolo link roadway: the work consists of a set of overhead roadways (viaducts) and at the level of the port quays. There are 3 viaducts, all with mixed steel-concrete structure with carriageways from two to four lanes: S: Benigno Bettolo 285 m long,

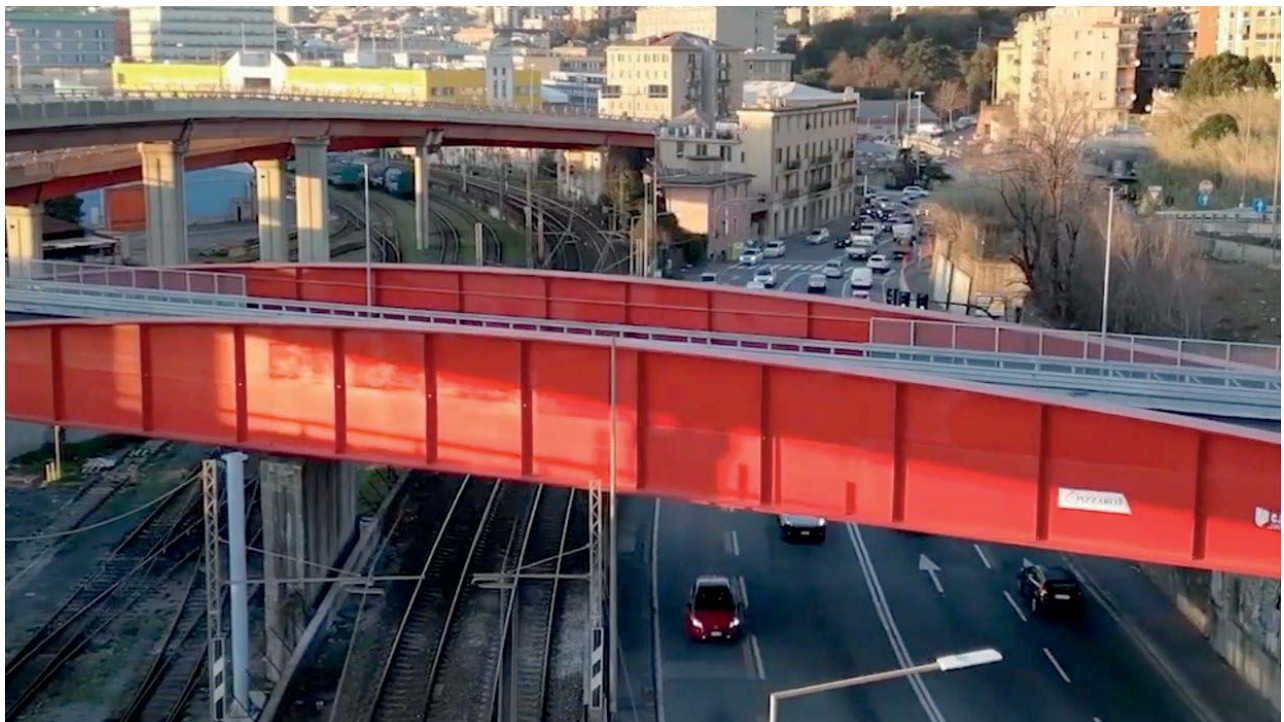
Etiopia - Bettolo 120 m long, MSC 255 m long. A two-level elevated traffic circle and connecting ramps to the elevated parts complete the work.

- WORK D: Ponente Car Park: The intervention area covers an area of about 44.200 m<sup>2</sup> near the right bank of the Polcevera Creek and provides equipped parking areas for heavy vehicles gravitating around the port area. It connects via works A and F to the left Polcevera port road system and then to the external road system.
- WORK E: Complete realization of the "La Superba" road: this is the completion of the "La Superba" viability with the construction of the connection between this viability and the traffic circle of the new port access gate. The viaduct has a length of about 477 m and is completed with the ground level viability and the traffic circle for access to the port.
- WORK F: New Pope Bridge: this is the new crossing of the Polcevera stream to connect the port causeway (Work B) on one side with the area on the Polcevera right. It is a two-level, all-steel, lower travel way arch bridge with a length of about 200 m.
- WORK G/L: Via Pionieri d'Italia Viaduct Safety Upgrading - Phase I and Phase II: The existing work has a length of about 370 m and the work consists of consolidating the portion of the Viaduct downstream of the overpass over Siffredi Street. In addition to the structural works, the resurfacing of the pavement, joints, signage and safety barriers are planned.
- WORK H: dredging of the Polcevera stream at an elevation of -4.0 above sea level for an excavation volume of about 107.000 cubic meters.
- WORK I: Static Consolidation Bridge of the Thousand: The object of the intervention is the evaluation of the static nature

of the West building of the Maritime Station, a building with Monumental constraint, (located on the so-called Bridge of the Thousand) and the consolidation work necessary for its opening to the public, being currently a part of the building not open to the public due to static problems.



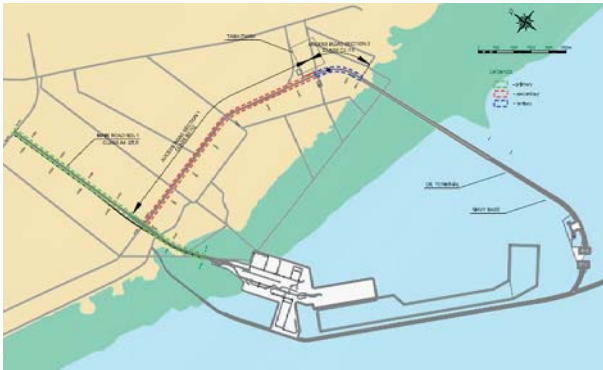
- WORK R: Via Siffredi railroad overpass: this is part of the Pioneers and Aviators of Italy Viaduct which is planned to be completely demolished and rebuilt with a new steel-concrete mixed structure viaduct to cross the railway park, the Genoa-Ventimiglia railway line and Via Siffredi. The viaduct has a special lower travelway span of about 66 m in length with an overall length of about 120 m.



# PRELIMINARY DESIGN, FEED AND WORKS SUPERVISION FOR THE CONSTRUCTION OF THE PORT ENTRANCE ROADS FOR “AL FAW GRAND PORT”

|                    |  |
|--------------------|--|
| Location:          | Basrah Governorate, Iraq   |
| Client:            | Ministry of Transport of Iraq                                    |
| Services:          | Preliminary Design, FEED, Tender documents and Works Supervision |
| Period:            | 03/2019– 03/2023   |
| Construction cost: | € 58,648,380   |

## Project Description:



The external main roads of the new Al Faw Grand Port, called Port Entrance Roads, are located in the most southern fringe of the Iraqi Region within a strip of coast located among the borders of both Iran, to the east, and Kuwait, to the west where no buildings and/or significant existing activities are present (figure 1).

Figure 1 Port entrance Roads - location

The road that branches off from the port will be necessarily of strategic importance for the Country and has been designed and it will be built taking into consideration the future developments.

In the Port Master Planning stage the following time phases of Port development were envisaged as it follows:

- First Stage – 4 mln TEU
- Master Plan Stage – 7.5 mln TEU

The new road network serving the port has been designed considering the Master Plan stage.

Port entrance roads are subdivided in two main branches (figure 1):

- Main Road – connects the Port to the existing road network via a two lane dual carriageway with an approximate length of 6.5 km and it is classified as a A4/25.5 road;
- Access Road – connects the Main Road No. 1 to the eastern breakwater to other Port facilities such as Tank Farm, and in future Oil Terminal, Navy Base, Hoc, Pilots, Tugs Lunches Services; The Access Road is a one lane single carriageway with an approximate length of 8,1 km. It is classified as a B2/12 road from the intersection with the Main Road No. 1 to the Tank Farm , called Access road 1 (approximate length of 6.7 km) and as a C2/11 from the Tank Farm to the break water, the end of this phase (approximate length of 1.4 km), access road 2.

The new roads have been simulated with a strategic traffic model and included in the Al Faw Peninsula Transportation Master Plan of the whole Al Faw Peninsula, within which they play an essential role (Figure 2).



Figure 2 Traffic assignments

The New Al Faw Grand Port infrastructures will be developed across areas with different hydro-geological conditions. In particular, areas affected by the Port construction can be identified as a “Dry/Wet Areas”, “Permanently Wet Areas” and areas created through land reclamation.



Despite its location close to the urban settlement of Al Faw, dry areas are not affected by the presence of buildings with whatever destination use. Therefore, no demolition works are required.



The Port Entrance road crosses in several points the existing road network which is mainly characterized by unpaved conditions and variable width. Local origin and destination (O/D) currently served by existing roads will be prevented by the port construction

Areas described above are mostly flat and crossed by unpaved tracks. These present different conditions according to the area they cross. Specifically, due to the presence of high content of moisture within the soil, the most tracks are close to the sea shore the worst are road conditions



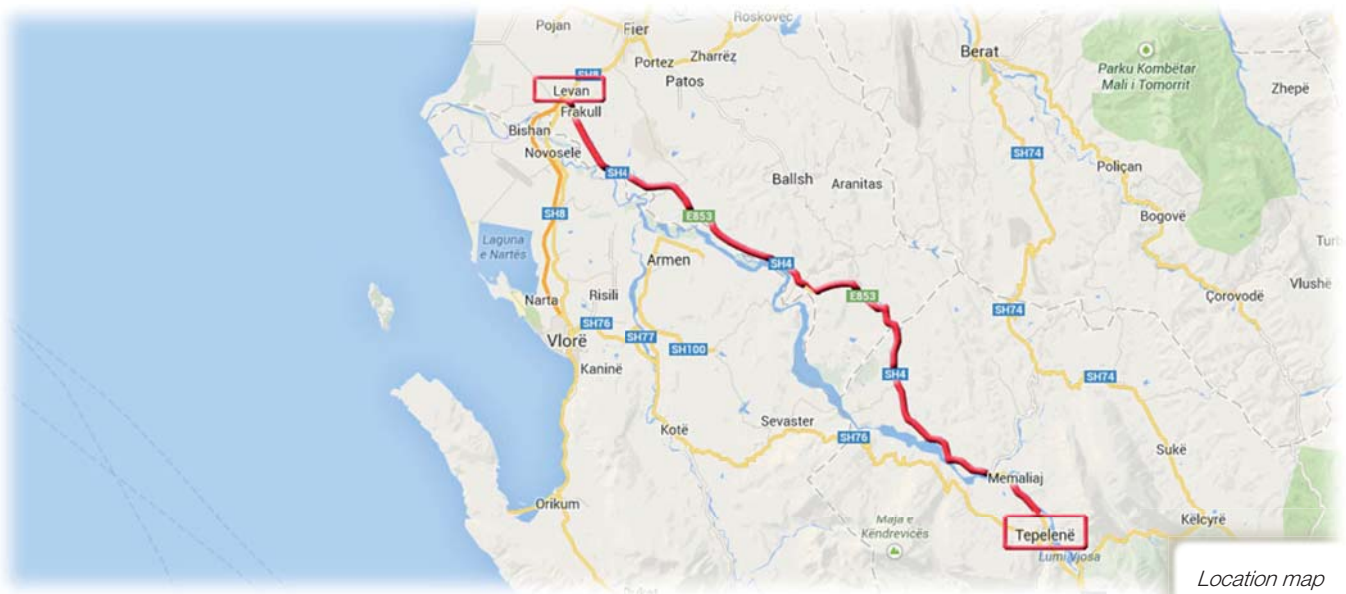
The relevant technical problem consists of the bad characteristics of the ground (experimented during the port breakwater construction), investigated by a large set of soil surveys. The soil conditions are represented by deposits of loose-to-medium cohesion less soil (with or without some soft cohesive layers), or of predominantly soft-to-firm cohesive soil. To avoid excessive settlements a maximum of 5m height of embankments has been considered while a minimum of 1 m height has been considered to ensure the correct water disposal.

Embankments have been protected against water by using a protection layer made of local clay soil, stabilized with binder (3% of quicklime or equivalent) and in order to ensure capillary cut-off, a layer of granular material shall be placed in between the ground level and the embankment itself (anticapillarity layer).

# SUPERVISION OF CONSTRUCTION OF LEVAN – TEPELENE ROAD

|                    |   |
|--------------------|---|
| Location:          | Albania   |
| Client:            | EC Delegation in Albania and General Roads Directorate (GRD), subsequently Albanian Roads Authority (ARA) |
| Services:          | Supervision of construction   |
| Period:            | 01/2008 – 12/2018   |
| Construction cost: | € 88,568,170  |

## Project Description:



The project comprises the supervision of the construction and upgrading of the section of highway from Levan (near Fier) to Tepelene in southern Albania. The project road is a link in the national North-South corridor from Han I Hotit, on the Albanian/Montenegro border, to Kakavija, on the Albanian/Greece border.

The construction works, funded by EIB/EBRD, were divided into two lots, but the supervision activities were tendered as one lot. The contract awarded to Technit and partners therefore covered both works contracts. The new/rehabilitated single carriageway highway will have two lanes of 3.75 m and shoulders of 1.25-1.5 m for a total road width of 10-11.5 m. The design speed is 60-80 km/h.

The first Works Contract concerned the Sub-Section **Levan - Dames**, a new road section about **38 km**, of which 30 km are in the flat valley of the Vjose River, and the rest in the more steeply sided Perroi I Thate Valley. The works supervised for this lot included:

- 2 000 000 m<sup>3</sup> of cut,
- 1 400 000 m<sup>3</sup> of fill
- 20 Bridges (total surface 10 000 m<sup>2</sup>) of which 17 have a p.r.c. decks (7,500 m<sup>2</sup>) and the rest in r.c.
- 35 Box culverts (total surface 2 300 m<sup>2</sup>).



Lot 1: New bridge at Km 0+326



Lot 1: Newly constructed road at Km34+400

The value of the works was € 56,022,600. This contract was completed in December 2012.

The second Works Contract regards Sub-Section **Dames – Tepelene**, a road section approximately 32 km long to be rehabilitated. Some 6 km of road are of new construction whereas for the remainder the works consist in the widening and rehabilitation of the existing road.

Due to problems during construction (including severe landslides), the works have been extended more than once, with the consequent increase in the Consultant's fee. Under Addendum no. 9, the construction works are expected to be completed by September 2014 (followed by the 12 months Defects Liability period).

**\*Note:** The General Roads Directorate (GRD) officially changed its name to Albanian Roads Authority (ARA) in August 2012.



*Lot 2 – Bridge under construction at Km 25+185*

# S.S. 27 GRAN SAN BERNARDO – REHABILITATION WORKS BETWEEN ETROUBLES AND THE HIGHWAY JUNCTION FOR THE SAN BERNARDO TUNNEL

|                    |   |
|--------------------|---|
| Location:          | Italy   |
| Client:            | ANAS S.p.A.   |
| Services:          | Detailed Design, assistance during construction             |
| Period:            | 08/2008 – 02/2011 (design) – 03/2012 – 12/2014 (assistance) |
| Construction cost: | € 111,252,852   |

## Project Description:

The project aims to bypass the area of St. Oyen located a few kilometres from the Gran S. Bernardo tunnel.

The new alignment follows a completely different route from that of the present road.

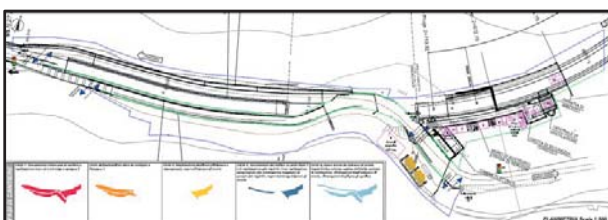
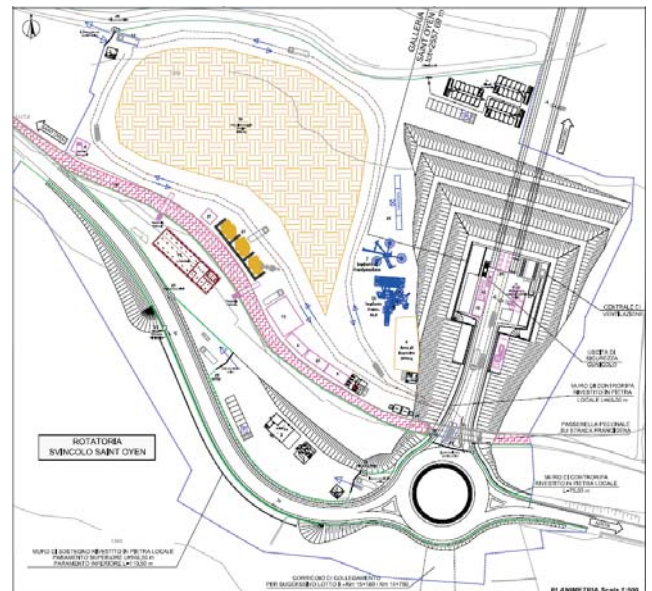
The project connects the new alignment to the old road with two wide roundabout on both sides. The tunnel follows a significantly curved alignment because of the need not only to connect to the junctions at both ends, but also to find the maximum cover at the junctions with a layout that must be as orthogonal as possible to the contour lines.



The present road, which runs from the tunnel junction to Aosta, is a single carriageway with two traffic lanes, one in each direction. It is the only communication route and has a fairly fluid course which undergone considerable improvements and widening over the years. However, in one section of approx. 3.5 km (between Etroubles and St. Oyen, from km 15+180 to km 18+700), the road alignment is quite winding with considerable slope and needs some adjustment works.

The project will create a variant to the present road passing through St. Oyen by building a road tunnel, which will be entirely within the St. Oyen municipality (from Km 16+800 to Km 18+700).

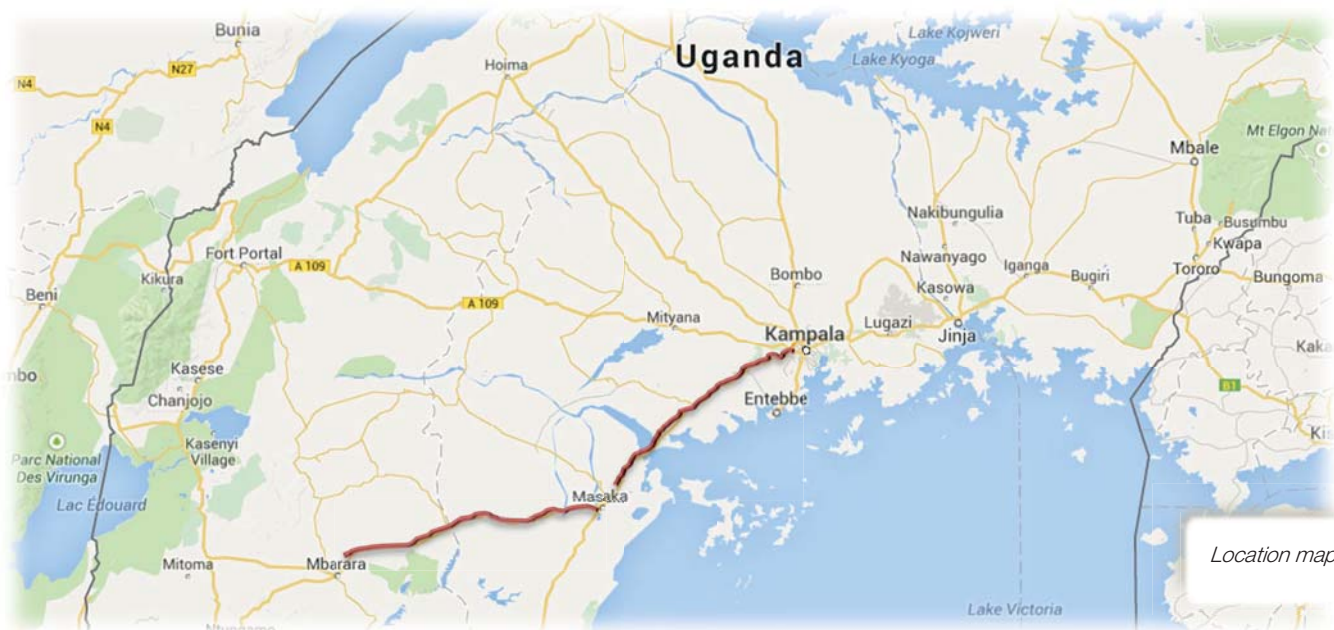
Ministerial Decree 5/11/2001) for a total width of 9.50 m; it's formed by two lines (one for each way) with a width of 3,50 m each and a shoulder road of 1,25 on both sides. The new road is characterized by a natural tunnel measuring more than 3,500 m and by two viaducts with a mixed structure in steel and concrete and a 90 m central span, so that the total length of the new roads is over 4,000 m.



# RECONSTRUCTION OF PRIORITY SECTIONS ON THE KAMPALA-MBARARA ROAD - NORTHERN CORRIDOR UGANDA

|                    |   |
|--------------------|---|
| Location:          | Uganda  |
| Client:            | Road Agency Formation Unit (RAFU), subsequently Uganda National Roads Authority (UNRA) - Ministry of Works and Transport  |
| Services:          | Works Supervision, tender assistance, management and monitoring of road reconstruction works, geotechnical investigations |
| Period:            | 01/2008 – 08/2012   |
| Construction cost: | € 162,042,788   |

## Project Description:



TECHNITAL in association with AIC Progetti (Lead company) and SABA Engineering was awarded this EU contract (EuropeAid/120262/D/SV/UG - Project No. 9 ACP RSA 15), funded by the 9th EDF.

The project road has an overall length of about 224 km, made up of three separate lots divided into two packages as follows:

### Package A

- *Lot 1:* Busega–Nsangi (11.5 km) single carriageway section from Busega Roundabout to Nsangi on the Kampala to Masaka Road. The section is rural in nature and contains lengths requiring realignment.
- *Lot 2:* Kamengo–Lukaya (51.6 km) single carriageway section between km 41.4 and km 93.0 of the Kampala to Katuna Road. This section is located in the districts of Mpigi and Masaka and the terrain is rolling to flat, crossing a number of swamps.

### Package B

- *Lot 3:* Masaka–Mbarara (149 km) single carriageway, plus the first 5.5 km of the Mbarara–Kyotera road. The project commences approximately 2.5 km before the start of the Masaka Bypass, passing along the bypass and through the towns of Lyantonde and Mbarara, ending approximately 7.0 km beyond Mbarara on the Ntungamo Road (km 120.2 to km 269.0 of the Kampala – Mbarara Road). The terrain is rolling with several swamp crossings.



The Northern Corridor Route, of which the project road is part, runs from the Kenyan border via Kampala to the Rwandan border, and is the country's most important road both nationally and internationally.

The **specific objectives** of the project are to secure the vital corridor between the Indian Ocean, Uganda and the regions beyond and support the economic and social development of the region. The project will also contribute to achieving the goals of the Poverty Eradication Action Plan and provide a platform from which to develop the district road network.



The project is consistent with the wider objectives of the Road Sector Development Programme (RSDP) to 'provide an efficient, safe and sustainable road network'.



The scope of the works supervised included the following major items:

- Provision and maintenance of site facilities and Laboratory
- Re-establishment of survey control points and setting out;
- Site Clearance;
- Temporary relocation and permanent diversion of Services by third party contractors;
- Exploration of materials sites;
- Passage of traffic and pedestrians through and around the works;
- New concrete and metal pipe culverts, extensions to pipe culverts and end structures;
- Extending box culverts;
- Construction of concrete lined drains and cover slabs;
- Widening of earthworks in both cut and fill;
- Swamp treatment of rock fill and filter layer with allowance for period of consolidation;
- Horizontal realignment at localised bends;
- Scarifying, widening and regulating of the existing road pavement and reprocessing with cement stabiliser to form the sub-base;
- Constructing new pavement layers of graded crushed stone base, DBM binder course and asphaltic concrete wearing course;
- Construction of climbing lanes, parking lanes and bus-bays;
- Construction of junctions and accesses;
- Installation of road furniture including road signs, guardrails, road markings etc.
- Maintenance of the works until the end of the maintenance period;
- All other works required or instructed under the provisions of the contracts.

The services to be carried out under the contract include:

- 1 Design Review: Road Design Standards & alignment, Pavement, Drainage, Concrete Structures, Geotechnical works, Utilities relocation, Traffic management and Land Acquisition Plans, Safety audits, Value engineering, Additional

site surveys and investigations, Detailed Design, Construction Planning and Project Implementation Schedule, Environment impact assessment



- 2 *Procurement:* Technical assistance to the Contracting Authority and the Road Agency Formation Unit during the period of the open international tender for the award of the Works Contract, in full compliance with the relevant laws and regulations of Uganda and all applicable 9<sup>th</sup> EDF procedures.
- 3 *Supervision:* Supervising in the capacity of Supervisor's Representative, the construction activities under the Reconstruction of the Northern Corridor Route – Kampala to Mbarara Road throughout the entire performance period of the works contract, including the maintenance period.
- 4 *Management.* Assistance to RAFU in the management of the reconstruction works of the project road, performing such activities as reporting, communication, liaison, etc.
- 5 *Monitoring.* Ensuring that project activities and outputs remain consistent with the project purpose i.e. guaranteeing full compliance by contractors with contractual obligations related to labour standards, environmental protection, HIV/AIDS awareness and Road Safety, as well as a general adherence within the project to the highest professional and ethical standards.

# REHABILITATION OF THE ROAD SECTION PAJARO NEGRO – SAN CARLOS (63.4 KM)

|                    |   |
|--------------------|---|
| Location:          | Nicaragua   |
| Client:            | Ministry of Transport – <i>Unidad Coordinadora del Programa</i> (UCP) and Transport     |
| Services:          | Design review, works supervision and technical assistance and environmental monitoring. |
| Period:            | 12/2009 – 04/2012   |
| Construction cost: | € 21,102,600  |

## Project Description:

In the context of the Programme for the Completion ation of the Acoyapa – San Carlos – Costa Rica border road, TECHNITAL, with the local company Corea y Asociados (CORASCO), was awarded the contract for the supervision of the construction works in relation to the Rehabilitation of Section II: the Pájaro Negro – San Carlos road of 63.4 km.

The construction of both subsections – I. Empalme Pájaro Negro – El Tule (33.5 km) and II. El Tule-San Carlos (29.9 km) has been entrusted to the local contractor Constructora Santa Fe Ltd.



The existing road, which is an essential link in the interregional road between Managua and Juigalpa, and also serves as the main connection to the Great Lake basin, with its wealth of historical, agricultural and natural-ecological resources, in direct communication with the Caribbean through Río San Juan, is in very poor condition, with badly damaged paving, eroded edges and no drainage system.



The road alignment runs parallel to the Great Lake of Nicaragua in a roughly north-south orientation, from the turnoff to Pajaro Negro to San Carlos, the departmental capital of San Juan. Being close to the border of Costa Rica, San Carlos is therefore of particular importance for the cross-border commerce and trade which has greatly increased in the last 10 years.



The services included under the contract are:

- Project evaluation and updating;
- Supervision and control of the field works;
- Coordination, assistance and advice regarding all the activities during the execution of the services.
- Transfer of technological know-how to the UCP technicians;
- Quality control for the quantity surveying during the works;
- Ensuring that the Contractor respects the design specifications, the budget and Work Plan;
- Advice and assistance to the UCP in the administration and diffusion of the information;
- Control of the physical and financial quality of the works;
- Preparation of all technical, financial and special reports and records regarding the road section;
- Guarantee of respect and implementation of measures to preserve the ecology and the environment.

The works include earthworks, road drainage (12 box culverts, sewerage along the entire route), 3 bridges, road paving and signage.



# CAGLIARI – PULA SECTION OF THE NEW S.S. 195 “SULCITANA”: LOTS 1 & 3 AND THE RELATED “SOUTH WORK”

|                    |                               |
|--------------------|-------------------------------|
| Location:          | SARDINIA – ITALY              |
| Client:            | Grandi Lavori Fincosit S.p.A. |
| Services:          | Detailed design               |
| Period:            | 10/2009 – 12/2011             |
| Construction cost: | € 88.415.291                  |

## Project Description:

The aim of the project is to build lots 1 and 3 of the new national road S.S. 195 "Sulcitana" - Cagliari-Pula section and the related structure to the south.



The main axis has a total length of 14.262 km and is divided into the first and the third lots, which are linked to the existing road that will form the object of a future contract.

**Lot 1** goes from km 10+200 to km 18+350 for a total length of 8,150 km within the Municipalities of Capoterra and Sarroch.

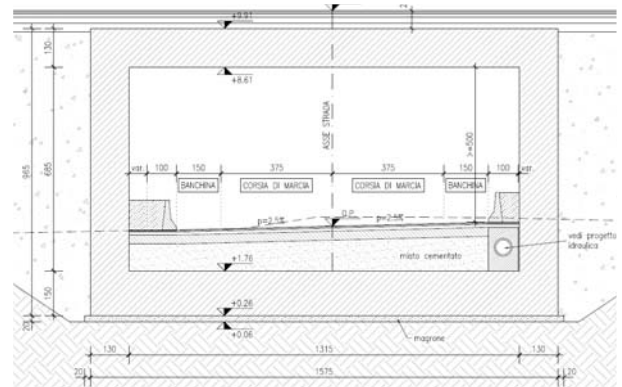
**Lot 3** goes from km 23+900 to km 30+011.69 for a total length of 6,112 km (approx.), within the municipal areas of Sarroch, Villa San Pietro and Pula.

The road surface of Lots 1 and 3, for a total length of 12.539 km (approx.), is a “suburban main road” type - B Category, formed by two lanes of 3.75m with the right hard shoulder measuring 1.75m and the left one measuring 0.50m. The two lanes are separated by a central traffic divider of 2.50m with a single double sided safety barrier of 0.910m. The total road width is 22.00m.

From km 28+550.756 to km 29+060, for a total length of 509m (approx.), the road surface is a “suburban secondary road” type - C1 Category.

The area of transition between the B and the C1 sections goes from km 28+289.095 to km 28+550.756 (Lot 3), for a total length of 262 m (approx.). Within this area, the road changes from a 4-lane dual carriageway road to a 2-lane single carriageway road with the narrowing of the road width from 22.00m to 10.50m.

From km 29+060 to km 30+011.69 (Lot 3) the existing road will be reconstructed, transforming the road cross section into a “suburban secondary road” type - C2 Category.



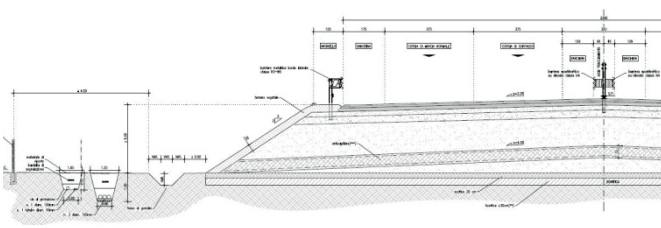
The project envisages five interchanges (Inceneritore – Dorsale Casic interchange, S.P. 91 Capoterra interchange, Su Loi – Villad’Orri interchange, Sarroch interchange and Villa San Pietro interchange) linking the new and the existing roads and facilitating the connections between the existing infrastructures.

The access to the interchanges will be guaranteed by one-direction ramps composed of a 4.00m lane, a 1.50m right hard shoulder and a 1.00m left hard shoulder (total width 6.50m) and by two-direction ramps composed by two lanes of 3.50m and a right hard shoulder of 1.50m (total width 10.00m).

The so-called “South work” is connected to the Inceneritore – Dorsale Casic interchange and will consist of a new first section crossing the Imboi Canal and a second section where widening of the existing Dorsale Casic road is foreseen. In order to ensure the road practicability, the road surface will be of a “suburban secondary road” type - C1 Category.

The main works of art are represented by the five viaducts (Santa Lucia, San Girolamo, Baccalamanza, Su Spantu and Rio Mannu) with reinforced concrete structures formed by four prefabricated beams (width 1.80m), piles, 35m lateral spans, and 36.10m main span.

The project also includes, underpasses and/or overpasses will be realized. The underpasses will have a box section in reinforced concrete while the overpasses will have a structure in reinforced concrete and prefabricated beams (1.40m or 1.60m) with of variable span (from 26m to 34m).



# HOL HOL – ALI SABIEH ROAD

|                    |                                      |
|--------------------|--------------------------------------|
| Location:          | Djibouti                             |
| Client:            | Djibouti Ports Authority             |
| Services:          | Detailed Design and Tender Documents |
| Period:            | 06/2007 – 09/2008                    |
| Construction cost: | € 65,000,000                         |

## Project Description:

The designed road links Djibouti with the Ethiopian border, in the locality of Guillaillè, passing through the villages of Hol Hol and Ali Sabieh, with a total length of approximately 72 km. The road alignment followed the corridor of the existing dirt track with few diversions in order to minimize the interference with the existing railway and to negotiate some deep gullies and wadis.



A topographical survey was carried out in order to define the best technical/economical road alignment to connect Djibouti to Ali Sabieh. This comprised a detailed level survey of all ground features and existing works on the existing dirt road and along the chosen alignment.

The recorded topographical data were used by TECHNITAL for the preparation of the topographical drawings and the 3D digital terrain model used in the design of the road vertical alignment and for determining relative earthwork quantities.



The cross section proposed for the first 3.75 km of the road starting from Djibouti is a two lanes (standard lane width of 3.75 m) dual carriageway with 1.5 m central reservation, 0.3 m inner shy distances and 2.5 m outer shoulders. The rest of the road has been designed as single carriageways. The cross-section for single road consisted of one lane (3.75 m) in each direction and a 2.5 m outer shoulder.

The standards considered during the road design are the following:

- From Km 0+000 to km 3+750: double carriageway road with two traffic lanes per carriageway, separation median of 1.50 m (same as adopted in Doraleh road)
- From km 3.750 to the end: Single carriageway road with two lanes of 3.75 m and 2.50 m wide, partially paved, shoulders.
- Design Speed: 100 km/h with few exceptions;
- Main rivers negotiated by Irish Crossings, minor river and streams by Box Culverts.
- Intersections with railway: at grade.



The services provided by TECHNITAL included:

- Topographic surveys;
- Geotechnical investigations;
- Study of the best alignment;
- Preliminary Design;
- Detailed design;
- Contract Documents.

# SUPERVISION OF REHABILITATION WORKS FOR THE SEBACO – MATAGALPA ROAD (24.7 km)

|                    |   |
|--------------------|---|
| Location:          | NICARAGUA   |
| Client:            | Ministerio de Transporte e Infraestructuras (MTI) |
| Services:          | Works Supervision                                 |
| Period:            | 09/2006 – 05/2008                                 |
| Construction cost: | € 19,674,400                                      |

## Project Description:

The Ministry of Transport and Infraestructuras (MTI), through the General Purchasing Division, awarded TECHNITAL with the contract for the *Technical Supervision Services for the Rehabilitation Works on the Sébaco – Matagalpa Road* (length 24.7 km) financed by the Interamerican Development Bank (Loan No. 1702/SF-NI).

The work supervised by TECHNITAL consisted in the rehabilitation of 24.7 km, of which the first 0.73 km are inhabited urban areas of Sébaco, including the new Sébaco intersection, with road width of 3.50 m per carriageway, service lane of 3.50 m, ditch with 0.45m wide curb and 1.0 m wide sidewalk.

Earthworks included cuts and fills in the spaces to be made either side of the road (according to the displacement of the existing axis), and lateral ditches will be made to channel the runoff water.



All the existing steel sewers were replaced with reinforced concrete pipes, the existing concrete caissons enlarged to adapt them to the new design cross section, the ditches lined with masonry, and subdrainage material and counter-gulleys placed to control erosion, etc.



The major drainage Works concerned the removal and construction of new structures at the crossing points of the bridges La Tijerina (10.0m clearance), and El Guayacán o Yaule (15.0 clearance).

The rehabilitation of the road paving involved the following works:

- Removal and replacement of the existing material of the road shoulders
- Recycling, homogenization with cement of the bearing surface and existing base layer, and its conversion into the new Sub-base layer.
- Laying of a ballast layer with suitable spraying and compacting and construction of a hot asphalt course 6.5 cm thick with maximum aggregate of ¾”.

The Works included the relocation of the public utility lines such as electric power lines and substations, the removal and installation of fencing, access to roads, including protection ramps. The Project also included road markings and signals to assist traffic and the construction of bus bays to guarantee the safety of pedestrians.



# ROAD LINKS TO DORALEH OIL TERMINAL

|                    |  |
|--------------------|--|
| Location:          | Djibouti   |
| Client:            | Dubai Ports International, Djibouti Ports Free Zone & Authority          |
| Services:          | Preliminary and Detailed Design, contract documents and work supervision |
| Period:            | 06/2004 - 11/2007  |
| Construction cost: | € 12,500,000   |

## Project Description:

The main purpose for the construction of the Road Links to Doraleh Oil Terminal is to connect the newly constructed Tank Farm of the Oil Terminal in Doraleh areas owned Djibouti Ports & Free Zone Authority, to the existing road infrastructures of the city of Djibouti.



The Road Links to Doraleh Oil Terminal are designed to be able to handle the high of heavy traffic that will be generated by the Oil Terminal Tank Farm once it is in full operation.



The project site is located in the surrounding areas of Djibouti and includes the area involved for the construction of:

- New road link from RN 1 (Rue Nationale 1) to the new Doraleh Oil Terminal Tank Farm called the "Mountain Road"
- Rehabilitation and doubling of the existing road between Avenue de Venise in Djibouti and Doraleh called the "Beach Road"
- River diversion channel is to be constructed to prevent the floods during the rainy season from the adjacent hills close to the Tank Farm Areas.

The Mountain Road, with a total length of approximately 4.75 km, is a double carriageway with two lanes for each carriageway divided by a kerbed median strip 1.5 m. wide, and three roundabouts.



The first roundabout is at the junction with RN1, the second at the junction with the Beach Road and the third in front of the Tank Farm.



The *Beach Road*, with a total length of approximately 5.68 km, is a double carriageway road with two lanes for each carriageway and kerbed median strip of 1.5 m.

The first section of approximately 800 m crosses the Ambouli River with two Irish Crossings.

The services provided by TECHNITAL included:

- Preliminary Design,
- Topographic surveys
- Geotechnical investigations
- Detailed design
- Contract Documents
- Construction supervision.

The construction supervision required the full-time services of 1 Resident Engineer, 1 Materials Engineer and 1 Site Inspector for a period of 16 months.

The construction contract is governed by FIDIC Conditions of Contract.

# RECONSTRUCTION OF ROAD INFRASTRUCTURES DAMAGED BY HURRICANE JEANNE

|                    |   |
|--------------------|---|
| Location:          | DOMINICAN REPUBLIC  |
| Client:            | ONFED – National Office for the Management of EDF funds in the Dominican Republic           |
| Services:          | EIA, Detailed design for rehabilitation and improvement works; Proposals for risk reduction |
| Period:            | 07/2006 – 04/2007   |
| Construction cost: | € 20,000,000  |

## Project Description:

In September 2004, the Dominican Republic was swept by Hurricane *Jeanne* which caused severe damage to the population, to the economy, to the natural environment, and to the infrastructures. Rainfall exceeded 1000 mm in just 15 days, causing floods, landslides and slips in all the major basins of the country and in most of the smaller ones as well.



As far as land communication infrastructures were concerned, the passage of Hurricane *Jeanne* caused the collapse of bridges and the crumbling of slopes with the result that in some cases entire sectors of the country were isolated, and in others transit was greatly impeded through the communication routes affected. The emergency interventions carried out immediately after the hurricane looked to solving the most urgent problems but left unresolved rehabilitation requirements in the priority sectors of communications, water and sanitation, and housing.

In this context the European Commission, at the request of the government of the DR, allocated a grant of 10 M€ (ten million Euros) for Urgent Humanitarian Aid for the rehabilitation and reconstruction of road infrastructures and the drawing up of a programme of works for the reduction and mitigation of risks.

The specific objective of the contract is the re-establishment of road links in the regions of Sanchez Ramirez, La Vega, Salcedo, Espaillat, El Seibo, Hato Mayor, San Jose de Ocoa, Peravia, affected by Hurricane *Jeanne*, in September 2004.



Of course the new works must not repeat the same deficiencies responsible for the high vulnerability of the road infrastructures, and the risk of further erosion and collapses in the event of the repetition of similar disasters must be greatly reduced. Consequently, in most cases it is necessary to re-examine all the design criteria, such as (among others) the location and evolution of the natural banks, the hydraulic cross section, the type of foundation, construction materials, access routes, etc. In relation to the structures and road sections damaged by Hurricane *Jeanne* (as identified by the reconnaissance mission carried out in the period February-April 2005), the services supplied included:

- Field investigations and surveys
- Concept Design and Detailed Designs for 11 bridges (5 new and 6 rehabilitated), 41 km of paved roads and 61 km of unpaved rural roads
- Tender Documents for the Works contracts

TECHNITAL carried out this EU contract (financed from the 9<sup>th</sup> EDF) in association with the local consulting firm Hanson Rodriguez S.A.



# RECONSTRUCTION AND REHABILITATION OF ROAD INFRASTRUCTURES IN THE SOUTH-EAST REGION of DOMINICAN REPUBLIC

|                    |   |
|--------------------|---|
| Location:          | DOMINICAN REPUBLIC                      |
| Client:            | EC Delegation in the Dominican Republic |
| Services:          | Final evaluation study of the design    |
| Period:            | 06/2005 - 08/2005                       |
| Construction cost: | € 6,730,000                             |

## Project Description:

According to the Financing Agreement, the general purpose of the evaluation was to examine project preparation and conception, its context, objectives and results, risks, and hypotheses, conditions, complementary measures, execution and operation, as well as its impact in the light of the feasibility criteria.

The evaluation also aimed at examining those aspects related to environmental protection and the mitigation of natural disasters.

The task of the Consultant's team therefore consisted in analysing the conception and pertinence of the project and its fulfilment of the project goals, the results obtained and its impact and viability. In particular the Consultant was to evaluate:

- a. the contribution to re-establishing the conditions necessary to stimulate socio-economic development following the devastation caused by Hurricane George;
- b. the re-establishment, in a sustainable manner and respecting effective disaster mitigation criteria, of road communications in the south-east region, at the same time reducing the risk of loss of life and materials as a result of the flooding of the southern Rio Yaque.

In particular the services provided were the following:

1. Analysis of the Project execution and results achieved, as well as its sustainability in the economic and institutional framework of the contract
2. Verification of attainment of Project goals
3. Evaluation and quantification of the value of the results in the light of the project financing scheme
4. Evaluation of the efficiency of the Project implementation and its effects on the results.
5. Evaluation of the congruence of the financial allocations for each activity and their impact on the results
6. Analysis of the efficiency of the management on the part of the Contracting Authority, especially in relation to the relevance and quality of the designs, and its capacity react to specific situations, identifying those factors or elements which may have affected the efficiency and effectiveness of its actions.



TECHNITAL carried out this EU Framework contract (AMS 451 – Lot 2: Infrastructures) as member of the consortium headed by KAMPSAX International A/S of Belgium.



# ROAD LINK BETWEEN THE IONIAN AND TYRRHENIAN SEAS

|                    |  |
|--------------------|--|
| Location:          | Sicily, Italy : Section San Piero Patti – Francavilla Di Sicilia From The Junction With The Highway S.P. 112 To The Junction With The Highway S.S. 185 |
| Client:            | Province of Messina (Sicily)   |
| Services:          | Preliminary Design and EIA   |
| Period:            | 11/2004 – 01/2005  |
| Construction cost: | € 275,166,000  |

## Project Description:

The project road allows the crossing of the eastern “horn” of Sicily, passing south of the Peloritani mountains and thus halving the distance between Patti and Giardini Naxos, in comparison to the motorway route A20 – A18 Patti-Messina-Giardini Naxos.

The design alignment is located in a natural corridor, starting with the Alcantara valley in the east, as far as Francavilla, and continuing, up to Moio Alcantara, parallel to the highway S.S.120 which is the northern crown of the Mt. Etna national park, and which has attractive link roads to above-mentioned municipalities.

The road has a total length of some 30 km and envisages 18 intersections. It is a C2 class road with a maximum gradient of 6.9%. The minimum curve radius is 350 m. The road includes mixed structure steel-concrete and p.r.c. viaducts for a total length of about 3 km, and some 12 kilometres of natural tunnels.



In the general scheme for the improvement and upgrading of the Sicilian road network, this project occupies a strategic role and attains the following goals:

- compensate the deficit of road links in disadvantaged areas and promote their possible development;

- create more balanced traffic flows in the coastal area, with the aim of limiting congestion and reducing the accident rate.
- minimize transport time and costs;
- contribute to the connection of production poles and to the territorial integration of the smaller towns within the coastal area;
- optimize the connections between road and port infrastructures, to facilitate freight and private vehicle traffic.

In conclusion, it may be asserted that the Ionian-Tyrrhenian road link between the towns of Patti and Giardini Naxos improves not only the infrastructure of the areas crossed, but also and especially the access to the slopes of Mt Etna and of the two opposing coastal areas.

The activities carried out were those concerned with a preliminary design and included the preparatory studies and investigations (geological, traffic, and hydraulic-hydrological studies), and the examination of the various design alternatives with special attention to the chosen solution.

The project also included an accurate Environmental Impact Assessment study, and where necessary provided landscaping and other mitigation works.

The project was carried out by Technital in association with SIS s.r.l., STI s.r.l. and INFRATEC s.r.l.; the proportion carried out by Technital was 25%.



# SUPERVISION OF THE WORKS FOR THE BORDER CROSSING ORASJE

|                    |  |
|--------------------|--|
| Location:          | BOSNIA & HERZEGOVINA                         |
| Client:            | Ministry of Civil Affairs and Communications |
| Services:          | Works Supervision                            |
| Period:            | 11/2002 – 06/2004                            |
| Construction cost: | € 3,100,000                                  |

## Project Description:

This Border Crossing is part of the Regional Trade and Transportation Facilitation Program in Southeast Europe, with the aim of strengthening and modernizing the Customs Administrations and Agencies for border control. Orasje Border Crossing is located on the border with the Republic of Croatia in the north-east region.

The overall objective of the Project is to ensure smooth and efficient legal movement of goods and passengers between Bosnia and Herzegovina and the Republic of Croatia.



The specific activities performed by the Consultant consists in providing professional supervision in compliance with the relevant laws and standards in force in Bosnia and Herzegovina, international standards, the design and the particular requirements of the Client.

The Consultant's services included:

- Control of the respect and fulfilment of the contractual obligations by the Works Contractor
- Financial Control
- Control of the respect of the time-frame by the Works Contractor
- Control of the safety measures on the job.

The Consultant had the obligation to ensure an external control on the laboratory, equipment and installations, which had been provided on the site.



The Head of the Supervision was also responsible for providing the Client with a Monthly Report, including the following:

- Statement of progress of the works
- Program of the Works planned
- Comparison between contractual works time-frame and the real progress of the works
- In case of delay, justification and the measures to undertake
- A chart about the Works time-frame
- A statement indicating the contractual expenses related to the Works



The Supervision Team consisted of six experts involved for 14 months maximum.

# STATE HIGHWAY SS 38 – MORBEGNO VARIANT – VALTELLINA

|                    |   |
|--------------------|---|
| Location:          | Lombardy, Italy   |
| Client:            | Lombardy Region (Milan), Italy  |
| Services:          | Detailed Design, Environmental Impact Assessment Study, and Geotechnical Survey |
| Period:            | 11/2001 – 02/2004   |
| Construction cost: | € 449,540,000   |

## Project Description:

The project concerned a 19.5 km long, B category (extra-urban fast flow) road in the Province of Sondrio (Lombardy Region).



The new road has a design speed 120 km/h, 2 carriageways each with 2 lanes 3.75 m width + shoulders 1.75 m right / 1.00 m left, and 3.00 m wide traffic island. The contract also included a section of Provincial road SP 58, length 2.0 km, C2 category.



The road consisted of 8.9 km on embankment (maximum height around 10m), 4.7 km of viaducts (3 of them across the river Adda, span variable up to 90 m, deck with iron beams), and 5.7 km in tunnels in 2 sections (2 separate tubes for the carriageways, 25-35 m inter-axis). Owing to the soft ground, extensive use of piling foundations was necessary.

The tunnels have a cross-sectional area of 150-200 sq. m and an internal width 13.2 m. The tunnel design includes all safety equipment and installations: lighting, emergency lane and stopping bays, fire-fighting, signalling, telecommunication, etc.).

During the topographic survey of the alignment, the tunnel was found to be close to a water hydro-electric tunnel, which meant that the tunnel alignment had to be changed to maintain a distance of at least 20-25 m.



The road also includes 3 main interchanges: 1 (Fuentes) with 5 directions – 2 levels, 2 (Cosio and Tartano) with 4 directions – 2 levels.



The contract included the following activities:

- Design of art works (viaduct, tunnels etc.)
- Design of ventilation system (longitudinal)
- Environmental impact study
- Design and execution of geotechnical survey
- Design of land reclamation (expropriation / temporary occupation).

The specific activities carried out by TECHNITAL were:

- Road design up to km 3+100 (civil works, viaducts included)
- Fuentes interchange (5 directions 2 levels)
- All tunnel equipment, ventilation included
- All hydraulic works
- Environmental impact study management.

# RECONSTRUCTION OF THE MUHAN – EL RAMA ROAD (90 KM)

|                    |  |
|--------------------|--|
| Location:          | NICARAGUA  |
| Client:            | Ministerio de Transporte e Infraestructuras - Managua. (Fin. WB) |
| Services:          | Detailed Design, Tender Documents and Works Supervision          |
| Period:            | 07/1999 - 12/2003  |
| Construction cost: | € 30,000,000   |

## Project Description:

The contract awarded to TECHNITAL concerns the rehabilitation of the 90.3 km section of the Managua-El Rama road between Muhan and El Rama, including 14 bridges and 342 culverts, with a design speed of 70 km/h.



The state of the existing road was extremely poor : the road paving is ruined and for some 50 km virtually non-existent, the bridges are totally inadequate for present and future traffic, the culverts are in appalling condition due to lack of maintenance and insufficient capacity and there are scarcely any road signs.



The project includes:

- ◇ adaptation of the horizontal /vertical alignment to the new design speed
- ◇ widening of the road crown from 7 to 9 m and renewal of the paving to cope with the traffic foreseen in 2015,
- ◇ upgrading or replacement of the culverts
- ◇ reinforcing and upgrading of the bridges
- ◇ guarantee of an adequate safety level by the introduction of vertical and horizontal road signs and metal barriers
- ◇ measures to mitigate the environmental impact

- ◇ elimination of the critical points of the alignment by slope protection, lateral ditches and culverts, etc..



The Contract was administered according to FIDIC rules (Red Book), the Consultant assuming the role of the “Engineer”

Technital carried out the project in association with Sotecni SpA of Rome. As the leading company Technital’s share amounts to 40% of the total contract value.



# DESIGN OF THE BORDER CROSSINGS KAMENSKO AND GORICA

|                    |  |
|--------------------|--|
| Location:          | BOSNIA & HERZEGOVINA                         |
| Client:            | Ministry of Civil Affairs and Communications |
| Services:          | Preliminary and Detailed Design              |
| Period:            | 08/2002 – 12/2002                            |
| Construction cost: | € 6,500,000                                  |

## Project Description:

The Border Crossings Project is part of the Regional Trade and Transportation Facilitation Program in Southeast Europe, with the aim of strengthening and modernizing the Customs Administrations and Agencies for border control. These Border Crossings are located on the border with the Republic of Croatia in the south-west region.



The overall objective of the Project is to ensure smooth and efficient legal movement of goods and passengers between Bosnia and Herzegovina and the Republic of Croatia.

The specific activities performed by the Consultant consist in developing the Preliminary and Detailed Design, including Technical Specifications and Bill of Quantities.

The Design of the Border Crossing comprised the following features:

1. Urban Planning, Architectural and Traffic Designs;
2. Facilities Design:
  - o Canopy over the space of primary control
  - o Control cabins
  - o Administrative buildings Testing hall
  - o Building for secondary controls of the buses and cars
  - o Truck weighing equipment
  - o Building for border inspections and secondary customs procedures
  - o Commercial offices
  - o Energy block



### 3. Installations Designs and utility connections:

- o water supply system, firefighting hydrants
- o sewerage system
- o air conditioning
- o surface water drainage system
- o electricity supply, signalisation, street lights and lightning protection
- o HVAC installations
- o phone lines/computer net/fire alarm net/security installations/loudspeaker system.

### 4. Technical specifications;

### 5. Bills of prices and quantities.

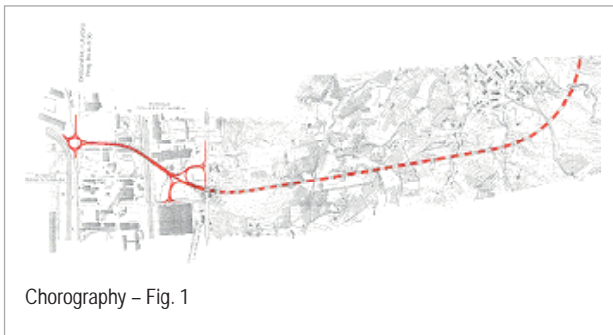
The Consultant also designed proper fencing to isolate the compound from the neighbouring area, and prevent illegal and uncontrolled trespassing. The landscaping has been foreseen as plane surfacing, finished with topsoil and grass turf strips.

# THE “MARBLE ROAD”

|                    |   |
|--------------------|---|
| Location:          | Tuscany, Italy  |
| Client:            | Municipality of Carrara   |
| Services:          | Final and Detailed Design, Environmental Impact Assessment Study, Safety Plan |
| Period:            | 03/2001- 10/2002  |
| Construction cost: | € 103,243,200   |

## Project Description:

A large part of the traffic in the municipal area of Carrara consists of heavy vehicles generated/ attracted by the mining and commercial activities related to the marble sector. The effects on the urban environment are further aggravated by the frequent road maintenance and repaving works, owing to the intensity of the heavy load through traffic.



In view of this situation, the need arose to provide a special road to serve the heavy traffic, thereby eliminating its crossing the historic centre of Carrara, while respecting the urban and environmental constraints of the area. The main axis of the “marble road” starts from the intersection in the industrial area opposite the ex-Rumianca works, a little further west of the state highway S.S.1 Aurelia and the Pisa-Genoa railway line, where the Marina di Carrara interchange will be built, and leads to the former weigh station of Miseglia Bassa, to the east of the historic town centre of Carrara, for a total length of 6.13 km, of which 4.45 km are in tunnel. Over its entire length the road has a type IV cross section as per CNR norms 78/80, with a central strip between the two traffic directions of 0.70 m. The choice of a largely underground alignment derives from the need to maintain a gradient with sufficiently low slope to allow a high service level for the heavy vehicles and reduce as far as possible the visual impact of the works, even if this implies a considerable technical and economic undertaking.



Although the total difference in level to be overcome is not great (about 149 m), in the first half of the alignment the longitudinal gradient is 3.8%, while the values are lower in the second half of the alignment (between 1.1% and 3.4%, and less than 1% for the Santa Croce tunnel). The main structures have the following characteristics:

- |   |               |
|---|---------------|
| • Artificial (push-in) tunnel for Pisa-Genova railway | L = 27 m      |
| • Underpass of S.S.1 Aurelia                          | L = 20.8 m    |
| • Monte Greco Tunnel                                  | L = 2405,5 m  |
| • Bridge  | L = 31 m      |
| • Bridge  | L = 24,5 m    |
| • Cornevale Tunnel                                    | L = 198,6 m   |
| • Taroccia Viaduct                                    | L = 55 m      |
| • La Foce Viaduct                                     | L = 131 m     |
| • Gli Ossi I Viaduct                                  | L = 49 m      |
| • Gli Ossi II Viaduct                                 | L = 55 m      |
| • Tunnel Macina                                       | L = 972,7 m   |
| • Carrara Viaduct                                     | L = 55 m      |
| • Santa Croce Tunnel                                  | L = 1010,80 m |
| • S. Giuseppe Viaduct                                 | L = 55 m      |

The project also envisages all the installations including interchange lighting, emergency call posts, digital signboards, photo-control of traffic, road circulation assistance, automatic fire-fighting and ventilation systems in the tunnels. The tunnels will also have emergency lanes, parking bays and escape routes.

# DOHA INDUSTRIAL AREA, ROCK QUARRY TO WUKHAIR MAIN ROAD, DOHA

|                    |   |
|--------------------|---|
| Location:          | Qatar   |
| Client:            | Ministry of Municipal Affairs & Agriculture - Roads Department  |
| Services:          | Detailed Design and Tender/ Contract Documents and services for the link road between Doha Industrial Area (Rock Quarry) and Route 75 (Wakrah Wukair Main Road) |
| Period:            | 12/2001- 09/2002  |
| Construction cost: | € 4,900,000   |

## Project Description:

The project site is located in zone 91 and the scope of work incorporates the design of extents of roads linking into subdivisions.

- Storm water drainage design;
- Street lighting design;
- Tender and Contract documentation;
- Tender and Contract services;
- Preparation of the supervision brief.



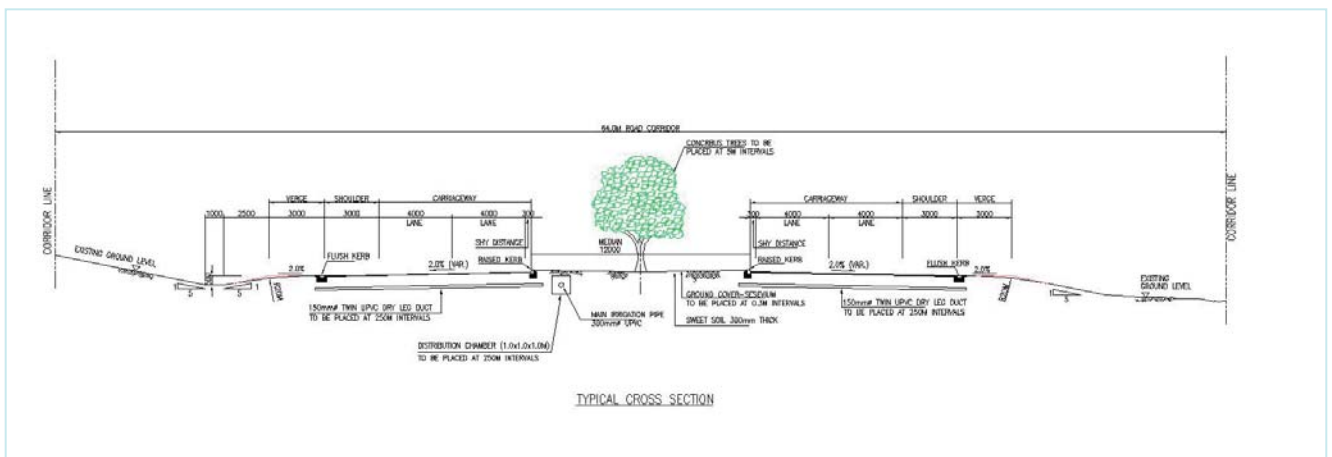
Existing site



Plan and subdivisions

The work requirements consist of the following main elements:

- Ground investigation;
- Topographic survey;
- Concept design and presentation of concept options;
- Preliminary and detailed design of selected options;
- Landscape and irrigation design;



# EMERGENCY ROAD REPAIR PROJECT – 2<sup>ND</sup> YEAR CONTRACTS

|                    |   |
|--------------------|---|
| Location:          | ALBANIA   |
| Client:            | Ministry of Transport - General Roads Directorate (Fin. WB) |
| Services:          | Detailed Design and Tender Documents                        |
| Period:            | 03/2001 – 02/2002   |
| Construction cost: | € 4,500,000   |

## Project Description:

In the context of the Emergency Road Repair Project, TECHNITAL was awarded the contract regarding the rehabilitation of the road sections:

- Fushe Kruje – Mamurras - Milot (30 Km),
- Qafe Qele – Fushe Arrez (49 Km), and
- Kukes – Morine (24 Km).



The road works foreseen include road paving repair and improvement, repairs/rehabilitation of bridges, drainage structures, retaining walls, etc.

The services required carried out included:

- assessment of the present state of repair of the roads in question;
- definition of the rehabilitation works for each road section to be carried out, according to the allocated funds
- detailed design and bidding documents for 4 separate construction contracts.



The activities therefore included the following:

- execution of topographical, hydrological and geotechnical studies and surveys;
- preparation of preliminary designs - including construction cost estimates - of design alternatives;
- preparation of detailed engineering designs;
- drawing up full sets of bidding documents.





# RECONSTRUCTION OF JASENOVAC BRIDGE

|                    |   |
|--------------------|---|
| Location:          | Bosnia and Herzegovina  |
| Client:            | Ministry of Civil Affairs & Communications, Financing: EU - OBNOVA  |
| Services:          | Construction Design, Tender Documents, Assistance with Tender Evaluation and Obtaining Construction Permit. |
| Period:            | 12/2000 – 05/2001   |
| Construction cost: | € 3,500,000   |

## Project Description:

The new Jasenovac Road Bridge will replace the former bridges over the Una and Sava rivers near Jasenovac on Road no. 14 linking the Republic of Croatia with Bosnia & Herzegovina.



Their location upstream near the mouths of the two rivers enabled the traffic connection to the town of Uštica, which is located between the rivers.



*Collapsed bridge over the Sava River*

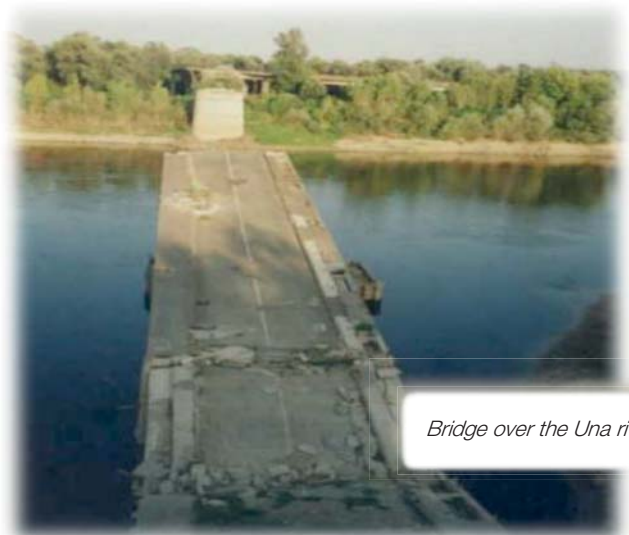
The entire structure (676.75 m) has been divided into seven statically independent parts, sharing piers where they abut one another.

The design involved in the present contract refers to the following structural parts:

- Structure III (central part) consisting of a triangle:

Sava River – Una River (2 spans, total of 31.25m); Sava River - Uštica (2 spans, total of 33.25m); and River Una - Uštica (2 spans, total of 37.40m).

- Structure IV (north left bank of the Una ): 2 spans, total 64 m.
- Structure V (crossing over the Una River): 3 spans for a total of 109 m.
- Structure VI (south right access to the Una River bank over the Dubica–Gradina Road): 2 spans, total 64 m.
- Structure VII (west connection to Uštica): 3 spans, total 96 m.



*Bridge over the Una river*

The services carried out by TECHNITAL include the construction design and tender documents for the following:

- reconstruction of a new road bridge at Jasenovac over the Una River (Structures IV and V)
- renovation of structures III, VI and VII
- renovation of approach roads leading to structures VI and VII

as well as assistance with tender evaluation and obtaining the construction permit.

# CERTALDO VARIANT - STATE HIGHWAY SS 429 « VAL D'ELSA »: SECTION POGGIBONSI-EMPOLI

|                    |  |
|--------------------|--|
| Location:          | Tuscany, Italy   |
| Client:            | ANAS (State Highway Authority) – Department of Tuscany |
| Services:          | Detailed Design and EIA                                |
| Period:            | 11/1999 – 07/2000                                      |
| Construction cost: | € 72,820,500   |

## Project Description:

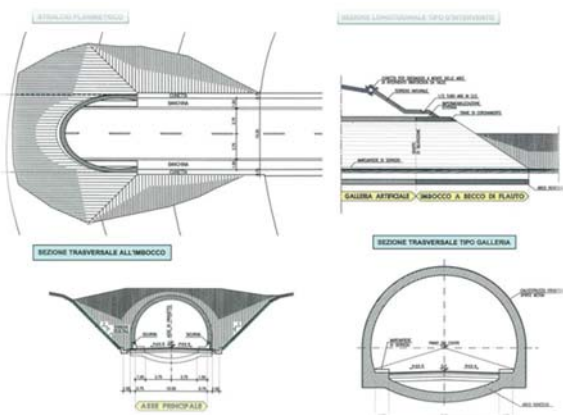
The design was completed by a thorough environmental impact study. The contract concerned the new section of the state highway SS 429 of the «Val d'Elsa». The new section of alignment, connecting the two Tuscan towns of Poggibonsi and Empoli, lies within the municipal area of Certaldo and is known as the «Certaldo variant». The project entrusted to Technital by ANAS consisted in the detailed design and environmental impact assessment of the variant alignment for the SS 429 between the towns of Poggibonsi and Empoli in the municipal area of Certaldo.



In the central part of the alignment, the true variant, which runs south-north for some 5 km west of the town of Certaldo, several major structures were foreseen, including three tunnels (for a total of over 1800 m) and four viaducts with steel-concrete decks.

The other two parts of the alignment consist in the connections to the existing road. These were achieved eastward (at the southern end of the variant), by means of a roundabout feeding off to two provincial roads (to San Gimignano and Piano d'Elsa) as well as to the existing SS 429 to Poggibonsi, and westward (at the northern end) exploiting and widening the existing municipal road of Pian di Sotto to rejoin the existing highway.

Since the project area is subject to flooding by the river Elsa, various techniques have been adopted to protect the road:



## Details of natural tunnel cross sections and entrances

- ◇ protection of the road embankments against erosion for a height of 1.50 m,
- ◇ design height of the roadway 2.50 m above the level of the surrounding land
- ◇ placement of culverts (diameter = 1500 mm) at 50 m intervals to allow the runoff of the floodwaters.

The environmental impact study led to the inclusion in the design of measures to counteract the acoustic and atmospheric pollution. These include the use of natural barriers consisting of trees and shrubs to absorb both noise and the atmospheric pollution of the industrial area.

The negative impacts of the road on the environment will be reduced by the masking effect of trees and shrubs planted along the alignment and by landscaping works at the interchanges (with lawns, groups of trees and shrubs) and by planting vegetation along the embankments. These works will not only mitigate the visual impact of the road but also favour spontaneous colonisation by both flora and fauna.



*Tunnel entrance before and after the works*

# ARUSHA – DODOMA ROAD

|                    |   |
|--------------------|---|
| Location:          | TANZANIA  |
| Client:            | Government of Tanzania - Ministry of Works with financing by the Italian Government.              |
| Services:          | Feasibility Study, Preliminary and Detailed Designs, Environmental Impact Study, Tender Documents |
| Period:            | 06/1982 – 03/1984   |
| Construction cost: | € 70,238,100  |

## Project Description:

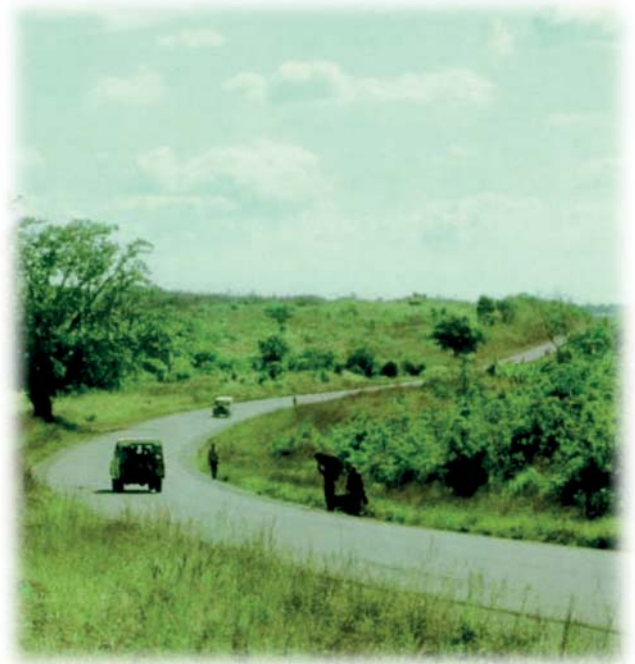
This project aims to improve the link between the city of Arusha, in the north of the country and the planned new capital, Dodoma. The road has a length of 430 km and forms an integral part of the broader international project for the Trans East African Highway.



The Project included a detailed Traffic Study to evaluate the traffic demand and composition in year 2000 and 2020, the aerophotogrammetric mapping of the area in scale 1:10.000 and 1:2.000 and a detailed geological-geotechnical survey.

The aim of this project is to improve the link between the cities of Arusha in the north of the country and the planned new capital of Dodoma. This link is currently provided by an unsealed road which is often flooded during the rainy season and therefore becomes impracticable to heavy vehicles. The road also forms an integral part of the broader international project for the Trans-East African Highway.

The *first phase* of the project, the Preliminary Design of the entire road alignment, and the Final Design of the upgrading of 105 km of the existing road between Arusha and Minjingu, also included a technical-economic Feasibility Study. For this purpose the existing data were collected and analysed in order to obtain an accurate picture of the socio-economic situation of the area concerned and of its physiographic features. Subsequently, a Traffic Study was carried out to estimate the present and future (years 2000 and 2020) traffic demand.



The execution of the Preliminary Design involved the topographic study on the basis of the 1:40,000 aerial photographs and the subsequent drawing up of the 1:10,000 maps. These maps served as the basis for the design of the alignment and the collocation of the structures. Finally, the costs relating to construction and routine and extraordinary maintenance were estimated. On the basis of the evaluation of costs, traffic demand, direct and indirect benefits, it was possible to calculate the economic indicators needed to determine the profitability of the investment and therefore to support the subsequent search for financing.

The *second phase* consisted in the Final Design of the whole of the remaining route, divide into 5 functional sections. A direct topographic survey was carried out, with the staking out of the alignment and marking of characteristic points. At the same time a series of geognostic investigations and laboratory tests were carried out to identify the soil types along the alignment and identify the borrow areas for construction materials. Hydrological studies were also done for the scaling of the structures and protection works.

Finally the structural calculations and construction drawings were prepared, for the road itself and the related structures. For each road section Tender Documents, Specifications and Cost Estimates were drawn up.

## Urban Roads

# BIKEWAY "TIRRENICA"

|                    |  |
|--------------------|--|
| Location:          | West coast from Ventimiglia to Rome, Italy |
| Client:            | Tuscany Region                             |
| Services:          | Preliminary and Detailed design            |
| Period:            | 05/2021 – 02/2024                          |
| Construction cost: | € 52,000,000                               |

## Project Description:



Preliminary Project for the TIRRENICA Cycle Route and Detailed Design of the priority lots (1 out of 2 in Liguria, 2 out of 5 in Tuscany and 1 out of 3 in Lazio).

The TIRRENICA cycle route project covers a total length of about 1076 km and touches 3 Regions, 11 Provinces and 105 Municipalities and involves a vast and complex territory from both the urban and environmental points of view. The Regions of Tuscany (leader), Liguria and Latium crossed by the route, given the complexity of the work to be carried out, have decided to collaborate through an Agreement and the establishment of a Technical Table. The Regions also play an important 'hinge' role in the planning and implementation phase between the national cycling network, coordinated by the MIMS, and the local network of which they are the main promoters, together with the municipalities,

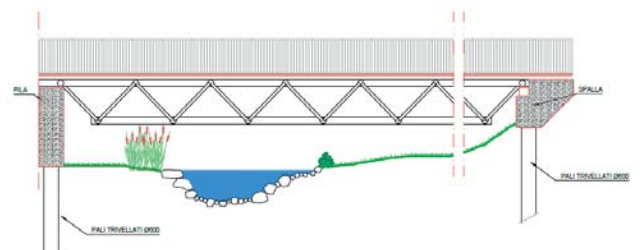
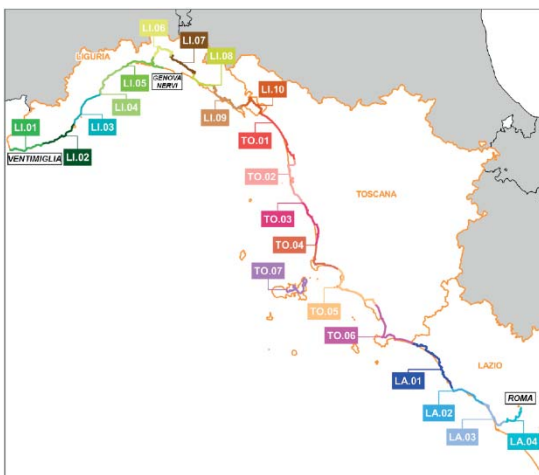
for the realisation of infrastructures dedicated to everyday mobility, home-work and home-school travel, as well as tourism.

The infrastructure consists almost in its entirety of a paved ribbon in mixed traffic or dedicated to bicycle and pedestrian traffic along the entire west coast of Italy, punctuated by special structures of the same nature dedicated to overcoming the countless roughness or hydraulic interferences.

A number of 469 crossings were identified, surveyed and studied, out of which 344 were existing and 125 new.

Standard interventions of various kinds were planned for these:

- securing of bicycle and pedestrian transit;
- modification of the rules of use, in mixed use;
- local interventions (e.g. restoration of parapets)
- construction of a new work (for which 8 different types of sections have been proposed, depending on the spans required to overcome the obstacle)



# PREPARATION OF PRELIMINARY DESIGN FOR "IMPROVEMENT OF THE COMMUNICATION LINK BETWEEN ISLANDS UZNAM AND WOLIN IN ŚWINOUJŚCIE"

|                    |   |
|--------------------|---|
| Location:          | Poland  |
| Client:            | Municipality of Swinoujscie                         |
| Services:          | Preliminary Design and Tender documents preparation |
| Period:            | 02/2015 - 09/2016                                   |
| Construction cost: | Not available                                       |

## Project Description:

The city of Swinoujscie is located on both banks of Swina river in the northwest of Poland. At the same time each bank is located on islands, Uznam Island at west side and Wolin Island at east side. Currently there are no road connections across both sides of the city and transport is provided by regular ferries. Therefore, the construction of a road tunnel under the Swina River is proposed by the Municipality of Swinoujscie for an improved connection.

Swinoujscie tunnelling project consists of a **1.44 km long approx tunnel** hosting two lanes which will undercross the Swina River in order to provide a direct link between the Islands, improving the communications and development of the Area.

The tunnel will be constructed with mechanised method (TBM) from Uznam Island West side of the Swina River to Wolin Island East side of the river

Due to prevalent geological conditions, tunnels will be excavated by Tunnelling Boring Machine capable to apply a stabilizing pressure to the tunnel face. A single TBM with Slurry technology will be utilized starting and arriving at two shafts.

The shafts will be constructed with cut and cover method using diaphragm walls.

The adopted road cross section has been designed upon International Standards fulfilling the requirements established by Swinoujscie Municipality. An inner diameter of 12.00 m has been adopted

Temporary and permanent support is given by a single pass segmental lining designed to resist temporary loads during **TBM excavation** and long term ground and water loads, corresponding to a maximum of 38 meters water head (at tunnel invert).

The tunnel will be connected to the existing road network with a new roundabout at Karsiborska street on Uznam island

On Wolin island, the exit to the ground level takes place approx. 300 m before the crossing of Wolińska, Fińska and Duńska streets. At this crossing a new roundabout and a new 5-span flyover are envisaged.

The project also includes the reconstruction of all underground utilities, all equipment of the tunnel, a control centre building for monitoring of traffic inside and outside the tunnel



Figure 1. Swinoujscie road variant and tunnel plan view

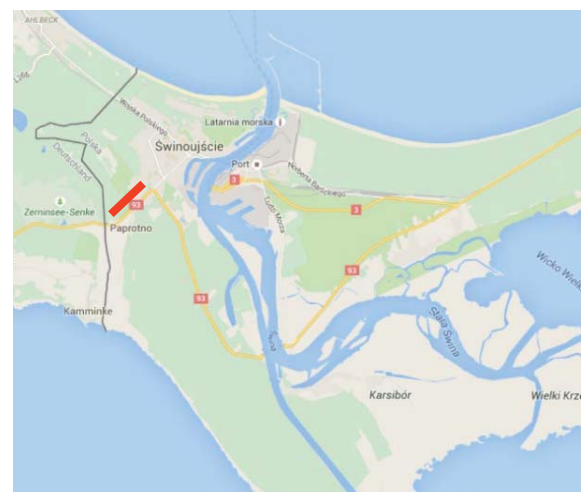
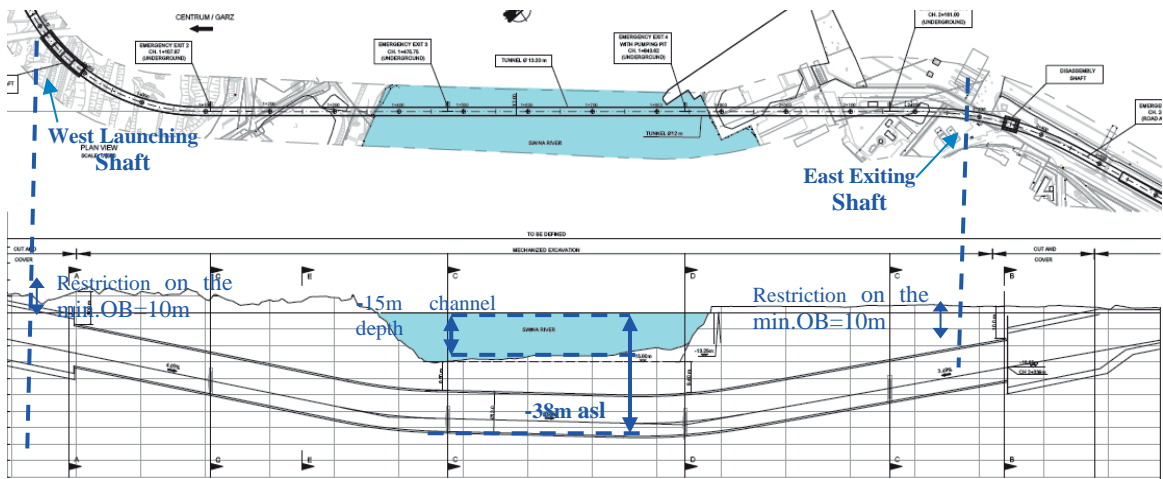


Figure 2. Swinoujscie road plan

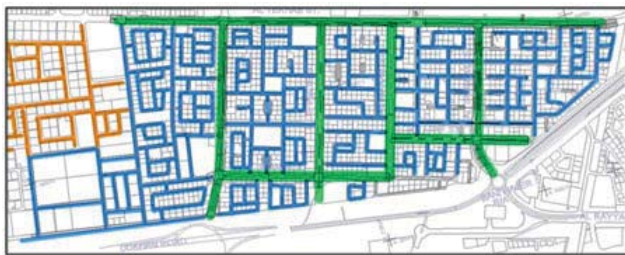


# DEVELOPMENT OF ROADS IN BANI HAJER - ZONE 51 – DOHA

|                    |   |
|--------------------|---|
| Location:          | Doha, Qatar   |
| Client:            | Public Works Authority, Road Affairs  |
| Services:          | Post Contract Professional General & Site Supervision and Quantity Surveying Services |
| Period:            | 02/2009 – 07/2014   |
| Construction cost: | € 141,331,000   |

## Project Description:

The site is located approximately 10km to the northwest, outside Doha.



**Part 1 & 2:** Comprise the construction of all roads, utility services, provision for future utilities and diversion of existing utilities and removal of existing bitmap roads. The works including construction of 5,250m of two lane dual carriageways (32m to 64m corridor), and 37,580m of one lane single carriageway (16m to 24m corridor).

Full detailed design & construction of Foul Sewerage system (by contractor), including foul trunk lines systems and all associated works along three main roads with the project. Foul sewerage network including all associated works as "Full Design Build".



**Part 3:** Comprises the construction of all roads, including surface water drainage system, and provision of future utilities (road crossings). The works include construction of 11.4km of one lane single carriageway (16 to 24m corridor).



The Works comprise the construction of all roads and services including the following:

- Site Clearance
- Surface Water Drainage
- Earthworks
- Granular Sub-Base
- Asphalt works
- Kerbing Works, footways, footpath and paved areas
- Traffic signs and road markings
- Sewerage house connection & TSE road crossings
- Public utility services



General Supervision is carried out by the Supervision and Design Team of the Qatar Branch Office, headed by the Head of Supervision Division, while the Site Supervision is carried out by a team of 8 staff specifically appointed to the Project, under the direction and coordination of the Senior Resident Engineer who assumed the role of the Engineer's Representative. The Site Supervision team is composed of the following professional figures: Quantity Surveyor, Planning Engineer, Utility Engineer, Highway Surveyor and Highway Inspectors.



# DEVELOPMENT OF ROADS IN NORTH KHALIFA & MARKHIYA – DOHA

|                    |   |
|--------------------|---|
| Location:          | Doha, Qatar   |
| Client:            | Public Works Authority, Infrastructure Affairs  |
| Services:          | Post Contract Professional General & Site Supervision and Quantity Surveying Services |
| Period:            | 09/2009 – 02/2012   |
| Construction cost: | €32,022,500   |

## Project Description:

The site is located approximately 10km to the northwest, outside Doha.

Zones 32 and 33 are situated approximately 3.5 km northwest of the centre of Doha, bounded by Al Markhiya street to the north, Khalifa street to the south, Jamiaa street to the west and Arab League street separating the two zones.



The two Zones are mostly residential, occupying a total area of approximately 376 hectares.

Zone 32 is almost fully developed and urbanized while substantial areas of zone 33 are vacant and undeveloped. The length of the roads is about 34 km ranging from internal access roads to district distributor roads.



The Works comprise the construction of all roads and services including the following:

- Site Clearance
- Surface Water Drainage



- Earthworks, preparation to road formation
- Granular Sub-Base
- Asphalt works
- Kerbing Works, footways, footpath and paved areas
- Traffic signs and road markings
- Sewerage
- Public utility services



General Supervision is carried out by the Supervision and Design Team of the Qatar Branch Office, headed by the Head of Supervision Division, while the Site Supervision is carried out by a team of 6 staff specifically appointed to the Project, under the direction and coordination of the Senior Resident Engineer who assumed the role of the Engineer's Representative. The Site Supervision team is composed of the following professional figures: Quantity Surveyor, Planning Engineer, Utility Engineer, Highway Surveyor, Highway Inspector, and Material Inspector.

# CONCEPT DESIGN OF ROADS & INFRASTRUCTURES - PHASE 2

|                    |  |
|--------------------|--|
| Location:          | Qatar  |
| Client:            | Urban Planning & Development Authority (UPDA)  |
| Services:          | Topographic Surveys - Geotechnical Investigations - Drainage Design - Utilities relocation - Specifications and Cost Estimates |
| Period:            | 04/2009 – 12/2011  |
| Construction cost: | € 1,550,000,000  |

## Project Description:

The project scope comprises the full design of eight packages within the State of Qatar with a total area of 30 sq. km. and a *total length of roads equal to approximately 385 km*. The project scope also comprises the assessment of the environmental impacts and the definition of the mitigation measures and of the monitoring activities to be performed in the later design stages.

Packages 7, 8, 11, 14 and 17 are empty areas which have been recently sub-divided into residential areas with small commercial outlets. These areas will require complete infrastructure and roads design.

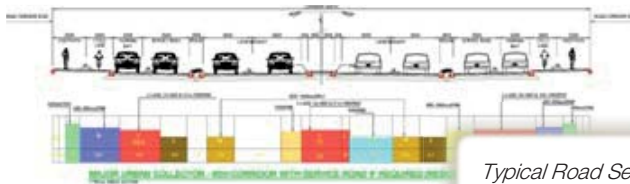
Packages 9, 12 and 13 are densely populated areas with commercial streets located in the heart of the city and will involve major redevelopment.

The project includes, in general, the following activities:

- Master Plan;
- Transportation Master Plan of Qatar and Sub-Area Models;
- General Traffic and Zones Development for 20 years extension;
- Traffic Modelling and Study;
- Hydrological study;
- Study & Evaluation of Foul Sewerage, Treated Sewage Effluent, Storm Water Drainage and Irrigation Systems;
- Topographical and Geotechnical (pavement, materials) Study;
- Environmental Impact Assessment;
- Design of Roads and Infrastructures.

The infrastructure works will consist of urban redevelopment of areas, such as change of the residential area land use from single family villas to multi-storey to higher (G+7) buildings which will induce a remarkable increase in the traffic generation and changes to drainage systems.

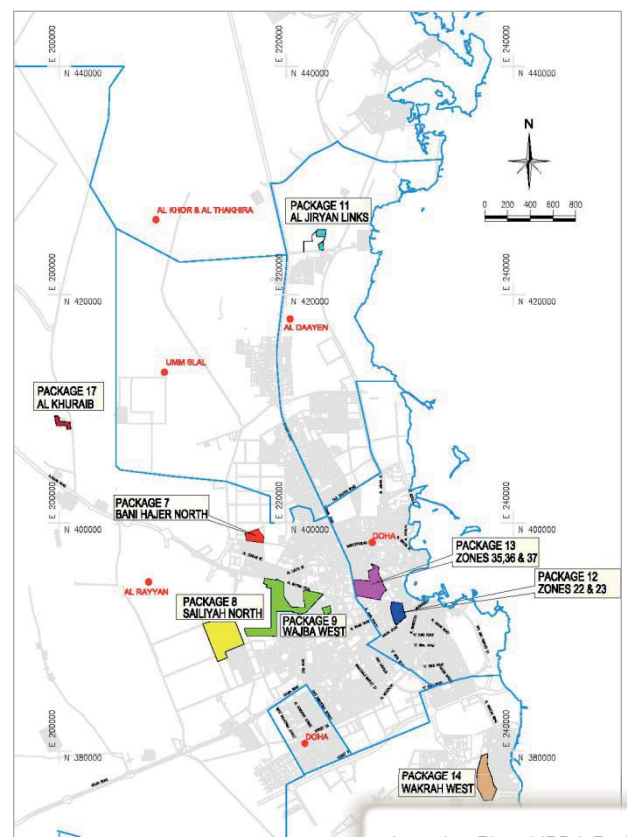
The project is located in 8 different areas across the state of Qatar. The scope of work incorporates the design of stretches of road linking into subdivisions and adaptation to the existing and future requirements and ongoing projects adjacent to the project area. The Project area comprises 2932 ha.



Typical Road Section

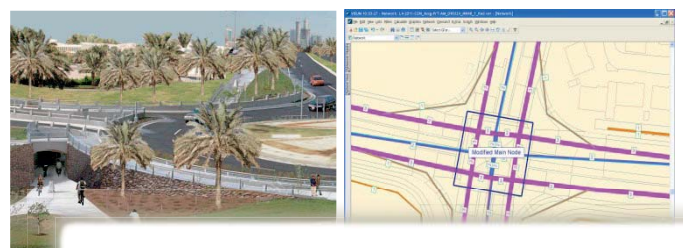
The required works includes the following elements:

- Services investigation;
- Ground investigation;
- Topographic surveys;
- Environmental investigation (air quality, noise, soil and groundwater, terrestrial ecology);
- Traffic surveys/ traffic impact analysis;
- Road network and road corridor plans;
- Detailed Road design;



Location Plan- UPDA Project

- Surface water drainage design;
- Foul Sewage
- Treated sewerage effluent (T.S.E);
- Environmental Impact Assessment Study
- Street lighting design and
- Landscaping design.



Grade – separated Roundabout & VISUM Model bikeway crossing

The project is divided into stages:

- Conceptual design Options and presentation of concept options;
- Concept design; and
- Cost Estimates.

# SUPERVISION OF CONSTRUCTION OF TIRANA MIDDLE RING ROAD, AND RECONSTRUCTION AND WIDENING OF LANA BRIDGE

|                    |   |
|--------------------|---|
| Location:          | Tirana, Albania   |
| Client:            | Municipality of Tirana (Financing: WB and EBRD)   |
| Services:          | Supervision of Construction of section of TMRR, Detailed design of works for Upgrading of the Rruga e Kavajes and Big Ring Road interchange, Detailed Design, Procurement and Supervision of reconstruction and widening of Lana bridge |
| Period:            | 11/2006 – 05/2011   |
| Construction cost: | € 15,500,000  |

## Project Description:

The Municipality of Tirana asked the World Bank to provide financial assistance, within the Transport Project, for improvement of the Tirana Middle Ring Road from Zogu I Zi (Blackbird) Junction around the northern section to the intersection with Bulevardi Bajram Curri. The **original contract** awarded to the Association TECHNITAL-TECNIC, *Supervision of road civil works contracts in the Municipality of Tirana*, regarded the supervision of three Civil Works Contracts for the construction of roads for a total of approx. 3.5 km. The Supervision Consultant assumed the role of the Engineer, according to FIDIC, administering the works contracts and ensuring that contractual clauses whether related to quality or quantities of work, were respected. TECHNITAL was also required, through its supervision team and central support resources, to assist the Client in all contract management tasks, including the preparation for, execution of, and taking over of any elements of the works.



In the early stages of the project, the scope of work was substantially amplified with **Addendum no. 1**, under EBRD funding, covering the *Detailed Design, procurement, implementation and supervision of works including rehabilitation of service roads and Upgrading of the Rruga e Kavajes and Big Ring Road interchange* at the entrance to Tirana city. Besides the study and design of the interchange (subsequently 2-level), the Project involved the detailed design of the works for the reconstruction and upgrading of the existing urban road segments (total approx. 2.5 Km), including the road pavement, sidewalks, the reconstruction of drainage and sewerage, safety barriers, road lighting, signals and markings, etc. However, the Contract was again modified after the completion of the design phase.

By **Addendum no. 2**, *Supervision of reconstruction of Lana Bridge*, the Client introduced another major change to the scope of work, preferring to use the remaining EBRD funds for the more urgent reconstruction of Lana Bridge, rather than for the interchange. This bridge crosses the Lana river near the Technological School on the south side of Tirana connecting Kavaje Road and Kombinati Road, which form the main radial route out of Tirana to the south-west. The new segment of BRR (future south By-pass) starts at the Kavaja road junction and is aligned in the informal zone of Selita then through the hills around

the Tirana Lake and Sauku hills and will connect Elbasani Road near the Police Academy. A new interchange in Kavaja Road will collect the traffic of Kavaja Road and the parallel roads along Lana River that are 3-lane urban roads.



The reconstruction and widening of the single-span bridge over the Lana River to three lanes each carriageway will eliminate the present congestion caused by the road narrowing. The works contract for Lana bridge also includes road signage and markings, and the demolition and reconstruction of the utilities. TECHNITAL was therefore charged with the preparation of all the civil works, including urban and architectural, structural, geological, drainage and sewerage works, electrical and traffic signals design details and drawings for all components of the works for the reconstruction and widening of the bridge, to such details that no further need for design is necessary during the construction.

The procurement of the Lana Bridge was through a single works contract based on FIDIC 'Red Book'. The duration of the supervision services for the construction works is 10 months.



# SUPERVISION OF CONSTRUCTION OF INDUSTRIAL INTERCHANGE, DOHA

|                    |  |
|--------------------|--|
| Location:          | Doha, Qatar  |
| Client:            | Ministry of Municipal Affairs & Agriculture - Roads Affairs Department |
| Services:          | Post Contract General and Site and Quantity Surveying                  |
| Period:            | 08/2006 – 03/2011  |
| Construction cost: | € 150,000,000  |

## Project Description:

The project works are located in Doha city and consist in the upgrading to a 4-level interchange of the existing Salwa Road/East Industrial Road/Al Furousiya Street Junction, otherwise known as the "Industrial Roundabout".



The works comprise the construction of all roads/ bridges / underpass/ infrastructure works including the following:

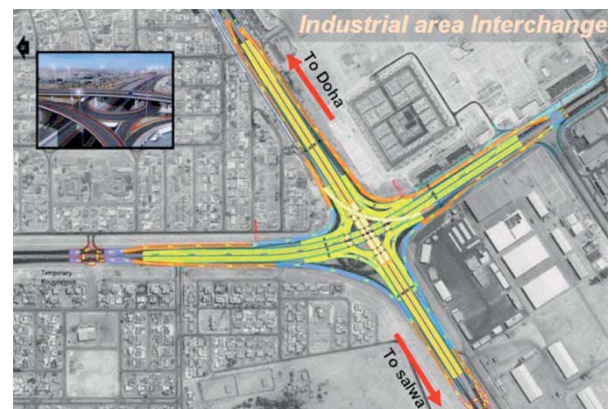
- Site clearance
- Fencing and Safety barriers
- Surface drainage
- approx. 400,000 m<sup>3</sup> of earthworks
- Granular sub base
- 300,000 m<sup>2</sup> of asphalt paving
- Kerbing works, footpaths, and paved areas
- Traffic signs and road markings
- Sewerage
- Storm water pump station
- Public utility services: provision for future services, diversions and protection of existing services (including full networks for water works, electricity works, street lighting, and public telephone works)
- Landscaping and irrigation/hardscape
- Bridges and underpass structure
- Intelligent transportation system.

In particular the works comprised

- ✓ 24 km of roads (12 km of 3- lane carriageways, 4 km of 2-lane carriageways and 8 km of single lane carriageways);
- ✓ 60.000 m<sup>3</sup> of concrete structures, including 4 post compressed bridges:
  - Salwa Bridge: 2 span bridge over 7 resting points (total length 248 m);
  - Viaduct for dedicated left turn (from Salwa Road to East Industrial Road): single span bridge over 12 supports (total length 630 m);
  - 2 single spans over 3 supports (total length 52 m).
- ✓ an underpass excavated to a depth of -11 m, with a cross section of 25.5 m to accommodate the 2 carriageways and retaining walls of reinforced concrete.

The contract also included:

- the procurement and construction of 8.5 km micro-tunnel with an internal diameter of 2.4 m made using TBM (Tunnel Boring Machine);
- laying of over 9000 m of pipes of different diameters along the various utility corridors;
- the procurement and installation of street lighting system, and of 4 high detection systems and CCTV system for surveillance and monitoring purposes;
- the procurement and installation of single unit New Jersey type Safety Barriers (each unit 6 m long, pre-cast and laid on foundation);
- construction of sidewalks paved with p.c. blocks (minimum width 2.5 m).



The services provided by TECHNITAL included:

- a. General supervision, including design checks and the proposal of any necessary alterations to the design
- b. Site supervision, including traffic maintenance plans, reviewing and assessing the Contractor's work, preparing all necessary reports, records, cost estimates, variation orders, certificates, etc.
- c. Quality Assurance, including monitoring of laboratory test activities, checking the Contractors' materials and equipment, etc.
- d. Post-Contract Quantity Surveying including monthly checks on works completed, monthly schedules and evaluations, records of materials deliveries, plant and manpower, etc.
- e. Project Management, including dealing with claims and outstanding works during the construction contract maintenance period.



The Contract was administered in accordance to the FIDIC Rules (Red Book). The Consultant's Resident Engineer has assumed the role of "Engineer's Representative, the "Engineer" role being kept by the Director of Roads Department of the Ministry.

# LOCAL AND MUNICIPAL ROAD DESIGN AND CONSTRUCTION SUPERVISION ADVISOR

|                    |   |
|--------------------|---|
| Location:          | Tbilisi, Georgia  |
| Client:            | Municipal Development Fund of Georgia   |
| Services:          | Technical assistance and advisory services to MDF for road project implementation in relation to: design review and recommendations for additions/alterations; contract variations with road contractors; construction supervision oversight; recommendations for improvement of urban road design guidelines |
| Period:            | 02/2011 – 05/2011   |
| Construction cost: | N.A.  |

## Project Description:

The Municipal Government of Georgia (MDF) aims at strengthening the institutional and financial capacity of municipalities through investing resources in local infrastructures and municipal economic and social services. The present project is part of the World Bank funded "Regional & Municipal Infrastructure Development Project Additional Financing" (RMIDP-AF), and one of several projects to be implemented by the MDF.

Some 36 road sub-projects are currently envisaged for additional WB financing but, according to WB findings, many of the designs which were drawn up in a very short time show deficiencies. The MDF therefore sought an internationally qualified consultant to provide urban road design and construction supervision advice.

Having to work in close collaboration with the MDF and WB supervisory consultants to develop joint recommendations, the international expert was given office space in the MDF headquarters in Tbilisi. He was also furnished with the all the necessary documentation (road design reports prepared by the local design consultants, presentations and findings of the World Bank, project justification reports) and a support staff of road construction supervision consultants (from MDF and from WB).

In particular the tasks/objectives of the Advisor consisted of:

1. Review of original and revised road designs: providing the Client with short design review documents for each road sub-project.
2. Construction supervision recommendations: making monthly visits to each road sub-project construction site, documenting any improvement works and minor modifications; issuing, in concert with WB and MDF consultants, verbal requests to the contractor; and reporting to the Client.
3. Monthly Progress reports: summary statements to MDF and WB on the progress of each road sub-project, including as annexes the design and construction reviews.
4. Design manual report: recommendations to MDF and WB on the basis of the Georgian field experience on appropriate additions/modifications to the existing design guidelines manual, either by editing the existing manual itself or developing a new one.
5. Final Report: including conclusions and analysis of results achieved during implementation of the sub-projects.

# CULTURAL HERITAGE, TOURISM AND URBAN DEVELOPMENT (CHTUD): SUPERVISION OF CONSTRUCTION WORKS TO REVITALIZE THE HISTORIC CORES OF JERASH, KARAK AND MADABA

|                    |  |
|--------------------|--|
| Location:          | Jordan   |
| Client:            | Ministry of Tourism and Antiquities – Amman - Jordan   |
| Services:          | Works Supervision of construction and project management including design completion and upgrading |
| Period:            | 06/2008 – 12/2010  |
| Construction cost: | € 22,400,000   |

## Project Description:

The project comprises the supervision of the construction and upgrading of the central areas of the 3 cities of Jerash, Karak and Madaba, including construction of the Tourist Heritage Trail which winds among the more characteristic buildings and ancient churches or antiquities of the cities.

Works in the historic areas include:

1. Reconstruction of the streets including construction of pavement and formation, sewer, water mains, drainage, sidewalks, on-street parking, laying underground of electrical and telecom cables and installing new lighting poles, traffic lights and traffic signs



2. Sign boards with archeological and complimentary information at every heritage site and quality elements of street furniture
3. Parking stalls in pre-cast concrete interlocks, limestone tiles for sidewalks and stairs



4. Laying underground of telecommunication and electrical cables executed by the companies concerned
5. Retaining wall and reinforced concrete structures.

For other areas of the cities the works comprise:

1. Rehabilitation of pavement and road formation
2. Construction of sidewalks of pre-cast concrete interlocks
3. Supply and placement of vertical or dropped kerbs and interlocking blocks in the parking places.
4. Street urban furniture.



The works are divided in two milestones of 12 months each depending from the priority of work execution on the centre of the cities.

The quantity of the various categories of work vary from city to city but can be roughly quantified as follows: 66–70% road works, 15-16% water supply and sewerage works, 7-12% street lighting, electrical and telecom works, and 5-8% street furniture

The contract was awarded to TECHNITAL in association with Dar Al Omran of Jordan. TECHNITAL's share of the contract is 50%.

# CONSULTANCY SERVICES FOR WEST BAY PROJECT: ROAD AND INFRASTRUCTURE WORKS AT TOWER ZONE - AREA 60 NORTH – DOHA

|                    |  |
|--------------------|--|
| Location:          | Doha, Qatar  |
| Client:            | Ministry of Municipal Affairs and Agriculture - Public Works Authority – Roads Affairs |
| Services:          | Post Contract Professional General & Site Supervision and Quantity Surveying           |
| Period:            | 08/2005 – 12/2009  |
| Construction cost: | € 34,200,000   |

## Project Description:

The Project comprises the construction of approximately 9.9 km of roads, service roads, parking and annexed infrastructures in the new zone of Doha City named Tower Zone Area 60.



It is an area where several tall buildings have been erected to constitute the new business centre of the City, considered one of the prime and most prestigious areas of the city.



General Supervision is carried out by the Supervision and Design Team of the Qatar Branch Office, headed by the Head of Supervision Division, while the Site Supervision is carried out by a team of 20 staff specifically appointed to the Project, under the direction and coordination of the Senior Resident Engineer that assumed the role of the Engineer's Representative.

The Works include complete infrastructures such as electrical distribution and transmission network, storm water drainage, telephone lines, water supply, TSE lines, irrigation and landscaping works. Traffic lights and street lighting are also included.

The services provided include General Supervision and Site Supervision in accordance with General Conditions of Contract which are based strictly on FIDIC rules.



# CULTURAL HERITAGE, TOURISM AND URBAN DEVELOPMENT PROJECT: REVITALISATION OF THE HISTORIC CORES OF JERASH, KARAK AND MADABA

|                    |   |
|--------------------|---|
| Location:          | Jordan  |
| Client:            | Jordanian Ministry of Tourism and Antiquities (MotA)                                  |
| Services:          | Urban planning, preliminary studies and surveys, Detailed Design and Tender Documents |
| Period:            | 05/2006 – 02/2007   |
| Construction cost: | € 18,000,000  |

## Project Description:

The Ministry of Tourism and Antiquities (MoTA) received a Grant from the Government of Japan (PHRD Grant) for this Project preparation, which MoTA, through its Technical Development Department (TDD), the Project's Executing Agency, secured for carrying out the Urban Design and Detailed Engineering Studies for the revitalization program of the historic cores of the ancient cities of Jerash, Karak and Madaba.



The three cities in question, Jerash, Karak, and Madaba have in common a number of features. One of the key problems affecting all the medium-sized cities in Jordan is the decay of the urban environment. In fact, urban space is threatened by physical decay, traffic and parking congestion, lack of appropriate management and visual clutter.

In **Jerash**, the visual clutter is the result of the physical decay of buildings and public spaces, presence of solid waste, uncontrolled signage and overhead electrical wiring, traffic jams and uncontrolled parking. The main site-specific issues to be dealt with include:

In general terms, these studies include:

- Traffic Plan and On-Street Parking Controls,
- Streets upgrading (including underground utilities networks),
- Landscaping, Street-scaping and Street-furnishing,
- Traffic Signing and Streets Marking,
- Buildings surveys.

- rationalization and beautification of King Abdullah Street;
- rationalization of the pedestrian crossing connecting the South Bridge to the Archaeological Site.
- beautification of Wasfi Al Tal Street.

While the expected results are mostly a matter of engineering and architectural design, although at a complex level, the objectives to be achieved by the Project go far beyond building networks, involving local development, economic growth, social cohesion and municipal governance. In fact, one of the main issues of the consultant is to ensure that the achievement of the specific Project goal (i.e. the implementation of a network system in selected areas of the three cities) will have a real impact on local development issues.

The main Specific Project Objective of the Project is to improve local economic growth, social cohesion, and municipal governance in the historic cities of Jerash, Karak and Madaba, by endowing these historic cities with revitalized and well functioning urban centres. This aim has a good chance of being achieved due to the high tourist potential of the three areas, whose development is a major precondition for the general development of the three urban areas. The compatibility of urban development with cultural heritage conservation and appropriate use has to be the main concern of planners and has to lead all plans, programmes and projects, including urban infrastructures.



The historic core of **Karak** needs to recover its urban centrality and be revived by assuming a new, stronger social and economic role within its territorial context. The Project therefore aims to partially reinforce street upgrading within two levels, depending on the



location of the streets, their role within the overall circulation dynamics within the urban fabric, and their existing conditions. The two site-specific issues to be solved are:

- rationalization and beautification of the Salah Ad-Din Al Ayyubi / Al-Madeenah street junction and landscape enhancement of the specific street section of Salah Ad-Din Al Ayyubi Street that enters the walls;
- creation of a safe Pedestrian Trail linking the Karak Castle to the newly rehabilitated Bus Station



The historic core of **Madaba** also needs to recover its urban centrality and be revived by assuming a new, stronger social and economic role within its territorial context. The Project will meet his challenge by implementing an area-based City Revitalization

Program (CRP) that includes a combination of physical actions, regulatory actions and capacity building actions. The most comprehensive actions are concentrated on enhancing the main urban axis composed of the Church of the Map Node, the King Tallal Street axis and the Saraya node. Closely related to this axis is the proposed new complex for leisure and handicraft-related facilities at the end of King Tallal Street. The overall upgrading of the street network and of the public space will involve the entire perimeter of the historic core.

The activities are carried out in two phases:

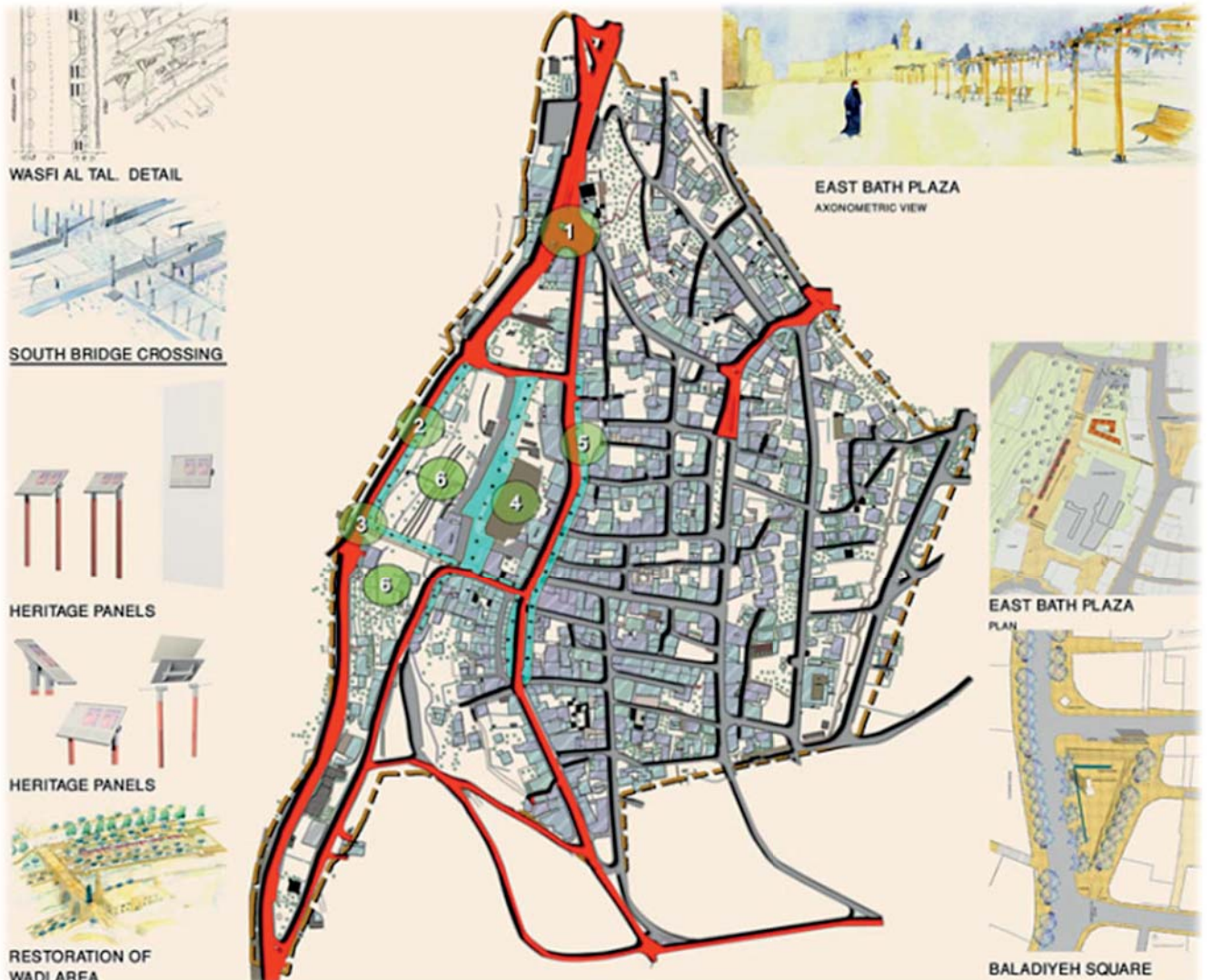
#### Phase 1

- Data Collection
- Traffic and Parking Management Plan
- Building and Urban Fixtures Survey
- Concept Design

#### Phase 2

- Design of Urban Streets, junctions and Landscaping of Public Spaces
- Detailed Engineering Design of Priority Interventions
- Bidding Documents

TECHNITAL has carried out this assignment in association with Dar Al-Omran of Jordan.



# REHABILITATION OF 3 URBAN ROADS (“ROCADES URBAINES”) AND PARKING AREA FOR HEAVY VEHICLES NEAR THE ENTRANCE OF THE DRY PORT

|                    |  |
|--------------------|--|
| Location:          | Djibouti   |
| Client:            | Ministère de l'Équipement et des Transports – Direction de l'Équipement (fin. EDF) |
| Services:          | Feasibility Study and Detailed Design  |
| Period:            | 10/2005 – 02/2006  |
| Construction cost: | € 3,600,000  |

## Project Description:

The project concerns the execution of Feasibility study and Detailed Design for the extension of the works for the « Rocades urbaines », a project already carried out by Technital (*see following project sheet*).

The roads in question needed to be upgraded as quickly as possible as many parts of the existing network have already reached maximum capacity at peak traffic times.

The limited traffic currently using the part of Rue 26 involved in this project could be logically attributed to the fact that this road had never been paved. The circulation there was very difficult and when it rained the road became a sea of mud. Rue des Salines, for its part, had two different sections of use: a first section requiring the rehabilitation of the paving for some 250m, and a second section serving an urban residential area between this intersection and the intersection with Rue 26. Boulevard De Gaulle is part of the road network of the « Rocades » of Djibouti.



Always subject to a very heavy traffic, in the absence of any alternative route, its traffic is on the constant increase. The bad state of the paving has been a major factor in the deviation of a large part of its traffic to the minor road, Route de la Siesta.

The project envisaged the following works: rehabilitation and upgrading of the roads - paving, signalling and renewal / shifting of all the related infrastructures (water supply, sewerage, electricity, telephone, etc.)



The feasibility study confirmed the need and the urgency of the proposed works. As soon as the approval was obtained for this study, the Consultant proceeded with the preparation of the Detailed Design.

The project is carried out on behalf of the Government of Djibouti under the auspices of the European Commission.



Technital carried out this program as a member of the consortium headed by Kampsax International A/S.

# CONSTRUCTION SUPERVISION OF AL GHARRAFA (IMMIGRATION) INTERCHANGE

|                    |  |
|--------------------|--|
| Location:          | Doha, Qatar  |
| Client:            | Ministry of Municipal Affairs & Agriculture - Roads Department   |
| Services:          | Site Supervision and Post-contract Quantity Surveying, including Project Management services along with and in |
| Period:            | 10/2002 - 08/2005  |
| Construction cost: | € 44,257,000   |

## Project Description:

The project is located in Doha City at the intersection of Shamal Road, Khalifa Street and Luqta Street in the vicinity of the Immigration Roundabout.



The works comprise the supervision of the construction of all roads / bridges / underpass / infrastructure works.

In particular, the works consisted of:

- ✓ 2 interchanges, one 3-level interchange and one 2-level interchange. The 3-level interchange is located at the junction between Al Shamal Road / Khalifa Street and 22<sup>nd</sup> February Street / Al Luqta Street, while the 2 level interchange is located at the junction between Al Luqta Street / Al Markhiya Street / Al Beday Street.



- ✓ 11 km of 3- lane dual carriageway roads;
- ✓ 5 bridges to serve all levels.
  - Al Shamal Flyover: 7 span bridge over 8 supports for a total length of 404 m, post-stressed over the central spans; and



- 4 single span bridges over 3 supports for a total length of 104 m.
- ✓ an underpass along Khalifa St./Luqta Road excavated to a depth of -11 m, with a cross section of 25.5 m to accommodate the 2 carriageways and retaining walls of reinforced concrete.
- ✓ ancillary works including:
  - replacement /relocation of high voltage cables between Al-Gharrafa Substation and Al-Gharrafa South and Al Sowaidi Substations respectively,
  - construction of road signalling and pavement marking,
  - landscaping,
  - street lighting,
  - irrigation ducts,
  - diversion and/or protection of services such as Electricity, Water, Q-Tel, Sewerage, Storm drainage etc.



The Project was considered particularly difficult because of the following main aspects:

- o Very tight construction schedule,
- o Location of the works in a densely inhabited and traffic congested area,
- o Interference with many underground utilities that have to be diverted/relocated,
- o Installation of H.V. cables and large diameter pipes requiring a long procurement time.

The Project was initially awarded to the Contractor on a lump sum basis for an amount of Q.RIs 175,000,000.00 (One Hundred Seventy Five Million Qatari Riyals). During contract negotiations, the Scope of Works has been increased to include the construction of an underpass along Al Al-Hanna-Al Beday Streets.

*The total revised contract amount is Q.RIs 188,093,619 (€ 44.25 million).*



The Services awarded to TECHNITAL included:

- Construction Supervision;
- TA during Maintenance Period and Final Handing Over of the Works.

The Contract was administrated in accordance to the FIDIC Rules and the Red Book. The Consultant's Resident Engineer has assumed the role of "Engineer's Representative, the "Engineer" role being kept by the Director of Roads Department of the Ministry.

The Consultant provided a team of 22 qualified engineers covering the following positions:

- 1 Resident Engineer
- 2 Assistant Resident Engineer
- 1 Materials Engineer
- 1 Electrical Engineer
- 2 Quantity Surveyors
- 1 Planning Engineer
- 3 Surveyors
- 9 Site Inspectors
- 1 Engineering technician
- 1 CAD Operator.



The Contract foresaw the completion of all the works in a period of 16 months starting from 15/10/02.



# CONTROL AND SUPERVISION OF WORKS FOR THE CONSTRUCTION OF 3 URBAN ROADS (“ROCADES URBAINES”)

|                    |   |
|--------------------|---|
| Location:          | Djibouti  |
| Client:            | Ministère de l'Équipement et des Transports   |
| Services:          | Geotechnical investigations and tests, Topographic surveys, Construction Site and Contract Management, Quality Control and general Monitoring of Construction |
| Period:            | 11/2003 – 04/2005   |
| Construction cost: | € 27,000,000  |

## Project Description:

The project concerns the monitoring and supervision of the construction works for the rehabilitation of three major road sections in Djibouti: *Route de Venise*, *Rue Nelson Mandela* and the section of the RN1 crossing Balbala.



The works consist in:

- The reinforcement of the 4-lane, dual carriageway “*Rocade de Venise*” between the intersection with state highway RN 1, near the port entrance, and the *Italie* bridge over the Ambouli wadi (roughly 5.3 km). The road was built in 1993 but has been badly damaged by the increasing heavy traffic.
- The reconstruction of the Avenue Nelson Mandela (1.8 km) which links, to the south of the city of Djibouti, the RN 1 (at the Ambouli roundabout) and the RN 2 (at the CDE level crossing), serving the Ambouli and Djebel districts.
- The reconstruction of the crossing of the Balbala district by RN 1, the main artery of the national road network, for a section of approximately 4 km.

The supervision team consists of 3 expatriate staff:

- Team leader /Resident Engineer responsible for the coordination and liaison with the Client
- Geotechnical Engineer to supervise to the laboratory technicians
- Site Engineer to supervise the topographic survey, the earthworks, road and restoration works.

This expatriate team is supported by local staff: consisting of 3 surveyors and 4 laboratory technicians.

The project, which is carried out on behalf of the Government of Djibouti under the auspices of the European Commission (FED), includes the following control and supervision services:

- Control of the setting up of the construction sites
- Control and approval of the Contractor’s work schedules, plans and topographic instruments
- Checking and installation of the equipment



- Quality control of the construction material
- Control and assistance with construction site organization and operation
- Execution of the geotechnical laboratory tests
- Issuing of service orders, certificates and monthly progress reports
- Control of the temporary detour works
- Monitoring of the construction costs and payments
- Technical assistance to the Administration and quantity surveying of the works
- Liaison between the Contractor and the Client for all matters concerning the contract
- Control and restoration to their original state of the borrow areas, work camps, access roads, etc. according to the environmental protection clauses
- Final Handover of the works and drawing up of the Final Report.



# INFRASTRUCTURE DEVELOPMENT OF AL-UDAID AIR BASE

|                    |  |
|--------------------|--|
| Location:          | Al-Udaid, Qatar  |
| Client:            | Rizzani De Eccher (Main Contractor)  |
| Services:          | Master Plan and Detailed Design of Infrastructure Development of Al-Udaid Air Base |
| Period:            | 11/2003 – 12/2004  |
| Construction cost: | € 60,830,000   |

## Project Description:

The Project includes the General Master Plan and Detailed Design of Supporting Infrastructure and Utilities of the Qatar Air Force Base of Al Udaid.



In particular, the Project includes:

### 1. Road Network and Paved Areas

- Design of approx 25 km of single and double carriageway distribution network including junctions, roundabouts and tie-ins;
- Design of road networks within development areas, including parking areas, facility accesses, bus-stops and sidewalks;
- Design of road corridor stormwater drainage;
- Design of traffic signs and road markings;
- Design of combined utilities plans indicating existing and proposed services and proposed diversions and service ducts;
- Design of ducting for street lighting network.

### 2. Sewerage Network

- Design of approximately 18km of building connections, collector mains, gravity outfalls and pumping mains serving various area of the base;
- Design of four sewage pumping stations and flow balancing facility;
- Design of Septic/Conservancy tanks (if gravity connection to network not viable);

### 3. Water Distribution Networks

- Evaluation of supply with regards acceptable flow rate, residual pressure and reliable duration;
- Computer modelling to define extensions or reinforcing requirements to the feeder ring main;

- Extensions and reinforcing of existing ring mains;
- Evaluation of ground / elevated storage needs and mechanical plant requirement, to supply domestic and fire flow demands;
- Design of fire mains and domestic networks up To and including supply point at each facility.

### 4. High, Medium and Low Voltage Electrical Network

- Establish primary sources of power to the site and location of primary supply points within the site;
- Evaluate existing sub-station infrastructure and assessment of their suitability;
- Location and design of sub-stations, including detailed electrical arrangements; and architectural and structural design of housings;
- Detailed design of HV and MV and LV cable network;
- Provision of all detailed drawings, plans, layouts, standard details, supporting calculations, specifications and schedules of quantities as required for the completion of construction works.

### 5. Street and General Area Lighting

- Design of Street and General Area Lighting including road lighting, general area lighting, parking areas.

### 6. Site Communications

- Design of a Site Communications Ductbank System to connect the various areas of the base.

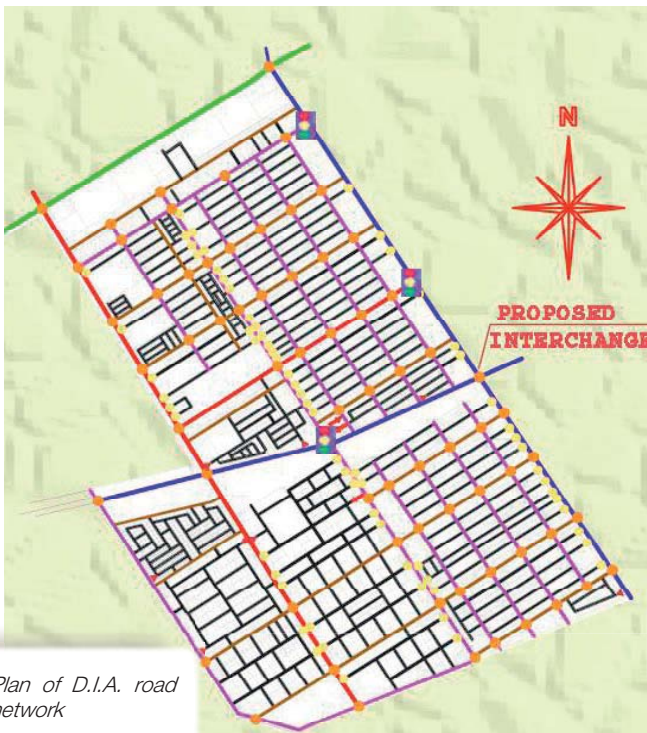
### 7. Surface Water Drainage and Site Grading

- Areas within and adjacent to the various development areas are to be graded to ensure that existing and proposed facilities and works are adequately protected from surface storm water run-off, resulting from a 1 in 10 year storm event. Grading of the above mentioned sites has been designed to take cognizance of watersheds, storm flow paths and localised depression areas such that run-off is conveyed safely away from development facilities.

# DESIGN OF ROADS IN DOHA INDUSTRIAL AREA AND PAVEMENT MANAGEMENT SYSTEM

|                    |  |
|--------------------|--|
| Location:          | Doha, Qatar  |
| Client:            | Ministry of Municipal Affairs & Agriculture - Roads Department   |
| Services:          | Procurement of Pavement Survey Equipment and software, Traffic counts and analysis, Topographic Surveys, Geotechnical Investigations, Pavement Condition Surveys on approx 300 km of roads; Pavement Management System; Detailed Design of 57 km of roads; Tender Documents; Training of the Ministry staff. |
| Period:            | 12/2001 – 05/2004  |
| Construction cost: | € 66,900,000   |

## Project Description:



Plan of D.I.A. road network

The Project includes two main phases.

### PHASE I:

In the first Phase the Consultant's task is to carry out an evaluation of the pavements of the existing roads in the Industrial Area of Doha by conducting the following:

- Geotechnical investigations;
- Pavement surveys;
- Detection of road roughness;
- Measurement of axle loads, etc.

The above investigations are carried out by the Consultant making use of special equipment procured for the project and reverted to the Ministry at the end of the Project.



The special equipment includes:

- Falling Weight Deflectometer,
- Laser Profilometer,
- Survey Car,
- Weight-in-Motion System,
- PMS Software.

At the conclusion of this phase the Consultant will deliver a Pavement Management Report.



### PHASE II

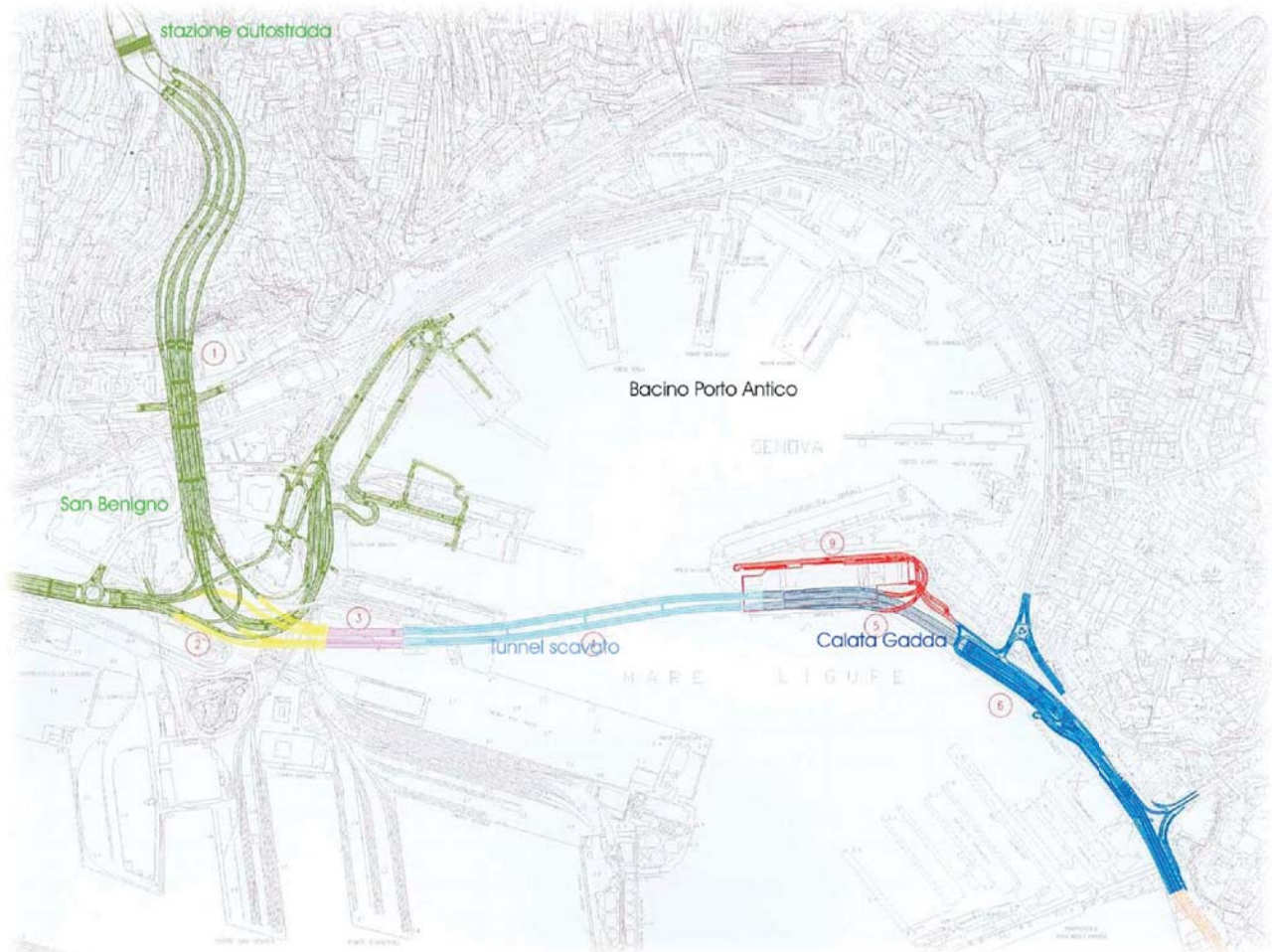
In the Second Phase, on the basis of the recommendations of the Pavement Management Report, the Consultant will carry out the detailed Design of approx. 55 km of roads within the Doha Industrial Area.



# SUB-HARBOUR TUNNEL IN THE PORT OF GENOA

|                    |   |
|--------------------|---|
| Location:          | Genoa, Italy  |
| Client:            | Tunnel di Genova S.p.A. (Genoa Port Authority, Genoa Municipality, and Cassa Depositi e Prestiti) |
| Services:          | Preliminary design  |
| Period:            | 02/2003 – 06/2003   |
| Construction cost: | € 295,870,000   |

## Project Description:



The idea of road tunnel under the Old Port (*Porto Antico*) mouth of Genoa has long been included in the action plans of the Municipality of Genoa and the Port Authority, and has recently become a priority project on a regional scale as urban prolongation of the northern highway access to Genoa. The tunnel project is strictly related to the *San Benigno* junction project (also carried out by Technital committed by SPEA - Italian Highways group), connecting the highway network respectively with the tunnel, the western side of the town, the commercial and passenger port terminals.

The project - tunnel and related works - constitutes an exceptional engineering work and a significant benefit to the local economy as well as an improvement of the urban environment in the Old Port area, providing:

- Safer and more efficient east-west crossing of the Old Port basin than the present elevated highway, reducing its visual and environmental impact;

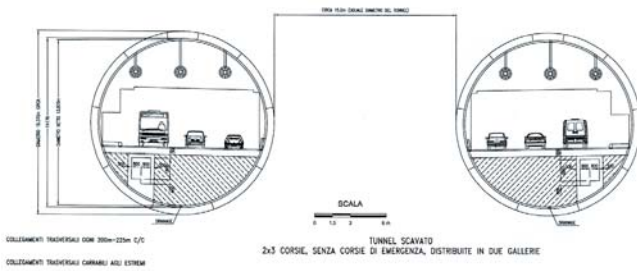
- Significant reduction of traffic along the city waterfront, with the partial demolition of the elevated highway;
- Improved and more direct access to the Old Port area and to the city centre, to the Ship Repairing Yard and to the Show-grounds in the east.
- Availability of a vast area (about 60,000 m<sup>2</sup>) of great value (*Gadda Quay* area)

The new road infrastructure running from the San Benigno junction in the west to Piazzale Kennedy in the east, is a fast urban through road with a design speed varying from 50 to 80 km/h. The cross section is 9.5 m wide (2 lanes) each side. The gradient of the submarine tunnel and the access ramps is 5% (exceeding the regulation 4%), owing to the height limits imposed by the passage through the Old Port mouth - access channel to the cruise liner and ferry terminals.



Construction works, from west to east, are:

- in both natural and artificial tunnel, along the ramps of the links to *San Benigno* junction;
- in artificial tunnel, using the cut and cover technique, for some 200 m, between the tunnel service building and the TBM entrance well.
- in natural submarine tunnel, from *Sanità* Quay to *Gadda* Quay, for some 730 m, using the blind excavation technique with a TBM, reaching a depth of about 40 m) with a circular cross-section and 2 one-way tubes of approximately 15 m in diameter, each with 3 lanes; 3 safety pedestrian passages are included to link the 2 tunnels.



- cut and cover technique again along the eastern link ramp for some 600 m, between the TBM exit well and the eastern tunnel portal.

- at ground level a new surface 2+2 lane road of 1.7 km, underneath the existing elevated highway retained in this section, from the eastern tunnel ramp to Piazzale Kennedy; in some cases piers are replaced by portals.
- interchanges to connect the new surface road section to the existing network, chief among which the interchange at the Fish Market, where the tunnel and the retained elevated highway join the surface road network (Piazza Cavour and Corso Quadrio); the multilevel interchange at Madre di Dio towards the city centre, the new Fiera Ovest roundabout at the Show-grounds, and the end junction of Piazzale Kennedy, linking Viale Brigate Partigiane, Corso Marconi and the new project road.

Special attention was paid to the design of the main interchanges with the urban road network, through studies carried out with the help of specific mathematical models, in different functional configurations, to optimize their geometry and number of lanes.

The project also includes:

- The relocation of the buildings with related activities of the Ship Repairing Yard;
- The realisation of a new underground parking facility, in the of *Gadda* Quay area, for 1000 cars and approx. 60 tourist buses.

The project was carried out by Technital in temporary association with High Point Rendel, D'Appolonia, and TEC Engineering Consultants.



# INFRASTRUCTURE DEVELOPMENT PROGRAMME

|                    |   |
|--------------------|---|
| Location:          | Montenegro  |
| Client:            | Government of Montenegro (Financing: EU - OBNOVA Programme)   |
| Services:          | Technical Assistance with tender evaluations, Design Review and Construction Supervision for roads and bridges. |
| Period:            | 06/2000 – 11/2001   |
| Construction cost: | € 6,000,000   |

## Project Description:



The project includes the following traffic infrastructure works in Podgorica:

- the construction of the bridge on the Moraca river in Revolution Boulevard in central Podgorica to ease urban traffic congestion
- reconstruction of the section of road M-2 (E-65, E-80) from the crossroad with Niksic Road M-18 to the connecting road to the Airport Golubovci
- reconstruction of the access road from the road M-2 (E-65, E-80) to the Airport Golubovci.



The road reconstruction works involve the improvement of the road cross sections, paving, horizontal and vertical signalling, and structures (including bridges and lateral fences).

The assignment includes assistance with and coordination of the following activities:

- review of the existing designs,
- evaluation of tenders for the construction contracts,
- supervision of the construction/reconstruction works.



*Repair of erosion damages on Railway overpass*



The contract was subsequently extended to include the construction of Union Bridge and Zlatica School, and the rehabilitation of other roads.



*Horizontal signalling and electric lighting completed on the airport road*

# PORT ACCESSES AND INFRASTRUCTURES SERVING THE ROAD AND RAIL TRAFFIC CROSSING THE MESSINA STRAITS AT VILLA SAN GIOVANNI (RC)

|                    |  |
|--------------------|--|
| Location:          | South Italy  |
| Client:            | Municipality of Villa San Giovanni (Reggio Calabria)                     |
| Services:          | Preliminary and Detailed Designs, Environmental Impact Assessment Study. |
| Period:            | 03/1996 – 12/1998  |
| Construction cost: | € 22,569,200   |

## Project Description:

The project entrusted to TECHNITAL by the municipal authorities of Villa San Giovanni includes the preliminary and final design of the road and port infrastructures for the Messina Straits traffic, including environmental impact study.



Following detailed traffic studies, analyses and investigations a preliminary study of the alternative solutions and the associated environmental problems was drawn up. This was followed by the preliminary design of the chosen solution and an environmental impact study.



*Existing link to motorway*

The final design, which involved the restructuring of the port infrastructures and access routes, envisaged the following works:

- addition of a fourth lane to the road link to the motorway
- widening of the eastern wharf
- creation of two new berths for two-way ferry-boats
- restructuring and lengthening of the lee breakwater.



*The access road before and after the project*



# URBAN ROAD TUNNEL BYPASS

|                    |   |
|--------------------|---|
| Location:          | Vial Cerros Orientales in Bogotá, Colombia                            |
| Client:            | Spie Batignolles T.P. (Cergy Pontoise - France)                       |
| Services:          | Concept and Preliminary Design, Environmental Impact Assessment Study |
| Period:            | 05/1995 – 01/1996   |
| Construction cost: | € 247,899,300   |

## Project Description:

The contract awarded to TECHNITAL consisted in the feasibility study and preliminary design of a fast through road, largely in a tunnel, to function as a bypass to relieve traffic pressure in the city of Bogotá.



The road designed, of a total length of 14 km, includes a road tunnel with two sections of 7 km each, 5 underground interchanges serving the most important urban areas, the ventilation, lighting and safety installations, and the toll system.

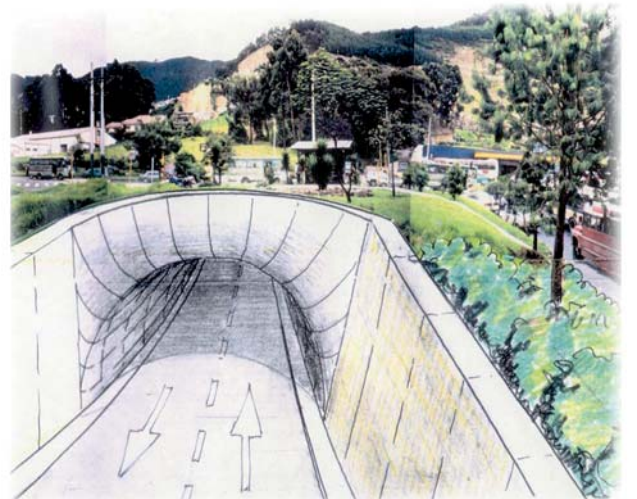
The contract involved the execution of the following engineering services:

- traffic studies,
- geological and geotechnical studies,
- the definition of the alignment,
- the scaling of the tunnels and all the necessary structures,
- the definition of the electromechanical installations (ventilation, safety and lighting) and an automatic toll system,



- an environmental impact assessment study
- drawing up of the financial plan for the construction of the works by means of a concession system.

The total cost of the project is expected to be around 300 million US\$, of which 230 million US\$ related to the civil works and 70 million US\$ for the installations.





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