Appendix D: SETEC’s railway references
Introduction and references Setec group

Independence

Founded in 1957 by Henri Grimond and Guy Saias, the Setec group is now one of France’s largest engineering firms. It has a staff of more than 1,500 and annual sales figures of more than € 170 million. Its entire capital is held by the management executives and the senior engineers. It is therefore completely independent of any contractor, bank or industrial corporation.

Expertise

The Setec group works on all stages of the life of a project, from feasibility studies to commissioning. For large, complex projects, the company puts together a multidisciplinary team, led by a Project Manager, that combines the skills of the company’s top specialists in every field.

Multidisciplinary and decentralised

The Setec group is organised in small subsidiaries whose human scale motivates employees, encourages them to take responsibility and facilitates direct relations between clients and subsidiary managers. More than 25 subsidiaries operate in France and abroad, specialized in the following fields: economics and traffic engineering, infrastructure, transportation systems and l.t.s., railway systems, building, industry, water and waste, environmental protection, project management, strategy and organisation, urban planning and development, telecommunication and information, and communication technology.

Railways systems expertise

In the railways field, the Setec group operates both on new lines projects and on the French operated network, from preliminary studies to commissioning phases.

Particularly, the Setec group is the main contractor on two civil works workpackages for the French East high-speed line, drives the reference preliminary design of the Lyon-Turin high-speed line, and is also the general main contractor on the first phase of the Rhin-Rhône high-speed line. It ensures, to this end, complete project management missions for the civil works part of railway projects and for all railways infrastructure equipments from detailed design phase.

The group also achieves complete project management missions on operated lines, such as the Sarlat – Bergerac line, or the Paray-le-Monial – Montceau-les-Mines line regeneration project.

The Setec group has been elected by the contracting owner RFF (French Railway Network) to assist him on the contracting management of the “Grands Projets du Sud-Ouest” project (South-West French high-speed lines) Bordeaux – Irun, -Bordeaux-Toulouse.

The Setec group brings a very high level expertise for any domain linked to the railway systems field, including civil works, track, power-supply, signalling, operation …
Indépendence
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by Henri Grimond and Guy Salas,
the setec Group is now one of France's
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fields:
- economics, traffic engineering
- infrastructures
- transport systems and I.T.s
- building
- industry
- water and waste
- environmental protection
- project management
- strategy, organisation,
- urban planning and development
- telecommunications and information
and communication technology (ict)
Range of services

The Setec Group provides a complete range of services:

- planning, definition of requirements
- technical, economic and financial feasibility studies
- urban development and environmental studies
- assistance to clients:
  - consultancy in operational strategies and implementation of projects and organisations
  - administrative and legal arrangements, agreements and specifications for concessions, and delegation of public services
  - project management:
    organisation, planning of design and construction procedures, cost control and schedule management, reporting and quality assurance
- project engineering and construction management:
  - drawing up preliminary design schemes and comprehensive design schemes
  - preparing, issuing and analysing invitations to bid, and preparing contractors' contracts
  - supervising construction work, scheduling, directing and coordinating, checking completed work, quality assurance, managing construction contracts, acceptance and commissioning

Locations in France

- Paris
- Aquitaine: Périgueux
- Basse Normandie: Cherbourg
- Bretagne: Lorient
- Midi-Pyrénées: Toulouse
- Nord: Lille
- Pays de la Loire: Nantes – Angers
- Provence Alpes Côte d'Azur:
  - Nice – Toulon – Vitré
- Rhône Alpes: Grenoble – Lyon

International business

The Setec Group works – or has worked – in all continents. It has subsidiaries or branches in the following countries:

- Europe:
  - Hungary: viziterv consult
  - Russia: setec ingniring
- Africa:
  - Morocco: maroc setec
- Tunisia: bmci

Main accreditations

IDA  International Development Association
ADB  African Development Bank
ADB  Asian Development Bank
IDB  InterAmerican Development Bank
IBRD  International Bank for Reconstruction and Development
WADB  West African Development Bank
EEC  European Economic Community
UNDP  United Nations Development Programme
Abu Dhabi fund for Arab Economic Development

Setec is a member of Europengineers

Europengineers is a European Economic Interest Group which includes engineering firms from ten countries in the European Union.
Project management consultancy
- Assisting public and private clients with project organisation, procedures, cost controls and scheduling (e.g. R.I., Ast, Saphir, Stift, Saban, Sante, S.E.O., Euretunnel, Vinci, Piller; local authorities and public works agencies, etc.)

- Architectural and functional planning (e.g. libraries, museums, universities, Beijing Olympic Organising Committee, Alibus, Radio France, Hermès, Cité des Sciences et de l’Industrie, etc.)

- Urban planning, management and development (e.g. development studies, Territorial organisation coordinator plans, local urban plans, urban development plans, project organisation and management, etc.)

General studies
- Master transport plans, national transport plans (Ivy Coast, Niger, Morocco) and regional transport plans (Ile-de-France – Rhône-Alpes – Provence-Alpes-Côte d’Azur – Vendée – Lorraine Atlantique – Guyana)

- Modelling and forecasts of traffic on major crossings (French-Italian Alps, Lyon-Turn, Pyrenees, Perpignan-Figueras, Gibraltar, English Channel), underground urban railways (Marseille, Lille, Toulouse), Lgv high-speed railway lines (Aquitaine, East European, Pirelli, Britain), numerous motorways in open countryside (metropolitan France, La Réunion, Hungary, Lebanon, Poland, Portugal, Azores, Russia) and in urban areas (Muse in the Ile-de-France region, Prado-Garavogio Tunnel in Marseille, Bnp in Lyon, Tokyo, Greece, Poland, Turkey, Senegal, Dominican Republic)

- Techno-economic feasibility studies for roads, railways and urban public transport systems in France and abroad

- Socio-economic studies, cost-benefit analysis, surveys, operational research and studies

Urban planning and transport
- Planning of Lyon Confluence and of Boulenger-Billancourt

- Planning of new towns (Evry, Cergy Pontoise, St-Cuentin-en-Yvelines, Villeneuve d’Ascq, Bahrain) and of mixed-development areas of all kinds

- Urban renewal (Villeurbanne, Gvpy in Lyon-La Duchère and Rillieux La Pape, O.R.U. Inly-City Hall, etc.)

- Tourist development and planning (reconstruction of the Cez de Aigale station, reorganization and development resources in Morocco, revision of the tourism strategy in Tunisia, seatfront in Menton, etc.)

- Urban parks (La Villettière, Tulleries and Carrousel, Château de Méry)

- Urban transport plans: Ile-de-France, Toulouse, Le Mans, Tours, Narbonne, Monaco, etc.

- Light underground urban railways in Lille and Toulouse (Vil Light Automated Train)

- Metal-wheeled tramways (Tunis, Rouen, Nantes, Orleans, and rubber-tired tramways (Caen, Nancy), Tansval de Mann)

- Bus rapid transit system on a dedicated corridor (Dousa)

- Intermodal stations and interconnection points (Vannes, Saint-Malo, Nantes-Sud, Amiens, Lille – Bocq, Issy-Les-Moulineaux, Cheilles, etc.)

- Catenary aerial power lines for trams (Lyon, Saint-Etienne, Limoges)

- Depot workshops (Saint-Etienne, Nantes, Clermont-Ferrand, Limoges, Valenciennes)

- Renovation of rolling stock (Lyon bus and trolleybus systems, Marseille underground railway)

References

- Roads and motorways
  - In France:
    - A43 in Maurienne
    - A28 in Eure
    - A29 in Alpines et Somme
    - A67 in Vendée
    - A69 in Biarritz
    - A41 in Haute-Savoie
    - A66 in Ile-de-France
    - A8 in Provence
    - A4 in Champagne

- Bridges and viaducts
  - Bivio bascule bridge
    - 102 m span – a world record
  - Preliminary design of Verdon bridge
  - Motorway and railway viaduct between Denmark and Sweden
  - Millau viaduct

- Design calculations for large deflection of Normandy bridge and complete design calculations for Eiffel bridge (Ministry of France)

- Numerous road and railway structures in Algeria, Benin, Brazil, Cameroon, Ivory Coast, France, Haiti, Iran, Luxemburg, Syria, Tunisia, USA

Tunnels
- Fréjus road tunnel
  - 128 km
- English Channel tunnel
  - 52 km
- Puymorens road tunnel
  - 3.9 km
- Gresenda underwater tunnel
  - 3.4 km
- Roche tunnel and underground railway stations
- Gaillan by-pass
- Viache tunnel renovation (5 km)
- Savoie tunnel
- Radioactive waste storage (Andra)
- Toulon tunnel (second line)

Railway infrastructures
- Uille and Marseille railway stations
- Lgv high-speed railway lines in France, Spain and Italy
- Railways in Algeria

Seaport and riverway infrastructures
- Port Hercule (Monaco)
- Large-gauge canal lock (Vif)

Airports
- Runways at Roissy Charles-de-Gaulle, Lyon-Saint-Exupéry, Nansha (Mauritania), Istanbul-Yalova, El-Azizia, Monastir and Djerba

- Airports (with Paris Airports Authority):
  - Nouassai (Morocco), Chandal (China), Abu Dhabi (United Arab Emirates), Catane (Sicily), Ekaterinburg (Russia)

- Vatry Europort (France)
- Aeroconstellation mixed-development area, Toulouse (France)
Buildings
- Arts buildings: Grand Louvre, Musée d’Orsay, Institut du Monde Arabe, Opéra Bastille, Luxembourg Philharmonic Hall, Palais Garnier, Foundation Finau
- Administrative buildings: Ministry of Finance, French embassies in Bohren, Marcou, Moscow, Riyadh, Tokyo, Beijing
- Offices: Atlantique-Montparnasse, Gaz de France head office, Étoile-Saint-Honoré, tower blocks at La Défense, Paris (Société Générale, Socr, Crédit Lyonnais, Coeur Défense, Pitié, Piti12, CD16, Cbix)
- Hospitals: France (Annery, Mulhouse, Saintes, Toulon, Pirennes, Antibes, Assistance Publique des Hôpitaux de Paris, Hospices Civils de Lyon), Algeria, Egypt
- Educational buildings: secondary schools and universities (Paris, Nancy, Casablanca, Tunis)
- Sports facilities: stadia in Toulouse, Canton, Casablanca, etc.
- Hotels: Meridien, Lucien Barrière, and Club Méditerranée chains
- Conference and exhibition centres: extension of Palais des Congrès in Paris, Halls 6 and 7 of the Paris-Nord-Villette exhibition park, Hall 5 of the Porte de Versailles exhibition park
- Shopping malls: Passage du Havre in Paris, Quatre Temps in La Défense, Chv in Châlons en Champagne, lives in Metz
- Housing: residential complexes in France and abroad
- Car parks: La Défense, Orly, Tignes, etc.
- Abroad: Lyceé Francais in Moscow, Mannsky Theatre in St. Petersburg, Grand National Theatre in Beijing, tower blocks in Teheran, hotels in Tunisia, hospitals in Egypt

Industry
- Factories for IBM, Raychem, Electronique Serge Dassault, Motorola, Hitachi, End, STMicronetronics, Pôle Minutec, Psa Design Centre, Rungis Market, LaserMagJoule Project (Cea/Atomic Research Centre)
- Laboratories for Pfizer, Servier, L’Oréal

Environment
- Environmental studies of motorways projects (A16,A26-A39-A45-A81-A87-A89)
- Environmental studies of Lyg high-speed railway projects (Mediterranean, Rhône-Rhône & East European lines)
- Environmental studies of main roads (Rh17 – Rh59 – Rh68)
- Environmental assessment and monitoring of motorways in use (A41-A51-A57)

Water
- Urban sewage disposal master plans and diagnostics - several towns in the Greater Paris area, Nantes, Chauft, Aix-les-Bains, Lyons
- Sewage treatment plants of all sizes: Sapp, Valenton, Aichères, Colombes, Nantes, Caen, Tours, La Ferret-Bernard, Villaparras, Provins
- Storage and regulation reservoirs: Lille, Nice, Lyon, Paris
- Water hydraulics: static and flood control studies for the Seine, Loire, Arc, Oise, Marne and Rhône river basins
- River engineering structures: La Marquesier on the River Orne, embankments on the River Oise and at La Bassée (on the River Seine)
- Management and protection of aquatic habitats: Marais-Vernier, Seine, Maurienne, Allier, Rhône
- Underground water: at La Bassée; quarry in Val d’Orléans
- Master plans for drinking water supply: Strasbourg, Tours, Limoges
- Drinking water transfers: Gannes area, Seine-Arnon-Marné, Ivry-Orly
- Drinking water treatment plants: Beaune, Corbeil, Nantes, Moussy
- Industry: Sewage disposal and treatment studies, water cycle studies
- Impact studies and Water Act studies
- Coastal engineering and marine environment: Port-en-Béziers, Cogemdis discharge at La Hague, hydrodynamics study of Monaco harbour main jetty.

Waste
- Multi-process recycling schemes (in France: Pas-de-Calais – Alain – Côte d’Opale – Belgium)
- Optimisation of selective waste collection (Saint-Cyr-sur-Loire)
- Assistance with organising facilities for sorting, methanisation-composting, incineration and landfill disposal (Grossée, Lille Urban Area Authority, Liers-Liévin, Compagne)
- Audit, expertise, research and development (Recod)

Aeraulics
- English Channel Tunnel - Paris and Buenos Aires under-ground urban railways - appraisal of Mont Blanc tunnel - Lyon-Turin Railway tunnel
- Socatop tunnel (A86)

Intelligent transport systems
- Intermodal operation (Géronde Gironde, LePliote Marseille-I)
- Road operation: study and design of automatic equipment, electrical systems, telecommunication networks, toll systems, traffic management and supervision systems (Struts, Alisyon, Gutenber, Erato, A75, A43, Toulon urban expressway, Normandy Bridge, Ronl, A14, etc.)
- Public transport: automatic systems, signaling, electronic banking and ticket management system, traveler information and operation support systems (Géronde, Paris, Marseille, Lyon, Valenciennes, Rennes, Strasbourg)
- Airport facilities: baggage sorting systems: Abu Dhabi, Nice

Telecommunications and IT
- Information and communication technology
- Broadband optic communications networks (Maine-et-Loire, Midi-Pyrénées, Hérault, Cee Massy Sclay, Riff, Socoval, etc.)
- Infrastructure telecommunications (Area, Ocelluros, Escada, Riff, Sncf, Sanef, Sctif, Ais, Afrii, etc.)
- Local and regional government authorities (Rhône-Alpès-area ICT assessment: Gergy, Nice and Courby cable networks)
- High points and radiocommunications (Riff, Sncf, Maine-et-Loire, etc.)
- Design and supervision of deployment of international telecommunications networks (Alstom, Gerlux, Rhodia, Casino, Voila, etc.)
- Optimisation of company telecommunications services (Ministry of Agriculture, Léage, Boisrot, Ctc, Compass, Société Générale, Cof, etc.)
- Supervision of ICT system relocations (Inducex, Ctc, Calais des Dépôts, Veolia)
- Telecom infrastructures of trading rooms (Ctc, Paris Bourse, Cce, Ctc, Société Générale, etc.)
- Technical infrastructures of buildings (Ctc, Ctc, Tour Pibl, Bnp, etc.)
- Multimedia call centres and contact centres (Swisscom Mobile, Mobistar-Belgique, Géant Service, Société Générale, Ctc, Nice Airport, etc.)
- Military telecommunications networks
The Setec Group has acquired extensive expertise in urban and interurban traffic engineering, in France and abroad, for all means of transport. Setec provides its know-how and experience to public and private clients from the initial design stage, including traffic studies, master plans for urban transport, technical, economic and financial feasibility studies. Resources and methods such as on-site surveys, statistical processing, traffic modelling, econometrics, geographic information systems, operational research, and socio-economic and financial assessments are used to obtain a comprehensive view of problems and to determine the best possible legal and financial strategy for major infrastructure projects.

1-Lyon-Turin Railway
(aerial view of Montée, the marshalling yard and the entrances to the present road and railway tunnels) Setec was appointed to carry out technical and socio-economic studies as well as freight traffic forecasts (conventional and railway-motorway) for this very large European-scale project.

2 & 3 - A2 Motorway in Poland: comparison of variants and choice of the best route
Poland’s Motorways Agency asked Setec to perform the preliminary study (technical, environmental, traffic and socio-economic aspects, cost/benefit analysis) of the section between Lodz and eastern Warsaw (200 km).

4 - Modelling of the Greater Paris Area road network
Setec developed a particularly elaborate model for the public works agency of the Greater Paris Area. This very precise, finely tuned modelling system is widely used for planning and evaluating numerous projects in the urban area (including urban toll roads).

5 - Millau Viaduct Toll Gate
Setec performed studies of traffic income for this outstanding structure (a 2,460 m long multi-cable stayed bridge) for Eiffage, winners of the concession’s invitation to tender.

6 - Le Mans Urban Transportation Plan
In this Urban Transportation Plan drawn up by Setec in close collaboration with local players, priority is given to projects that support public transport, including the return of a tramway that will become a central organizing feature of the town.

7 - Railway network of the Midi-Pyrénées Region
As part of preparation of the forthcoming Joint State Region Development Plan and a longer-term, forward-planning study, Setec has completed economic studies of the regional railway network in liaison with the different partners (RFF, Regional Council, SnCF, State, SNCF-Transdev).

8 - City of Bamako (Mali)
A Setec study for improving traffic conditions, particularly in the city centre. Measurements, traffic counts, in-depth analysis and numerous consultations with the authorities.
Designing the project, determining its technical and financial feasibility, performing detailed studies, supervising construction work, managing the project, and assisting the client, etc. Setec handles all these assignments and has acquired recognised expertise, as evidenced by its many completed large-scale projects. Setec always applies its multidisciplinary approach to provide the best solutions for a wide variety of projects: roads and motorways, tunnels and bridges, urban development and planning, networks, railway infrastructures, port installations, airports, navigable waterways and offshore structures. Setec carries out these projects throughout the world. On the site and at the head office, our engineers use the most efficient software, which is often developed by the project teams themselves to meet their own needs.

1 - La Maurienne Motorway
For 35 years, Setec has contributed to the development of the valley of La Maurienne. After managing the contract for the Flégère tunnel, which opened in 1980, Setec was commissioned to direct the entire project and to act as project managers for the upper sections of this upland motorway on difficult mountainous terrain: a 65 km road between Modane and Chambéry, with more than 100 bridges and four tunnels.

2 - Development of Monaco harbour
After dividing the working design for the semi-floating main jetty and the counter-jetty, Setec has been greatly involved in development of the Port Hercule infrastructures, acting as project managers for the construction of new wharves, pontoons and moorings in the harbour and the outer harbour.

3 - Ivory Coast
Setec has wide experience in the design and construction of surfaced and non-surfaced roads in tropical and desert environments. Here is a view of the 270-km long Man-Touba-Odienné road.

4 - Aquitaine Bridge
In collaboration with the Danish engineering design firm, COWI, Setec designed the widening of the bridge and the replacement of its suspension system; all work was carried out without interrupting traffic.

5 - Toulon underground crossing
Setec provided appraisals and project management consultancy for rebuilding work after the crossing's collapse in March 1998. The techniques used for this urban project in difficult terrain made extensive use of new processes for reinforcing the front of the tunnel face: glass fibre bolting and divergent metal bolts.

6 - Development of Georges Pompidou Road, Paris
Setec designed and acted as construction manager for the development of Quai Henri IV and Mazas Road in the fifth and eighth districts of Paris.

7 - Millau Viaduct
Acting for the statutory concessionary company, Setec provides comprehensive project management of the Millau Viaduct. This 2460 m long structure with exceptionally long spans (342 m) and slender soaring "pillars" (456 m high) is a major element of France's motorway network.

8 - Orléans Bridge
This new bridge over the River Loire was designed by Santiago Calatrava with Setec's technical backing. Considering its ambitious architecture and structural complexity, very elaborate studies were performed for this engineering structure of rare finesse.
Designing and building a transport system requires a broad range of expertise. Setec’s multidisciplinary capability enables it to handle an entire project, from determining the requirements to final commissioning. After assessing traffic forecasts, its economic and organisational specialists recommend the most appropriate legal and financial arrangements. Its town planners take care of urban integration and draw up circulation and parking plans. Its engineers devise the technical design: infrastructure, facilities, equipment, rolling stock and systems. Setec has expertise in all modern urban transport technologies.

1 & 2 - French terminal of English Channel tunnel
This immense 600 hectares station is used for transferring cars and lorries to and from shuttle trains. The site also contains the central control station and the servicing and maintenance installations. Setec was involved in all stages of the terminal’s design before supervising its construction.

3 - Rouen Métrobus system
Setec provided project management assistance for the Rouen urban area tramway, particularly for the rolling stock, industrial facilities for the workshops, and the tramline.

4 - Saint Etienne Depot Workshop
Setec planned and designed several depot workshops, particularly one in Saint Etienne involving facilities for the rail line.

5 - Orléans Tramway
Creating a new tramway line and integrating it into the town require in-depth studies. In Orléans, working as part of a group of firms, Setec managed the project for this 18 km line. Special attention was given to integrating the tramway into the historic Royal Boulevard.

6 - Toulouse underground railway
In 1965, Setec was chosen by the owner of the Toulouse underground railway to provide multidisciplinary technical assistance on line A. Setec engineers later developed the operational specifications and compared the rolling stock proposed for line B.

7 - Lille Val
Setec played a very active role in developing the world’s first automatic underground urban railways. It started work on the Lille network in 1968 and, throughout construction, it provided technical assistance for successive developments concerning civil engineering and fixed installations.

8 - Nancy Tvr
As part of development of the Tvr (Guided Light Rail system) in Nancy, Setec played a major role in managing the project for infrastructures in Greater Nancy’s city centre.
Setec is resolutely committed to the development of information and communication technologies applied to the transportation of goods and people. Setec is involved at all stages of the most significant projects, including road management (Sirius, Allegro, La Réunion Island, A43, Arcos 2003, etc.), public transport operation (ticket management system, electronic banking, operation support systems and passenger information systems), and multimodal systems operation (Grenoble, Monaco, Nice, Actif). Setec engineers have complete knowledge of their clients’ trade and have all the necessary expertise concerning field equipment, electricity and telecommunication networks, and processing and supervision information systems. This multidisciplinary capability enables Setec to provide comprehensive services and an overall vision of these complex systems.

1—Strasbourg Tramway
Setec’s specialists provide assistance with the design and implementation of contact-free ticket management systems and multimodal information systems in a number of French cities (Grenoble, Toulouse, Strasbourg, etc.) and regions (Rhône-Alpes, Basse-Normandie, Aquitaine, Alsace, etc.). In Strasbourg, Setec provided project management assistance for all phases of the project that involved renewing the ticket management systems for urban and inter-urban networks in Strasbourg and surrounding areas.

2—Marseille underground railway
Setec is designing and managing projects for communications installations, signaling, and the central control stations of public transport systems. In particular, Setec is taking part in managing projects for renovation of the central control station for the entire Marseille underground railway system and the communications installations for the extension of line N°1.

3—Smart traffic management systems for A43 motorway
Setec takes part in the design of smart traffic management systems for road infrastructures. In particular, Setec managed the project for facilities on the A43 motorway (emergency call networks, variable message signs, weather station, traffic data collection, electrical, radio and telecommunication networks, etc.).

4—Remote toll gate
From the early 1990s, Setec took part in the design of France’s first remote toll gate installations. Based on a contact-free smart card, the Gepal automatic toll gate (in Lyon) allows motorists to pass through the toll gate at high speed in total safety.

5—Fréjus tunnel central supervision station
Setec designed and supervised the construction of several traffic supervision and management systems. The system applied in the Fréjus tunnel is based on an expert system and provides 24-hour-a-day supervision of safety facilities, traffic and the tunnel’s technical equipment.

6—User screen of the Sapr site management software
Setec produces road-operation software tools for numerous clients, such as Sanef, Sapr, Selra, Dél. 69 (Gonalys) and Sier (Sirius 2 configurator). For example, for Sapr, Setec developed software to support programming and monitoring of workstations on its motorway network.

7—Sirius 2 configuration
As part of the redesign of the operating system for urban expressways in the Greater Paris Area (Sirius 2), Setec is developing a software tool for centralizing and maintaining a single coherent reference of the road network’s description and broadcasting this referential to the different client applications.
For more than 40 years, Setec has partnered with leading French and non-French architects in designing and carrying out prestigious public and private projects. Setec masters the most sophisticated technologies and applies complex modelling, particularly for structures and for heating, ventilation and air conditioning. Its assignments cover the entire engineering field, from preliminary studies to project design and construction work supervision.

In certain cases, Setec also produces working designs. Setec has managed contracts for around 10 million sq. m of buildings of all kinds, often meeting stringent requirements for deadlines and costs.

1- Beijing Opera House
Setec worked on all the technical studies for ADPI and Paul Andreou, architect, for construction of the new Beijing National Theatre. The large 2600 seat opera theatre and the three other concert halls make this one of the largest opera houses in the world.

2- Obx tower block in La Defense-Paris
The architects Kpf (New York) and Scn (Paris) designed this 32-floor office block on an inverted podium, crossed by a public footbridge, for the owners, Tishman Speyer Properties. The building reaches a height of 160 m. Setec worked on the structures and the technical services plant.

3- Renault 57 Métal-Beaulne-Billancourt
Jakob & Macfarlane, architects, have designed the reconversion of the industrial hall due to Claude Vasconi into the Communication Center of Renault with 14,000 m² (conference rooms, exhibitions rooms and offices area). Setec was responsible for engineering design, project and construction management.

4- Gare Defense-Paris
This 60,000 sq. m project, completed in 2001, is one of the largest office property complexes built in Europe in recent years. Setec was commissioned by the owner, Tanagra, to act as technical design and construction contract manager, together with the architect Jean-Paul Viry.

5- Palais des Congrès, Porte Maillot-Paris
The extension of the Palais des Congrès conference centre at Porte Maillot (30,000 sq.m) includes three conference rooms, offices and shops. Together with the architect Christian de Portzamparc, Setec carried out design work and supervised structural and technical trades work, as well as the fire safety system. The building's cantilevered structures have set standards in their field.

6- Vanack II tower block
This 50-floor tower block with three underground car park levels in Tehran was designed to very stringent earthquake-proof standards. The structural concept is based on the high rigidity obtained by thick reinforced concrete structural walls and a triple-branched plan.

7- Shanghai Airport-China
This 200,000 sq. m complex was designed by ADPI and Paul Andreou, architect. The large passenger arrival concourses, more than 1.5 km long, are air-conditioned by a low-speed airflow system designed by Setec which provides comfortable conditions despite the largely glazed elevations.

8- Peugeot Citroën (Psa) design centre in Vélizy (in the Paris area)
Setec assisted the architect Jacques Ripault with all technical disciplines for construction of the new Psal Design Centre (45,000 sq.m). The chosen structural principle enhances lines, forms, affords great flexibility of internal spaces, and allows different projects to be carried out in extreme confidentiality.

9- Sainte Anne Military Hospital-Toulon
Construction of the new military training hospital in Toulon (with 360 beds and 60,000 sq. m) was directed by the architect Aymeric Zuber with Setec's expert support in all technical disciplines. This project is exceptional in the world of health care, due to its large scale and its special challenges.

10- Simulation, modelling and research
Setec has developed numerous software applications for simulation, modelling and research in order to provide a very high level of expertise for projects: STM electronics Grafes 2 (Grenoble), earthquake and vibration modeling of the research centre - Abu Dhabi Airport, simulation of the concourse's temperatures - Grand Palais, Paris, simulation of airflow speeds.
In its industrial projects, Setec implements the latest, most advanced technical solutions: very large span sheds, air-conditioning of clean rooms, treatment of industrial gas and liquid effluents, anti-vibration floors, production of ultra-pure water, storage and distribution of chemical products. Due to the technical complexity of the projects and the joint work by the teams of specialists involved, Setec develops a real partnership with the industrial client, from design to construction.

1—STMicroelectronics, Crolles (Grenoble)
Crolles 1: This 60,000 sq.m production facility includes 9,000 sq.m of Class 1 to Class 1,000 clean rooms. This project illustrated Setec’s ability to work in close collaboration with its client’s technical teams. This partnership then developed and was used to good effect in other STMicroelectronics projects.
Crolles 2: This research centre for development of new technologies on 300 mm wafers includes more than 5,000 sq.m of clean rooms. In close collaboration with the client’s technical staff, Setec developed techniques that are applied to industrial processes.

2—Minatec (Grenoble)
The Minatec centre, designed in cooperation with the architects of Groupe E, houses Inp Grenoble’s two electronics and physics schools, in an area of 44,000 sq.m. This project, the scientific showcase of Grenoble’s Polygones, benefits from environmental quality assurance. Client: Isra local government authority.

3—Airbus A330 and A340 assembly shops, Toulouse
The Airbus assembly shops can house aircraft that are being assembled. They have a column-free area of 80 by 80 metres and 30.5 metres headroom. Despite their size, these shops have high aesthetic qualities, and their interior facilities are good examples of innovative technical solutions for the design of large volumes.

4—La Maree Pavilion, Rungis
Setec carried out the complex reorganisation of this 45,000 sq.m pavilion dedicated to the sale of seafood and freshwater products at the Min national wholesale market in Rungis. The architectural design was by Frank Humboume. The work was carried out without interrupting sales. Client: Semmaris.

5—Ikea, Metz
The depot and logistical base that Setec designed and coordinated for Ikea in Metz with the architect C Dubuisson includes 167,000 sq.m for goods and 100,000 sq.m for deliveries.

6—STMicroelectronics, Agrate, Italy
This project on an existing industrial site in the outskirts of Milan is an example of Setec’s know-how in the renovation of existing factories. Despite the client’s need to keep production going, Setec renovated 5,000 sq.m of clean rooms during an 18-month period.

7—IBM in Corbeil-Essonnes
Setec has contributed to the construction of this facility since Building B2 in 1972, including extensions of the built surface area (now 156,000 sq.m) and redevelopment, mainly of clean rooms. This project helped Setec develop its expertise in the field of electricity production and in the transport and distribution of chemical products.

8—L’Oréal production plant, Aulnay-sous-Bois
This 23,000 sq.m factory was designed by the architects Valode and Pistre and by Setec with great emphasis on architectural and technical quality. It is an example of responsible industrial architecture that corresponds to the client’s image.

9—Hydro Automotive, Louviers site
In collaboration with the architect R. Schélemeur, Setec focused on creating a very high quality environment for this factory that produces car bumpers.
The Setec Group offers an extensive range of water and waste engineering services. In sewage disposal and drainage, drinking water and industrial water, Setec’s work covers all aspects, from diagnostics and master plans to project management for complex factories. In waste, it covers general studies for managing waste collection and storage, assessment of existing installations and contract management for incineration plants. Setec uses well-proven mathematical simulation tools.

1. Urban sewage treatment
Setec does extensive work in urban sewage treatment. Setec’s multidisciplinary capability enables it to act as a consultant and project manager for its clients, offering the full range of complex techniques required for construction and operation of these facilities.

2. Calcia (Airvault factory)
Setec performs diagnostics on industrial sites in order to design means for eliminating water pollution and limiting the risks of accidental pollution.

3. Sewage treatment plant, Caen Urban Area
This plant treats almost 60,000 m³ every day, in compliance with European standards, particularly for nitrogen elimination. The plant also includes ultra-violent effluent disinfection, effluent polishing by filter beds, and sludge drying. Setec’s job included all contract management and upstream environmental studies, a bacteriological impact study, a sludge elimination study and implementation of the operating contract.

4. Reverse osmosis unit
Setec’s drinking water projects cover all aspects, from audits of existing installations to contract management for drinking water treatment and production facilities, complying with very stringent quality and reliability requirements.

5. Project management for renovating a waste incineration plant and bringing it up to standard, in Noyelles-sous-Lens (in the Calais area)
Setec acts as project manager for construction and rehabilitation work on treatment plants (energy recovery, organic recycling, sorting centre, transfer centre) for domestic waste. Setec uses its expertise to determine the specific requirements for these operations (factory in operation, local sensitivities, etc.).

6. Management of a project for standards compliance of the fumes treatment system of a waste energy recovery centre in Saint-Thibault-des-Vignes (Paris area)
Setec manages contracts for bringing facilities up to standard in accordance with future or current regulations applicable to all types of waste treatment or storage units (Technical Landfill Centres). Setec’s uses its acknowledged expertise, particularly in handling air and liquid discharges, to meet the statutory requirements by providing appropriate, adaptable solutions.

7. Optimisation of the waste management scheme in the Wallonia region (Belgium)
Setec has developed software for tracking and modelling waste management, allowing clients to optimise their regional organisation. Setec designs and sets up comprehensive schemes that deal with the "waste" issue as a whole.

8. Engineering design of waste storage centres – Assistance with operating permit applications
The design quality of a storage centre determines the provision of appropriate development and equipment measures for protecting the environment.
All the constraints inherent in the activity and the site must be taken into consideration from the early stages. For example, Setec performs simulations using Plaxis finite element software, to evaluate the loads imposed on lateral waterproofing structures.
Setec provides administrative and technical expertise for public and private operators, ensuring reliable and rational operation.
The environment is an important field of activity for the Setec Group, which works with major public and private developers as project manager (civil engineering, facilities, amenities and processes). Setec has all the multidisciplinary expertise required for environmental studies, impact studies, protection of aquatic habitats, landscape analyses, noise studies, development of rivers and coasts, and flood protection.

1 – Modelling of Loire River hydraulics
Setec has modelled the Loire from Nevers to Angers in order to assess and map the risks of flooding. The specific model developed provides detailed knowledge of the Loire's hydraulic operation and provides the basis for protection plans.
2 - Water management and development scheme for the Thelle and Vezin area
Setec devises many comprehensive development schemes for rivers, covering all aspects, including hydrology and hydraulics, and also the quality and uses of water. Setec has extensive experience in the procedures covered in water-related legislation.

3 - Comprehensive development study for the La Bassée site (on the Seine River)
This study concerns the feasibility of a hydraulic concept for reducing the impact of Seine River floods within a perspective of local sustainable development.
Setec is conducting technical studies of the hydraulic plan and is helping the Seine Basin Reservoirs Institute to carry out this comprehensive study, while extensively consulting local people and organisations.

4 - Flood control in the Orne Valley
Setec provides complete project management for flood control developments in the Caen area. These mainly include a canal in Caen town centre and a 47 m-wide weir on the Le Maresquier site at Oléastrem.

5 - Ecological engineering
Reconstitution of a diverted stream - Salt water stream at Pontainvilliers (La Maurinière motorway).

6 - Ecological engineering
Conversion of a gravel pit into a fishing and leisure lake (La Maurinière motorway).

7 - Landscaping
Planting of greenery behind a noise screen as part of the La Maurinière motorway construction project, managed by Select.

8 - Mapping noise levels on the A94 motorway between Caen and Arranças
Setec’s infrastructure studies include noise protection. For example, on the Pont-Farcy diversion, Setec studied noise levels without protection and with protection by ear embankments.
Planitec, Planitec Btp and Setec Organisation cover all fields of project management: schedule management, cost control, risk management, quality control, organisation management, configuration management and change management. This work is carried out in a wide range of fields, such as building, infrastructures, development, transport, defence, automobile, nuclear, aerospace, aeronautics and information systems. Setec's engineers have all the required personal qualities – authority, thoroughness, communication skills, enterprise, spirit, etc. – for successfully completing assignments both in France and abroad.

1 - Roissy Charles-de-Gaulle airport
The Paris Airports authority has been developing the Roissy Charles-de-Gaulle site since 1974. It enlisted the services of Planitec Btp for scheduling, supervising and coordinating construction of the Road/Rail/Air exchange module, then Hall 2 E, and the recent rehabilitation of Terminal 1.

2 - Seine Amont sewage treatment plant (Valenton, Paris area)
As part of its improvement programme for Seine River discharges, Ssaap (the Greater Paris area's joint authority for sewage disposal and drainage) appointed Setec as consultants to manage schedules, costs and technical coordination, in order to double the Seine Amont effluent treatment plant's capacity to 300,000 m³/day.

3 - Psa Group
As part of a continual reduction in development schedules, Planitec carries out planning, coordination and work-load management assignments for all departments involved in the development of future Peugeot and Citroën cars.

4 - Don (French military shipyards)
Planitec carries out assignments covering all aspects of project management (general organisation, costs, schedules, risks, configuration, contracts, quality, etc.) for all types of Don products (frigates, submarines, aircraft carriers, etc.).

5 - Lgv high-speed railway lines
SNCF appointed Setec to do detailed planning and supervision of schedules for all procedures, studies, procurement and construction work for its Atlantique, Nord, Rhône-Alpes and Méditerranée Lgv high-speed railway lines, as well as investment budget control for certain projects.

6 - Huygens space probe
In 2004, this probe will be dropped from the Cassini spaceship onto Titan, a satellite of Saturn. In this operation managed by Nasa, several European companies are responsible for construction of the probe, under the supervision of the European Space Agency, which appointed Planitec to devise and supervise the work schedule.

7 - Siemena Moteurs
In a sector in which development and qualification play a fundamental role, Planitec provides advice and operational assistance for civil and military engine development projects.
The Setec Group has reliable staff, widely experienced in operational consultancy. In addition to the project management described above, Setec Organisation works in the following fields:
- strategic and organisational consultancy,
- planning of infrastructure construction,
- planning of events.

By combining conceptual thinking with its considerable practical experience, Setec devises powerful practical solutions with its clients and assists them in implementing the solutions they choose. Partenaires Développement, which joined the Setec Group in July 2003, works in all fields of urban development, from initial planning to organising and directing urban projects. Planitec assists its clients in organising their industrial projects.

3 - Bahrain New Town
Partenaires Développement and Setec International are performing a preliminary study regarding the building of a new town in Bahrain, called North Bahrain New Town: development of an urban strategy, general and detailed planning, block plan, technical feasibility study, assistance in issuing the invitation to tender, and supervision of construction work (2030 target: population of 130,000, 26,000 dwelling units, and creation of 20,000 jobs).

4 - Louvre Museum
The Louvre Museum Public Corporation has appointed Setec to carry out various assignments to study circulation flows in order to measure the capacity of special exhibition rooms for the Louvre’s leading works of arts ( Mona Lisa, Venus de Milo). Setec has also performed several preliminary planning studies concerning redevelopment of offices for the museum’s various departments.

5 - Nice Côte d’Azur Tramway
Setec is providing overall assistance to Nice Côte d’Azur Joint Urban Area Authority in managing phase I infrastructure construction of the Nice urban area tramway (8.0 km). Setec works on all aspects of quality assurance, document management, contract follow-up, procedure supervision, management of schedules and costs, and technical supervision.

6 - Operational consultancy
Whether it is for territorial development or improving the performance of staff, organisations and systems, Setec applies the “shared management” method to highlight expectations, strong points and potential, knowledge from comparable experience and various options, as a way to define new objectives and working methods and translate them into concrete action.

7 - Jussieu Campus
Setec assists the Public Corporation for Development of Jussieu Campus in organising, coordinating and directing operations for eliminating asbestos dust and for transferring programmes to the Jussieu university campus; operations that began prior to work on asbestos elimination and bringing the buildings up to safety standards.

8 & 9 - Project management and procedures code
For many years, Setec has developed expertise in project management consultancy, particularly for the design and construction of large infrastructure projects in accordance with requirements for schedules, costs and quality. This involves putting in place efficient management: setting up legal procedures (training/ procedure codes), scheduling procedure studies and construction work, schedule management, cost management, human resources management, risk management and reporting.
In France and in Europe, Setec Telecom is a major partner in large networks and telecommunications projects: defining requirements, architecture, project management assistance, contractual management, and operational engineering.

**Companies and end users**

It-Cal, a subsidiary of Setec Telecom, assists large companies and government bodies in the design and implementation of their voice and data networks. It mainly works in the following fields:

- Designing company voice-data networks; assisting the designation of contractors and telecom operators; directing deployment, operations and maintenance; and outsourcing of networks.
- Complete engineering of trading rooms and call centres, and optimising their operation.
- Directing the relocation of information systems and designing voice/data cabling infrastructures for buildings.

**Infrastructures**

Benefiting from the Setec Group’s dual expertise in telecommunications and construction, Setec Telecom develops numerous projects for local government authorities, statutory concessionary companies in charge of infrastructures (railways, motorways, airports) and partners in real estate. These projects mainly involve broadband infrastructures and networks (feasibility studies, project management assistance, operational supervision and commissioning), cable networks and radio network engineering (including Wi-Fi).

**Defence and space**

Setec Telecom has taken over the consultancy and research work for Setics, which has been involved in defence and space telecommunications for fifteen years.

**Telecommunications & information and communication technology**

Building on its expertise and independence, Setec Telecom advises general management of companies in the telecommunications sector. It provides advice on management (strategy, technical assignments, benchmarking, appraisals) and mergers.

Setec Telecom also works with telecommunications operators in France and in Europe, with a particular focus on optimising customer contact centres and service centres: technical architecture, planning and process optimisation, and customer relationship management.
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Management assistance
Studies and reports
Project management
- Civil and structural engineering
- Underground works and tramway
- Railways
- Roads, motorways, bridges and tunnels
- Airports
- Concrete and metal structures
- Ports and waterways - dams - offshore structures
- Industrial buildings
- Mechanical and electrical engineering
- Parks and gardens
- Urban development
- Urban networks
- Traffic studies, car parks.

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Large transport infrastructures
- Project management: roads, motorways, railways, underground urban railways, tramways, airports
- Management assistance to project owners/clients

Environment and landscape
- Impact (air, water, natural environment, noise)

Landscaping design

General studies, economic studies and feasibility studies
- Technical, economic and financial feasibility studies of large infrastructure projects
- Transport plans, master plans, urban transport plans
- Traffic modelling and income projections for concession structures
- Socio-economic assessments
- Transport/town planning interaction.

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Large transport infrastructures
- Project management: roads, motorways, railways, underground urban railways, tramways, airports
- Management assistance to project owners/clients

Civil works
- Bridges
- Tunnels
- Complex structures

Environment and landscape
- Environmental impact (air, water, natural environment, noise)

Landscaping design.

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Project management, Assistance to Owner
- Alignment, civil works, systemwide, environmental
- High Speed, Intercity and Suburban Railway

General design and management
- Transport plan
- Operation planning
- Signalling brief and studies
- Design assistance system design
- Public address
- Traffic and revenues studies
- Environmental studies
- Feasibility studies.

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Intelligent transport systems
- Intermodal operation and information
- Road operation
- Smart traffic management equipment
- Electrical and telecommunications networks
- Traffic management and supervision systems
- Tolls

Public transport
- Crew scheduling, fleet vehicles scheduling, vehicle availability and operation
- Operation support systems
- User information systems.

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Geotechnical engineering
- Engineering geology
- Soil and rock mechanics
- Foundations of buildings and engineering structures
- Excavations and retaining structures
- Earthworks and soil treatment
- Stabilisation of slopes
- Marine structures
- Soil-structure interaction
- Soil improvement and reinforcement
- Environmental projects
- Soil dynamic behaviour
- Geotechnics software.

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Water engineering
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- Sewage treatment
- River engineering
- Flood control
- Water supply and transfer
- Drinking water production and treatment
- Coastal engineering, marine environment
- Industrial sites
- Underground water, quarries
- Physical measurements
- Impact studies and water related legislation
- Development of hydraulic and aerodynamic engineering software

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Waste engineering
- Consultancy, feasibility studies
- Multi-system management plans
- Organisation and monitoring of selective waste collection
- Technical, financial and administrative assistance in setting up facilities for waste sorting, composting, methanisation and incineration
- Management/organization/operation
- Development of waste management software
- Audit of waste collection services and waste treatment plants
- Technical appraisals, Research & Development.

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Management assistance
Design and project management
- Public buildings
- Intelligent office buildings/Offices
- Hotels/Tourist complexes
- Hospitals and laboratories
- Factories/Clean rooms
- Airports and railway stations
- Arts and leisure amenities
- Schools and universities
- Conference and exhibition centres
- Corporate/mall/retail catering
- Rehabilitation of old and historic buildings
- Housing (new construction & rehabilitation)

Specific studies/design
- Foundations of all types
- Concrete structures
- Metal structures
- Roads and miscellaneous external works
- Electrical installations: high voltage power and lighting circuits, low voltage communications installations
- Building Management System (Bms)
- Voice Data Integrated Networks (Vdi)
- Heating, Ventilation & Air Conditioning (Hvac)
- Smoke extraction
- Cogeneration/Trigeneration
- Domestic & Industrial plumbing
- Lifts, document transport systems
- Maintenance engineering
- Asbestos and lead treatment
- Environmental quality assurance.

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Management assistance to management
Design and project management for industrial projects
- Production facilities
- Research and development facilities
- Laboratories
- Clean rooms
- Industrial and process engineering
- Facilities needs analysis
- Equipment layout
- Equipment hook-up design and management
- Processes and instrumentation diagram (Pd)

Technical review of existing facilities
- Upgrades and expansion
- Technology transfer

Technical assistance and specialized technical studies.

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- Feasibility studies
- Estimation of investment and operating costs
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Industrial project management
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- Training.

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  - Project management consultancy
  - Construction site management
  - Management of common worksite costs
  - Preparation of interim valuations of work carried out
  - Management of project coordination groups.

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Project management and consulting
- Structure and functioning of companies, central government bodies and local government authorities
- Functional programming
- Project management:
  - organisation
  - procedures
  - budget control
  - planning
- Human resources
- Training.

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Urban projects management
- Urban project development (new urban developments and urban redevelopment schemes)
- Organisation of complex planning and development projects
- Regional economic development
- Urban planning
- Urban renewal and town planning policy
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- Sustainable cities: concepts and management.

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Consultancy and engineering for networks, telecommunications, and information and communication technology (ICT)
- General management of Setec Telecom Telecommunications and ICT Division
- Consultancy and engineering for stationary and mobile telephone networks
- Improvements in infrastructure assets: motorways, railways, structures, local government authorities
- Strategy consultancy
- Partnership development and company mergers
- Project management consultancy and contract management of large multidisciplinary projects (optics, radio, security, infrastructure)
- Consultancy and engineering for telecommunications operators (contact centre, service process, and organisation)
- Consultancy and engineering for defence information system security and networks.

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Consultancy in corporate telecommunications and networks
- Consultancy and project management in telecommunications and information & communication technology projects
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- Telephone and information system networks
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Strategic consulting, assistance and project management in telecommunications, information systems networks and infrastructures:
- Strategic consulting with public organisations and telecom providers
- Technologies
- Regulation
- Project assistance (network design and operation) for major private networks
- Audit, design, specifications, tenders, assistance to contacting owner, project management
- Converging networks: voice, data, image, very high speed, rGbit, FTTx, radio, WiFi
- Real-time usage and applications: ToIP, videocall, voice call reception, call centres
- Advanced technologies: IPv6, MPLS, VPN-IP, QoS.

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The construction of the East Branch Rhine-Rhone high-speed track was declared to be in the public interest in January 2002 and its approval was confirmed by the interministerial planning committee on 18 December 2003.

The first stage of the East branch for which engineering studies are being performed covers a distance of approximately 140 km between Villers les Pots and Petit Croix.

The East Branch Rhine-Rhone high-speed line includes:
- Besançon TGV station,
- Belfort / Montbéliard TGV station,
- Chavanne tunnel (2 km long),
- Aibre Trémoins covered cutting (200 m long),
- Four track change-over points located in Thervay, Moncley, Sorans and Les Magny.

Connections to the Decevey – Besançon Viotte line are planned:
- via the TER tracks in the Besançon TGV station
- on track 2 at km point 57+133,
- on track 1 by two reserved connection points in the Besançon TGV station and at km point 57+133.

SETEC mission:

As part of the general project management for sections A and C, SETEC managed the project for the railway facilities, basing itself on the technical references and scheme designs provided by RFF.

For these purposes, SETEC’s missions for the works installation, railway, catenaries, electrical supply and telecommunications systems were as follows:
- project design studies,
- preparation of the consultation documents,
- analysis of bids,
- finalisation of contracts,
- works supervision,
- assistance in handover operations,
- supervision of the first test phases.

To meet RFF requirements, SETEC (sections A and C) and Egis Rail (section B) created the EF2R joint venture company which brought together a team formed from members of the two companies covering all required fields of expertise.

This organisation made it possible to comply with the engineering studies schedule and allowed the railway systems works to begin in a manner that fully complied with the civil engineering works schedule.
GENERAL PRESENTATION OF THE PROJECT:
The Rhin-Rhone project Line is a Y shaped three branches high speed line which is articulated around the city of Dijon. The state approval to the preliminary studies has been published in 2003. The particularity of this project is that for the first time, the final design and the construction surveying for the railroad’s equipment has been attributed to a private engineering group after a call for bid (by contrast with previous project, for which the national French Railway Company was the only authority). It’s also the first high speed project in France which isn’t directly connected to Paris Its international vocation, with the proximity of the German and Swiss networks can also be noticed. About 12 million additional passengers should be generated each year with those new lines, including an important contribution of foreigner passengers. Those three branches are part of the same global program, but their approval, design and construction are scheduled to be non-simultaneous. The Eastern Branch will be the first to be put into service, especially a 140 km part which will be ended at the end of 2011. This section includes 160 bridges, 12 viaducts and two new stations dedicated to high speed trains.

This 1st section includes 4 junctions with the existing networks, its stations. This supposed important work for modernizing this network. Among the many structures of this project, we can especially underline:
- the station of Belfort-Montbeliard TGV, with an original structure of central building and platforms located between the main lines
- the station of Besancon TGV, which includes a connection to the conventional network
- the viaduct of Tasty, 792m long, which includes a system of following light on the bridge for each train
- the tunnel of Chavanne, single tube tunnel with 2 tracks: it’s got a 1970m length and 80m² of section; it’s designed for an operating speed of 300 Kmph. (190 MPH)
- the viaduct of Lizaine, 717m long, which passes across a broad valley and over several roads, a river and two pipelines.
The Pertuis viaduct crosses a deep-set valley containing the Pertuis stream and the RD 37 minor road. A 220 m long structure was designed as a result of the site’s very undulating terrain and the very little latitude available to the designer in following the terrain as closely as possible because of the very slight curvature required to allow TGV high speed trains to travel at up to 350 km/hour. The piers have a maximum height of 19 metres. The 12.60 metres wide deck is designed as a mixed double girder construction, with 3.65 m high metal girders and a concrete slab between 0.25 and 0.43 m thick. Bottom lateral bracing is provided by a 15 cm thick concrete slab.

Due to the large amount of karstic rock discovered, deep foundations were provided for certain bearings, and major soil treatment was also provided under the consolidation blocks and access embankments in order to avoid any settlement or subsidence near the structure.

**SETEC TPI mission**

- Definition and follow-up of the preliminary contracts (geotechnical survey),
- Preparation of the detail design then the working design,
- Contractors’ tender documents,
- Analysis of contractors’ tenders,
- Finalising the contracts,
- Supervision of construction work,
- Approving the working design.

**Main features:**

- Length: 220 m
- Width: 12.60 m
- Maximum span: 55 m
- Mixed double girder load-bearing structure

**Cost of works:**

€8.8 M excl. VAT (2006 value)
Duration of construction: 28 months
(including a 250 m long second viaduct with the same features)
Viaduct over the River Lizaine for the Rhine-Rhone LGV high speed railway line

The 717 m long Lizaine viaduct crosses a wide valley which contains three minor roads (RD 204, RD 438 & RD 316), the two Belfort - Besançon railway lines, a local road, two oil pipe-lines and the Lizaine river. The siting of the piers and abutments was restricted by the crossings over the minor roads and the railway lines, and also by the aim to not disturb the river’s bed and banks. A detailed study determined the optimal spans for siting the bearings, by rerouting only a pipe-line and the RD 316 road. This resulted in 11 spans: 47 m + 55 m + 67 m + 68 m + 69 m + 70 m + 72 m + 74 m + 76 m + 74 m + 45 m, which also met the dynamic criteria for allowing the TGV high-speed train to travel at speeds of up to 350 km/h. Consequently, the structure remains within the range of viaducts that can be launched, and therefore the means to be used can be optimised. It is on a straight line, with a 21,000 m radius on the longitudinal section. The 12.60 metres wide deck is designed with a double metal caisson construction, with 3.75 m constant height and a concrete slab of variable thickness (0.25 m to 0.43 m). The structure’s 10 piers are in concrete and of variable height (10 m to around 40 m). Their architecture is a modern version of the arched form of old railway viaducts. The bearings are on strip foundations where there are marly calcareous outcrops, otherwise they are on piles. The viaduct is in an Ib seismic activity area and on an S1 site.

SETEC TPI mission
Complete project design and construction management, including:
- Definition and follow-up of the preliminary contracts (geotechnical survey),
- Preparation of the detail design then the working design,
- Contractors’ tender documents,
- Analysis of contractors’ tenders,
- Finalising the contracts,
- Supervision of construction work,
- Approving the working design.

A 717 m long railway bridge

The length of the viaduct – 717 m – greatly exceeds the maximum length of 450 m for which track expansion joints are designed. Considering the size of the braking forces and the seismic forces, this requires the use of a functional principle that includes a fixed point composed of two piers (rather than one) and two track expansion joints at the two abutments. The two fixed longitudinal points have fixed pot bearings that take up all loads. The other bearings have longitudinally-sliding bearing mechanisms, one of which is transversally blocked.
Rhine-Rhone high speed line, East branch, Dijon - Mulhouse sections A

The line crosses a large number of sites initially identified as potentially being karstic. This subsequently proved to be the case. To increase the reliability of the design and of the subsequent construction of the works, Setec defined and managed a major soil survey from the initial design phase. This led to a clear understanding of the risks and problems to be integrated into the works contracts.

During the works, a supervision unit was set up to monitor new surveys and finalise the treatments to be adopted; its reactivity meant that at no point did the problems related to the karstic nature of the soil jeopardise the general work schedule.

SETEC mission
Setec provided the general civil engineering studies and works project management for two of the three high-speed line sections, representing 85 km.

The mission particularly included:
- data acquisition (geotechnical, hydraulic, surveys, land use),
- the preparation of technical construction files for the railway working platform and the restoration of communications,
- consultations with contractors,
- works supervision.

It should also be noted that, in partnership with Egis, Setec provides the project management for railway facilities (EF2R joint venture).
SETEC TPI’s remit:
- Within Eurotunnel (until the end of 1994):
  - oversight of design and detailed studies,
  - supervision of work and trials,
  - control of costs, timescales and quality,
  - general technical support.
- Independent Project Manager on behalf of the Governments and Banks:
  - assessment of preliminary designs and their Concession compliance,
  - monitoring of construction conformity with preliminary designs,
  - attending acceptance tests and commissioning,
  - scrutiny of operating regulations and security system,
  - monitoring of costs, timescales and any contractual problems,
  - monitoring the application of the quality control system.

The Channel Tunnel was built using 11 tunnel boring machines (TBMs) drilling through chalk marl. The rate of progress exceeded 1,000m per month. The tunnel can accommodate traditional trainsets (passenger/freight) and shuttles carrying road vehicles (vans and cars, coaches, caravans and HGVs). The vehicles embark in the terminals. The installations are operated using highly sophisticated equipment which also means users enjoy a high level of service.

This is an innovative, exceptional project, with Setec playing a central role in every aspect since 1957. The 1986 project, commissioned in 1994, follows on from Setec’s preliminary work in 1971-1975.
Underground structures

Rhine-Rhône high-speed line –
Eastern section - Chavanne Tunnel

Initial geotechnical runs based on probes taken from the surface revealed the complexity of the ground underneath, which ranged from bituminous schists on the western head to the mudrock found deeper. This is why Setec suggested carrying out geotechnical surveys on a larger scale and drew up two contracts, one to cut a test trench 8 m in depth and 40 m long aimed at validating the slopes of the embankment of the access trench at the face (200,000 m³) and the other to dig a shaft 35 m deep and a 20 m tunnel on the site of the future tunnel. These sites were completed for the launch of the tender.

SETEC TPI’s remit

- Design project manager:
- Development of the detailed preliminary design and Project documentation.
- Supplementary Project Management support tasks.
- Project management of the supplementary geotechnical surveys (design and build).
- Build project management:
- Drafting the bidding documents for 90 km of high-speed line including the tunnel
- Monitoring of the work.

Monotube with 2 tracks side by side.
Length: 1,970 m.
Air draught: 100 m
Incline: 2.6% maximum.
Longitudinal fire main.
Excavated with explosives or by digger.
Project cost: €80 million + VAT.

The Chavanne Tunnel enables two tracks on the high-speed line to traverse the highest point in their journey via a unique bore. Its 100 m² useable section, representing around 160 m² of excavation allows TGV trains to pass through at 350 kph.

Interministerial Technical Instruction No 98300 on rail tunnel safety was taken fully into account from the start of the design process: for example, there is a built-in fire system incorporating a raised reservoir with 3 x 60 m³ compartments and a longitudinal main with hydrants every 250m, the incorporation of which into the tunnel passages was a challenge because of their space requirement.

Measuring 1,970 m in length, the tunnel is located near an area of outstanding natural beauty which called for extensive precautions to protect the natural environment during the work.

The terrain encountered was mediocre, being comprised largely of Toarcian mudrock including some parts that have potential for significant swelling when wet.

This therefore necessitated special measures during the excavation process itself plus modification of the lining by increasing its thickness, or even by accentuating the curve of the bottom slab of the tunnel, achieving the sought dimensioning through finite element analysis calculation.

Main characteristics:

Monotube with 2 tracks side by side. Length: 1,970 m.
Air draught: 100 m².
Incline: 2.6% maximum.
Longitudinal fire main.
Excavated with explosives or by digger.
Project cost: €80 million + VAT.

Large-scale ground surveys

Initial geotechnical runs based on probes taken from the surface revealed the complexity of the ground underneath, which ranged from bituminous schists on the western head to the mudrock found deeper. This is why Setec suggested carrying out geotechnical surveys on a larger scale and drew up two contracts, one to cut a test trench 8 m in depth and 40 m long aimed at validating the slopes of the embankment of the access trench at the face (200,000 m³) and the other to dig a shaft 35 m deep and a 20 m tunnel on the site of the future tunnel. These sites were completed for the launch of the tender.

Client:
Réseau Ferré de France - Rhine-Rhône High-speed line – Eastern section

Project manager:
SETEC

Dates:
Detailed preliminary design: Sept. 2003 - June 2004
PROJECT: Sept. 2003 - June 2005
Bidding documents: June 2005 - November 2005
Invitation to tender: December 2005 – February 2006

Main characteristics:

Monotube with 2 tracks side by side. Length: 1,970 m.
Air draught: 100 m².
Incline: 2.6% maximum.
Longitudinal fire main.
Excavated with explosives or by digger.
Project cost: €80 million + VAT.

RESEAU FÉRÉ DE FRANCE - RHEIN-RHÔNE HIGHT-SPEED LINE – EASTERN SECTION

The Chavanne Tunnel enables two tracks on the high-speed line to traverse the highest point in their journey via a unique bore. Its 100 m² useable section, representing around 160 m² of excavation allows TGV trains to pass through at 350 kph.

Interministerial Technical Instruction No 98300 on rail tunnel safety was taken fully into account from the start of the design process: for example, there is a built-in fire system incorporating a raised reservoir with 3 x 60 m² compartments and a longitudinal main with hydrants every 250m, the incorporation of which into the tunnel passages was a challenge because of their space requirement.

Measuring 1,970 m in length, the tunnel is located near an area of outstanding natural beauty which called for extensive precautions to protect the natural environment during the work.

The terrain encountered was mediocre, being comprised largely of Toarcian mudrock including some parts that have potential for significant swelling when wet.

This therefore necessitated special measures during the excavation process itself plus modification of the lining by increasing its thickness, or even by accentuating the curve of the bottom slab of the tunnel, achieving the sought dimensioning through finite element analysis calculation.

Large-scale ground surveys

Initial geotechnical runs based on probes taken from the surface revealed the complexity of the ground underneath, which ranged from bituminous schists on the western head to the mudrock found deeper. This is why Setec suggested carrying out geotechnical surveys on a larger scale and drew up two contracts, one to cut a test trench 8 m in depth and 40 m long aimed at validating the slopes of the embankment of the access trench at the face (200,000 m³) and the other to dig a shaft 35 m deep and a 20 m tunnel on the site of the future tunnel. These sites were completed for the launch of the tender.

Client:
Réseau Ferré de France - Rhine-Rhône High-speed line – Eastern section

Project manager:
SETEC

Dates:
Detailed preliminary design: Sept. 2003 - June 2004
PROJECT: Sept. 2003 - June 2005
Bidding documents: June 2005 - November 2005
Invitation to tender: December 2005 – February 2006

Main characteristics:

Monotube with 2 tracks side by side. Length: 1,970 m.
Air draught: 100 m².
Incline: 2.6% maximum.
Longitudinal fire main.
Excavated with explosives or by digger.
Project cost: €80 million + VAT.
Underground structures

The Lyon-Turin rail link

As the common portion of the international section of the new Lyon – Turin rail link, the project involves 70km of line in all, and includes a main tunnel 52km long, a 1km viaduct and a second 12km tunnel.

It is intended to take annual freight traffic estimated at a total of 50 million metric tons, which involves in particular the carrying of 1.2 million of heavy goods vehicles with and without drivers (the so-called “Rail Highway” system) between two terminals, one in the Lyon area and the other in the Piedmont. It also provides a link for high speed train passengers (travelling at a nominal 220kph) between the two countries.

The tunnels are of twin-bore construction with an interior diameter of 8.4m connected by cross-passages every 400m. The 52km-long Base Tunnel is also equipped with comprehensive safety systems: a security and emergency passenger evacuation post, located at the tunnel’s midpoint and, regularly spaced along it, four intervention facilities for dealing with freight trains on fire. These structures are connected to tunnels leading out to the open air with lengths of between 2km and 10km.

SETEC TPI’s missions
1. In the preliminary project design phase (2002 – 2003):
   - SETEC was the agreed representative of an international engineering grouping responsible for all studies on technical aspects, rail operation and safety & security for the preliminary project design.
   - SETEC conducted goods traffic studies incorporating a specific model for the Rail Highway and supplying elements for analysis of project economics flowing from this
   - SETEC, in a grouping with the engineering companies previously responsible for the operational studies, carried out a preliminary survey on the organisation of the terminals of the Rail Highway system.
2. In the reference preliminary project design, a phase due to occupy the period 2004 to 2006, SETEC has taken on the task of overall coordination of the international engineering grouping which is beginning the studies on system operation, maintenance and safety & security and to which LTF will also be entrusting the execution of technical studies for the civil engineering and infrastructures.

New 70km section of line comprising:
- a 52km tunnel
- a 1km viaduct
- a 12km tunnel
Total estimated cost: €6 billion

SETEC made a major contribution to the safety studies-smoke control system, emergency and evacuation procedures – as well as to the studies to determine the methods for civil engineering work, with a focus on the optimisation of lead times and costs.
Underground structures

CDG Express

The project involves the provision of a dedicated rail service between Paris and Roissy Charles de Gaulle airport offering a journey time of less than 20 minutes with four trains per hour over a very large part of every day of the year.

The core solution involves defining the route taken by the CDG Express (between the Gare de l’Est and the TGV high speed train station at Charles de Gaulle airport) to make partial use of the existing infrastructures (between Paris and Noisy-le-Sec and the point of arrival of the line at Roissy station) and requires the creation of some 14km of new track, 10.8km of which would run through a tunnel.

Following the Public Debate initiated by the National commission for public debate in 2003, the CDG Express Economic Interest Grouping undertook to look at possible alternatives. The aim continues to be to start up construction in 2007 with the aim of commissioning the service in 2012.

The Mission of SETEC TPI

Before the holding of the Public Debate, the EIG CDG Express wished to have carried out by Setec an independent technical audit of the project for the construction of the new infrastructures for the core solution which the EIG has taken forward to the preliminary project design stage. The audit entrusted to Setec, performed in 2001 – 2002, involved the following:

- Statement of an opinion on the technical difficulties of construction of the 10.8km tunnel and their consequences in terms of duration of construction and lead-time to completion. On this occasion Setec gave an opinion on the tunnel safety systems, on its route in terms of plan and profile, and on the advantages and disadvantages compared with a single-tube solution (the core solution) and a twin-tube solution in terms of rail operation, safety and construction;
- Statement of an opinion also on the technical difficulties of the structures planned for the point of arrival at Roissy station, underpasses under runways and taxiways and integration into existing structures.

The strengths of the audit

The audit highlighted the technical difficulties involved in the civil engineering work for what is a long tunnel in the prevailing geological context and for the integration of the safety constraints into the design of the structure.