

**ines**  
ingenieros consultores

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Company dossier



## Company

Presentation	4
Multidisciplinary Team	6
Organizational Structure	8
Technology and Systems	10
Quality and Environmental Policy	12

## Areas of activity

### Engineering

Geotechnical Engineering	15
Civil Works	16
Building (Construction)	17
Maintenance, Preservation and Operation	18
Social and Cultural Heritage	20

### Consultancy

Structural Consultancy	22
Materials Consultancy	23
Technical-Economic Consultancy	24
Training Consultancy	25

<b>RDI</b>	<b>26</b>
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Project and Construction Management. International Exposition Zaragoza 2008. Participans Building.



Project and Construction Management. Replacement of 5 steel railway bridges in Tarragona - Barcelona

## ■ ■ ■ Presentation

INES INGENIEROS CONSULTORES is a Spanish company that provides highly skilled professional services and is greatly respected in the civil engineering field. It is a market leader for its expertise and excellence in services offered to its clients in both engineering and multidisciplinary consultancy. INES is one of the companies with the most profound expertise and with the best prospects of future growth in the world of infrastructure preservation, maintenance and operation.

INES has enjoyed an exemplary career providing services based on excellence, and it stands out in the Spanish market and is a growing force in the international arena. The areas of activity of INES include sectors such as:

- **Roads**
- **Railways**
- **Building**
- **Industrial works**
- **Metropolitan systems**
- **Airports**
- **Harbors and coasts**
- **Underground structures**
- **Hydraulic works and water management**
- **Historic heritage**

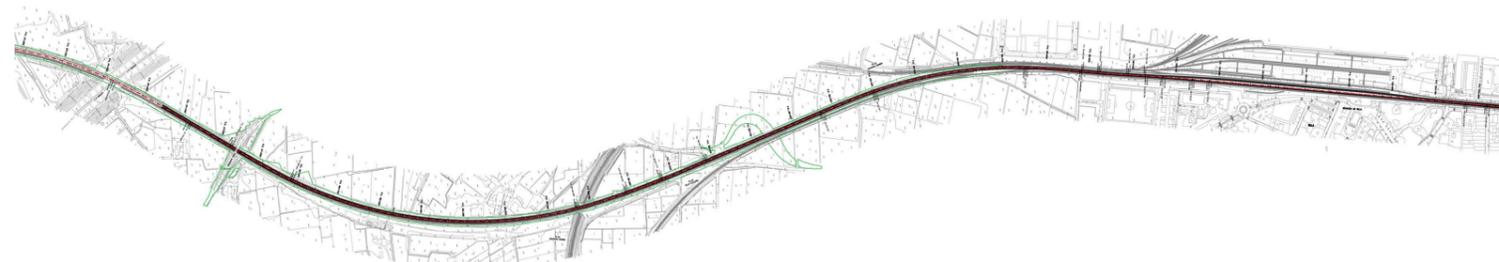
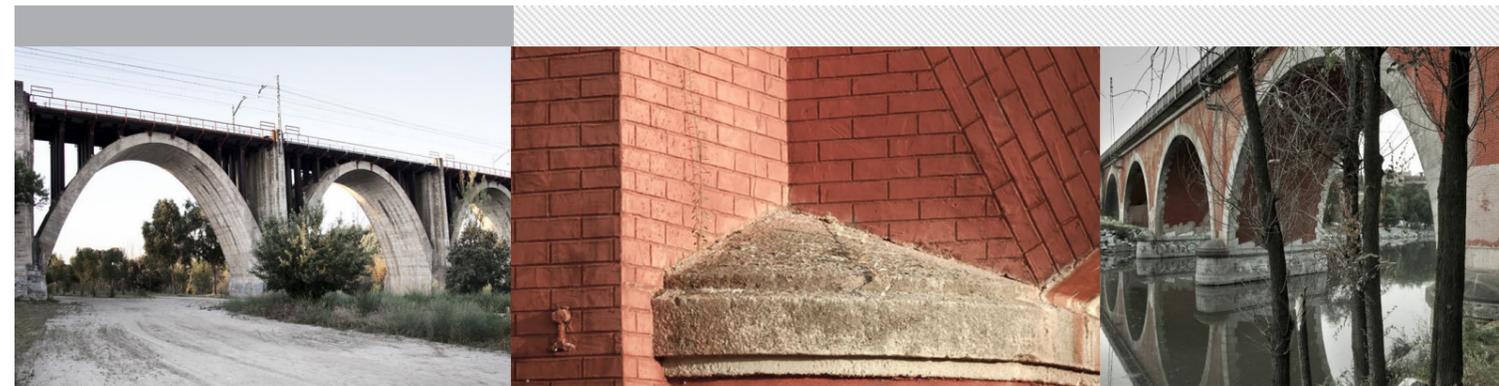
This wide range of activities allows the transfer of information from one sector to another, making it possible, on one hand, to introduce the use of modern technology in works related to maintenance and operation and, on the other, to improve new building projects, inspecting and learning about the constructed reality and its evolution over time

INES has all the facilities required to provide the best professional services to its clients, but the company's greatest asset is undoubtedly its personnel. INES's partners, together with its hired professionals, form a highly qualified multidisciplinary team. INES's team is young and enthusiastic, and shares a set of ideals and values regarding state-of-the-art engineering and consultancy, always oriented towards the principles of sustainable development and aimed at meeting customers needs at all times, exceeding their initial expectations, gaining their loyalty by offering civil engineering consultancy services of the highest quality.

INES is an active partner of the professional community of Consultants, Engineers and Architects, as well as Member of Colleges and National and International Associations. INES maintains close links with the University and research centers and participates actively in Spanish and European reference research organizations such as the International Union of Railways (UIC), Association Mondiale de la Route (PIARC) Asociación Científico Técnica del Hormigón (ACHE, Technical-Scientific Concrete Association).

INES is untiring in its pursuit of innovation, making a continuous effort in research and development of new technical and computer systems to enrich the services offered to its clients and to apply them in other areas of the company. Part of the work of INES is devoted to the development of RDI projects, as a clear indication of the wish to put the goals and values of the company into practice.

It is important to note the strong commitment of INES with compliance with quality and environmental objectives, enabling continuous improvement in all services offered while maintaining an environmentally friendly activity. INES is constantly seeking and implementing the best practices to provide services for their clients in the most effective, profitable and sustainable way.



Track and infrastructure renewal. Xativa - Silla Line.

## ■ ■ ■ Multidisciplinary Team

The most outstanding element of INES Ingenieros is its team. All of the founding partners of INES are PhDs in Engineering and come from the university teaching and research environment, where they taught materials and structure design and produced significant and outstanding research work.

In addition, INES has a highly-qualified multidisciplinary team (many of its professionals come from the research field) with experience in various disciplines. 25% of its workforce are doctors and 70% are senior engineers, architects and other university graduates.

INES team consists of professionals with a clear technical profile:

- **Civil Engineers**
- **Mechanical and electric Engineers**
- **Architects**
- **Mining Engineers**
- **Geologists**
- **Chemists**
- **Graduates in Environmental Sciences**
- **Public Works Engineers**
- **Quantity Surveyors (foreman builders)**
- **Draftsmen**
- **IT Engineers**
- **Economists**
- **Lawyers**

The INES team has a lengthy professional experience in the technical field and makes this experience constantly available to their customers. INES is in a constant search for the best professionals with a strong engineering vocation, and it encourages its team to delve deeper into technical excellence through ongoing research and training to train experts in the different fields of the company while at the same time encouraging teamwork. INES invests heavily in the training of its staff and provides the best career opportunities for its team within the company. In addition, INES encourages participatory management of its team and recognizes their merits both individually and as a team.

INES stands out because it shares the experience and knowledge acquired in each project among all the company professionals as well as with its clients, offering efficient high-value engineering.

INES has stable partnerships with other teams or companies that integrate into its organization to complete and extend its resources whenever needed by the nature of the services.



New double steel railway bridge in Barcelona - Spain

“ INES invests heavily in the training of its staff and provides the best career opportunities for its team within the company. In addition, INES encourages participatory management of its team and recognizes their merits both individually and as a team. ”

## Organizational Structure

INES Ingenieros is divided into two distinct levels: the first one corresponds to the Quality, Environment, RDI and Systems and Technology departments, while the second one covers the production departments. In turn, the latter is subdivided into the five strategic areas of the company.

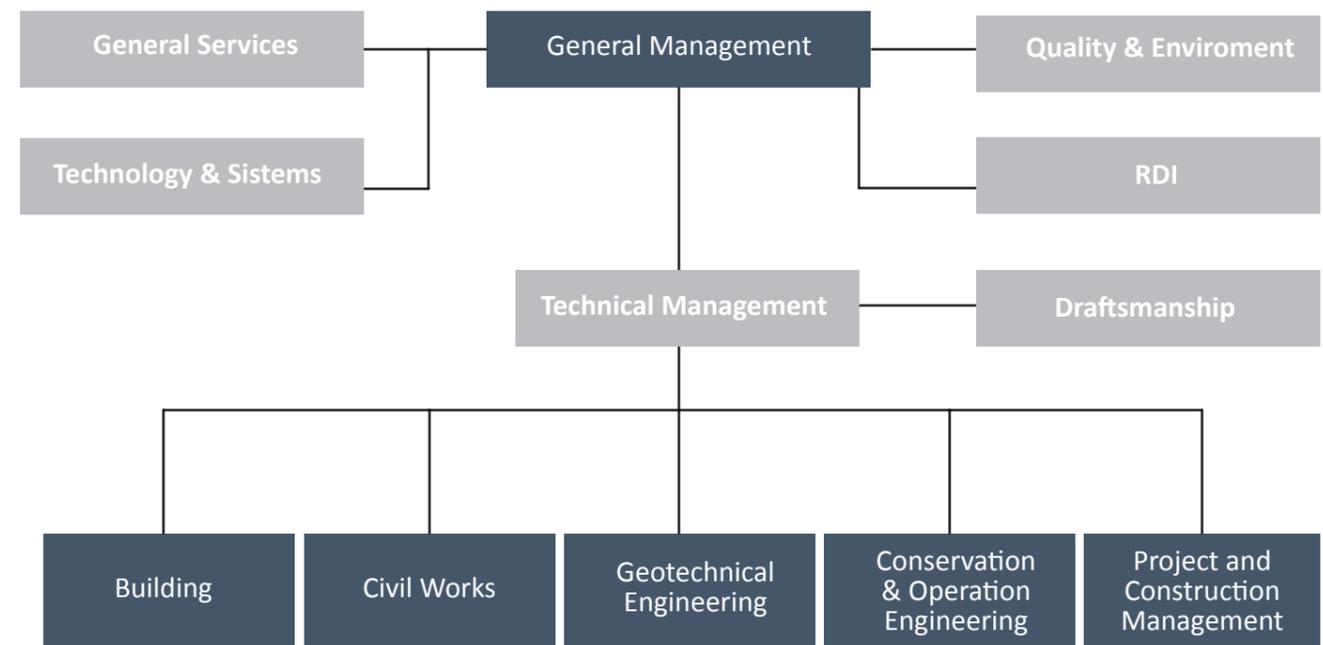
The activity of the first level departments gives two types of results in: internal (process improvement and team training) and external (research projects tailored to clients' needs).

The activity of the second level departments shows the vocation of the company of specializing in strategic sectors that complement each other.

The areas that make up this structure are:

- **General Management.**
- **General Services.**
- **Quality and Environment.**
- **RDI.**
- **Systems & Technology.**
- **Technical Management.**
- **Building Department.**
- **Civil Engineering Department.**
- **Geotechnical Engineering Department.**
- **Conservation and Operation Engineering Department.**
- **Project and Construction Management .**

## Organization Chart



## Technology and Systems

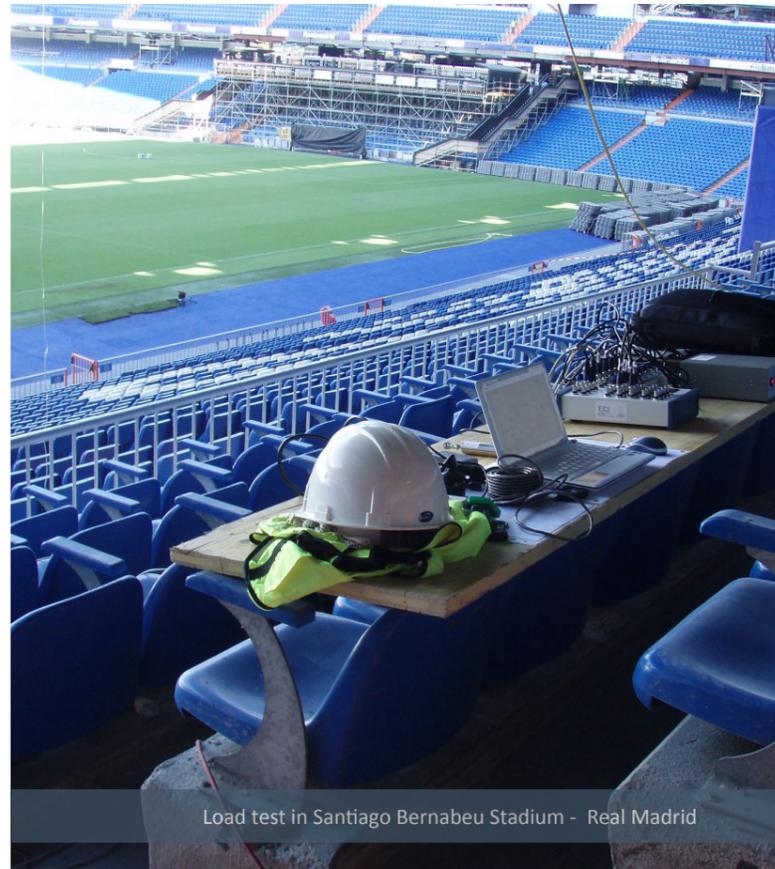
INES Ingenieros main offices are on the third floor of 120, Nuñez de Balboa street, Madrid, Spain. Its activity has been always related with research and innovation. Projects and Research Programs developed by INES in different fields can be highlighted: analysis of structures and materials, monitoring systems and, finally, infrastructure management.

**Bridge Management Systems:** INES Ingenieros has developed a comprehensive methodology for bridge management, ranging from the structure inventory module (definition of the bridge heritage) to the routine inspection and main inspection modules (the preservation state of this heritage.) This methodology is based on:

-A series of manuals or guides, used as working papers for each of the phases and aimed at different levels of participation (structure manager, expert inspector, consults, etc.), supplemented with the corresponding training courses.

-A software application adapted to different users. This application has been developed on two different platforms (INGRID, fully programmed by technicians of the company, and INCA, in cooperation with the firm IPSVial)

The different work levels (inventory completion and the different degrees of inspections) are globally or partially performed by INES technical engineers, always seeking as much active collaboration as the client's personnel can provide as a way of obtaining an activity in the system that guarantees its own operation. The most specialized tasks (implementation of the system, training, etc.) are always carried out by the company technicians.



Load test in Santiago Bernabeu Stadium - Real Madrid

The instrumentation available to INES Ingenieros is:

- **Displacement Sensors (LVDT).** Inductive displacement sensors manufactured by Schreiber Messtechnik are used to measure bridge movement. Each sensor has a coil inside which moves a NiFe core axially, and the position of this core produces the corresponding inductance distribution in both halves. This distribution is then transformed by an external amplifier into a signal that is proportional to the travel and generates voltage readings that can be transformed later into measurements of length through the data acquisition unit and the software used.
- **Accelerometer.** Schaevitz servoaccelerometer with a range of  $\pm 0.5$  g and 1 g of internal compensation, to measure linear vertical acceleration.
- **Data Acquisition Unit.** A USB-6229 BNC module manufactured by National Instruments is used. This is a multipurpose high-performance data acquisition USB module (DAQ) that provides high levels of accuracy at high sampling rates. The NI USB-6229 has 32 analogue inputs, 4 analogue outputs, 8 DIO and 2 BNC terminals. The data acquisition unit has threaded terminals that ease and simplify configuration, installation and signal connection. It also allows bidirectional high-speed data transfer speed through the USB bus.
- **Metering Software.** The Labview 8.6 software is used for data acquisition and processing. The latest version of this software is a functional graphical development environment that also allows the functional analysis of measurements and the presentation of data, applying the customized user interface that is compatible with the data acquisition unit with USB connectivity.



Bridge Management System. General Road Network of the Ministry of Public Works

INES Ingenieros also has independent reading units to read different discrete parameters (movement, turns, temperature, humidity, etc.). These units have been successfully applied in buildings as unique as the BBVA headquarters in Bilbao.

Moreover, the company has developed different methods of inspection, monitoring and diagnostics of structures and materials for engineering and consultancy work.

This Structural Management System has been successfully implemented both in local governments such as in the Zaragoza and Barcelona councils (2008 and 2009, respectively) and in the central government, where it is used in the General Road Network of the Ministry of Public Works, as well as in private clients (CINTRA).

**Structural Monitoring Systems:** In addition, INES Ingenieros has developed dynamic monitoring systems that allow static and dynamic loads on structures of both civil works and buildings to be tested.

“ INES Consultant Engineers is certified with regard to the regulations of UNE EN ISO 9001 (Quality) and UNE EN ISO14001 (Environment). ”



The quality and environmental policy of INES Consultant engineers, within the framework of designing infrastructures, consists in providing projects to fulfill the applicable law, rules and regulations, with regard to technical as well as environmental characteristics, and the expectations of the client by complying the terms of contract / order, within a strict commitment with the protection and conservation of the environment.

# Areas of activity

INES Consultant Engineers is a leading civil engineering company that offers its clients highly specialized professional services, of high added value and great technical complexity in the Engineering and Consultancy fields.

INES always aims for excellence in the services offered and provides each client with professional support that is adapted to its specific needs, regardless of whether they involve technical, management, analysis or control issues, in order to improve their initial expectations and ensure their loyalty.

INES has important clients not only in the Government but also among leading companies in the private sector. INES carries out its professional activities not only within the Spanish territory but also anywhere in the world where clients require the expertise of a company that offers the best engineering services, a highly specialized consultancy service and the highest quality..



## ■ ■ ■ Geotechnical Engineering:

- Geological and Geotechnical studies
- Stability studies of slopes, excavations and landfills
- Special foundations
- Tunnels and underground works
- Land improvement treatments
- Drainage and waterproofing
- Analysis and diagnostics of geotechnical problems
- Monitoring and control



INES provides Geotechnical Engineering services consisting in the development of geotechnical reports and surveys on stability and foundations, drainage and land treatment. In general, it carries out work in the field of specialized geotechnics, advising on building construction as well as in civil engineering, in the field of land development, as support or as part of the works.

INES operates within such a variety of fields that it can provide a fast interdisciplinary response by integrating all of its departments.

## Civil Works:

- Roads and railways
- Bridges and walkways
- Maritime Works
- Industrial Works



## Building:

INES offers technical consultancy support at all stages of work definition and construction. It has participated in numerous projects, from large works such as shopping centers to small detail works, so its professionals are the best placed to advise, assist and develop projects or direct works



- Shopping Malls
- Office Buildings
- Airport Structures
- Educational Buildings
- Housing
- Cultural Buildings

## Maintenance, Preservation and Operation

Interest in maintenance and preservation of infrastructures has increased in recent years. Their technical and economic importance has led to the understanding of civil and industrial works within a much broader time context. Interest has risen mainly due the understandable concern of different administrations, both public and private, given the already large number of structures that require high costs of maintenance, rehabilitation and repair. After many years of research by INES professionals in this field of engineering, working in the design, construction, maintenance, preservation and rehabilitation, adaptation and demolition of infrastructures, the company is in a position to complete their life cycle, thanks to a major effort specializing in consultancy in the fields of structures, materials, geotechnics, etc, so as to provide customers with high added value services.

### » Past history or medical history:

- Document collection and search
- Preparation of inventory
- Routine inspections
- Major inspections

### » Analysis and diagnostics:

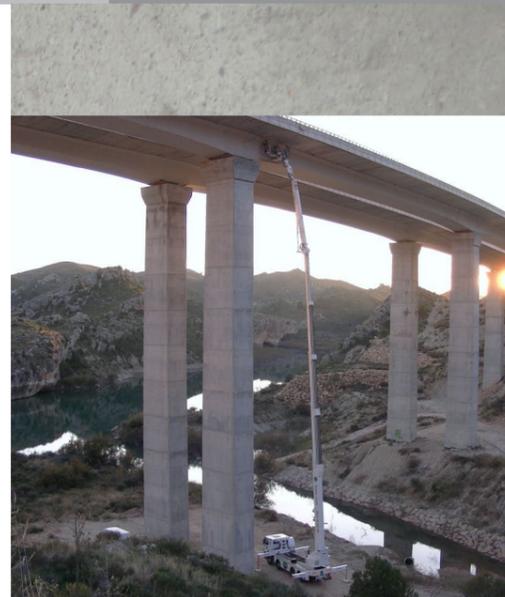
- Studies on deterioration processes
- Studies on technical and building possibilities
- Fatigue and service analysis
- Service life studies
- Feasibility studies
- Technical-economic analysis
- Monitoring and control

### » Therapy:

- Repair Projects
- Reinforcement Projects
- Functional adaptation projects
- Use and load limitations
- Demolition projects

### » Prognosis and Monitoring:

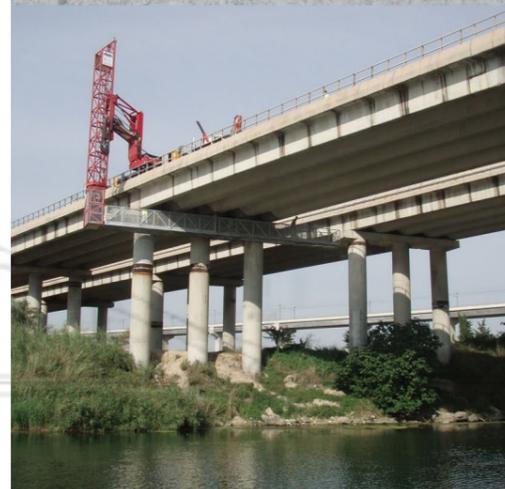
- Maintenance and integral preservation plans
- Training Plans
- Monitoring and follow-up campaigns
- Audits



Inventory, inspection and assessment. Bridges and Tunnels in AUSOL Highway CINTRA



Subaquatic inspection. Foundations of a bridge in the A002 Highway.General Road Network Ministry of Public Works.



Special inspections in concrete viaducts. Road Administration

It is becoming increasingly accepted that having a management tool based on technical and economic criteria, agreed upon by the technicians of the Public Administrations and specialists in design and construction, allows a great reduction in operating costs over the whole building lifecycle (design, construction, maintenance and demolition).

This perception is gaining popularity among owner or manager Administrations, consultants, technology providers and other professionals that, in an inevitably multidisciplinary environment, must work hand in hand during the infrastructure operation phase. It is important to note that 60% of the projected construction sector investment in Spain for 2010 corresponds to operation (repair, strengthening, rehabilitation, change of use, heritage preservation, etc) and 40% corresponds to new works, so the trend of recent years has been reversed and there is a tendency to converge with what is already happening in countries like Germany, Britain, Italy or France.



Repair Project and Construction management of a Bridge in N-502 - Road Administration.

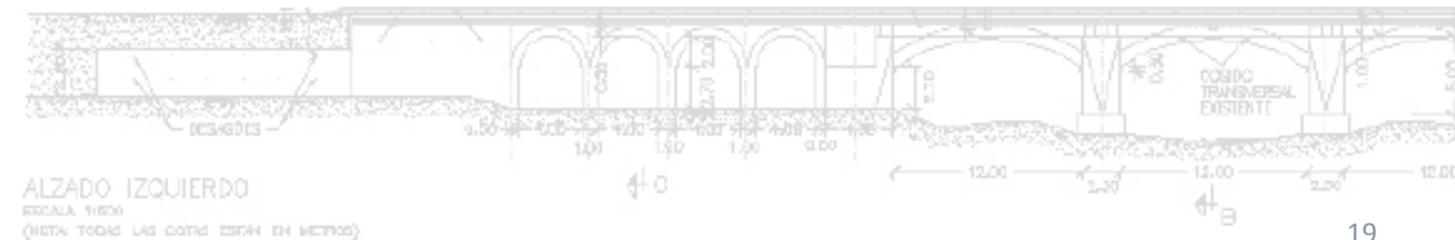
The ultimate goal therefore is to provide the various administrations with a tool that allows them to make swift decisions that make maintenance more efficient. This is the context in which the INES team has been created.

On one hand, INES has a staff that specializes in the development of infrastructure projects, in developing infrastructure management systems and in operation engineering. On the other hand, the company specializes in the development and integration of geographic information systems and relies on specialized personnel and the software and hardware tools necessary to tackle this type of work most effectively.

Finally, its recent experience has involved working on maintenance and management projects with Public Administrations (ADIF, Public Works Ministry and municipalities), private customers (CINTRA, ABERTIS, ITINERE, etc.) and International Organizations (UIC).



Studies for the Conservation and Restoration of the Erbil Citadel. IRAK. UNESCO





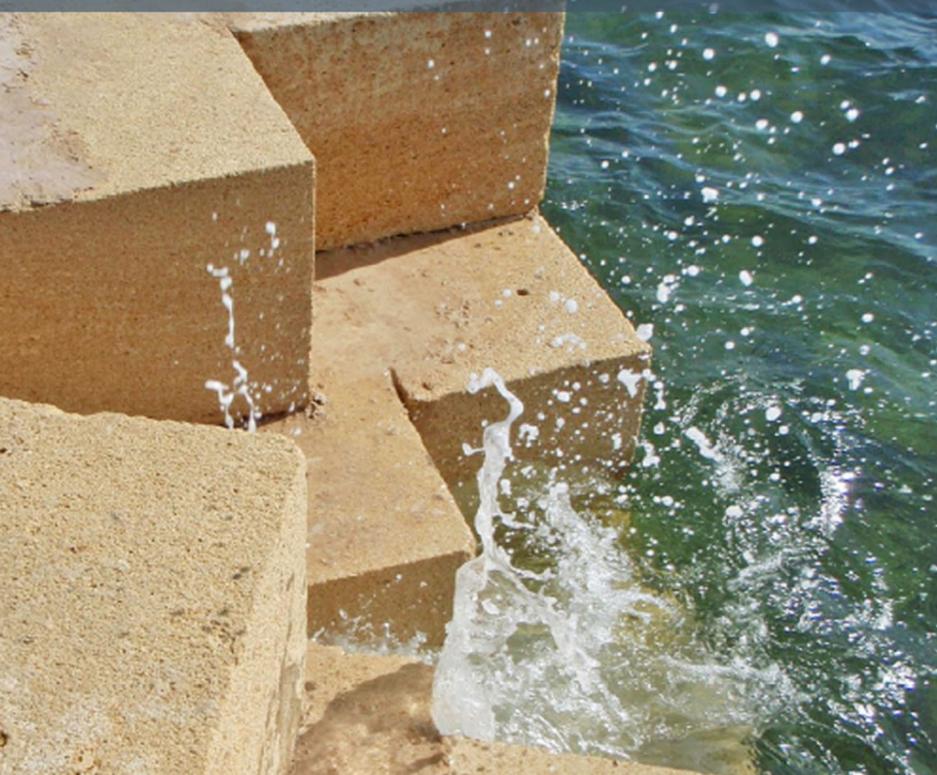
# Social and Cultural Heritage

The career of INES Ingenieros in the analysis, study and evaluation of the country's social, cultural and industrial heritage over the past few years allows it to address refurbishment, rehabilitation and adaptation projects of the different properties of cultural interest from a multidisciplinary, objective and efficient point of view.

The different and complementary training of members of INES Consultant Engineers (architects, engineers, petrologists, chemists, etc) allows the cultural elements to be objectively and reliably treated from the first phase (preliminary studies) to the last (drafting of comprehensive maintenance plans). Its recent experiences have received prizes and distinctions.

Moreover, INES spends much of its time and energy participating in research projects whose ultimate goal is to identify, document and preserve our heritage. The recognition and refurbishment of these assets is equivalent to valuing and recognizing the importance of our culture and history.

Project and Construction Management. Integral Rehabilitation of Sancti-Petri Castle. Cádiz. Spain

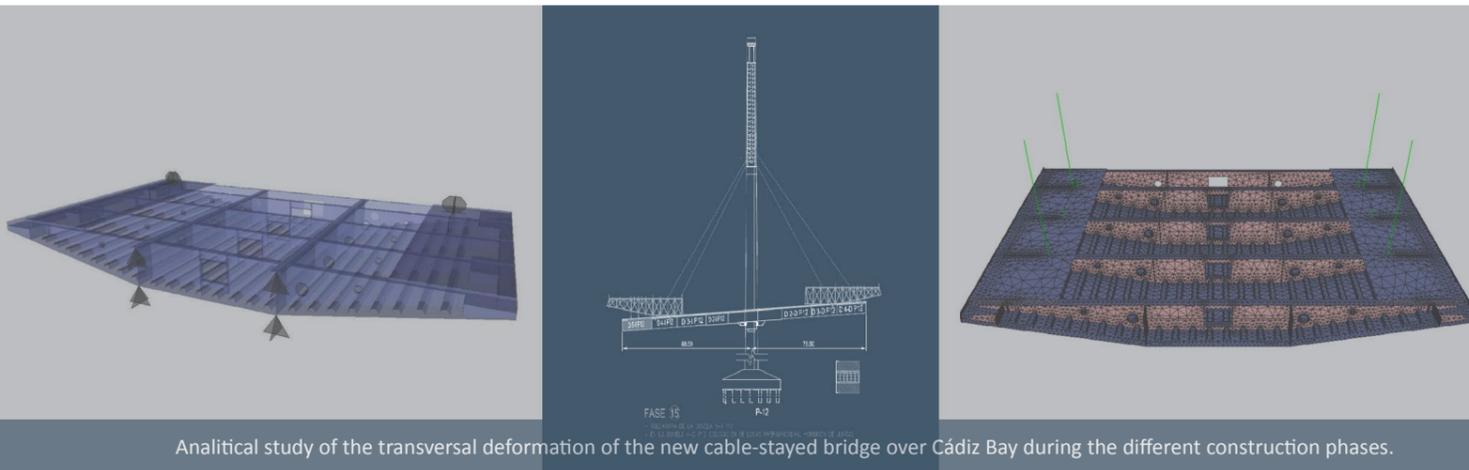


- Cataloguing and identification of cultural properties
- Implementation of previous studies in
  - History
  - Materials
  - Construction
  - Structure
  - Etc.
- Refurbishment and protection projects
- Monument adaptation projects
- Implementation of comprehensive conservation plans
- Monitoring

## Structural Consultancy

Within the consultancy services related to structural behavior, it is important to note some highly specific studies such as those on the evolution of existing structures under new operating conditions (load and speeds) or scour and vulnerability studies, as well as general studies such as typological solutions, the monitoring and review of projects, etc..

It is important to be aware that a large number of structures were designed and built under a different legal context, some of them under pseudo-theoretical rules that, in some cases, have been in use for over 150 years. These structures are subject to very different loading conditions from their original operating ones, so it is necessary to study their behavior in service and under ultimate loads. Sometimes, the crossing of a special transport vehicle makes it advisable to analyze the structural response under these exceptional new loads.



Analytical study of the transversal deformation of the new cable-stayed bridge over Cádiz Bay during the different construction phases.

Another aspect in which INES has invested a great deal of time and energy (in both professional and research projects) is in the analysis of the vulnerability of different structural types of bridges under river bed action.

Analyzing structures correctly means they can be used more efficiently. From this point of view, INES is able to analyze, diagnose and adapt all kinds of materialized typologies to any material (concrete, metal, wood, masonry, factories of all types, etc).

## Material Consultancy

Construction materials are affected by changes in boundary conditions. Taken together, these actions are capable of modifying the properties for which the material was selected, significantly affecting its behavior and therefore the service life of the buildings. The characterization of materials and their durable state is therefore crucial when addressing the study of any type of built structure.

In response to the growing need of having to work with different materials in the field of engineering and consultancy, INES has developed a consultancy on materials, whose primary value is based on solid training and expertise in the field of traditional materials (stone, ceramics, lime mortar) and their application to the heritage restoration, and of modern organic and inorganic materials. This training and expertise have been gained over years of close collaboration with research centers. All this allows us to address any issues relating to building materials and maintenance and gives us the ability to design diagnostic lines and the necessary intervention solutions.



Durability studies of a concrete bridge in Barcelona

- **Structure durability studies.**
- **Petrological and petrophysical characterization of traditional masonry structure materials (stone, tile and lime mortar).**
- **Location of the likely source quarries of stone materials.**
- **Evaluation and diagnosis of the deterioration processes acting on the materials (damage mapping, mapping of wetlands and salt content).**
- **Assessment of suitability of products for the treatment of materials (factory, concrete, ceramics, mortars).**
- **Monitoring of the effectiveness of treatments to repair building materials.**
- **Quality control of materials applied to restoration**
- **Campaigns for the characterization of structures with aluminous cement.**
- **Assessment on the corrosion state of structures.**
- **Characterization of electrochemical corrosion parameters: power and electrical resistivity mapping.**
- **Characterization study of aggressive elements on construction materials and constructed elements.**
- **Studies on accelerated aggressive elements for concrete.**
- **Study of concrete structures affected by expansive reactions: formation of ettringite and alkali aggregate reactions.**
- **Effect of deicing salts on concrete.**
- **Monitoring of protection systems.**
- **Evaluation of cathodic protection facilities.**
- **Design of reinforcement protection systems.**

## ■ ■ ■ Technical-Economic Consultancy

The services covered in this section are an expression of the need for interaction between theory and economy in the new scenario of infrastructures.

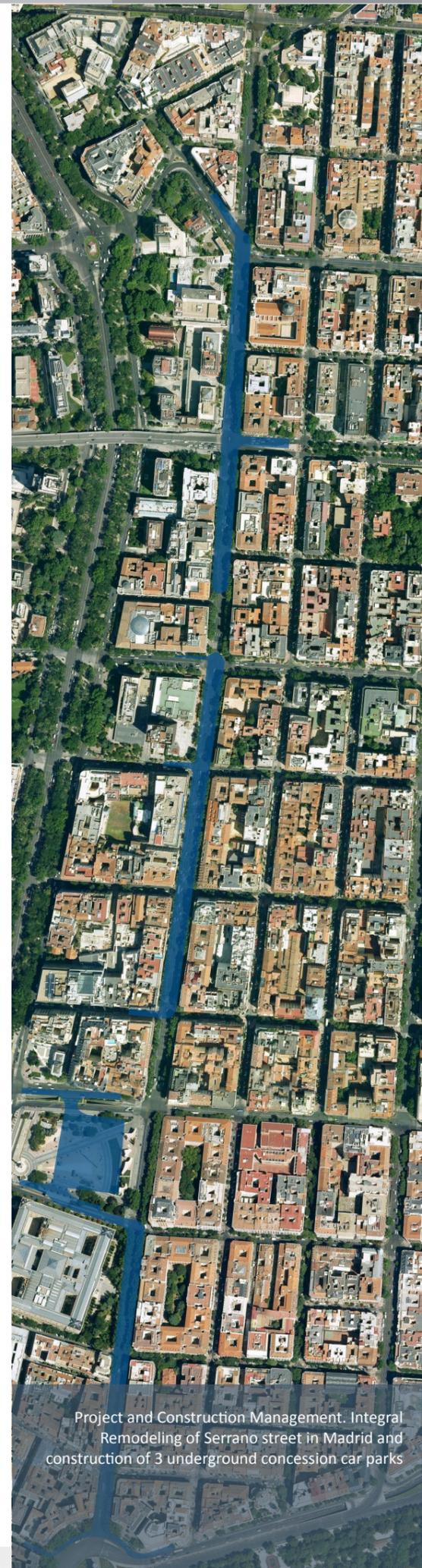
INES's experience in this sector in recent years working with both the government (Ministry of Public Works, ADIF, etc.), local authorities (municipalities, regional governments, etc) and private companies (CINTRA, ABERTIS, etc) allows us to efficiently focus on this analysis.

More than ever, the appearance and promotion of new scenarios for infrastructure financing requires an analysis and quantification of the risks from this dual perspective.

The feasibility and risk studies, analyzing the entire life cycle of an infrastructure (design and construction, maintenance and operation, repair, adjustment and demolition) form a key tool for the decision-making process.

Moreover, the audit of the infrastructure-related processes allows problems and mistakes in their management to be corrected.

The estimate of the various costs related to infrastructure management based on the structure and organization of the client facilitates the counseling to concessionary systems.



Project and Construction Management. Integral Remodeling of Serrano street in Madrid and construction of 3 underground concession car parks

## ■ ■ ■ Training Consultancy

The level of expertise and the team profile mean INES is highly qualified to provide specific courses on the above knowledge areas (structures, materials, geotechnical engineering, property, maintenance and operation, etc).

Moreover, these courses also can be tailored to suit the clients' needs.



INES Consultant Engineers wishes to remain in touch with research and technological development, so it is involved in research projects within European RDI programmes and works with technology centers, universities and governments.

Activities within the field of research and development projects generally fall within the framework of R&D programs (national or European) and of internal self-financed development programmes. Innovation is a priority in this company, and it thus invests in personnel and materials to develop methodologies and techniques as well as IT programs and applications to standardize the acquired knowledge and obtain a profit from it. These programs include the following:

- **Development of structural analysis tools**
- **Programming of databases and of structure management systems**
- **Development and implementation of instrumentation systems**
- **Development of methods for early detection of undermining problems**
- **Development of inspection and maintenance methodologies**
- **Development of specific repair techniques**
- **Development of monitoring techniques**

Research has been an important part of INES since its inception. It has carried out an average of three research projects per year, and it devotes 15% of its total working hours to it.

As evidence of the importance of this sector within the company, INES Consultant Engineers implemented standard UNE 166002: CERTIFICATION OF RDI MANAGEMENT SYSTEMS in November 2010.

