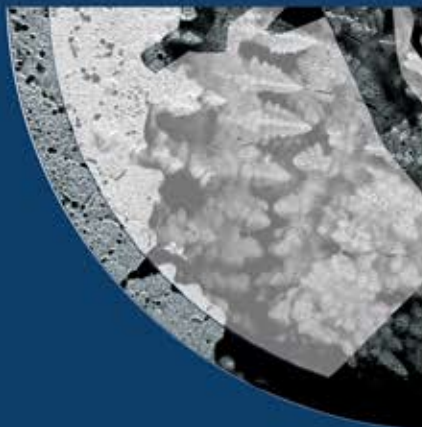




ITALIAN INSTITUTE
OF WELDING

Group of companies



IIS

THE IIS GROUP

The Italian Institute of Welding Group is constituted by the **Italian Institute of Welding** - a non profit Association - and three limited companies: **IIS CERT**, **IIS PROGRESS** and **IIS SERVICE** solely owned by the Italian Institute of Welding.

The IIS Group is characterized by a multidisciplinary and versatile structure, consisting of operating divisions specialized in different areas of expertise, offering comprehensive services in many industries, such as oil & gas, civil and industrial infrastructures, power generation, transportation, chemical, electromechanical and manufacturing, in Italy and abroad.

The IIS Group currently employs about 230 people.



The **Italian Institute of Welding** (IIS) currently employs about 70 people and promotes Laboratory services, institutional activities organizing technical events and conferences, coordinating marketing and commercial strategies for the Group as well as research and development; ensuring and managing the external relations through its media. Within IIS are main Group corporate services.

competence is



Official Magazine of the Italian Institute of Welding, since **1949**, the only Italian journal specialized in the field of Welding.

Authoritative Instrument of Technical and Scientific information, the **Italian Welding Magazine** publishes every two months, is freely sent to IIS Members, upon subscription of IIS Annual Membership.

The magazine can be received by subscription.

Info: www.iis.it



IIS CERT, Certification Body accredited by ACCREDIA, provides certification services for personnel, procedures, products and companies and operates as a Notified Body for the certification of conformity with EU Directives through the CEC (European Consortium Certification), consortium controlled by the IIS Group.



IIS PROGRESS performs theoretical and practical training of personnel in the field of joining and related technologies and disciplines. Supported by the Laboratory of IIS Group, it provides specialist education on welding and NdE advanced technologies and carries out tests for electronic components manufacturer.



IIS SERVICE provides services in the fields of inspection and NDT, engineering and technical assistance, both for new constructions and during operating life and maintenance, of welded components and structures, systems and industrial plants, during the phases of design, prefabrication, assembly, final testing and during in-service inspection.

an achievement

Our Vision

Our know-how and expertise in the field of joining has been built since **1948** by generations of highly motivated technicians and engineers: a long journey always undertaken with *impartiality* and *integrity*.

We want this will remain available to both the benefit of industry and anyone who strives to actively contribute to technological advancement, protecting HSE fundamental principles.

competence

*technological
transfer*

In providing our Clients with top quality professional services

The **IIS Group** still upholds as priority the primary objective that has distinguished it since its establishment: namely the aim to increase, spread and adopt know how in every area of the market its business arms operate in, in strict keeping with the brand original mission statement

IIS GROUP SERVICES



- Welding education and training
- Courses for NDT personnel
- Training courses in soldering in electronics
- Technological transfer
- Courses on adhesive bonding
- Training in the field of coating
- Customised training courses



- **NDT**
- NDT - Surface, Volumetric Non Destructive Testing
- Piping inspection - Long Range Guided Wave inspection
- Automated non destructive testing
- Detection of typical damage - Ultrasonic procedures for HTHA, SCC, SOHIC, HIC
- Non destructive testing for aboveground storage tanks
- Heat exchangers tubes inspection
- Metallographic replicas
- **Inspections**
- In-service inspection
- Our inspectors
- Technical and scientific support
- Pre-service Inspection
- Workshop and site inspection during fabrication stage
- Welding Inspection



- Welding engineering
- Structural integrity assessment
- Technical specifications
- Materials and Corrosion
- Tailored information tools
- Asset Integrity Management
- Technical support for the protection systems of industrial installations
- RBI analysis
- Decision Support System (DDS)



- Certification of personnel
- Products certification 
- Certification of fabrication processes
- Technical assistance
- Third party in-service inspections
- Management systems certifications
- IT services for documentation and certificates management
- VIS - Independent safety assessment of the railway sector
- Authorization ANSF - National agency for railway safety

*technical
impartiality*

integrity

In order to be acknowledged by all parties as fully independent and thereby consistently offering technical reference points highly regarded by Clients, competitors, institutions and market at large

In consistently pursuing long term relationships with Clients, partners, suppliers and staff alike

Laboratory

Technical events

- Failure Analysis
- Welding processes
- Pressure tests
- Physical and chemical analyses
- Microscopic and metallographic examinations
- Simulated Heat Treatments
- Corrosion tests
- Tests on anticorrosion coatings
- Non destructive examinations
- Calibration and verification of NDT equipment
- Conventional mechanical tests
- Fracture mechanics tests
- Fatigue tests
- Creep tests on metallic or thermoplastic materials
- Additive Manufacturing

Technical events are an important statutory activity that the Italian Institute of Welding has been carried on for over 50 years, to spread the knowledge in all fields where welding and related technologies are used. IIS Group schedules every year many educational, technical and scientific workshops and conferences encountering the approval of experts



*from Genoa
worldwide*

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GRUPPO IIS
ISTITUTO ITALIANO
DELLA SALDATURA
www.iis.it

Education and Training



Since IIS has been founded, education and training has been an essential activity.

The first course run in IIS was the "specialization course for Engineers and Technologists" (1952). This course has been updated through the years, until it has been included as a whole in the EWF and IIW courses for personnel with responsibilities for welding coordination activities, as a result of the international harmonization process in the field.

Since then, education and training offered by IIS has been growing in the extent, covering almost all welding and related technologies.

Being strictly linked with the industrial world is one of the most appreciated features of IIS education and training activities; as a matter of fact, *technological transfer of industrial experience of the IIS Group and of industrial best practices* is a part of the IIS mission. This is achieved also through the on field experience of teachers and instructors involved, as it is transmitted through the courses.

Similar attention is paid to the education and training materials, which include customised reference textbooks and presentations, a large number of representative specimens and richness of equipment as per quantity and quality.



WELDING EDUCATION AND TRAINING

- Education and training according to other IIW and EWF qualifications
 - Heat treatment of Welded Joints (PWHT)
 - Laser welding and cutting
 - Welding of reinforcing bars
- Introduction to welding fabrication (Corso celere)
- Practical courses for underwater welding
 - European MMA Diver Plate Welder
 - European MMA Diver Tube Welder
- Education and training of responsible welding coordinators in accordance with requirements of EN 1090-2
- Courses on Quality Management, Health, Safety and Environment in welding
- Practical courses for Welders and Operators - Metallic Materials
 - Shielded Metal Arc Welding (SMAW)
 - Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW)
 - Oxyfuel Welding (OFW)
 - Gas Tungsten Arc Welding (GTAW)
 - Plasma Arc Welding (PAW)
 - Submerged Arc Welding (SAW)
 - Welding of structural steelwork
 - Pipeline Welding
- Courses for Plastic Welding Personnel (PE - PP - PVC - PVDF - GFRP)
- Training courses for the qualification of Welding Coordinators according to IIW and EWF
 - International Welding Engineer (IWE)
 - International Welding Technologist (IWT)
 - International Welding Specialist (IWS)
 - International Welding Practitioner (IWP)
- Education and training of Welding Inspection personnel
 - International Welding Inspector - Comprehensive (IWI-C)
 - International Welding Inspector - Standard (IWI-S)
 - International Welding Inspector - Basic (IWI-B)
- Courses for new professional figures for robotic processes
- Additive Manufacturing Technology PBF-LB

COURSES FOR NDT PERSONNEL (EN ISO - ASNT)

- Courses for NDT personnel
 - Visual Testing (VT)
 - Magnetic Particle Testing (MT)
 - Penetrant Testing (PT)
 - Radiographic Testing (RT)
 - Ultrasonic Testing (UT)
 - Leak Testing (LT)
 - Eddy Current Testing (ET)
 - Infrared Thermographic Testing (TT)
 - Computed Radiography (CR)
 - Phased Array (PA) Ultrasonic Testing
 - Time-of-Flight Diffraction (TOFD) Ultrasonic Testing
 - Mechanized Ultrasonic Testing
 - Magnetic Flux Leakage (MFL) Testing

TRAINING COURSES IN SOLDERING IN ELECTRONICS

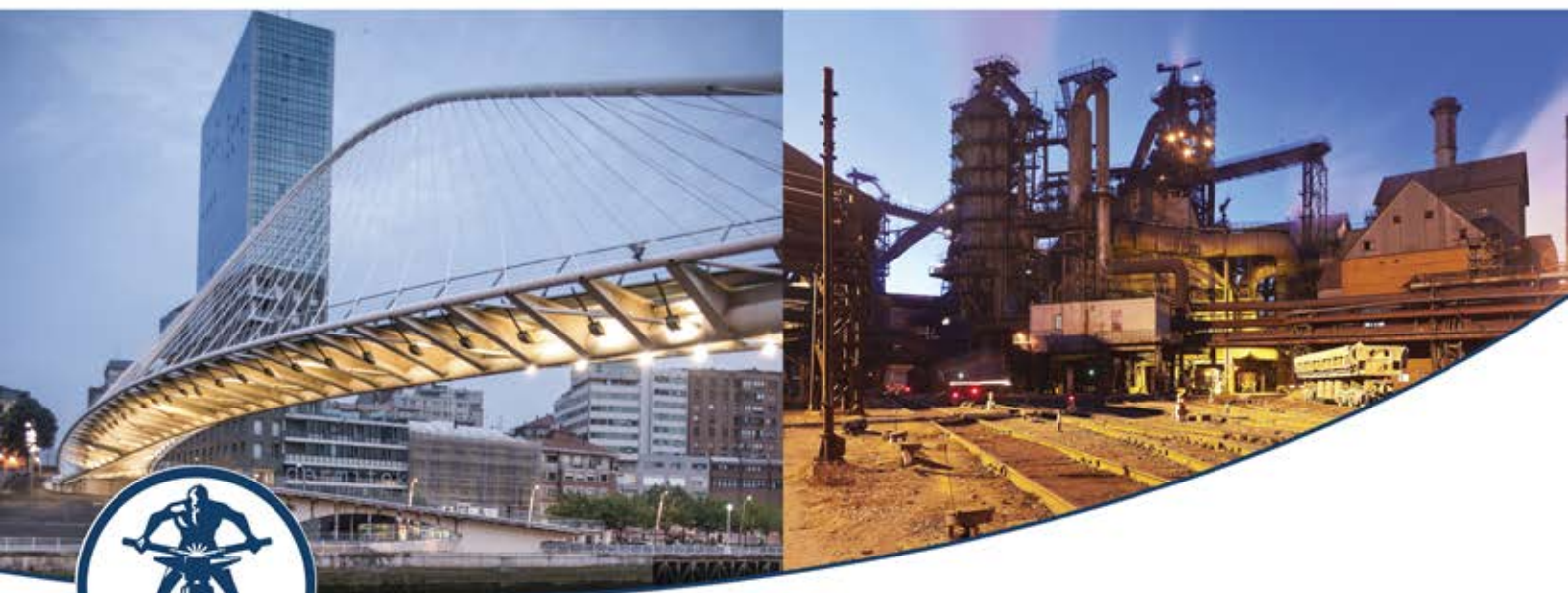
TECHNOLOGICAL TRANSFER

COURSES ON ADHESIVE BONDING

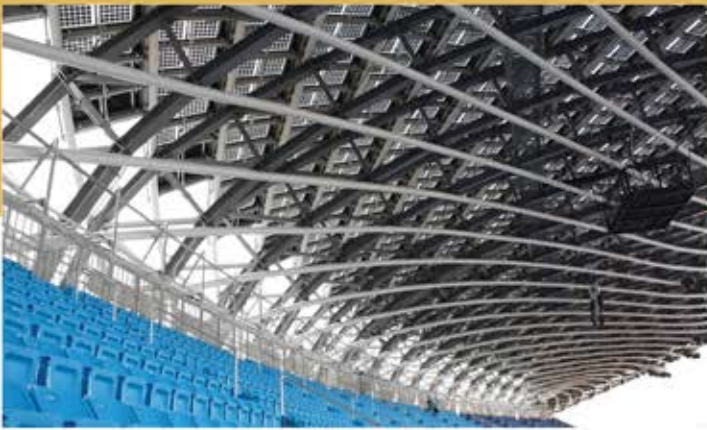
TRAINING IN FIELD OF COATING

CUSTOMISED TRAINING COURSES

TRAINING COURSES IN CORROSION AND SERVICE



Inspection and NDT



The **IIS Group** operates in the field of inspections and testing with about 60 Qualified Inspectors, capable of performing second and third party inspections, non destructive testing with different methods, expediting, QA/QC functions, on site inspections.

At shortest notice our inspectors can be operating at any location, in Italy and abroad, in workshops, construction yards, plants, to perform inspections and tests on pressure equipment, steel structures, piping.

IIS Group provides inspectors for supervision and coordination of inspection and NDT activities carried out in MTA of petrochemical and power generation plants.

Inspections on most critical equipments are performed directly by our inspectors. Training and experience of IIS Group inspectors are key issues which allow plant users' needs to be met.

We have accomplished inspections and in-site NDT in a large number of countries. More than 70 countries in the last ten years.

NDT

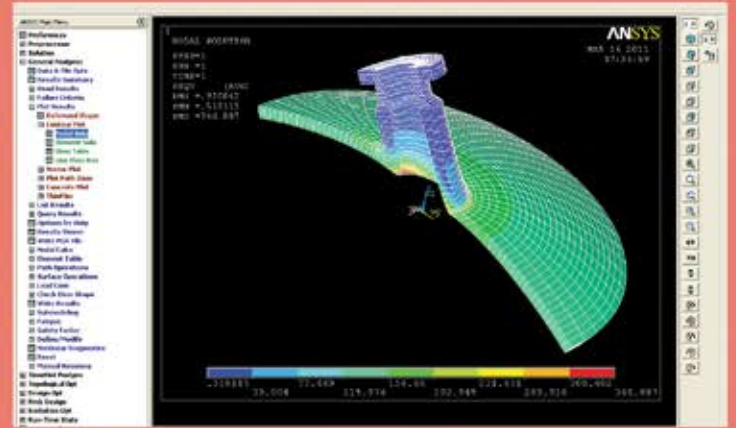
- Automated non destructive testing
 - P-SCAN for materials and welds ultrasonic remote testing
 - PAUT (Phased Array Ultrasonic Testing)
 - TOFD (Time of Flight Diffraction)
- Detection of typical damage - Ultrasonic procedures for HTHA, SCC, SOHIC, HIC
 - HTHA - High Temperature Hydrogen Attack
 - SCC - Stress Corrosion Cracking
 - SOHIC - Stress Oriented Hydrogen Induced Cracking
 - HIC - Hydrogen Induced Cracking
- Non destructive testing for aboveground storage tanks
 - Acoustic Emission
 - Floor Scanner for the bottom
 - Dimensional check - verticality
 - UT testing for shell by magnetic crawler
- Heat exchangers tubes inspection
 - Eddy currents
 - IRIS technique
 - Remote field
 - MFL - Magnetic Flux Leakage
- Metallographic replicas
- NDT - Surface, Volumetric Non Destructive Testing
 - Visual testing VT
 - Magnetic particle inspection MT
 - Penetrant testing PT
 - Ultrasonic testing UT
 - Leak testing LT
 - Hardness testing
 - Portable parent material identification PMI
 - Alternating Current Field Measurement ACFM
 - Metallographic replicas
 - Organic and anticorrosion coating inspection and testing
- Piping inspection - Long Range Guided Wave inspection
- Pulsed Eddy Current technique
- HandySCAN technique
- Terrestrial Laser Scanner technique

INSPECTIONS

- Pre-service Inspection
 - Ultrasonic testing for thickness measurements with as built thickness mapping
 - Ultrasonic testing of welds recording most relevant indications even if they are acceptable according to reference fabrication codes
 - Metallographic replicas: location mapping and recording of microstructures
 - Surface NDT and recording of most relevant indications
- Workshop and site inspection during fabrication stage
- Welding Inspection
 - Base materials, filler materials, welding machines
 - Fit-up and pre-assembly check
 - Check or definition of proper welding sequences
 - Check of welding parameters
 - Technical advice for solving welding and assembly concerns
 - Steady relationship with QA/QC functions and Site Management
- In-service inspection
- Our inspectors
 - IWI International Welding Inspector
 - IWE - IWT - IWS
 - CSWIP (TWI)
 - AWS CWI (QC1) Inspector
 - Liv. 2 NDT
 - Liv. 3 NDT
 - FROSIO Painting Inspector
 - NACE Coating/Corrosion Inspector
 - Plant Inspectors and 2 ASME Lev. 1 Plant Inspectors
 - API Inspectors (510, 570, 653)
 - ASME PCC-1 Inspectors
 - Painting Inspectors - AICQ
- Technical and scientific support
- QA/QC inspection
- Expediting
- Inspections by drone



Engineering



IIS SERVICE boasts an Engineering Division provided with the most advanced tools and expertise to take on complex problems of structural engineering, process engineering, material and corrosion engineering, RBI analysis.

FEM analysis and **calculations** addressed to structural evaluations, life assessments, fatigue and thermo-mechanical verifications are accomplished by IIS SERVICE adopting the most sound and reliable international software (ANSYS, Autopipe and other).

IIS SERVICE supplies materials engineering expertise to help Clients in preparing material requisition documents and recommending supplementary requirement in order to ensure the expected performance of materials and components. Drafting and revision of manufacturing procedures and general recommendations for welding are provided.

IIS SERVICE and Corrosion: expertise in inspection and failure analysis and the updating knowledge in process engineering, have produced an original and, by now, well tried approach to corrosion studies.

Risk Based Inspection is a leading supporting service for the IIS Group. RBI analysis are accomplished adopting **API 580-581** approach.

The integration within other Group departments, such as advanced NDT and Laboratory testing, allows us to supply our Clients with exceptionally powerful tools for the assessment of the reliability of components and plants, for Fitness for Service and life extension evaluations, and for structural integrity issues at large.

STRUCTURAL INTEGRITY ASSESSMENT

- Stress analysis of piping equipment
- Structural analysis and design of pressure vessels
- Repair / modification design of pressure equipment
- Structural assessment of lifting appliances
- Structural analysis of atmospheric storage tanks
- Fitness For Service (FFS) & Engineering Critical Assessment (ECA)
- Residual life assessment for pressure equipment:
 - Preliminary residual life evaluation
 - Inspection, metallographic examinations and NDT planning and execution
 - Residual life assessment and life extension evaluation
 - Designer declaration for further service time for the legal obligations.
- Repair / modification design of civil structures, lifting appliances and mechanical components
- Assessment of fatigue life for civil structures, lifting appliances and mechanical components
- Pipelines reliability assessment:
 - Smart Pig inspection data processing
 - Conventional or smart Pig inspection data processing

MATERIALS AND CORROSION

- Material and corrosion engineering - Material Selection
- Evaluation of the damage mechanisms affecting pressure equipment and piping

WELDING ENGINEERING

- Technological design verification
- Conception and technological design of welding
- Comparative evaluation of compliance with different fabrication codes

ASSET INTEGRITY MANAGEMENT

- RBI Assessments (Risk Based Inspection)
- RAMS Assessment (Reliability, Availability, Maintainability, Safety)
- RBI (Risk Based Inspection) for road and railway infrastructures



TECHNICAL SUPPORT FOR THE PROTECTION SYSTEMS OF INDUSTRIAL INSTALLATIONS

- SRMCR (Safety Related Measurement Control and Regulation) - PSV (Pressure Safety Valve)

TECHNICAL SPECIFICATIONS

- Mothballing Operative Procedures for equipment and plants
- Drafting and revision of technical specifications for procurement, fabrication and repair:
 - Material / component procurement specifications establishing supplementary or particular requirements for quality or safety that allow to reach the expected performance
 - Fabrication specifications and procedures
 - Welding and PWHT procedure specifications
 - NDT specifications
 - Coating specifications
 - Repair specifications and procedures
- Piping Design Specifications

TAILORED INFORMATION TOOLS

- Development of software routines and tailored information tools



Certification



The **IIS Group** operates in the field of certification through its own company IIS CERT, providing its Clients with certification of quality management systems, environment and safety, manufacturing processes, materials, products and personnel.

A distinguishing feature since the establishment of the **IIS Group** is the strict link with the industrial world in materials production, fabrication processes, in service requirements and performances of components and structures, knowledge and consistent updating about standards and regulations: this feature is perceptible through the daily activity of our Inspectors and Auditors and their hands on experience.

IIS CERT is a Brussels notified institution with the number 0475 EC and operates accreditations **ACCREDIA** and authorizations for the European Federation for Welding, Joining and Cutting (**EFW**), International Institute of Welding (**IIW**), the Ministry of Economic Development and the National Agency for the Safety of Railways (**ANSF**).

In addition IIS CERT is the reference partner of **CEC** (European Certification Consortium), through which it carries out conformity assessment of products under the Directives **PED** and **TPED**, as well as periodic inspections of in service equipment according to the current legislation regarding the safe use of them.



MANAGEMENT SYSTEMS CERTIFICATIONS

- Quality Management System ISO 9001
- Health and Safety Management System OHSAS 18001
- Environment Management System ISO 14001

CERTIFICATION OF PERSONNEL

- Welders and Welding Operators for metallic materials
- Other Professional Careers
- Certification of NDT (Non Destructive Testing) Personnel Welder for plastic material
- Certification of personnel in soldering in electronics (ESA/IPC)
- Professional Careers in bonding
- Professional Careers in Corrosion Protection (painting, thermal spraying)
- Certification of welding coordinators and welding inspectors

PRODUCTS CERTIFICATION

- Conformity assessment of fluid transport piping systems in railway crossing
- CE Conformity for Simple Pressure Vessel - SPVD
- CE Conformity and Independent Safety Assessment (ISA) in the European and National Railway System
- CE Conformity for Construction Product (CPR 305/2011)
- CE Conformity assessment in the field of pressure equipment (PED - TPED)

TECHNICAL ASSISTANCE

- Technical support for the interpretation of European Product Directive and Regulation (PED, TPED, ATEX, SPVD, LVD, EMC, Machinery, RoHS, CPR 305)
- Technical support for the correct interpretation the National Legislation DM 329/04 and D.Lgs. 81/08
- Suppliers technical capabilities assessment

CERTIFICATION OF FABRICATION PROCESSES

- Welding Fabrication Process for railway vehicle - EN 15085
- Welding Fabrication Process for civil engineering construction works - EN 1090
- Bonding Fabrication Process
- Welding Procedure Specification (WPS)
- Painting processes
- Certification of the welding fabrication process - ISO 3834

IT SERVICES FOR DOCUMENTATION AND CERTIFICATES MANAGEMENT

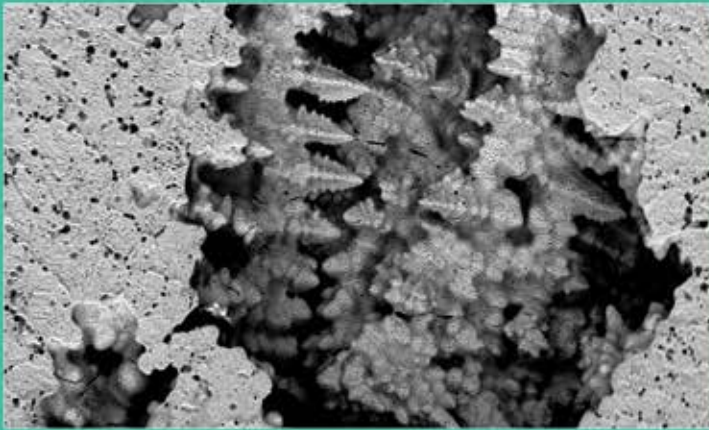
- IIS CERT Certificates ON LINE

THIRD PARTY IN-SERVICE INSPECTIONS

- Periodic inspections on transportable pressure equipment
- Periodic Inspection on pressure and lifting equipment
- Periodic inspection of electrical installations as per Italian regulation DPR 462/04
- Technical assistance for inspection intervals extension



Laboratory



The laboratory of IIS GROUP is divided into **Testing Laboratory**, specialized in mechanical, technological, and special tests, and **Welding Processes Laboratory** where research, experiments, studies and setups are carried out with traditional and advanced welding processes.

The Testing Laboratory is accredited by **ACCREDIA** (National System for the Laboratories Accreditation) - Cert. nr. 0029 according to **UNI CEI EN ISO/IEC 17025 - 2005 standard** - for the execution of the most conventional tests on metallic and plastic materials. At the laboratory facilities fracture mechanics tests, creep tests, corrosion tests and tests in the field of microjoining are available.

The experience gained in metallography and corrosion, integrated with structural engineering competencies are adopted to undertake mechanical damage analysis and to perform metallurgical studies.

The laboratory can boast a longstanding experience in the design of testing programs related to the behaviour of base materials and welded joints, and addressed to failure analysis. The annexed mechanical workshop allows the set-up of mock-up and of particular test equipments to carry out full-scale tests on small and medium components.



LAB N° 0029

LABORATORY TESTING

- Pressure tests
- Physical and chemical analyses
 - Chemical analysis with Optical Emission Spectroscopy (OES)
 - Semi – quantitative chemical analysis with EDS
 - Diffusible Hydrogen and/or water content of welding consumables
 - Chemical and physical tests on electronics components
 - Welding Fumes and emissions rates analysis
- Microscopic examinations
- Metallographic examinations
- Simulated Heat Treatments
- Corrosion tests
 - Environmental accelerated testing type ASTM B117 (neutral salt spray, acetic and cuproacetic salt spray)
 - Pitting and intergranular corrosion test on stainless steels and nickel alloys according to the most common international standards (ASTM G48, ASTM G28, ASTM A262, ASTM A763) and Customer specific/custom (SAIPEM SPC. CR . UR. 510 rev. 04)
 - Crevice corrosion test on stainless steels, nickel alloys, titanium alloys and aluminum alloys
 - Stress corrosion cracking (SCC) test on stainless steel (ASTM G36) and copper alloys (ASTM B858, ASTM G37)
 - Corrosion and stress corrosion cracking (SCC) test of aluminum alloys
 - Dezincification corrosion tests of copper alloys.
- Tests on anticorrosion coatings
- Non destructive examinations
 - Visual Examination (VT)
 - Ultrasonic Test (UT)
 - Advanced Techniques Ultrasonic Test (AUT)
 - Film or Computer Radiographic Examination (RT)
 - Magnetic Particle Examination (MT)
 - Dye Penetrant Examination (PT)
 - Leak Testing (LT)

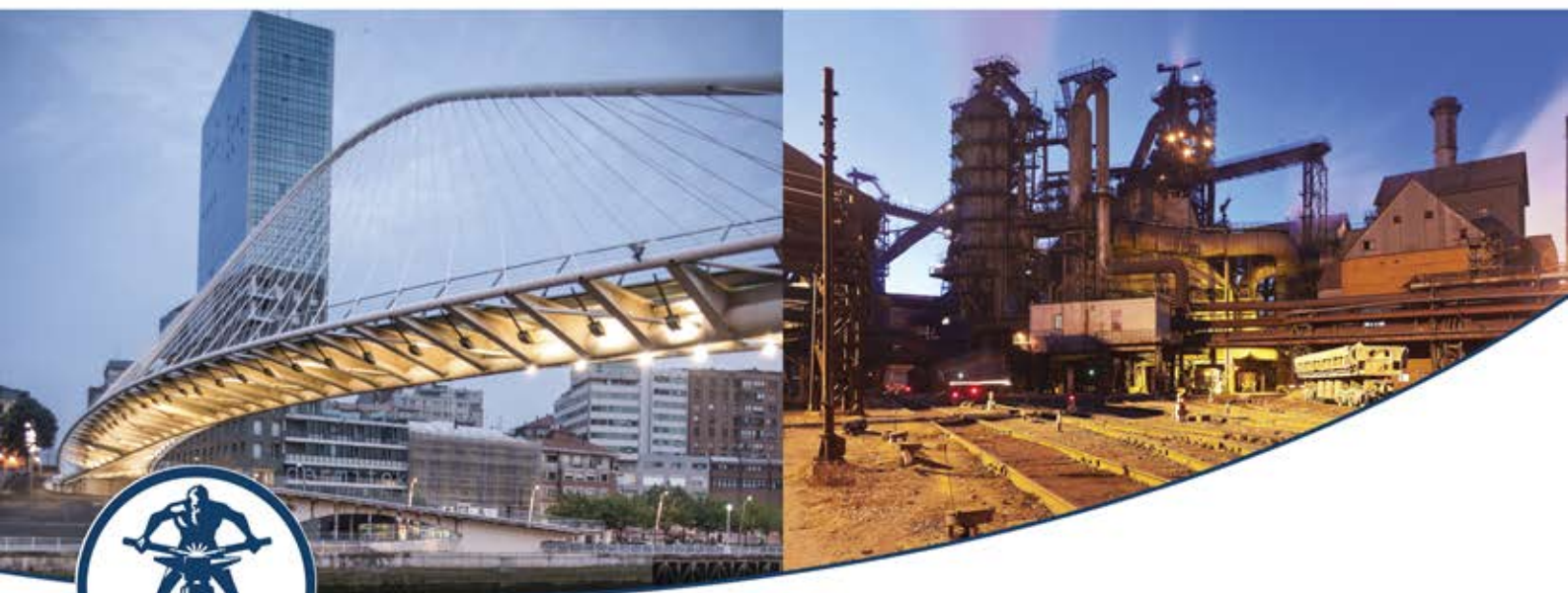
- Calibration and verification of NDT equipment
 - Verification of the effective focal spot dimension of industrial X-Ray tubes
 - Verification of the penetration power of industrial X-Ray tubes
 - Verification of optical densitometers for Industrial films
 - Verification of industrial illuminators for radiographic films
 - Characterisation and verification of the black light intensity of for magnetic particle or dye penetrants examinations
 - Verification of the lifting power of yokes for magnetic particle examination
 - Verification of probes for Ultrasonic examination - Conventional or advanced Techniques
- Conventional mechanical tests
 - Metallic alloys
 - Plastics materials
- Fracture mechanics tests
- Fatigue tests
- Creep tests on metallic or thermoplastic materials
- Laboratory tests in the field of Microjoining

FAILURE ANALYSIS

ADDITIVE MANUFACTURING

WELDING PROCESSES

- Welding Laboratory
 - Powder plasma transferred arc (PTA)
 - Submerged arc welding with square wave 1000 A power source
 - Robotised welding cell with GMAW-CMT, Fiber Laser (with 3 kW source) or Laser Hybrid
 - Solid state Friction Stir Welding (FSW) for aluminum / magnesium alloys, steels, nickel or titanium alloys
 - Automatic Laser CO2 (with 6 kW source)
- Technical assistance for welding consumables and equipment manufacturers



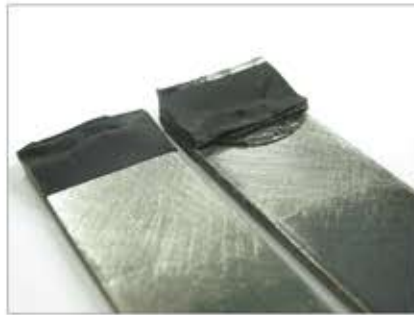
IIS Adhesive Bonding



Over the last years, the whole industrial sector has been living a deep technology innovation. The introduction of new high performance materials, such as Ultra High Strength Steels (**UHSS**), aluminium alloys and, particularly, polymer based composites (i.e. **CFRP** or **GFRP**) established the needs for the development of new and more advanced joining processes.

Adhesive bonding technology represents an effective solution to realize low weight, high performances multi-material hybrid structures. Like welding techniques, adhesive bonding is a special process, hence a deep theoretical knowledge of its working principles as well as an integral process management is required.

The **Italian Institute of Welding Group** keeps pace with this technology innovation by offering new training, laboratory and support services to the Customers which deals with adhesive bonding process.



EDUCATIONAL AND TRAINING PROGRAMS FOR PERSONNEL QUALIFICATION

The use of adhesive bonding as the main joining technique to manufacture components is getting more and more common for many realities. The diffusion of this process produced a growing demand for new working figures characterized by specific theoretical and practical skills to perform and manage the bonding process and all the related activities in a proper way.

IIS PROGRESS meets the needs of this new industrial scenario by offering different educational and training programs specifically developed on the basis of the requirements established by the European Welding Federation (**EWF**), which are already implemented in many technical codes and industrial standards, such as German **DIN 6701** standards or **AICQ** guidelines for the railway sector.

Particularly, three training programs for the qualification of the following figures have been outlined:

- Adhesive bonding process coordinator at Engineer level (European Adhesive Engineer - **EAE**)
- Adhesive bonding process coordinator at Specialist level (European Adhesive Specialist - **EAS**)
- Adhesive bonding operators (European Adhesive Bonder - **EAB**).

In order to support the pressing market needs, which are strictly linked to an increasing pace of production, **IIS PROGRESS** organizes different training sessions during the year. In addition, specific in-house training session can be arranged.

CUSTOMER SUPPORT SERVICES AND ADHESIVE BONDING PROCEDURE QUALIFICATION

The Italian Institute of Welding Group provides a specific assistance service to Customers dealing with adhesive bonding activities, offering the support of qualified **EAE** personnel to setting up and manage the whole adhesive bonding manufacturing process. Particularly, assistance for the definition of the substrates and adhesives, for the evaluation of the best surface treatment, for the definition of the process parameters, as well as for working instruction editing are provided.

In addition, IIS also give support for the qualification and certification activities performed according to the main International standards (i.e. German standard **DIN 6701**).

CHARACTERIZATION OF JOINT PERFORMANCES

IIS GROUP is provided with an advanced laboratory equipments to perform different tests according to the main reference standards, such as **UNI, ISO** or **ASTM**. These laboratory test are carried to define the mechanical/physical properties of the bonded joint or of the adhesive itself, as wells as to assess the long term properties of the joint under real working conditions.

Particularly, the following test can be performed

- Tensile, compressive, shear and bending strength
- Impact tests
- Static test for the assessment of the adhesive behaviour under creep
- Fatigue tests
- Ageing tests
- Corrosion resistance test
- Characterization of the glass transition temperature.

FAILURE ANALYSIS

The reliability of an adhesive bonded joint is strictly related to its ability to guarantee its own functionality in the different working condition and for all its working life, for which it has been designed. This ability results from complex chemical and physical interactions which occur between the adhesive, the substrates and the environment.

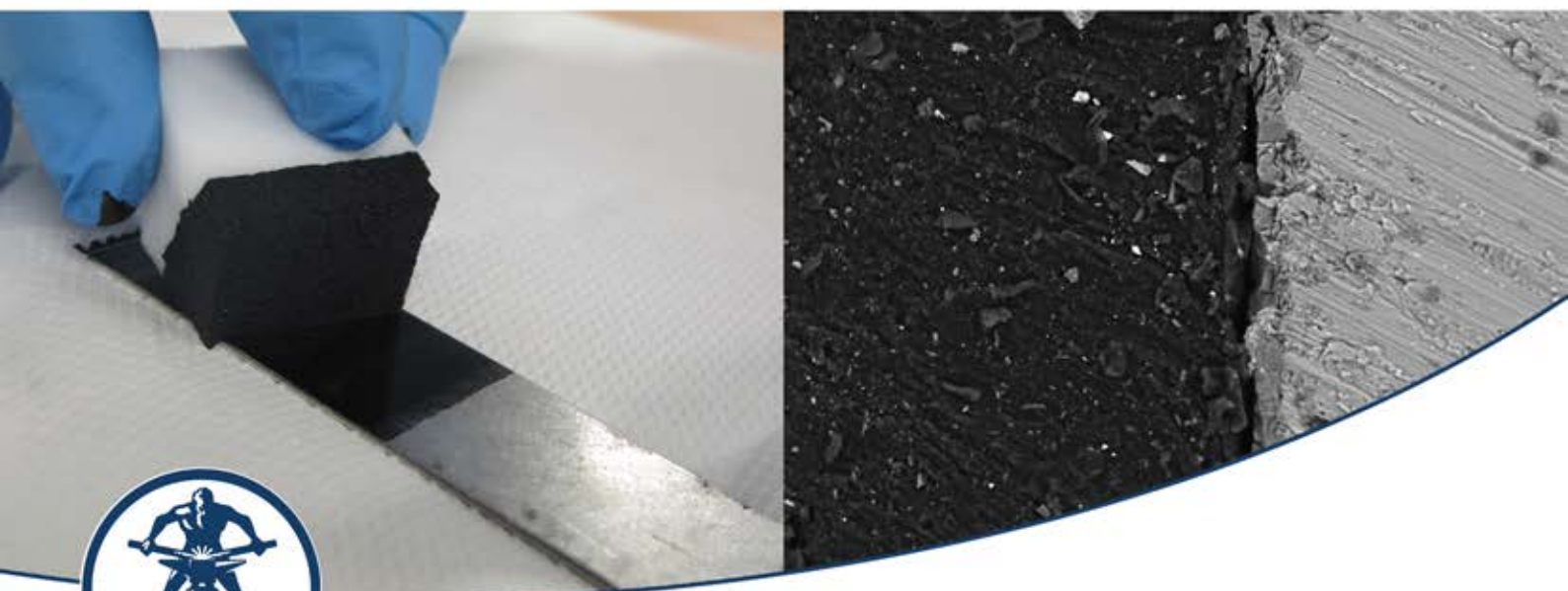
However, there are many external factors that can jeopardize the reliability of a bonded joint, causing a sudden and premature failure with serious economical and safety-related consequences. The influence of the external environment, the presence of contaminants, not expected stress states or, as often occurs, an improper management of the process can be really critical for the joint integrity. Hence, finding out the causes which are at the basis of a failure is extremely complex and require a great experience in order to be able to "read" and understand the indications observed.

IIS GROUP offers its experience and its advanced equipment to support Customers in these complex failure analysis activities, which are necessary to prevent critical and dangerous situations in the future



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IIS Coating



Corrosion damages can produce deep alterations of the structural properties of metallic components affecting both their safety and functionality. An effective modern corrosion mitigation management process is therefore essential to ensure the state of the art service reliability and to reduce direct and indirect costs arising from a corrosion failure. In this context, failure of a specific corrosion protection system means additional costs for maintenance, loss of production, damage of image and more.

The **Italian Institute of Welding Group**, founded in **1948**, supported Clients offering high quality services mainly in the field of education, research, certification, diagnostic (NDT) and technical assistance. Nowadays, the Italian Institute of Welding Group has implemented its own services offering its Clients a complete and integrated technical support in order to manage and solve corrosion related issues as analysis and interpretation of damages and mitigation & protection systems optimization against corrosion.

In the specific field of corrosion protection by coating, the IIS Group can offer services as :

- Training, qualification and certification of professional careers specialized in the activities of coordination, inspection and application of coating systems
- Coating cycles qualification and certification by LAB tests
- Qualification of coating systems application processes
- Third-party inspections of Applicators quality process
- Support in developing technical documentation
- Inspection & Coordination of corrosion protection processes
- Failure analysis.



TRAINING AND CERTIFICATION OF PERSONNEL

The IIS Group offers specific training courses in the field of protective coatings, including courses specifically aimed at qualifications/certifications in accordance with Corrosion Protection Guideline for Railway industry issued by AICQ, with particular reference to the following professional profiles.

- Corrosion protection coordinator in railway industry (**CCF**)
- Non-destructive and destructive testing inspector for corrosion protection systems in railway industry (**ICF**)
- Operators (applicators) of corrosion protection systems in railway industry (**OAF**).

All courses are organized in theoretical parts, tailored on the type of course, and practical parts.

PROTECTIVE COATING SYSTEMS APPROVAL AND CERTIFICATION

The IIS Group is able to carry out LAB tests (**UNI, ISO, ASTM**) as part of the certification/approval procedure of protective coating systems for different industrial sectors: transportation, Oil & Gas and civil structures. Tests allow to verify the properties of the coating systems with regard to corrosion resistance, heat/thermal shock resistance, chemical resistance, abrasion resistance, in order to ensure regulatory requirements as far as service reliability.

In addition, the IIS Group provides LAB tests focused to evaluate long term in service expected performances of paints and coatings, in order to minimize the uncertainty associated to the "selection/ definition" of best performing coating system during design phase of components.

THIRD PARTY INSPECTIONS OF APPLICATORS QUALITY PROCESS

IIS Group with expert personnel is able to assist Clients through inspection and certification activities of anticorrosion systems applicators as far as through surveillance and certification renewal processes.

ASSISTANCE IN DEVELOPING TECHNICAL DOCUMENTATION

IIS Group can support Clients in the preparation and revision of Painting Specifications, Inspection Test Plans (ITP) and Quality Control Plans (QCP) for surface protection activities.

TECHNICAL ASSISTANCE, COORDINATION, INSPECTION AND CONTROL

Historically, the Italian Institute of Welding Group has been involved, providing its services, in activities related to steel infrastructures (bridges, viaducts, etc), steel works related to Oil & Gas sectors, pressure vessel and piping.

In particular for corrosion protection activities, IIS is able to offer support by Inspectors certified by NACE and FROSIO (2 and 3 level), with survey of the entire process of corrosion protection by protective coatings (organic, hot dip galvanizing, metallization, etc.), from the selection of products to surface preparation, application and NDT.

IIS Group also has AICQ-CCF certified coordinators able to perform supervision and inspection activities related to the corrosion protection in the railway industry, and all the required tools/equipment for the execution of non-destructive and destructive testing, to verify the quality of surface preparation, paintings and other types of surface protection.

FAILURE ANALYSIS

Every year the Industry experienced huge financial losses due to early failure of coating systems and corrosion protection.

Premature degradation of coating may be induced by multiple causes, with different complexity, even though in most cases the failure event is induced by non proper product application, non proper product selection or a "poor" and incomplete coating specification. The determination of the root causes of early failures is of outstanding importance in order to define responsibilities and, most important, to make a first and important step towards reducing the likelihood of occurrence of new failures and unplanned further economic losses.



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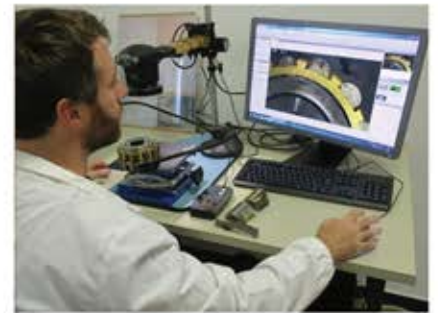
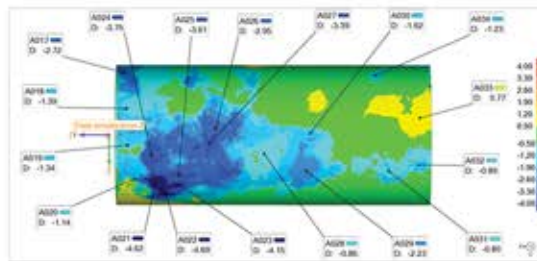
IIS Failure Analysis



FAILURE ANALYSIS INVESTIGATION SUPPORT SERVICES

The Istituto Italiano della Saldatura Group (IIS Group) boasts the availability of a of highly specialized and multidisciplinary technicians' team that grows and lives breathing the air of a Company, the IIS Group itself, which has in the last 70 years the fundamental mission, to support its customers in the various Industry fields.

Therefore, the IIS Group, within its Laboratory division and in real-time collaboration with its other specialized technical divisions, can represents a **single Go-To** reference to better clarify all the aspects connected to the failure of a component (how and why) and to define actions that can potentially be implemented as lesson learnt after the event of failure (**corrective actions**).



MISSION

IIS as a Group of companies supporting Industry, is largely recognized for its transparent and in-depth approach to failure events investigation. The failure analysis department is committed every day to provide Customers to interpretation of how and why components failed due to specific degradation/damage mechanisms.

PURPOSE & BENEFIT

Anytime a failure event occurs across the Industry (either due to corrosion or other damage mechanisms), a failure analysis and/or root causes analysis job can be of primary importance, especially if this is performed in timely and decisive way; the results of a failure analysis job can be "pro-actively" applied to mitigate the likelihood of future bad events, to increase safety, to optimize processes and as a tools for design (e.g. material selection, geometrical details).

SKILLS

IIS has in-house availability of skills and expertises to perform a detailed analysis of failure events. Its technicians apply the most advanced methods, laboratory testing and modeling to determine the mechanism/mode of failure and the root cause/s of a bad event. Its experience is enriched/consolidated through a considerable number of failure analysis case histories in many different fields of the Industry with different levels of criticality.

METHOD

In case of failure event, IIS technicians and experts are present through both in-situ inspection activities and planning/execution of ad-hoc tests/analyses in the Laboratory. IIS failure analysis reports are prepared with the aim of being as complete as possible, focused on engineering aspects (answers for the industry!) and with worthwhile quality in the description of events/components and in the interpretation of the experimental results.

FRACTURE MAP



The in-depth **approach** of IIS to failure and root causes analysis studies is supported by a robust *knowledge of Codes, Standards, Regulations* applicable around the Industry.

THE MECHANISMS

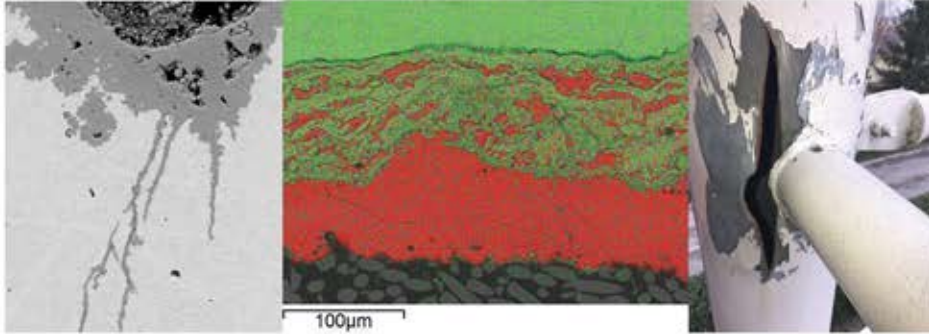
The most common damage modes/mechanisms that IIS failure analysis team faces every day include as "best seller":

- Mechanical damages
- Generalized corrosion
- Localized corrosion
- Stress Corrosion Cracking (SCC)
- Microbiologically Corrosion (MIC)
- Fatigue/Corrosion Fatigue.

THE MAIN CAUSES

The origin (physical and root causes) of a bad event can be recognized in different phases of component life and at different levels of hierarchy of causes, each characterized by specific barriers against possible "failure".

1. Design - 2. Fabrication (e.g. welding, forming...) -
3. Service - 4. Maintenance - 5. Knowledge - 6. Organization.



Main Industry served

- ✓ Pipeline
- ✓ Oil&Gas upstream & downstream
- ✓ Chemical and petrochemical plants
- ✓ Food and beverage
- ✓ Shipbuilding
- ✓ Transportation & Infrastructure
- ✓ Utilities & Manufacturing
- ✓ Electronic devices

Some of the testing methods applied in IIS laboratory in support of failure investigation

- Optical Microscope (OM)
- Scanning Electron Microscope (SEM)
- Microscopio elettronico a scansione (SEM)
- Energy Dispersive Spectroscopy (EDS)
- X-ray diffraction (XRD)
- Infrared Spectroscopy (FTIR)
- Mechanical tests and Fracture mechanics
- Fatigue tests
- Creep tests
- Corrosion tests (immersion & electrochemical)
- Corrosion product analysis

IN CASE OF FAILURE EVENT

...a site inspection as timely as possible in the failure analysis process can be a focal point for first-rate results.

1. Site inspection - 2. Interviews & data collection - 3. Samples identification - 4. Metallographic replica - 5. Fractographic replica - 6. Positive Material Identification (PMI) - 7. Non-Destructive Examination (NDE).

MANAGE A FAILURE EVENT

IIS provides support services in case of litigation and arbitration. The 70-years life of IIS Group in the Industry as 3rd party source of proficiencies and expertise can guarantee:

*transparency, credibility,
reliability e competence.*

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