



Testing Solutions for Railway Components



Testing solutions for railway components

The growing Railway Market



575 Projects Worldwide

Today, the growing transit and freight demands of vibrant nations with surging economies are now making major investments for the future.

“Railways are the lifeline of progress and great opportunities”.

This has created many unique and lucrative business opportunities for many companies throughout the world, totalling more than a hundred billion dollars. This megatrend has great global impact in terms of mobility, transport infrastructure and is shaping the future.

IBERTEST is a member of MAFEX and is involved in some of these projects.



The constant increase of speed with modern trains has increased the dynamic stress in the rail tracks, anchorage elements, components, materials & etc. This requires the implementation of a very strict set of official testing standards to certify the component design, manufacturing process and Quality Control of the manufactured components and assemblies. We have developed specific, cost effective, solutions to meet all of these strict testing standards.

Thereby, insuring correct design implementation, Quality Control and Safety requirements.

Governments of many countries are now investing heavily in the expansion and improvements of their railway networks.

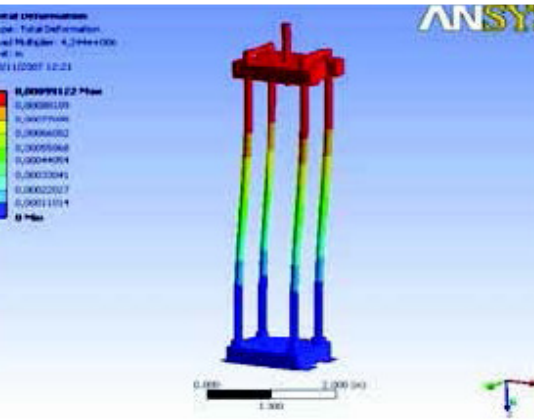
***IBERTEST** has extensive experience in designing, manufacturing and supplying testing machines, equipment and complete turn-key centers for research and quality control in the railway industry.*

The administrators that are responsible for the purchase, control and supervision of railway infrastructures, need advanced technological solutions while controlling the total cost (initial + operating). With our "Combined Testing System" CTS™, we keep the total cost down to a minimum. We have worked hard to develop the most efficient Railway testing system that combines common machine elements and is designed for a streamlined and easy work flow. This includes the ability to perform all the necessary independent tests on each component and the whole assembly of elements, mounted together, to insure the individual quality and to prove the total resulting performance.

Nowadays, assuring that materials are resistant is not enough: the materials used are also required to provide passengers with greater comfort. This point is vital in the elements for load supporting and transferring stresses to the ground: support bogies, systems for wagons coupling, shock absorbers, etc.

This broad range of capabilities enables Ibertest to offer single-point responsibility and to successfully meet the increasingly strict quality standards. Ibertest is part of a national strategic alliances called MAFEX, with others companies, leaders in railway industry, to expand our combined capabilities and remain on the cutting edge of technology.

IBERTEST - Engineered in Spain since 1970



About IBERTEST

- **Equipment made in Spain:** with real know-how.
- **R +D + innovation:** 43 years of innovation and continuous improving of our products.
- **Tailor-made:** highly technological and customizable solutions adapted to your requirements.
- **Reliability:** manufactured based on the most demanding quality criteria and according to international testing standards.
- **Real value.** Excellent quality doesn't have to have a high price.

- **Full service:** flexible and complete solutions, from design to final installation in the user laboratory.
- **Pre-sale service:** consultancy services for new and present clients, including tailor-made quotations and advice about material testing machines, test procedure, sample preparation, etc.
- **Post sales service:** calibrations, preventive and corrective maintenance, spare parts, upgrades and modernizations.
- **Worldwide guarantee:** International technical service.
- **International sales:** more than 4000 machines sold in 67 countries.



- **CE marking.**
European Quality
- **ISO 9001:2000 Quality System**
Accredited by SGS
- **Calibration laboratory**
Accredited by ENAC internationally recognized by ILAC (International Laboratory Accreditation Cooperation)
- **Telediagnosis service:** On line diagnostics and maintenance service. When connected, our technicians are able to take control of the testing machine to act on the problem quickly and effectively, without travelling to your laboratory.
- **Official MAFEX member**
Spanish Railway Association



Testing solutions for railway components



Railway SAFETY

Safety is the first and foremost important criteria in Rail Network development.

Engineers need to ensure safety and reliability in the implementation of all the elements of rail infrastructure in use today, including both the line network elements and rolling stock.

Railway infrastructures are continuously evolving by increasing the:

- Speed of trains
- Axles loads of trains
- Locomotives traction
- Density of traffic
- Harmful influences of the environment

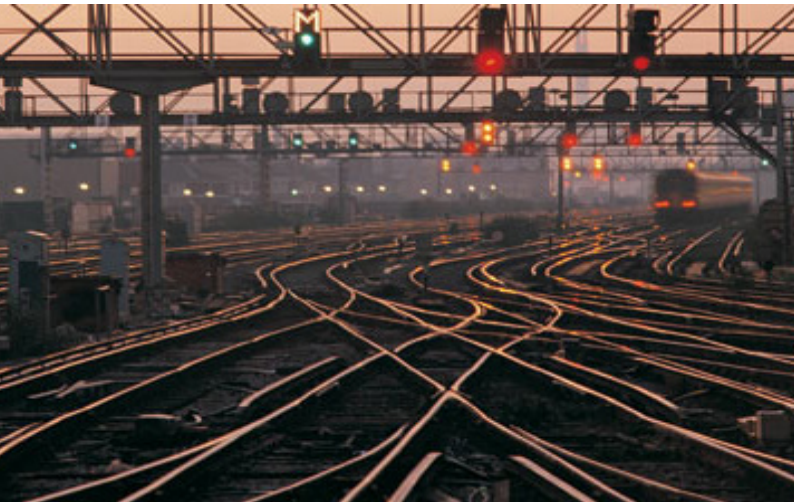
This increasing demand put on the railway infrastructure, requires a greater improvement in the quality for each element of the rail infrastructure.

Assessment, testing and certification is necessary to ensure the safety and reliability of all the elements of rail infrastructure. International testing regulatory requirements have been established to ensure this high level of safety while a railway system is being installed and for years to come afterwards.

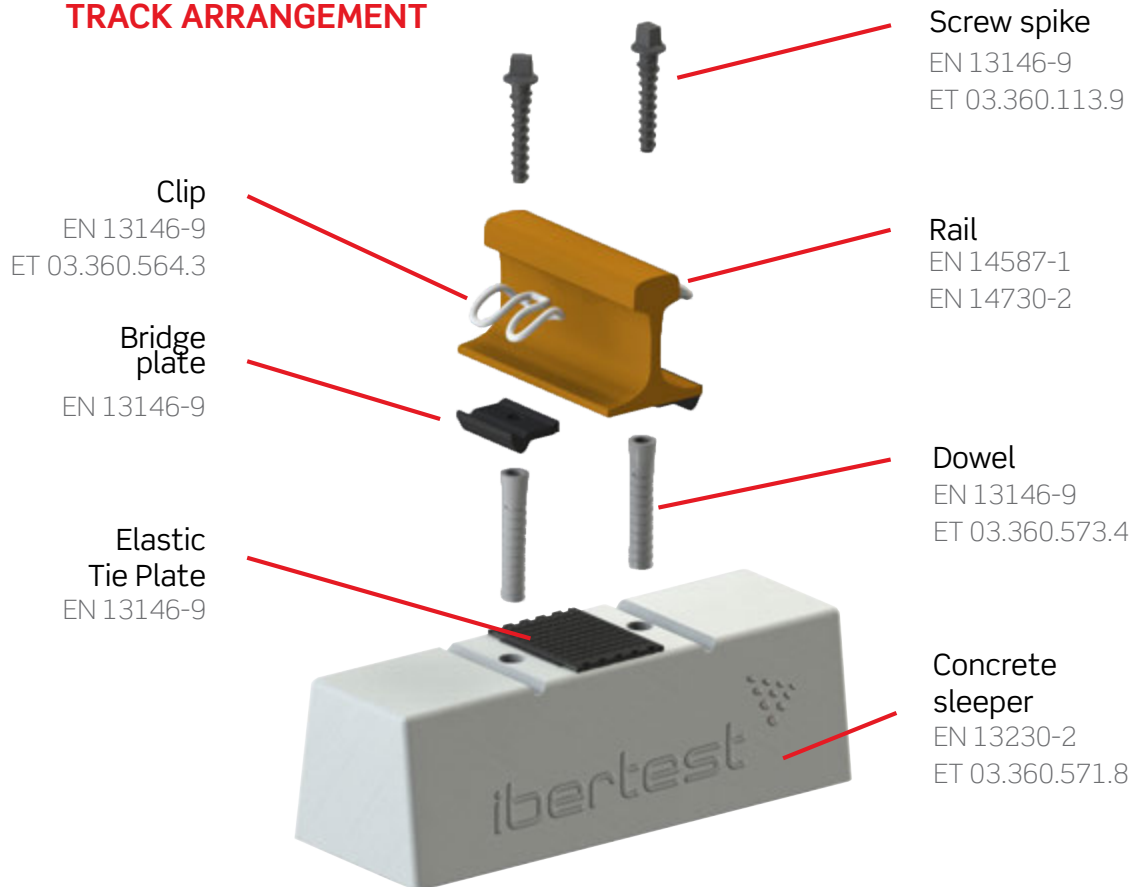
Ibertest is internationally recognised for its extensive experience in providing testing solutions for railway infrastructures.

Our railway assessment and testing solutions, implement the required international testing standards assuring that you will be able to demonstrate quality, reliability and safety for all the railway elements. The assurance we offer will help you build a market of trust with your railway infrastructure customers.





**TYPICAL RAILWAY
TRACK ARRANGEMENT**



All elements, individual and as an assembled unit, require quality assurance verification testing to International Standards

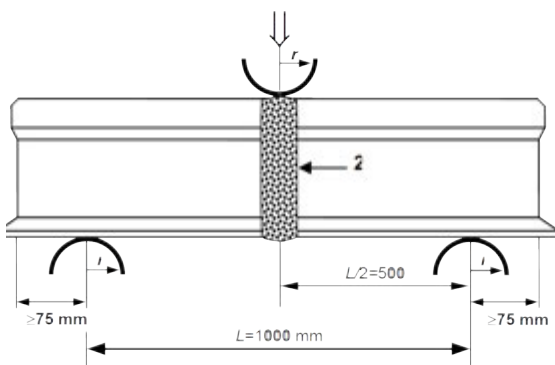
Testing solutions for railway components: Rail

Load capacity on welded joints. Static flexural test.

TEST STANDARDS

EN 14587-1 Railway applications - Track - Flash butt welding of rails. Part 1: New R220, R260, R260Mn and R350HT grade rails in a fixed plant

EN 14730-2 Railway applications - Track - Aluminothermic welding of rails. Part 2: Qualifications of aluminothermic welders, approval of contractors and acceptance of welds



This test has to be conducted until the welded joint reaches its failure point. This is done by carrying out a three-point flexure test in which the upper load point is located on the weld.

The aim of this test is to find out the ultimate load capacity of the weld, so it is essential that the failure takes place along the welded line.

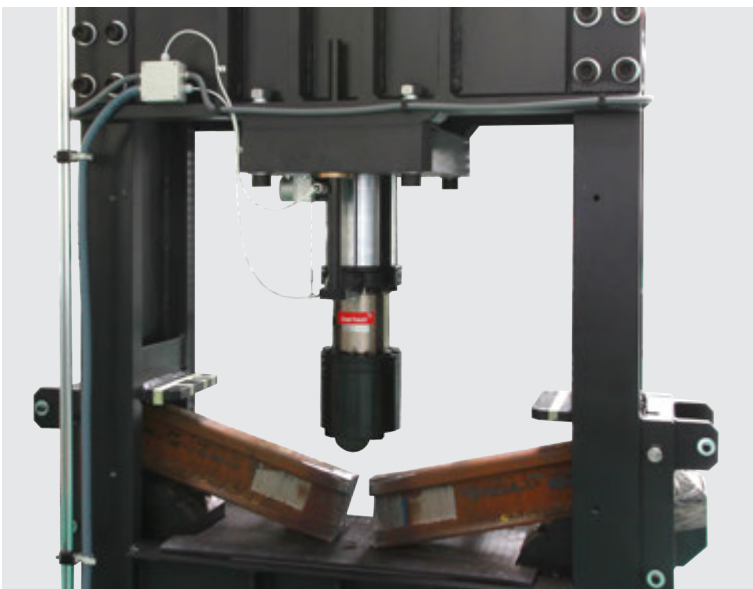
Due to the great energy, that is released at the moment of failure, the broken parts of the rail track are thrown out violently, so it is necessary to use a reinforced protective cage. If damaged, the reinforced material can be easily replaced.

A welded joint can be rejected for following reasons:

- Failure takes place beyond the welding line
- Strain is lower than required at a specified point
- Failure-load is lower than required



IBERTEST Servohydraulic testing machine MFPIB-2000



MFPIB-2000: detail



Servohydraulic testing machine MFIB-2000

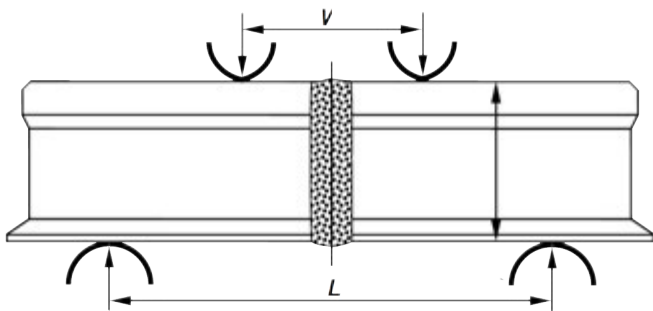
Testing solutions for railway components: Rail

Load capacity on welded joints. Dynamic flexural test

TEST STANDARDS

EN 14587-1 Railway applications - Track - Flash butt welding of rails. Part 1: New R220, R260, R260Mn and R350HT grade rails in a fixed plant

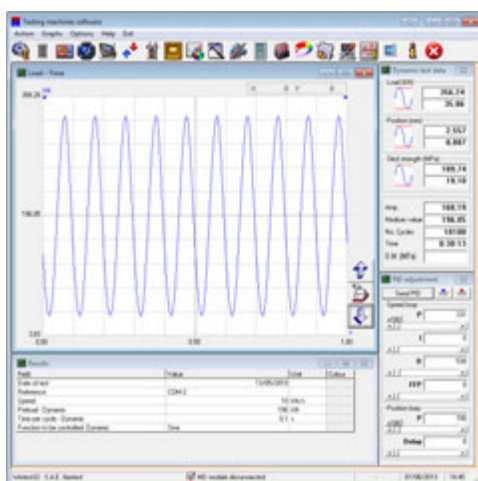
EN 14730-2 Railway applications - Track - Aluminothermic welding of rails. Part 2: Qualifications of aluminothermic welders, approval of contractors and acceptance of welds



The load will be applied sinusoidally, and will range from the maximum load value to 90% of that value.

This waveform will be repeated for 5 million cycles, or until the weld fails.

The welded specimen has to complete the 5 million cycles to successfully pass the test.



If the specimens fails, then it must be marked as failed, and the zone where the failure started must be indicated for inspection and further analysis.

Servohydraulic machine for Fatigue Testing
UFIBE-1500/1000-MD5W



IBERTEST fatigue testing machines are equipped with our high speed electronic control system MD5, data collection computer, high performance hydraulic unit and cooling system.

Combining two frameworks with a single hydraulic unit, control system, etc is also possible (see left)



Combined Test Frame for
Static and Dynamic Tests
MFIB-2000-UFIBE-
1500/1000-MD5W

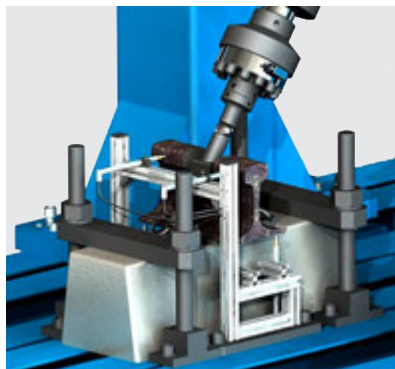
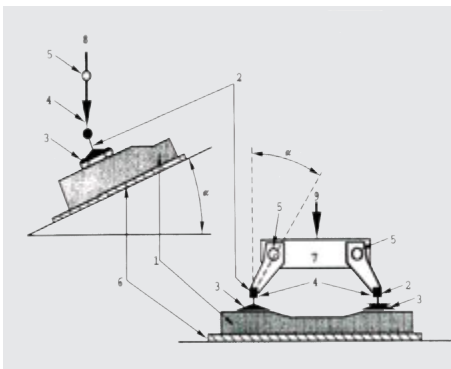
Testing solutions for railway components: fastening element

Dynamic testing

TEST STANDARD

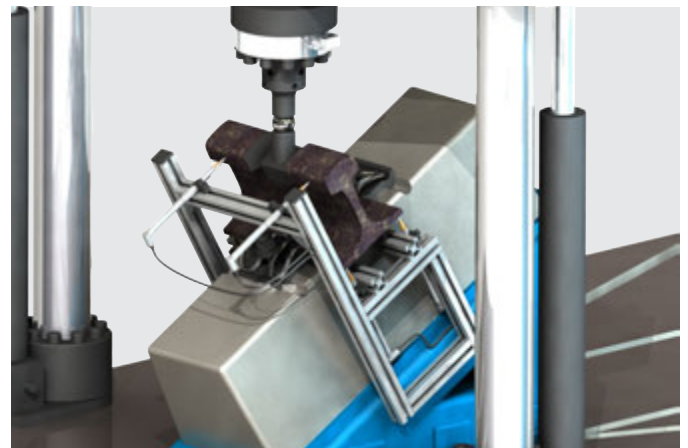
EN 13146-4. Railway applications. Track. Test methods for fastening systems. Part 4. Effect of repeated loading.

A constant amplitude, cyclic force is applied by a single actuator at a predetermined load line and position on the rail head.



The load, position and line of application to be used are determined from: the vertical stiffness of the fastening assembly, axle loads and curve conditions of the track for which the fastening assembly is being tested.

Curve conditions include radius and cant deficiency.



Dynamic testing on plastic elements

TEST STANDARD

EN 13146-9. Railway applications. Track. Test methods for fastening systems. Determination of stiffness.

Some of the materials used by fastening elements are polymeric, due to several reasons:

- **Isolation:** this property is essential to ensure that there is no thermal interaction with other components.
- **Shock absorption:** providing high comfort level due to excellent damping features.

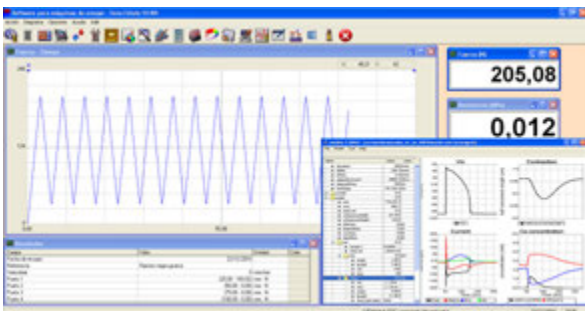
The main problem with polymeric materials is their poor response against mechanical stress.

Thus, it is essential to test the behaviour of the selected materials previous to their use in high mechanical stress conditions.

IBERTEST UFIB dynamic machines series are perfectly suitable for conducting these tests.

Dynamic machines IBERTEST UFIB 250

The UFIB-250-MD5W machine is able to apply dynamic loads of up to ± 250 kN at frequencies of up to 5 Hz, as well as static tensile and compression loads of up to 250 kN.



IBERTEST UFIB series of dynamic machines can conduct dynamic tests on a wide variety of materials (remoulded samples, subsets or finished products) by using tooling that is adapted to each application.

Featuring an extremely rigid 2-columns frame, upper crosshead, highly responsive servohydraulic system and a high-speed electronic PID control. The upper crosshead height can be adjusted by means of lateral hydraulic jacks and locking system.

The UFIB-250-MD5W is equipped with suitable testing fixtures, adapted for each type of component to be tested.



Dynamic Testing Machine
UFIB-250-MD5W



Alignment verification system

Testing solutions for railway components: elastic elements

Stiffness tests for elastic tie plates

TEST STANDARD

EN 13146-9 Railway applications - Track - Test methods for fastening systems - Part 9: Determination of stiffness

ADIF E.T. 03.360.750.0. Elastic tie plates for VM fastening

Vertical stiffness. Static test

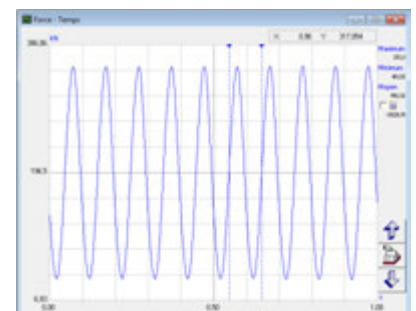
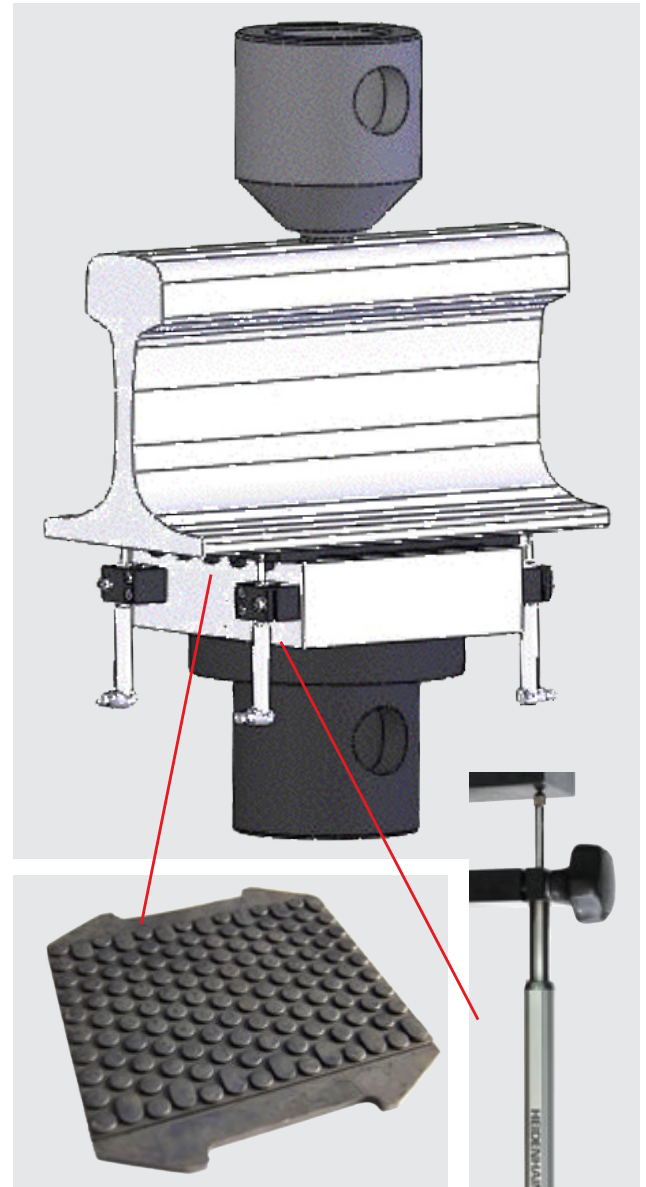
This is accomplished by applying a static vertical load on a section of rail laying on the elastic plate to be tested, the load and the plate being perpendicular. Strain and deflection of the plate are measured with linear transducers LVDTs. The stiffness (kN/mm) is calculated in the load/strain graph

Inclined load. Dynamic stiffness

This test is performed with an IBERTEST UFIB dynamic testing machine of up to 150 kN load capacity and applying a sinewave at a frequency of 4 ± 1 Hz on a section of rail laying on the elastic plate to be tested.

The load and the plate are placed at a specified angle. Strain and deflection of the plate are measured with linear transducers LVDTs.

The stiffness (kN/mm) is calculated in a graph load/strain after several fatigue cycles.



Bridge plates fatigue Test. Lateral load

TEST STANDARD

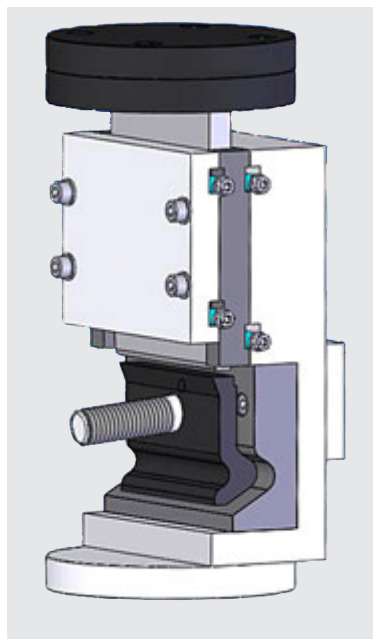
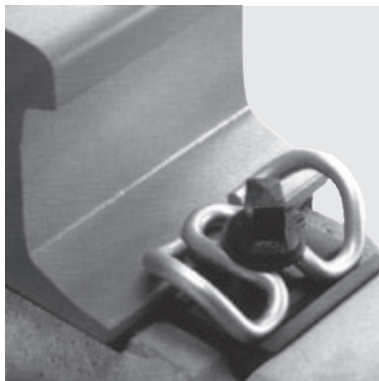
EN 13146-9 Railway applications - Track - Test methods for fastening systems - Part 9: Determination of stiffness

ADIF E.T. 03.360.578.3. Light bridge plates for fastening

To simulate the lateral load of a train on the rail, our dynamic testing machine, IBERTEST UFIB 250 is ideal for this test.

The bridge plate is fastened in the device as shown in the figure. This device has been designed and developed in our facilities according to the instructions given by the light bridge plates manufacturer.

This lateral load is compressive for the bridge plate specimen: the effects of the screw passing through must be taken into account.



Testing solutions for railway components: concrete sleepers

Load tests concrete sleepers

TEST STANDARD

EN 13230-2: Railway applications. Track. Concrete sleepers and bearers. Part 2. Prestressed monoblock sleepers.

Flexural static tests

- Rail set section positive load test
- Centre section negative load test
- Centre section positive load test

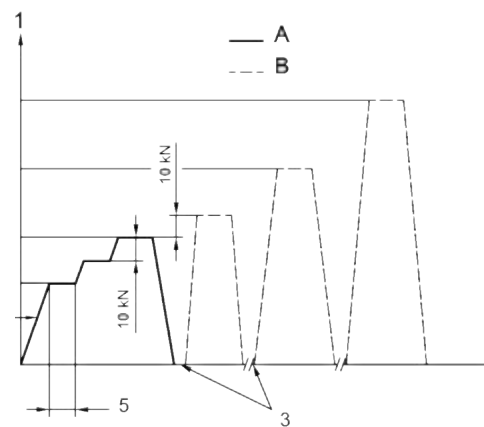
Load is applied perpendicularly to the base of the sleeper.

The sleeper must pass a test routine with incremental load steps without permanently cracking.

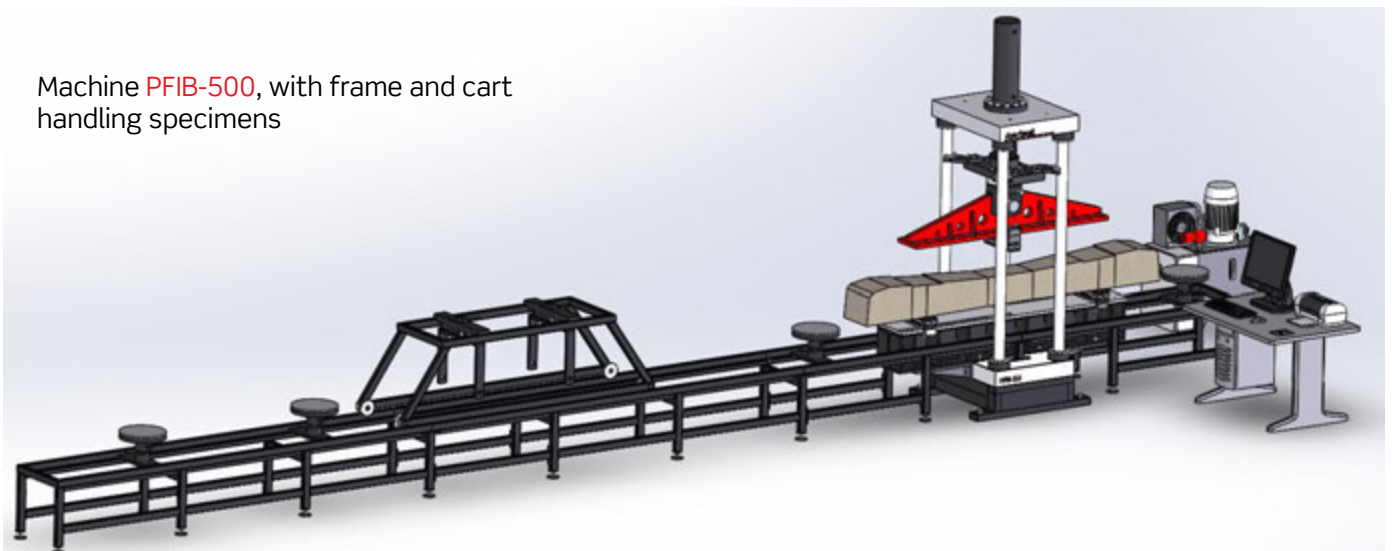


Servohydraulic machine IBERTEST PFIB-500

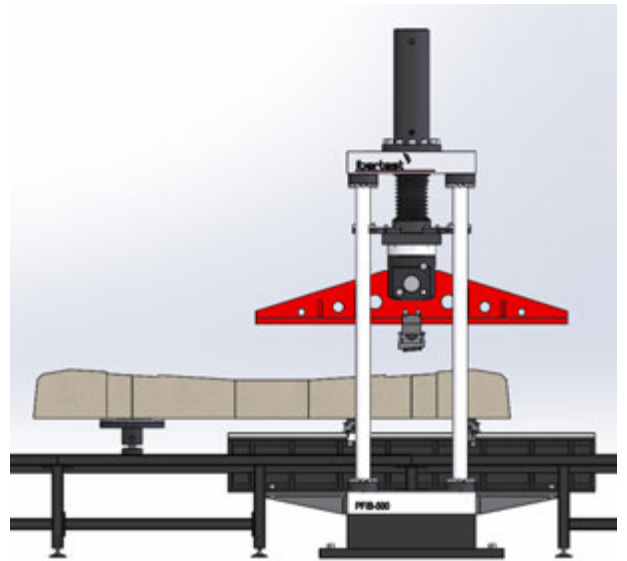
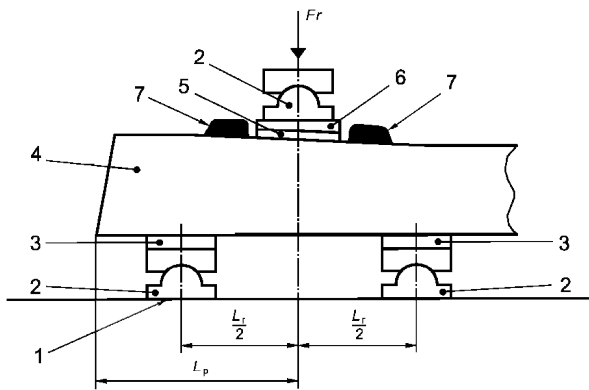
- High Efficiency CTS™ design
- Meets all required standards
- Designed for easy work flow
- Optimizing test preparation
- Minimizing safety hazards
- High quality components providing the best technological solutions



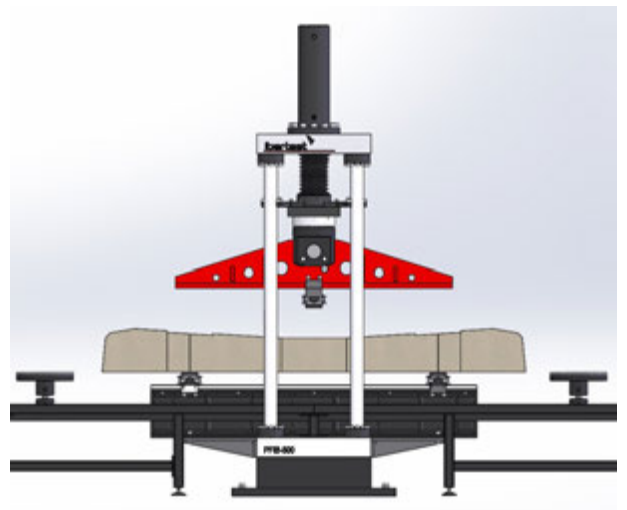
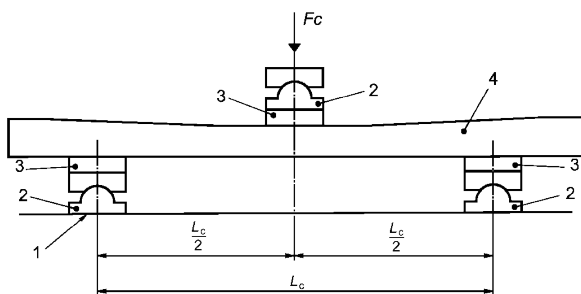
Machine PFIB-500, with frame and cart handling specimens



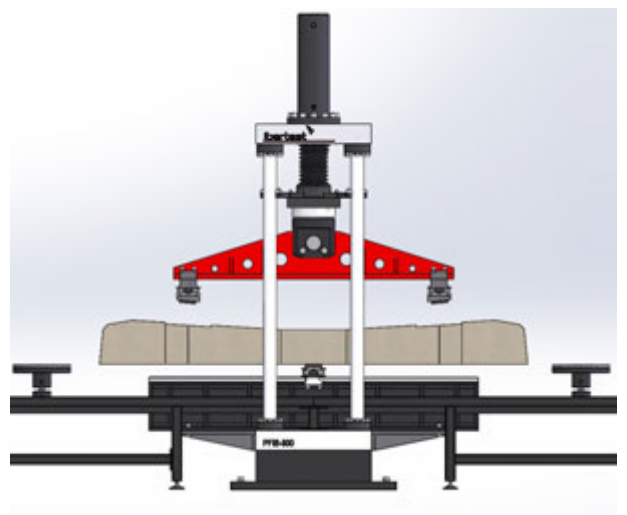
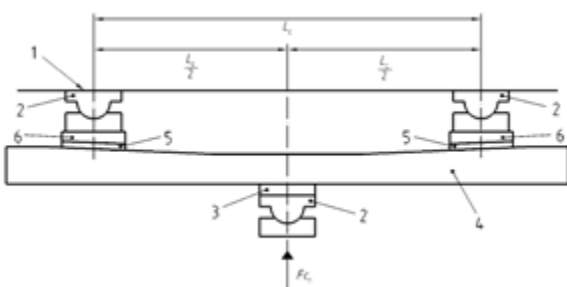
Test arrangement at the rail seat section for the positive load test



Test arrangement at the central rail section for the positive load test



Test arrangement at the central rail section for the negative positive load test



Bogies and components. Static and dynamic tests

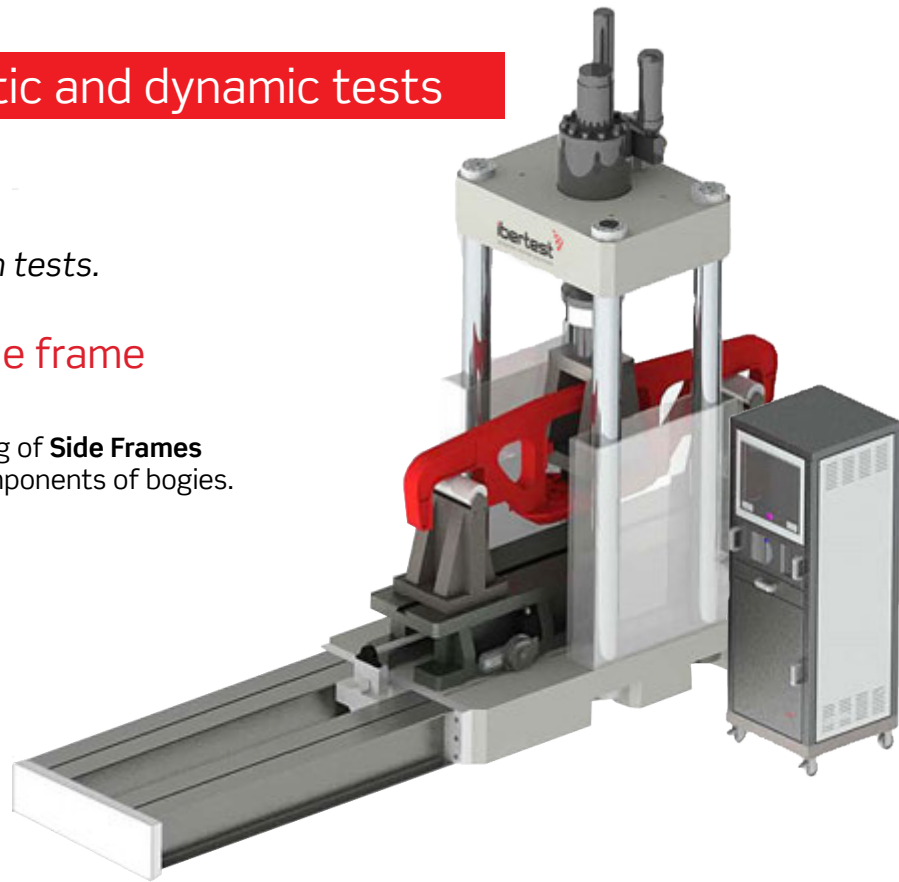
TEST STANDARD

UIC 615: Bogie frame structure strength tests.

Static and Dynamic load on bogie frame components

Specific testing machine for Certification testing of **Side Frames** and **Bolsters**, which are the main structural components of bogies.

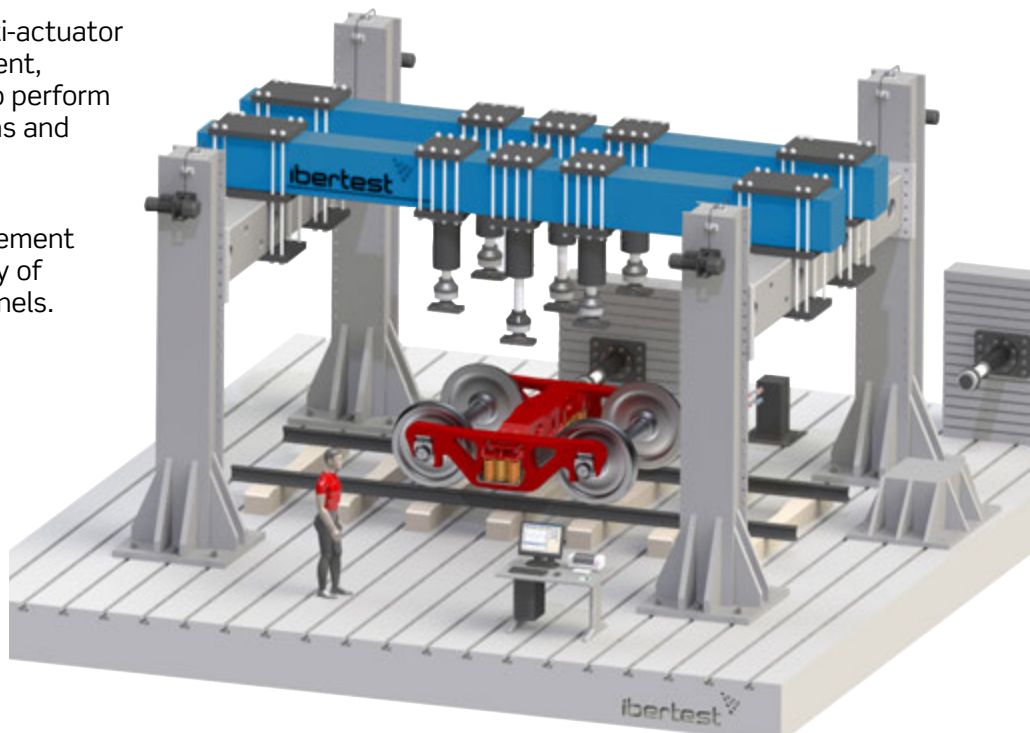
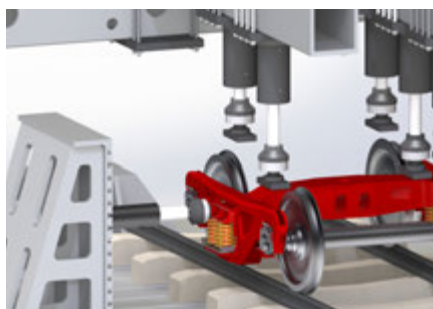
Capacity: up to 4000 kN



Portal Load Frame for Complete Bogie frame fatigue tests

High strength Portal Frame with a multi-actuator system, suited for all testing requirement, allowing Rolling Stock manufactures to perform the certification tests, optimise designs and new product development.

This solution has an advanced measurement and control system, with the possibility of adding all required measurement channels.



Turn-Key Projects

CENTER FOR RESEARCH AND QUALITY CONTROL IN RAILWAY INDUSTRY

Complete center, designed by IBERTEST for quality control, R&D for railway industry (infrastructures, rolling stock and components).

IBERTEST can supply a complete turn-key testing systems laboratory, including R&D consultancy, project management, laboratory equipment, furniture, training and qualifying courses for users.

AREAS

Rolling Stocks and Components

- Bogie frame
- Wheels
- Axle
- Suspension system
- Structural Components
- Pantograph

Infrastructure

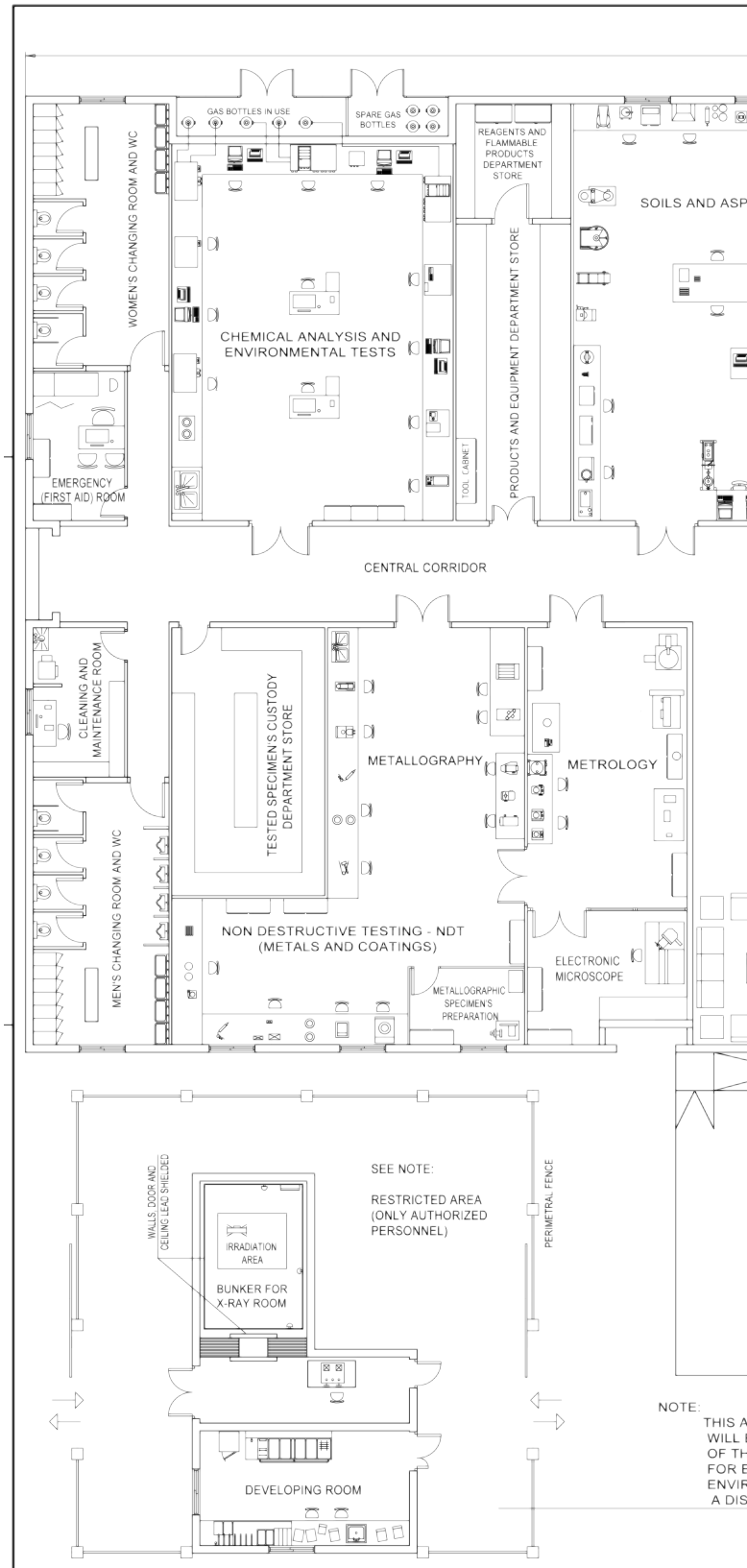
- Rail
- Concrete and wooden sleepers
- Elastic joints
- Catenary cables, wires and supports
- Track Crossings
- Ballasted and unballasted tracks
- Other components

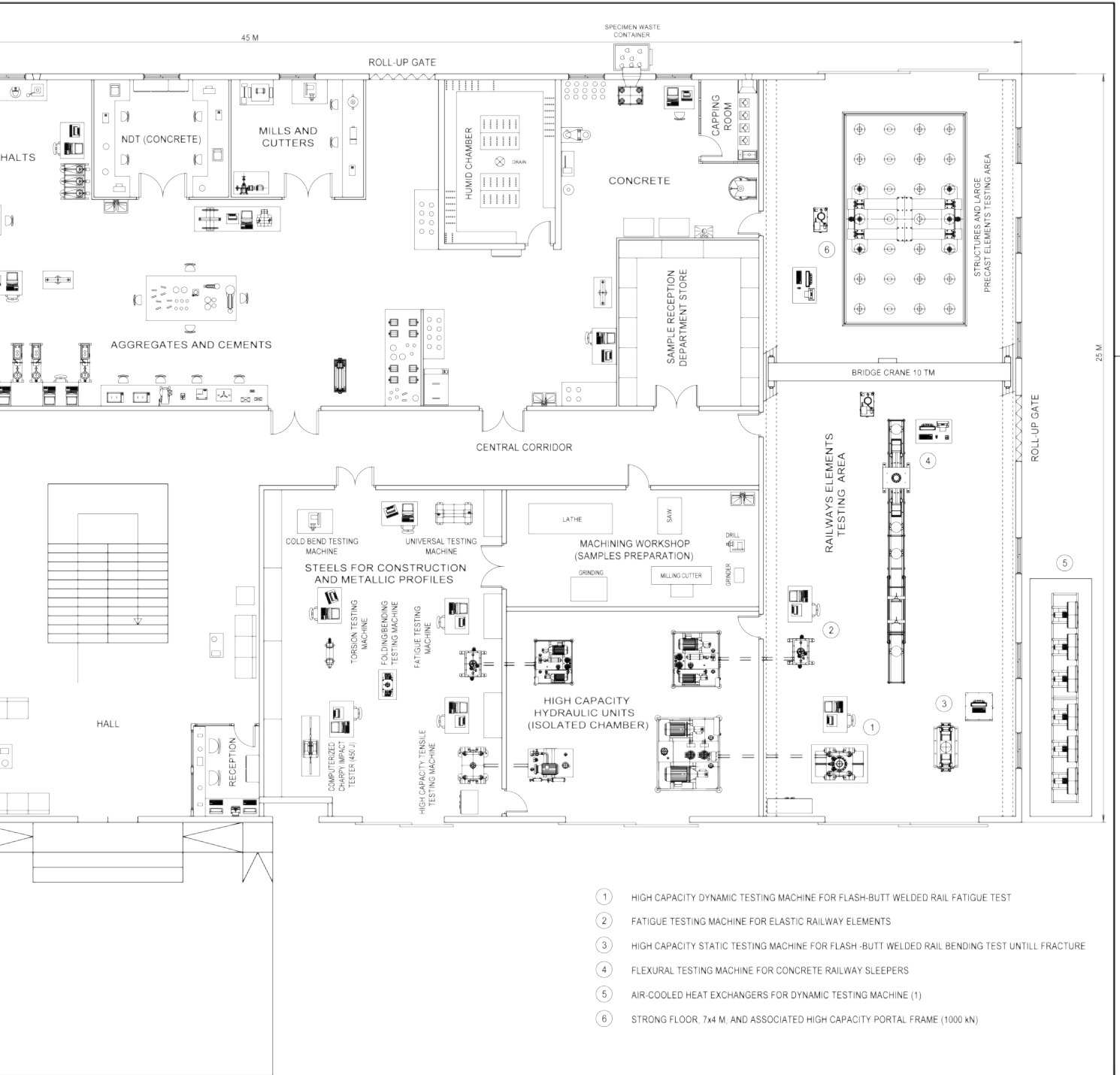
Mechanical Engineering

- Steel for construction and Metallic Profiles
- NDT (Non destructive tests)
- Machining workshop and sample preparation

Civil Engineering

- Large Pre-cast elements
- Structures
- Aggregates and cement
- Concrete
- Soils and asphalts
- Chemical analysis and environmental tests
- NDT for concrete





- ① HIGH CAPACITY DYNAMIC TESTING MACHINE FOR FLASH-BUTT WELDED RAIL FATIGUE TEST
- ② FATIGUE TESTING MACHINE FOR ELASTIC RAILWAY ELEMENTS
- ③ HIGH CAPACITY STATIC TESTING MACHINE FOR FLASH-BUTT WELDED RAIL BENDING TEST UNTILL FRACTURE
- ④ FLEXURAL TESTING MACHINE FOR CONCRETE RAILWAY SLEEPERS
- ⑤ AIR-COOLED HEAT EXCHANGERS FOR DYNAMIC TESTING MACHINE (1)
- ⑥ STRONG FLOOR, 7x4 M. AND ASSOCIATED HIGH CAPACITY PORTAL FRAME (1000 kN)

AREA, INCLUDING PERIMETRAL FENCE, SHOULD BE PREFERABLE LOCATED AT THE BACK OF THE BUILDING.
EXAMPLE BEHIND CHEMICAL ANALYSIS AND ENVIRONMENTAL TESTS LABORATORY AND AT A DISTANCE => 5 M

| | | | |
|--|--|------------------------|------|
| | Center for Research and Quality Control in Railway Industry | | REV. |
| | | | X X |
| C/ Ramón y Cajal, 16-20 Polígono Industrial GITESA I DAGANZO DE ARRIBA 28814 Madrid - ESPAÑA Tfn: (34) 91 884 53 85 Fax: (34) 91 884 50 02 Telediagnóstico: (34) 91 878 20 49 e-mail: info@ibertest.com web: http://www.ibertest.com | Fecha: 03/2013 Firma: J. ARMENTA Dibujado: J. ARMENTA Project: F. ALVIR Revisado: F. ALVIR | DISTRIBUTION PLANT | |
| Sustituye a: | MASA: | | |
| Sustituido por: | ESCALA: 1/100 | Piano n.º: laborat_214 | |

Turn-Key Projects

CENTER FOR RESEARCH AND QUALITY CONTROL IN RAILWAY INDUSTRY

RAILWAY TESTING AREA

1 Dynamic testing machine.
For elastic elements, bridge plates, and others. Capacity: ± 250 kN

2 Impact Pendulum.
For Charpy and Izod testing of metallic materials. Energy: 150 -750 J

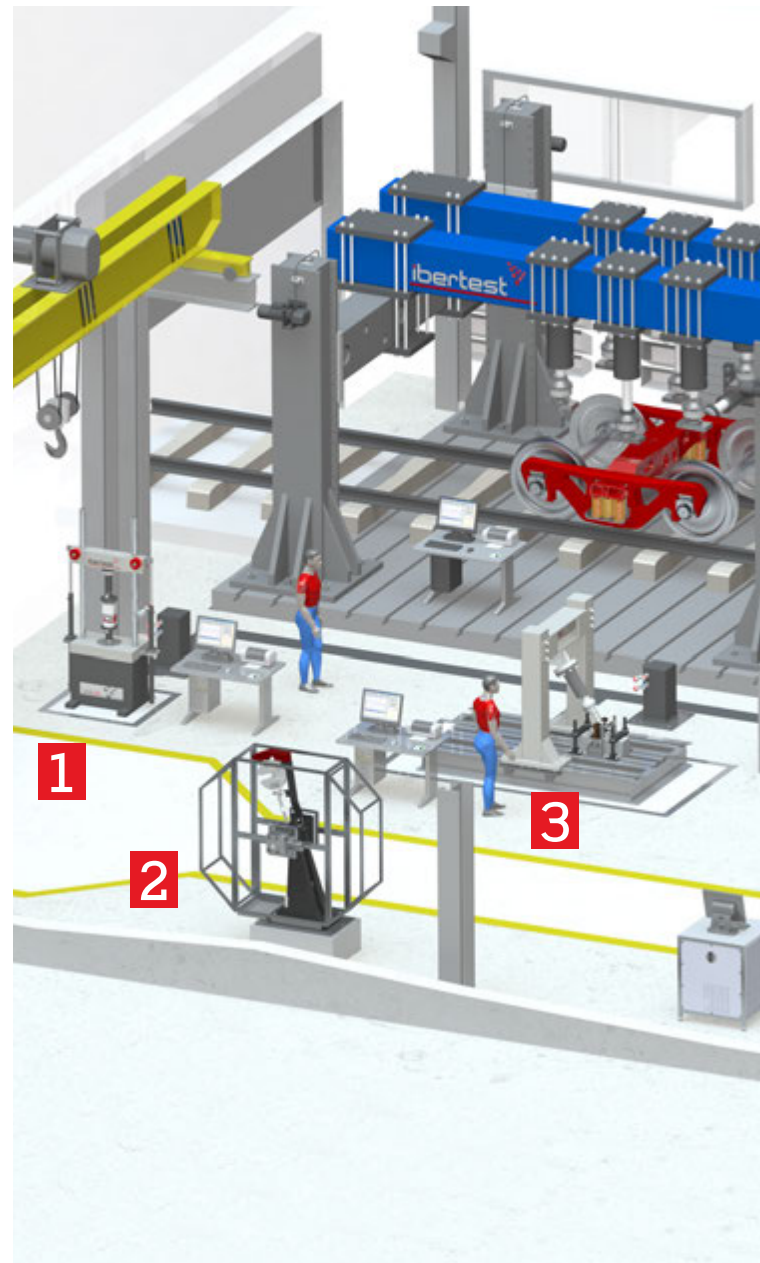
3 Portal frame for dynamic testing.
For track set testing. Capacity: 150 kN

4 Flexure testing machine.
For welded rail joints up to the breaking point. Capacity: 2000 kN

5 Fatigue testing machine.
For welded rail joints. Capacity: 1000 kN

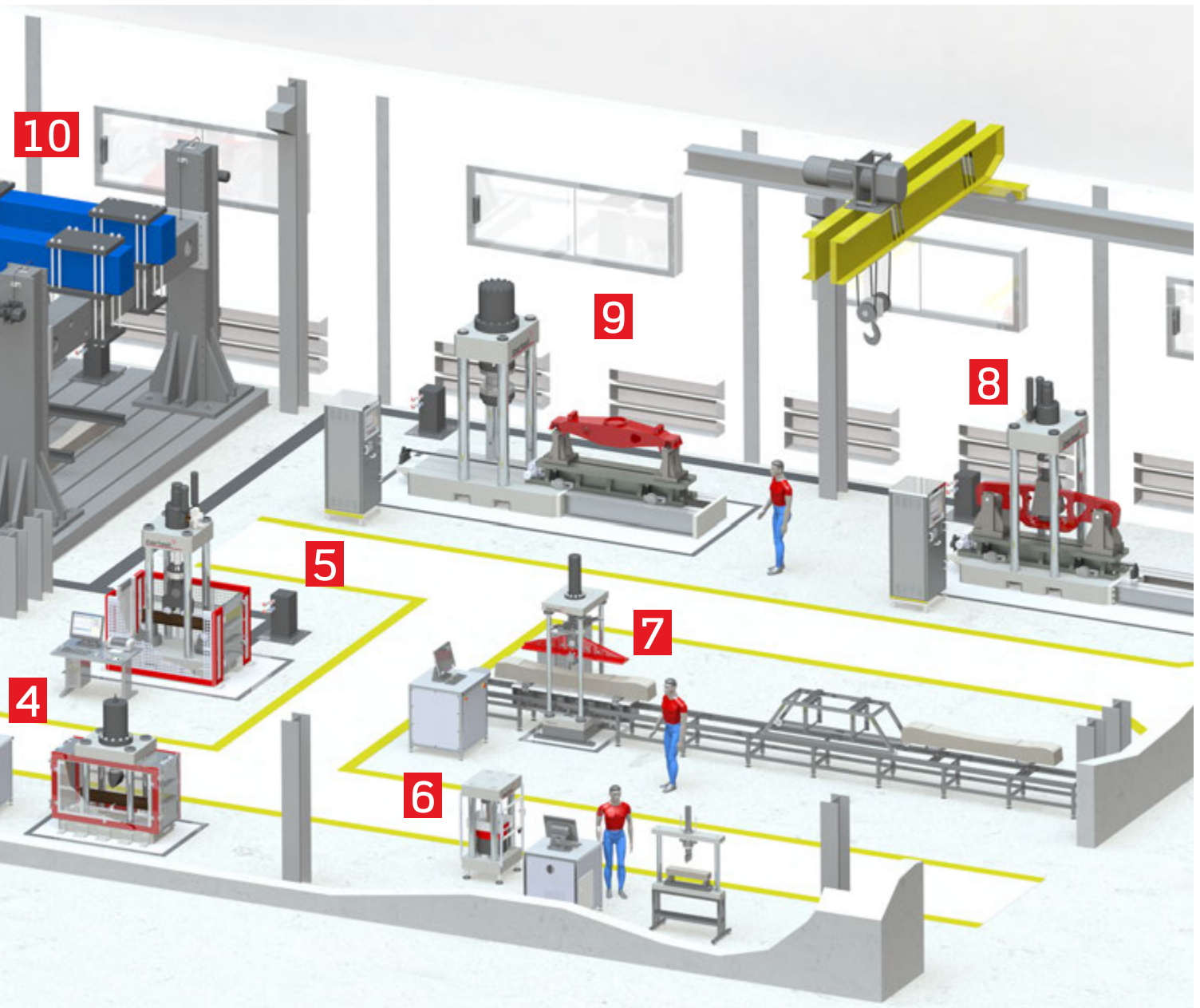
6 Combined Station for compression and flexure test
For concrete specimens. Capacity: 3000/100 kN

7 Dynamic testing machine.
For flexure of sleepers. Capacity: 2000 kN



8 Dynamic testing machine.
For wheel supports of bogies. Capacity: 1000 kN

INDUSTRY (PARTIAL VIEW)



9 Compression testing machine.
For static loads of bogies and their components.
Capacity: 4000 kN

10 Bogies Portal Frame.
For testing complete bogies and suspension systems.
With 8 actuators mounted at any angle



www.ibertest.com

S.A.E. IBERTEST

c/ Ramón y Cajal, 18-20
28814 Daganzo de Arriba
Madrid - Spain

Tel. +34 918 845 385

Fax. +34 918 845 002

E-mail: dircom@ibertest.es

V2014-1.76

