

research

# **fibag**

invention

innovation

technology



[www.fibag.at](http://www.fibag.at)

## The test centre

### Range of services (tests and examinations):

- Weathering tests
- Impact resistance (pendulum impact)
- Load bearing capacity for safety installations
- Acoustic performance (sound transfer and passage)
- Thermal permeability (insulating properties)
- Radiative properties (reflectance and transmission)
- Air permeability
- Forces on the facade during operation
- Mechanical strength
- Ventilation characteristics
- Repeat testing (opening and closing of installations)
- Burglary resistance
- Behaviour under various climatic conditions



### SHOCK RESISTANCE

- Glass in construction – pendulum test EN 12600
- Curtain wall – shock resistance – performance requirement EN 14019
- Doors - load with a soft, heavy impactor, EN 949
- Windows - load with a soft, heavy impactor, EN 13049
- External finish - Resistance to hard body impact EN 13330



### AIRBORNE SOUND INSULATION

- Measurement of sound insulation in buildings and of building elements, EN ISO 140-3
- Rating of sound insulation in buildings and of building elements, EN ISO 717-1

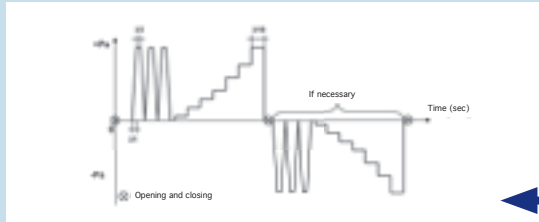


### MECHANICAL STRENGTH

- Force measurement with the load cell of a steel / glass construction
- Application of the force through computerized hydraulic ram and hydraulic press

## WEATHERING TEST CURTAIN WALL, ÖNORM EN 13830

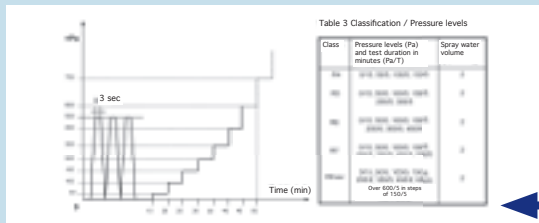
- Air permeability, EN 12152/EN 12153



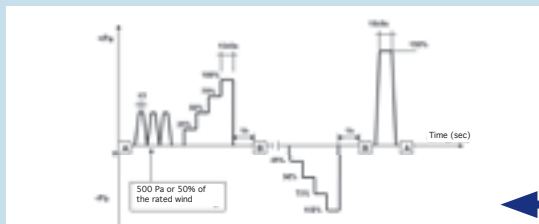
### TEST RIG INSIDE:

- Examination of the air permeability

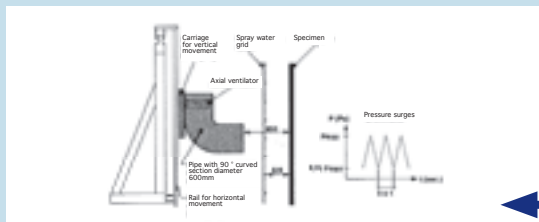
- Water tightness, EN 12154/EN 12155



- Resistance to wind EN 12179/EN 12116



- Water tightness with varying air pressure and water spray, EN13050



### TEST RIG OUTSIDE:

- Examination of wind resistance
- Optional: Examination regarding water tightness with air pressure

## Dear partners and users of **fibag**

Since 2008, **fibag** has been operating as a privately managed research centre in a new economic-scientific environment which it initiated – that of “integral construction engineering”. Integral stands for the joining together of technologies and know-how in order to realise synergetic, technical solutions for applications in and on buildings.



You all know of the problems of climate and environmental changes – with solutions offered by **fibag** (e.g.: integration of energy technologies into the building shell or the optimisation of the entire energy balance of a building through the combination of the technologies used in the building’s shell with the technical facilities of the building itself) the buildings are able to contribute to the improvement of the overall global situation, reducing CO2 emissions or even generate a net energy production through application of the “Active Building Concept” method. This booklet attempts to briefly acquaint you with the infrastructure as well as the scope of the **fibag**’s work and to invite you to visit our homepage or our centre on site.



Programme for the Endorsement of Forest Certification Schemes

Sustainable forestry is based on the environmentally friendly, economically and socially acceptable care of forests to preserve them, both today and for future generations. The PEFC guarantees that the raw materials used in paper production are sourced from verifiably sustainable forestry.

DI Dr. Mario J. Müller  
Director of **fibag**



## The whole is more than the sum of its parts

The “**Forschungszentrum für integrales Bauwesen AG**” (**Research Centre for Integral Construction Engineering, fibag** for short) creates a space for **new** and **innovative** ideas in a centre which is unique in Europe, in order to combine technological aspects with aesthetic design in the field of **facade engineering**. The basic needs for research and development in facade engineering stem from the business sector, while at the same time

the required **know-how** lies untapped in the desk drawers of experts at universities and polytechnics. The recognition value of a building lies in its facade (architecture) and the functional applicability in the integrated technologies. The **fibag** building forms the cornerstone, the foundation for all future developments.

The designation „**...for integral construction engineering...**“ implies the fact that technologies from different disciplines are merged together, therefore “**...research centre for merging technologies of construction engineering.**”

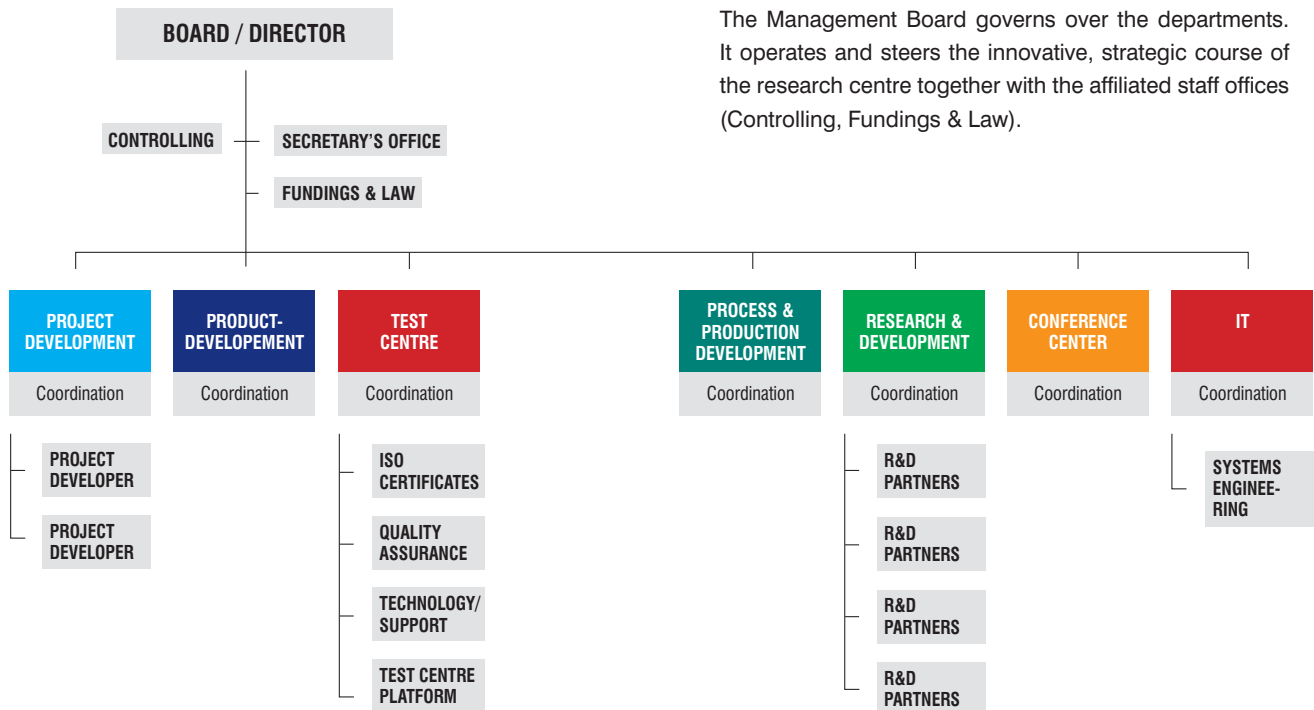
## The research centre's organisation

**fibag**'s organisation guarantees prompt, task-oriented assessment, supervision, management and control of R&D projects through dynamic systems with stable regulations.

The **fibag** is divided into seven departments:

- **Project development**
- **Product development**
- **Test centre**
- **Process and production development**
- **Research & Development**
- **Conference Centre**
- **IT**

The Management Board governs over the departments. It operates and steers the innovative, strategic course of the research centre together with the affiliated staff offices (Controlling, Fundings & Law).



1.000 m<sup>2</sup> barrier-free space for new and innovative concepts

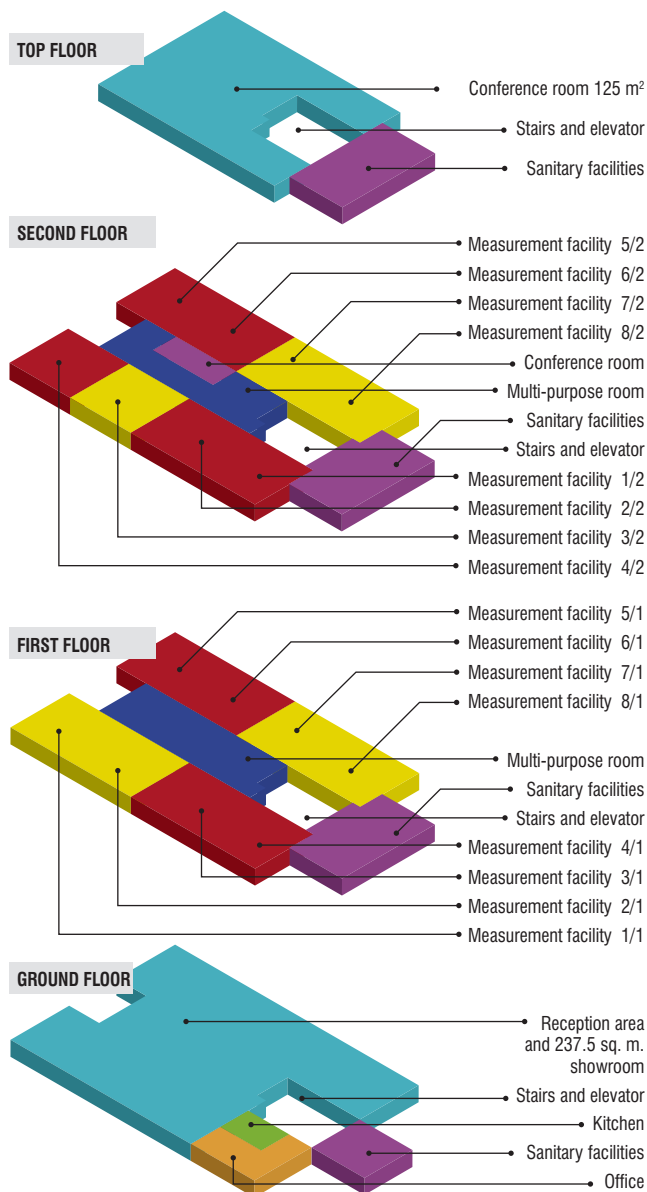
- Exhibition area for the presentation of products, objects and scientific studies.
- Offices and measuring facilities (including access control)
- Seminar and conference room
- Computer centre for simulation calculations

State-of-the-art R&D cells of 25 m<sup>2</sup> each offer maximum flexibility and best research conditions through

- mobile walls,
- double floors,
- suspended ceilings,
- individual climate zones and
- supply and exhaust air with own control and monitoring system
- modular building management system based on LINUX

#### Implementation of long term tests...

... with regard to technical, environmental, economical and aesthetic aspects. In the development stages of long term trials, the facades can be aligned in all directions, mounted over either one or two floors. The replacement of facade elements takes only a few days.







## The test centre

### Test rig:

With a height of 13 m, a width of 8 m and a depth of 3 m, this is one of the highest in Europe and represents the stationary part of the test. The objects to be tested (large facade systems) are mounted and fixed to and within the test rig, so that exactly defined testing conditions are assured. The test rig can also be used as an assembly test rig in order to optimise assembly steps or to push the degree of prefabrication in the production to a degree where the assembly becomes faster and safer.

### Mobile test rig:

The **fibag** test centre has a large number of mobile, mechanical-electrical measuring and testing devices to test and certify large facade systems.

### Test equipment:

The **fibag** test centre uses measuring units and media (air, smoke, water ...) for measurements in the areas of acoustics, optics, building physics and electrical engineering.

Numerous testing methods and procedures, which are based on European and Austrian norms, are carried out for customer products and contract research.

- **Wind load resistance**
- **Weathering strength**
- **Shock resistance**
- **Load bearing capacity in safety installations (including glass)**
- **Acoustic performance (sound transfer and passage)**
- **Thermal permeability (insulating properties)**
- **Radiative properties (reflectance and transmission)**
- **Air permeability**
- **Forces on the facade during operation**
- **Mechanical strength**
- **Shot resistance**
- **Cycle tests of mechanical components**
- **Burglary resistance**
- **Behaviour under various climatic conditions**

Further tests are carried out in cooperation with other institutes:

- **Fire resistance, effects of fire, influence of external fire, resistance to explosion (shock tunnel), resistance to explosion (field test).**



## Building analysis and “active building concept”

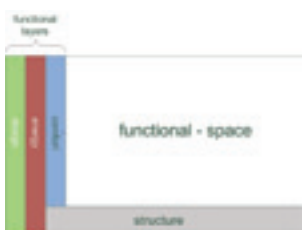
In order to optimise a building, the system of the building must be understood, particularly in the analysis of the technical inventory. This know-how and information is particularly relevant for renovations and the revision and optimisation of plans for new buildings.

**fibag** offers thermal analyses on the basis of infrared testing and the issuance of energy passes for buildings. Since January 1, 2008, the EU Buildings Directive requires the issuance of an energy pass for all new buildings and major renovations.



### active building concept (abc)

Through the **fibag-abc**, new ideas are conceptualized for the building shell with the supporting structure and the building services engineering – systems are joined together and organized on functional levels. That which is separate is united and newly organized.



### Systemic Systematic Synergies (S³)

Finding solutions in the details while keeping an eye on the whole.



Contract research  
unburdens the customer

### Project development:

The run-up to a project sets the path for failure or success in the implementation. In **fibag** project development, your projects are optimized, tested and certified, taking economical, ecological, technical and aesthetic aspects into consideration. “abc” moves and changes projects and creates new functionality with buildings.

### Product development:

An optimal product is created according to specifications, and a model is built, which by means of simultaneous engineering can be developed into a working prototype. This is followed by test series and optimizations at the **fibag** test centre until the product satisfies all specifications.

### Process and production development:

In order to turn the invention of a prototype into an innovation and to generate economic success, the gap between R&D and production must be closed with the concurrent processes. **fibag** accompanies this consolidation in order to keep both times and routes to the product and thus to success as short as possible.

## “Think Tank” – shared facility for targeted research

**fibag** offers experts from the scientific and business sectors space, infrastructure and know-how in the areas of both architecture and materials science with active and passive energy production, regarding sustainability issues with the help of the “Green Certification” and for discussions and developments in the area of structural implementation of major facade systems.

- **Technology push (input from affiliated universities and technical colleges)**
- **Market pull (market needs: clients, architects)**

### Education and training

In the area of abc systems, there is no general education provided by schools, polytechnics, technical colleges or universities. The entire necessary knowledge is acquired through learning by doing, on the run. **fibag** provides education and training services with an interdisciplinary integration of technical colleges, technical universities and civil engineers as well as suppliers, creating a new basis for abc systems.

### Training program:

- **abc QA (quality assurance) in production and assembly**
- **Seminars on "abc systems"**
  - **Materials**
  - **Recent advances**
  - **Synergies**
- **Symposia on abc**



## Thematic Priorities - Project topics

At **fibag**, the facade is established as a general design element, taking into consideration construction, production and safety aspects (DESM). A further focus is the determination and attainment of the limitations of materials and production techniques. Intelligent facade and roof elements should offer functional support to large construction in the areas of energy efficiency, energy production, ventilation and air conditioning are (EERE). The façade is established as an information carrier and supplier (ICAT) in the realization of communication with e.g. media facades, but also by means of automation & control systems.

## Thematic priorities

### DESM – Design, Engineering, Safety & Manufacturing

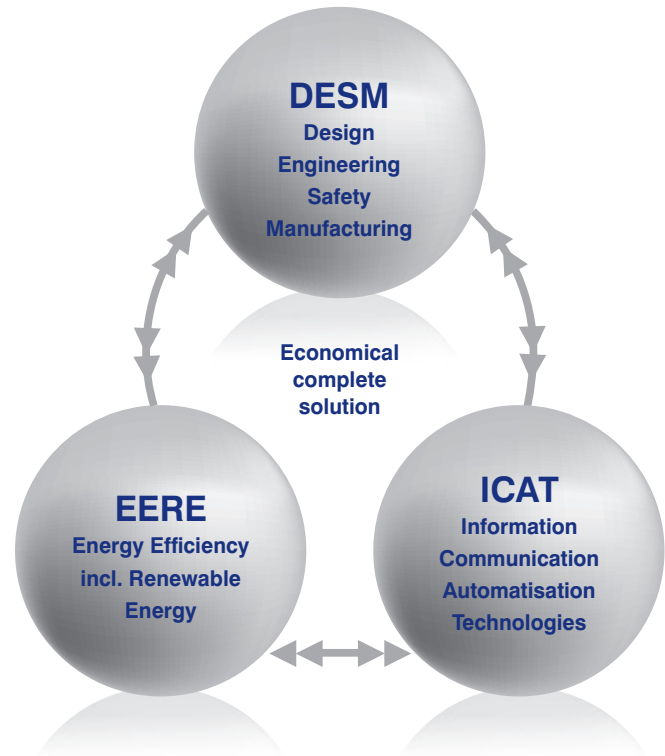
- Architecture + Optics + Form > EERE
- Materials + coating > EERE
- Statics
- Testing + Safety (fire, physical, personal protection > ICAT)
- New production technologies > EERE

### EERE- Energy Efficiency incl. Renewable Energy

- Energy management and integration (large-scale implementation) of energy systems > ICAT, especially from
- Solar heating
- Photovoltaics
- Climate and comfort management > DESM
- Insulation and sealing optimization > DESM
- Ventilation, heating optimisation > ICAT

### ICAT – Information, Communication & Automatisisation Technologies

- „the learning building“ – generating automatic system changes based on changes to the environmental influences
- Control, measurement and instrumentation systems (MSRT) > EERE
- Neural networks, predicative logic > EERE
- Sensor technology > EERE
- Lighting (lumens/lux optimisation) > DESM
- LCD / LED within the facade > DESM



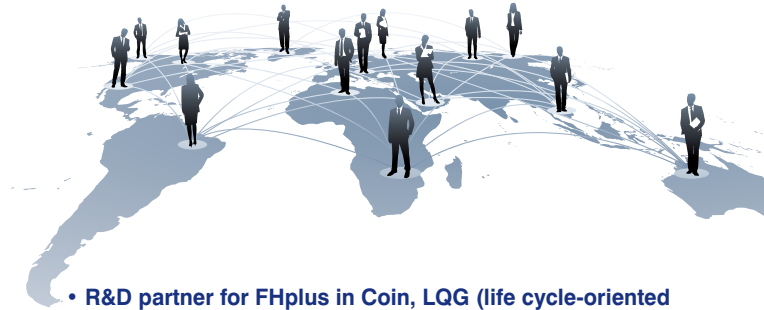
### Benefits for the client (One-Stop-Shop)

- Examination, testing and necessary certificates
- Prototype development and optimization
- Financial savings
- Development of new technical solutions
- Presentation of products and objects
- Publications in the exhibition area
- High frequency of expert audience (e.g. symposia)
- „abc“ for the generation of a Green Building

## Research collaborations and research projects

One area that **fibag** emphasizes is the establishment of numerous research collaborations and the implementation of research projects. The collaboration between academia and industry is brought to life not only by participating in and leading various research projects, but in particular by involving different partners in the individual projects.

- **Consortium leadership for the K-Project MPPF (multifunctional plug & play facade); fibag area of research:** realization of modular, multi-functional facade systems with integration of plug & play features such as solar heating, photovoltaics, ventilation and cooling and building control.
- **R&D partner for the K1-Centre PCCL (Polymer Competence Center Leoben); fibag area of research:**
  - dichroism through silver nanoparticles in glass
  - Measurement of IR-reflective coatings
  - Thermotropic coating
- **R&D partner for the K-Project Light; fibag area of research:** Integrated Day- and Artificial Light – development of an integrated lighting technology for buildings, composed of a combined LED and ambient light system based on a newly developed control system
- **R&D partner at the HdZ Light from Facade; fibag area of research:** Development of entirely facade-based energy efficient lighting options (use of daylight and artificial lighting) for the rooms adjacent to the facade



- **R&D partner for FHplus in Coin, LQG (life cycle-oriented quality improvement of buildings); fibag area of research:** Creation of guidelines for sustainable planning and building for builders, taking life cycle cost, environmental impact and user satisfaction into account.
- **Bilateral cooperation partnership:** HFA (Holzforschung Austria) cooperation through tests for large facade elements in the area of accreditation.
- **Networks:** ECO World Styria – **fibag** as shareholder. The world's leading business network in the field of energy and environmental technology. ECO World Styria supports companies and Styria as a business location with services and projects focused on the growth drivers of innovation, know-how and new markets.
- **R&D activity: Multifunctional daylighting facade** – use of solar radiation to save energy for cooling and ventilation in the summer and for heating in the winter.
- **R&D activity: Brain City Lab** – development of an energy facade which generates more energy than the building uses, and impact on the instruments of urban planning.
- **R&D activity: SolarGetsVertical** – Development of facade-based solar thermal collectors with the greatest possible degree of prefabrication in the area of housing, for both new construction and energy-conserving building renovations.



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