Key features of the test facility

- In-situ measurement of total solar energy transmittance (solar factor, g-value) and heat transfer coefficients (U-values) of façade and roofing components in industry-standard installation environments
- Determination of g-value at different angles of solar incidence
- Analysis of photometric properties of transparent structural components
- Analysis of angle-dependent glare situation of sun protection systems
- Testing of façade and building component specimens
- Optimization of transparent components based on the principles of building physics
- Determination of building physics characteristics of skylights, membrane constructions, complex façade components, transparent roofing components etc. under real-life climate conditions
- Development of test methods for novel building systems

Your contact

Please contact us for more information:

Fraunhofer Institute for Building Physics IBP
Holzkirchen site
Fraunhoferstrasse 10
83626 Valley

Phone +49 8024 643-0
Fax +49 8024 643-366

Dipl.-Ing. Herbert Sinnesbichler
Phone +49 8024 643-241
herbert.sinnesbichler@ibp.fraunhofer.de
www.ibp.fraunhofer.de/es

www.ibp.fraunhofer.de

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CALORIMETRIC FAÇADE AND ROOF TEST FACILITY

PURPOSE AND BENEFITS

Since the Fraunhofer Institute for Building Physics installed the calorimetric façade and roof test facility at its outdoor testing site in Holzkirchen, it has broken new ground in data acquisition with its test methods for transparent building components. With most conventional laboratory test benches only able to accommodate test specimens of a certain size and shape, researchers were previously limited to testing reduced-scale test specimens. Now, Fraunhofer IBP's new test facility offers researchers the opportunity to test large-scale building components such as façade structures, skylights, and multilayer membrane cushion systems. The test facility is primarily intended for the in-situ measurement of total solar energy transmittance (solar factor, g-value) and heat transfer coefficients (U-values) in a realistic installation environment under real-life weather conditions.

To investigate specific aspects of local temperatures, air speeds, heat transfer resistances, and lighting and glare evaluations, the facility is equipped with a three-dimensional robot which can be used to position measurement sensors at any point inside the test chamber.

CONCEPT AND DESIGN

The façade and roof test facility is a large-scale in situ calorimeter. The internal surfaces of the test chamber are fitted with highly absorbent, water-carrying absorbers which can be used to heat and cool the test chamber. By determining the amount of energy required to maintain a given internal temperature, it is possible to derive the energy performance of the test specimen.

The test box can accommodate specimens up to a sample size of 2.6m x 3.5m.

Thanks to the ability to swivel the test chamber by almost 360° and incline it at an angle of 90°, specimens can be tested in any position between the horizontal and vertical. This flexibility allows researchers to use a heliostatic approach (where the specimen tracks the movement of the sun) in order to maintain a perpendicular angle of incidence, or alternatively to maintain the specimen at a defined angle to the sun or secure it in a fixed position in order to mimic the real-life situation of a façade or roof construction.

DATA LOGGING

The measurement data is collected by IMEDAS™, a measurement system developed by Fraunhofer IBP scientists which also communicates with the central control unit. The software program offers the following key features:

- Centralized data logging and storage
- Real-time process visualization of measurement data in a graphical user interface
- Optional password-protected online access to data visualizations (e.g. for in-house presentations or trade-show demonstrations)
- Link between data logging and control systems
- All relevant system information is saved to the central measurement database
- High reliability / failsafe operation
- Any data analysis software can be used to further refine the data
- Internet access via web browser to all the functionalities offered by the software (process visualization, database access, evaluation templates, measuring channels, etc.)