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Computer-Aided Thermal Analysis of Building Components

Development
Optimization
Verification by calculations

For the thermal analysis of complex structures, the finite difference program STATWL and programs of the Physibel software group are in use at the Fraunhofer Institute for Building Physics. The advantage of calculations in comparison to measurements is the significant reduction of time required for installing of test setups. The test method is validated and applied according to EN ISO 10211. If the geometrical structure of a building component is once entered in the computer, different variations can be quickly calculated by changing material data and constructional details allowing the optimization of the building component in this way.

The programs STATWL, BISCO, TRISCO and SOLIDO allow the calculation of up to three-dimensional steady-state temperature and heat flow fields in any given component. Time-dependent investigations are made by means of the programs BISTRA and VOLTRA, whereby transient boundary conditions, e.g. real climate data, are arbitrary.

Selected application examples

Optimization of e.g.

- windows and façade profiles,
- spacers of laminated insulation glazing units,
- shutter boxes,
- masonry blocks, brick wall,
- roof elements, façade elements (with thermal bridges),
- exterior wall construction, fastening elements.

Calculation results

- calculations approved by the construction supervision authorities according to DIN EN ISO 10077,
- parameters: U-, R-, ψ-values, equivalent thermal conductivities λ_{eq},
- temperatures, temperature gradients, dew point temperatures,
- heat flows and heat flow densities.

The following parameters are necessary for calculations:

- completely dimensioned CAD drawings,
- material properties,
- detailed information of user-defined boundary conditions, if possible.

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