

# BSim

## The complete program package for building energy design

BSim is a computer tool that offers advanced simulation facilities for building designers, engineers, architects and others engaged in analysing hygrothermal conditions, when planning, designing or analysing energy consumption and indoor climate in connection with the design for almost any type of buildings.

With BSim it is possible to perform all simulations and calculations based on one single building model. The building model is created as a complete 3D representation in the common graphic user interface and model editor for the whole program package. The model geometry can also be established by extracting the geometry from CAD drawings saved in DXF format.

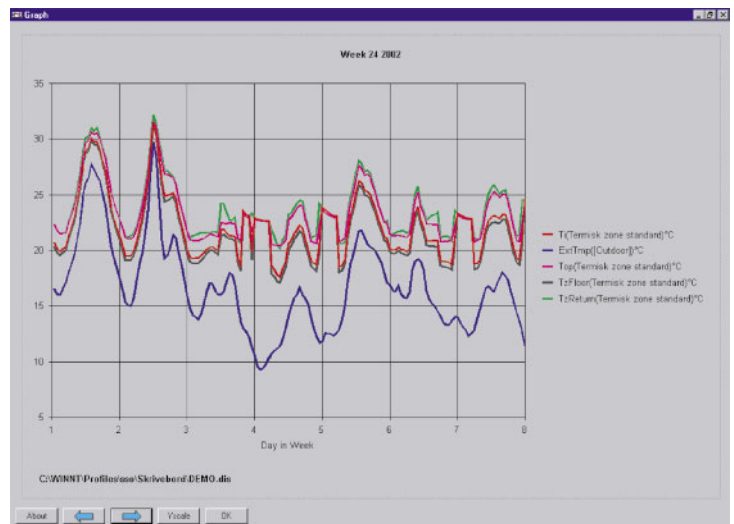
- Thermal indoor climate
- Moisture conditions in buildings
- Shadows and solar incidence
- Shading devices
- Analyses of ventilation strategies
- Energy-conscious building design
- Daylight calculations



### Indoor climate and hygrothermal simulation

tsbi5 is the hygrothermal simulation core of the BSim program package. tsbi5 makes it possible to perform a dynamic simulation of the indoor climate, energy and moisture conditions in buildings. This can contribute to the selection of heating, cooling and ventilating systems at the design stage of new buildings and refurbishment of existing buildings and installations.

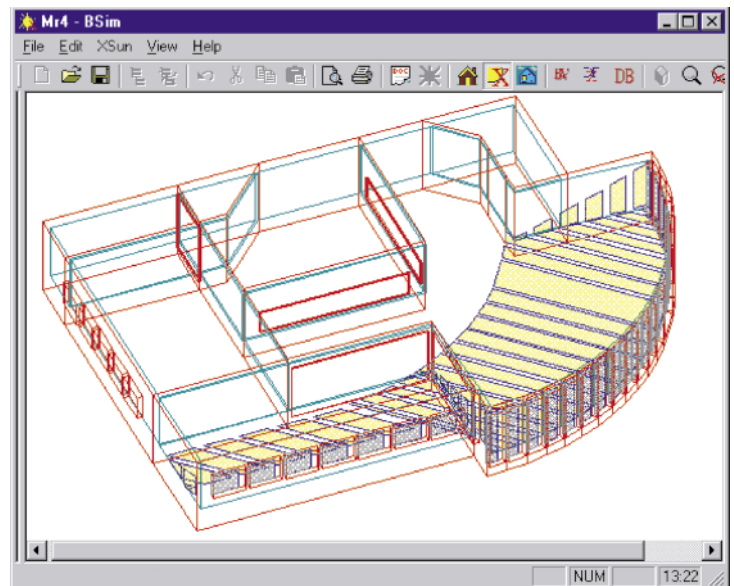
By using tsbi5, it is possible to test different strategies for obtaining desired indoor conditions in buildings by means of utilising solar shading, venting, ventilation, cooling etc.



### Sunlight and shadows

XSun is a tool for making detailed analyses and simulation of direct solar radiation through windows and openings in building constructions. Analyses of shadows from remote objects such as neighbouring buildings can also be analysed by using XSun. During thermal simulations with tsbi5, the routines of XSun are used to distribute direct solar energy to the exact location in the model.

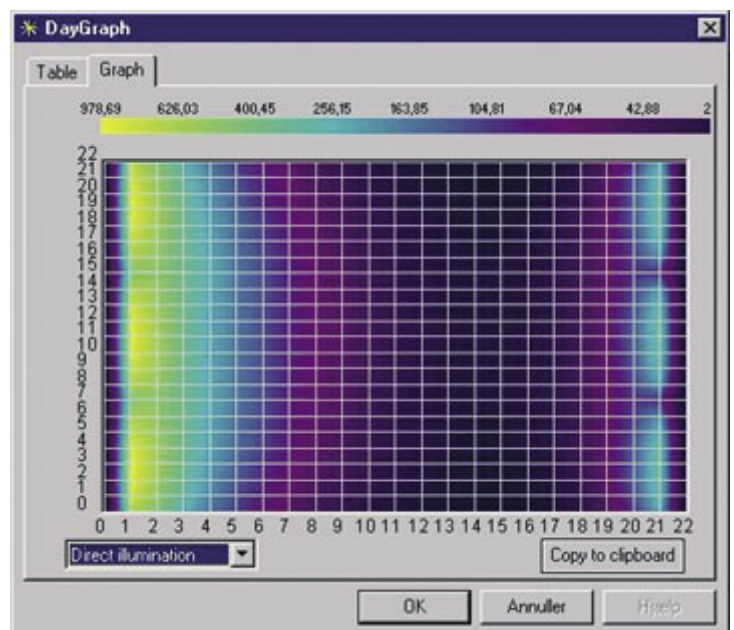
Simulations with XSun can be shown as animations of the movements of sunspots in the spaces of the building model. Animations can be saved as standard Windows video sequences and be shown on a PC, even where BSim has not been installed.



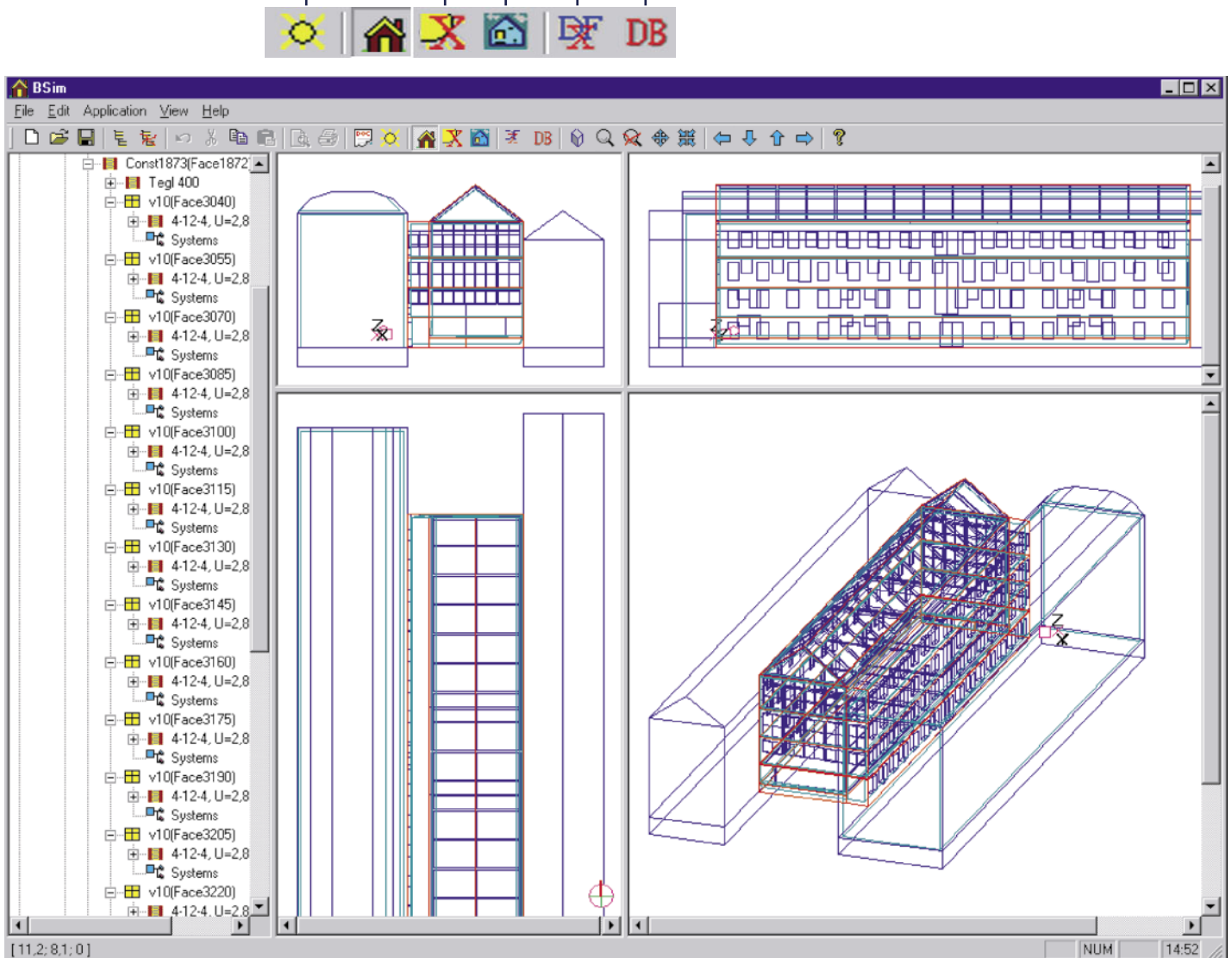
### Daylight calculations

SimLight is a model for calculating daylight conditions in a reference point, or in a grid of points in a plane, in a space with simple (convex) geometry.

Results from the calculations with SimLight can be used directly for controlling the use of artificial light in tsbi5 simulations.



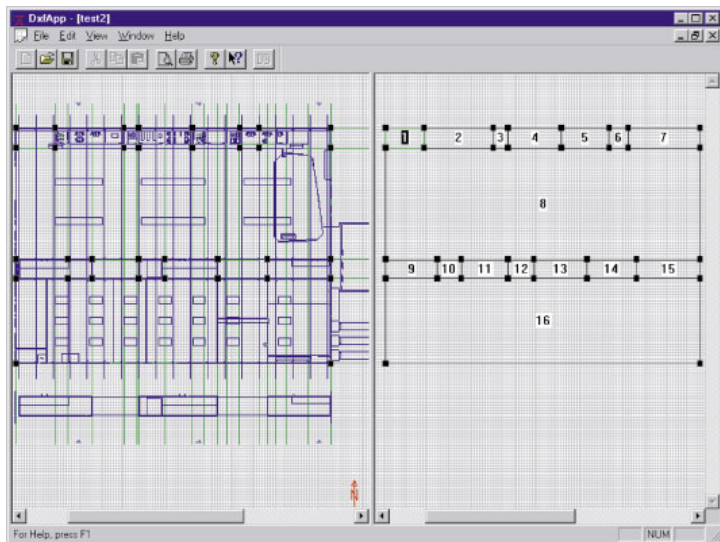
# The BSim program package



## Graphic user interface

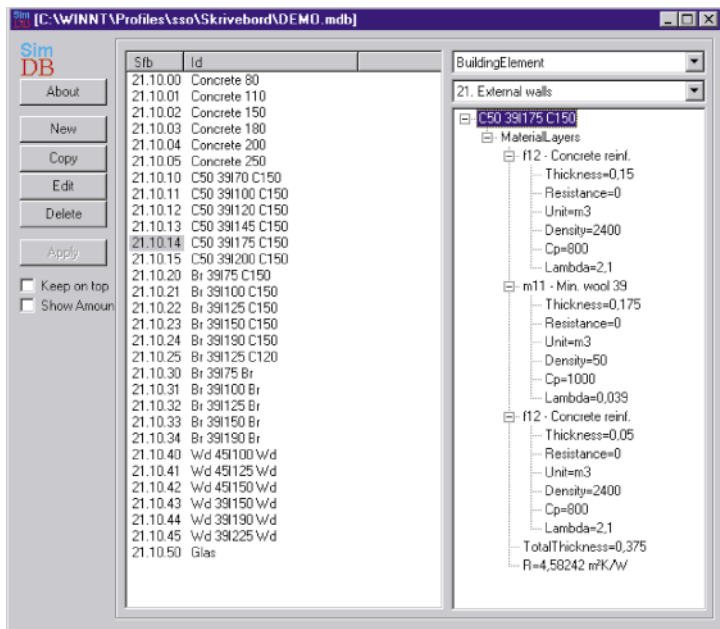
SimView is the graphic user interface of the applications included in the program package and the graphic model editor. SimView is used for creating and defining features and properties of the building such as geometry, constructions, materials and installations.

The model is shown simultaneously as a 3D drawing, a floor plan and two sections. Moreover, a hierarchical tree structure is shown on the left of the display, allowing the user to access and edit individual parts of the building model.



## Importing CAD drawings

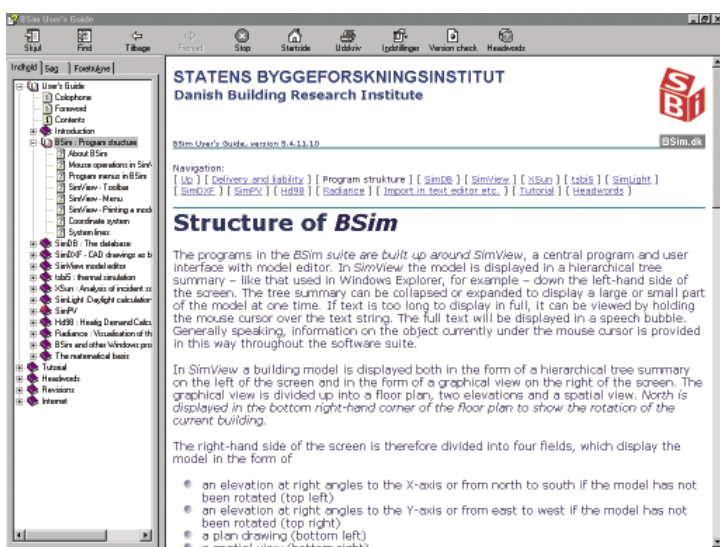
SimDXF can be used to create a spatial geometry from a CAD plan drawing saved in DXF format. This enables CAD drawings to be used as a basis for establishing complex model geometry in BSim. System lines are selected from the CAD drawing and they generate the 3D geometry when opened in SimView.



## Database with constructions and materials

A standard database (MS-Access) containing thermal and moisture data for a number of different materials, constructions, windows and surfaces is also included in the BSim package. The contents of the database can be extended as needed.

SimDB is the BSim user interface to the database and even in models with several hundred constructions and windows, it is possible with only a few clicks on the mouse to attribute data to different groups of constructions, e.g. all external walls by a few clicks on a mouse button.



## Context sensitive help

BSim provides context sensitive help, opening the relevant help page when pressing the F1 button within the program. The help text is updated dynamically to reflect any change in the program and has a built-in function that enables the user to check for the most recent version available for downloading from the BSim web site.

Besides the context sensitive help, the help file also contains documentation on the mathematical background used in the program and direct access to Internet resources related to BSim.



## BSim used in practice

BSim has been used in connection with the design of almost all complex Danish buildings constructed over the past years, e.g. the headquarters of Danish Broadcasting Corporation at Ørestaden, the extension of the Ordrupgaard art museum and a number of new company domiciles on the harbour front of Copenhagen.

### Used by most Danish consultants and builders

BSim is used by most Danish consulting engineering companies, engineering schools, occupational health services and local authorities.

The program package is well established among builders and their consultants, and its use is often requested as documentation for the expected indoor climate.

Owing to its simulation capabilities, its intuitive program structure and its pedagogical user interface, BSim is increasingly used internationally. The program package is now used in Norway, Sweden, Germany, The Netherlands, Poland, Estonia, Spain, New Zealand, Iceland, Malaysia, Japan and Greenland.

### Extension modules

Further to the basic BSim version, a number of extension modules are available, which are fully integrated parts of the program package. Access to these modules can be obtained separately. Read more about the prices and the extension modules on the enclosed data sheet.



Above: A building with glass extension. (Photos: Morten Kjærgaard).

Photo on front page: The Nordea bank headquarters in Copenhagen. (Photo: Steen Traberg-Borup).

Further information about the BSim program package is available at the Internet address [www.bsim.dk](http://www.bsim.dk). On the Internet you can find general information about the program package and the prices of its commercial or educational use, respectively.

Moreover, you will find links to various papers and you can download an electronic User's Guide in Danish and English free of charge. On the Internet you can join an information and discussion forum (via e-mail), which has been established to keep users in contact with each other and for questions to the BSim developers.

### Try a demo-version of BSim

You can order a demo-version, including all extension modules of BSim at [www.bsim.dk](http://www.bsim.dk). The price of the demo-version will be refunded when you order a full license for BSim.

The demo-version will run for 30 days after installation. Compared with the complete version, the sole existing limitation is that only 14-day periods can be simulated.

### Climate data from all over the world

Climate data from any geographic location can be used in the simulations. BSim is delivered with complete Danish climate data, and from [www.bsim.dk](http://www.bsim.dk) you can download some climate files free of charge. BSim also has a built-in function that allows the user to download and convert ASHRAE climate data to the binary BSim format. The conversion function enables the user to establish his own climate data files e.g. from recorded hourly data.

### Links to other programs

All results from simulations and calculations can be transferred directly from BSim to any other Windows program for further processing or used as documentation for the building design.

Results and model geometry can be exported for use in CFD (Computational Fluid Dynamic) programs. The model geometry and surface properties

### Simulation possibilities in BSim

- Heating, cooling, ventilation, varying infiltration and venting
- Utilisation of passive solar heating
- Exchange of heat and air between zones
- Simulation of different ventilation strategies
- Temperature stratification in spaces
- Temperature and moisture conditions through constructions
- Simulation of mechanical ventilation systems with different control strategies: inlet temperature, zone temperature, natural night cooling, moisture and variable air volume (VAV)
- Heating loads from persons, lighting and equipment
- Surface temperatures and condensation risk
- Heating and cooling recovery in ventilation systems
- Inlet and exhaust temperatures in ventilation systems
- Air humidification in ventilation systems

can be exported for use in Radiance – an advanced ray-tracing program for lighting calculations and visualisation. Model geometry can also be exported for visualisation by using DirectX compatible software.

### System requirements

- CPU: Intel Pentium processor or compatible with a clock-frequency of minimum 500 MHz
- RAM: Minimum 128 MB
- Hard disk: Minimum 40 MB free hard disk space
- Operating system: MS-Windows 98 (SE) or more recent. MS-Windows NT version 4.0, service release 3 or more recent.



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