

# Project report

**Intelligent use of  
natural daylight**

**Effective  
heat protection despite  
internal installation**

**Comfortable room climate  
with WAREMA  
LONWorks® control**



**Genzyme Headquarter Cambridge MA, USA**

# Project information

Energy efficient building is not yet on the agenda in the USA. Thermal comfort and adequate lighting are guaranteed through air conditioning systems and all-day artificial lighting.

## Building owner

But there are exceptions. The Genzyme Corporation, an international biotechnology company, designed and built their new headquarters in Cambridge as the first green building in the USA. The 12-story building with an office space of 27,900 sqm shows various architectural features for the utilisation of solar energy and natural daylight.

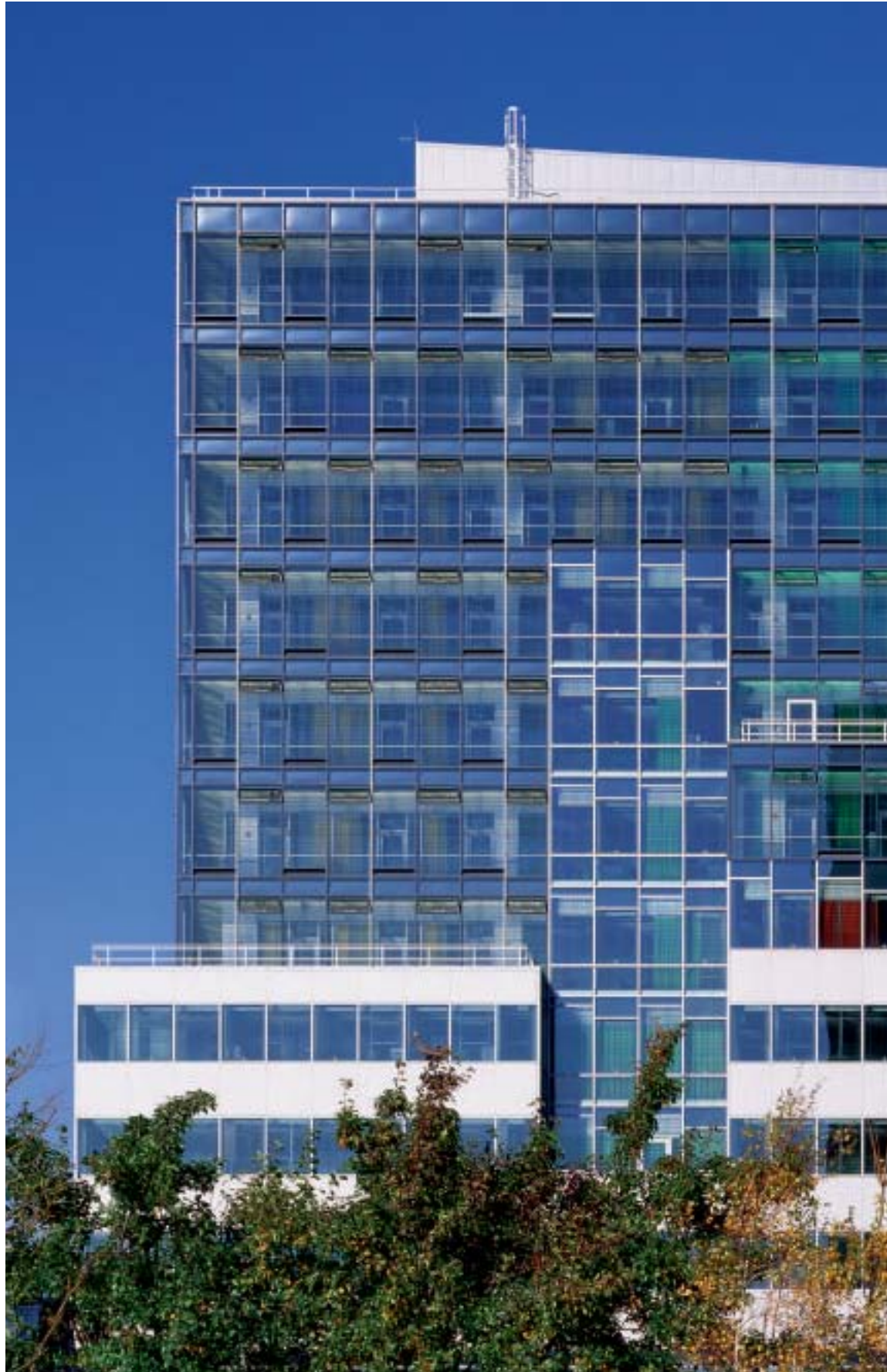
Like photovoltaic cells on the roof and heliostats which flood the atrium with daylight, WAREMA's light-control systems play an important role in the energy concept.

## Architect

The successful project was managed and planned by the German architects Behnisch, Behnisch + Partner from Stuttgart in cooperation with architects House and Robertson from Los Angeles.

## Light planning

The daylight and artificial light solutions designed by the Light Laboratory Bartenbach in Innsbruck make the building appear bright and inviting. The offices are flooded with natural daylight and create a pleasant atmosphere, thus increasing the wellbeing and contentment of its users.



### Building details

Building height: 55m  
Floor space: 27,900 sqm  
Number of storys: 12  
Architects: Behnisch,  
Behnisch  
and Partner, Stuttgart  
Start of construction:  
October 2000  
Completion: October 2003



Photo: Roland Halbe, Stuttgart



Photo: Roland Halbe, Stuttgart

### Specifications:

Glazing

- heat protection glas
- $U_g=1.1 \text{ W/m}^2$
- $g = 0,56$

Light-control system

- 808 light-guiding blinds E80 LD with Hall sensor
- 123 light-guiding blinds E80 L with Hall sensor
- Slat quality Miro 3
- $g_{\text{tot Facade}} = 0,25$

LONWORKS® control

- 600 LON motor control units for 4 motors
- 1 LON weather station
- Conventional blind switch in each room
- Service PC with tabular visualisation
- Remote maintenance via modem
- Support of heating and air conditioning
- Slat guidance
- Annual shade program

# Light-control systems

## Light-control systems

The 931 light-control systems installed at Genzyme fulfill four main functions:

- The luminance of the windows always remains at a level which is permissible for workstations - regardless of the position of the sun.
- The contact with the outside world remains largely intact without detrimental effects on thermal and visual comforts.
- All rooms are illuminated with natural daylight for as long as possible.
- Thanks to the regulation of solar energy (g value), the room temperature always remains at a comfortable level.

## WAREMA Light-guiding blind

These slats with a reflective top side and a reflectance of 93 % form the foundation of effective utilisation of daylight. As the light is reflected on the ceiling of each room, the daylight is distributed evenly and dazzle-free around the room.



Photo: Roland Halbe, Stuttgart



Photo: Roland Halbe, Stuttgart

## Double-motor blind

Most blinds are divided into two sections, which can be adjusted independently. Whether workstation or meeting room, grey November day or sunny summer's day - for every work or illumination situation, the perfect light settings can be programed.

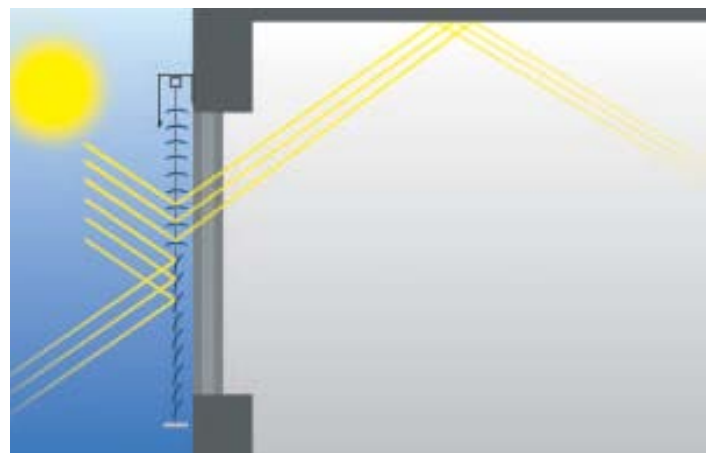




Photo: Roland Halbe, Stuttgart

**Glare protection and contact to the surroundings**

Even with the blinds down, the contact to the outside world remains intact. This is achieved by special semi-perforated slats. The non-perforated half of the slat reflects the direct sunlight.



Photo: Roland Halbe, Stuttgart



Photo: Roland Halbe, Stuttgart

From the workstation, the perforated side of the slat appears transparent and allows dazzle-free contact to the surroundings.

**Effective heat protection despite internal installation**

At Genzyme, all blinds are fitted internally. The architecture and height of the building did not allow for the use of an external sun shading system.

The mirror-finish slats reflect a large part of the solar radiation when closed without converting it to thermal radiation. Hence, the building stays comfortably cool even with extreme outside temperatures.

# Control

Each user can adjust the blinds via a push-button switch according to their own requirements in terms of illumination, surroundings and temperature.

Full performance of the light-guiding blinds is only achieved by adjusting the slats to the best position related to the measured weather data and the position of neighbouring buildings. In connection with the automatic slat guidance which is sensitive to the position of the sun, the best possible use of daylight, glare protection, transparency and heat protection can be achieved.

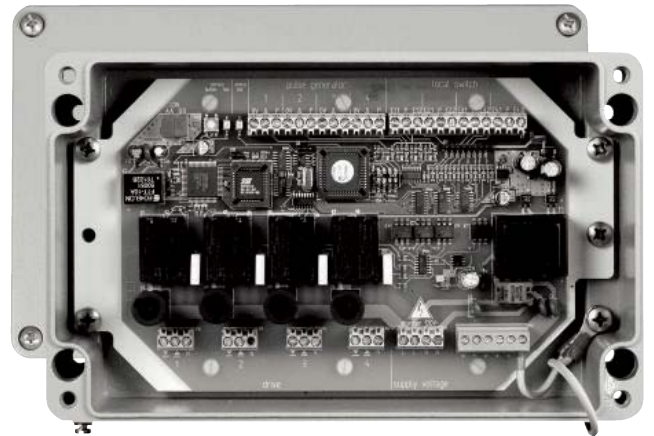
**The solution: LONWORKS®**  
Planner and building owner demanded highest functionality as part of a standardised, efficient and reliable system. This is why the building owner chose LONWORKS® technology. A particular advantage of this technology: The local processing of data render this system extremely efficient and reliable.

The control mainly consists of a weather station, the motor control units (actuators) and the manual overrides.

The LON sensor unit is the first component to which the outside brightness and temperature sensors are connected. The data measured by these sensors (such as date, time and the current position of the sun (elevation and azimuth) are transmitted to all Bus participants.

The motors are controlled by the UL-certified 4 motor control unit LON MSE 4M120I. This unit processes all necessary data and can control up to four light-guiding blinds independently. In connection with the position feedback device (Hall sensor), the LON MSE 4M120I allows a particularly exact position control.

The manual override allow the independent control of the light-guiding blinds on a room by room basis. The light-guiding section (top) and glare protection section (bottom) can be controlled independently.



## Safety First...

In case of a fire alarm, a retraction command is sent to all light-guiding blinds, whilst emergency services are alerted. This ensures that casualties and the source of the fire can be easily located from outside.

## Features of LON MSE 4M120I

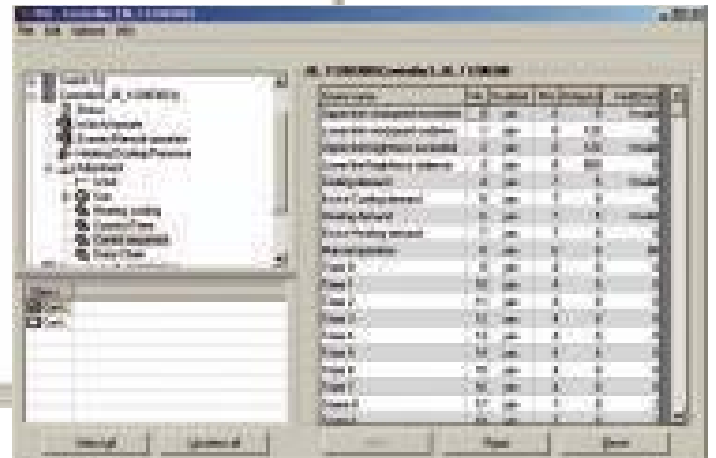
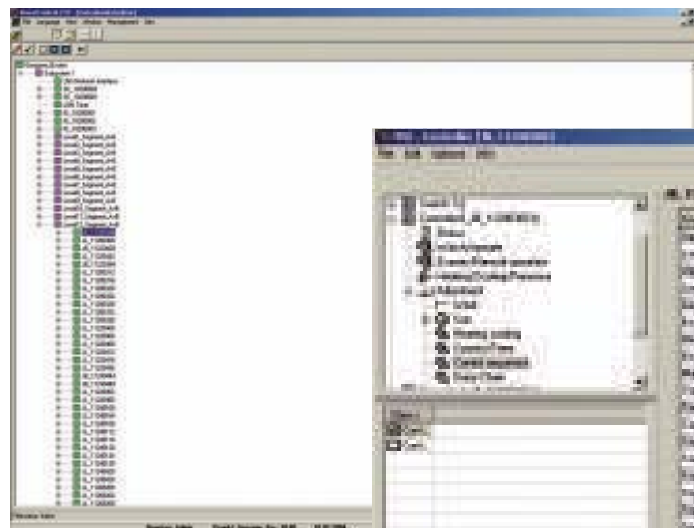
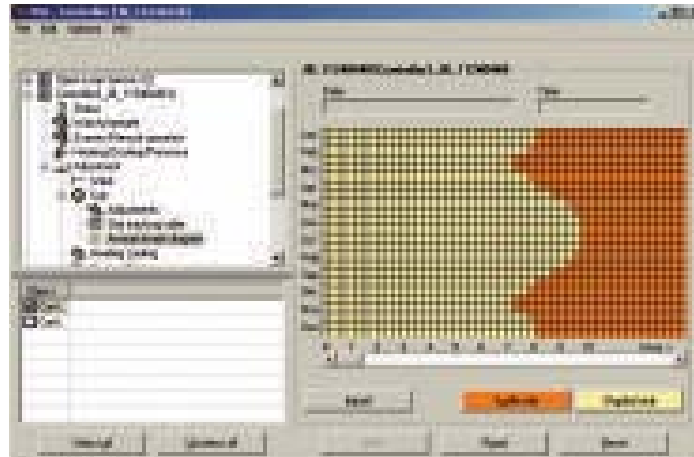
- Local processing of data
- Switching point for sun, clock...
- Parametrisable scenarios
- Parametrisable automatic reverse
- Support of heating/ air conditioning requirements
- Annual shade diagram
- Slat guidance
- Extremely exact position control through use of Hall sensor
- Processing of window contacts
- Connection of up to 4 blind buttons
- Visualisation through GLT
- UL certification
- Robust unit with metal housing



Photo: Roland Halbe, Stuttgart

### Slat guidance

The slats are traced according to the position of the sun. This ensures perfect use of light guidance and glare protection. The actuator receives the measured position of the sun. It then computes the perfect slat position based on the parametrised limit values and facade direction, and controls the blinds accordingly. The slat guidance is based on two different guiding curves. These are activated in dependence to outside temperature in order to support the heating or cooling process. Heating is supported by transporting more sunlight into the room and cooling is supported by reflecting more sunlight.



### Annual shading

An important element for the optimisation of sun shading and daylight guidance in the Genzyme building is the annual shade diagram.

The building and its neighbouring buildings are illustrated in a CAD program and a reference point is defined for each light-guiding blind. The specifically developed WAREMA software calculates the shading patterns for each reference point and each day of the

year. The calculated data are stored in the motor control units and activate each blind if needed.

### Service PC / Visualisation

The service PC is used for visualisation, remote maintenance, central control and parametrisation. Maintenance and other service tasks can be conducted from Marktheidenfeld in Germany via a modem - even for locations as remote as Cambridge, USA.

Although the service PC is not essential for the daily operation, as the processes are controlled locally by the various motorcontrol units, Genzyme chose this option for outstanding service.



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