Building Climatology
Objectives and benefits

Modern transparent architecture demands simple, intelligent climate concepts, in order to allow environmentally compatible buildings with high user comfort combined with low investment and operating costs and high functionality.

Building climatology supports the architect in achieving a comfortable building climate together with an energy-saving structural design. Here the primary emphasis is on providing maximum protection against external factors by means of passive measures concerning the building construction, such as glazed facades, storage masses and so on. Another essential aspect is the utilisation of natural resources, such as natural light, natural ventilation, solar heating and geothermal heat.

Building climatology represents the link between the various design disciplines, and it pursues an integral design approach that focuses on the complex interactions among the facade, the building’s structure and the technical plants of the building. This objective is supported by a variety of simulation tools.

Building climatology consulting yields an optimal overall solution that is adjusted to the particular building project and its specific requirements. It allows to achieve a high degree of design reliability, thereby supporting the realisation of ecological building concepts.

Cover picture:
Administration building of MEAG GmbH, Munich.
Architects: Denk, Mauder, Wisiol & Altenberend, Munich.
Exemplar for an atrium with a glazed roof and adjacent natural ventilated offices.
Climatisation concepts

The desire for environmentally compatible, energy-saving buildings where users feel comfortable requires new approaches to climatisation concepts.

In line with the motto „less often is more“, the objective pursued is to achieve more functionality using less technology. This is done by regarding the building as a total system that interacts with its environment. For example the facade, the structure of the building and the technical plants of the building interact with each other.

Within the context of the building climatology approach, the objective is to exploit available natural resources and to match the facade, the building structure and the technical plants of the building optimally to each other.

Here the primary emphasis is on optimisation of the facade’s energetic properties, activation of the building’s storage masses and maximum use of natural lighting and natural ventilation of the building’s rooms.

Building simulation is an important tool for the development of innovative climatisation concepts. It enables to predict the influence of the complex interactions between the building and its environment, in order to develop an optimal solution which fulfills the requirements of investor and user. Various potential solutions can be evaluated, compared and analysed in terms of their cost effectiveness. Furthermore innovative solutions and the utilisation of regenerative sources of energy can be investigated with regard to their functionality and cost effectiveness under the prevailing general conditions and constraints.
As the link between the building and its external environment, the façade is highly significant for the design of the building. Furthermore, it plays a decisive role with regard to energy flows and other interactions between the interior and exterior of the building. The demands imposed on the façade thus arise from a variety of technical functions. In particular, the interactions among these technical functions are very important and compel an integral perspective.

With regard to climatic conditions present during the summer months, limiting solar thermal heat gain via the transparent areas of the façade is a key consideration. Here it is recommended to analyse the shading situation as the first step, in order to determine whether a shading system is necessary. Such an analysis may also be relevant with regard to planning permission and building regulations.

The amount of solar heat gain via a transparent façade exposed to intense solar radiation depends on the choice of glazing materials and the shading system.

The shading quality of a façade is expressed in terms of its solar heat gain coefficient (shading factor). Although an initial, rough value for this coefficient can be approximately estimated using the solar heat gain coefficient of the glazing and the attenuation factor of the shading system, such an rough estimate cannot take system-specific properties into account, such as high levels of reflection from specular elements of the shading system. Significantly better results can be obtained by computational calculations, which base on the physics of energy radiation and the spectral distributions of transmission, reflection and absorption for each of the façade’s individual layers (i.e. glass panes and/or shading system) and which deliver reliable values for the specific façade’s properties of the particular project.

These calculations can also provide information about the temperature profile within the glass façade under conditions of intensive solar radiation.
Day light is becoming an increasingly important factor in the process of developing buildings that are energy-efficient and user-friendly. In architecture, natural light represents an essential design factor.

With good day lighting, changes in the natural light level during the day, as well as variations in light due to weather conditions and the seasons, can be perceived at the workplace. This maintains the connection to the external world. Well day lighted rooms with pleasant natural-light atmospheres significantly enhance the sense of personal well-being.

Besides, this intensified day lighting generally yields a decreased use of artificial light. However, since the availability of natural light is characterized by strong seasonal variations at our latitudes, a strategy that strives to exploit day light to the maximum possible extent must also consider adequately the aspects of solar shading and glare protection. The objective is to develop solutions, which are compatible with the use of the building while taking local conditions and structural factors into account. Ingenious day light planning begins in the early conceptual design stage, in order to allow the design freedom to be fully exploited. During subsequent conceptual and detailed design stages, various day light systems or strategies for rational natural lighting can be investigated and evaluated in terms of their functionality and efficiency.
Natural ventilation of buildings is a key factor in climatisation concepts that aim to achieve low energy consumption and a high level of environmental compatibility. Only a few years ago, a uniform, artificial interior climate produced by full air conditioning was regarded as ideal. Now, by contrast, it is generally recognised that the sense of personal well-being and the quality of the workplace can be significantly enhanced by providing an increased influence of ambient air (for instance, to allow daily and seasonal climatic variations to be experienced) and allowing people to adjust room climates to suit their personal favorites. Even in office buildings and administrative buildings, it is now hardly imaginable to build working rooms that do not allow at least occasional natural ventilation.

As part of the current trend towards transparent architecture, natural ventilation is increasingly tasked with discharging heat loads out of the building in addition to air hygiene aspects.

In the conceptual and detailed planning of natural ventilation solutions, appropriate consideration must be given to wind forces as well as thermal induced buoyancy forces. Our range of services includes formulating requirements for air hygiene, fresh air supply and heat discharge, determining ventilation rates and air speeds, dimensioning ventilation openings and developing concepts for control and regulation.

We would like to inform you that Müller-BBM has a quality management system which includes our headquarters in Planegg (near Munich) and all branch offices. This management system is based on the international standard ISO 9001 and was certified by the DQS Deutsches Institut für Zertifizierung von Managementsystemen mbH. The certificate registration number is 5398.