Calculation Method for Double Façades

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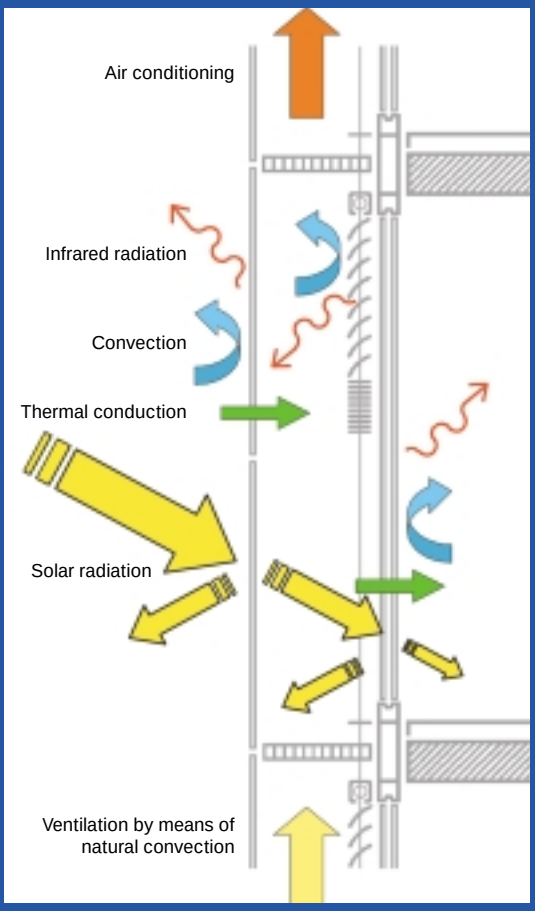
Double façades have been favoured by architects for some time. Sulzer Infra Lab (SILab) has devised a simplified method for the initial estimation of the cooling and heating power of buildings with double façades. It entails the calculation of the heat transfer through the two façades. SILab also provides planning aids for the further design steps of the double façade.

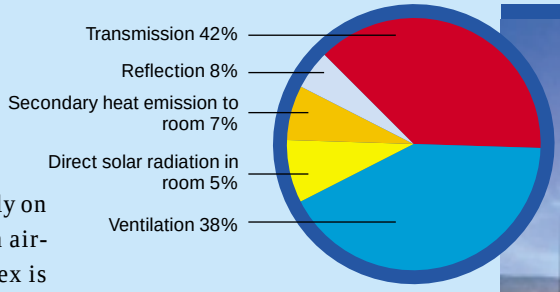


1■ Thanks to a simple method devised by Sulzer Infra Lab, it is possible to estimate the cooling and heating power of buildings with double façades. This also entails the calculation of the heat transfer through the two façades.

The provision of so-called double façades has become very popular with architects over the last few years. In such cases, the normal façade – in the true sense of the word – separates the inner side of the building from the environment and is usually enveloped with a further glass casing. Double façades are also expected to have an energy-saving effect during the colder months of the year, because the intermediate space serves as a thermal insulation and is also heated by the sun. Double façades, however, are difficult to calculate. Up to now, there were no generally recognized guidelines for the initial estimation of the cooling and heating requirements or the necessary peak performances. Since there are diverse types of double façades, computing methods and tools have to offer sufficient freedom for the investigation of the relevant parameters.

CALCULATION OF THE HEAT TRANSFER

Sulzer Infra Lab, a company of Sulzer Infra, has developed a calculation method for double façades, in order to check the functionality of an existing draft concept. It is a stationary, unidimensional method that, in the main, facilitates the calculation of the mostly unknown heat transfer through the double façade system. The model is based on the creation of heat balances for surfaces (Fig. 1■). These balances account for the heat flows resulting from absorbed solar radiation, exchanged infrared radiation, convection and thermal conduction. Six surfaces are considered: the outer and inner side of the external glazing, outer and inner side of the solar protection, and the outer and inner side of the interior glazing.
The calculation model was employed, for example, for the Blandonnet International Business



2■ SILab was commissioned by Sulzer Infra Romandie to assess the effect of various types of solar protection on an office building at the Geneva-Cointrin airport. The example shows the energy distribution in summer with black solar protection.

Center, which is located directly on the site of the Geneva-Cointrin airport. The first building complex is already occupied; the second is now under construction. For its double façade, SILab was appointed by Sulzer Romandie SA, who is responsible for the mechanical services of the two complexes, to undertake a preliminary study to assess the effect of various forms of solar protection (Fig. 2■). As a result of the respective calculations, temperature profiles and heat flows (g values) are now available for the double façade.

FURTHER AID FOR PLANNING PURPOSES

SILab also offers tools that go beyond the rough estimation for the design of double façades. In general, the investigation is performed in three steps. An analysis of the conceptual drafts with the above mentioned method is followed by the thermal (dynamic) building simulation. This entails the calculation of the energy and power requirement, as well as the layout of the regulating and control system. In the final stage, numerical flow simulations, which include the calculation of the thermal and solar radiation, are employed to determine airflow and temperatures. With this, vibrations of the sun shades and noise in the space between the two façades may be predicted.

SILab was appointed by the building owners, Mobino AG with head office in Lucerne (CH), for example, to create thermal building simulations for the former Sulzer Escher Wyss office tower in Zurich (Fig. 3■). The most important question thereby was whether the planned double façade would act as a solar collector and thus contribute to the heating of the supply air for the air conditioning system in winter and so reduce the energy consumption of the building. With the simulation, it could be confirmed that the heating and cooling requirement would be lower and the consumption of energy reduced accordingly. The building was completed in December 2000.

RELIABLE CALCULATION OF DOUBLE FAÇADES

With its diverse calculation processes, SILab places methods at the disposal of the planning engineer which enable double façades to be calculated from the concept to the final design in a reliable manner. Companies responsible for the design and installation of mechanical services, which have to guarantee that the systems will function in a proper manner and provide the desired comfort for the user, can check the functionality of a draft concept and thus exclude the risks associated with the performance of the systems to a major degree. Ω

3■ The airflow can be calculated with numerical flow simulations. In the case of the former Sulzer Escher Wyss office tower in Zurich, it was shown that the airflow should not cause any disturbing noise.

FOR MORE DETAILS

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