

**Technology and Media Center Erfurt, 1999-2001**  
**Innovative Systems for an Industrial Building**  
**Building time: March 2000 to October 2001**

(tmz night- vue)

The owner expressed, with the technology and media center a building arose, that is raked contemporary and future claims on intelligent, longtime-lasting building with innovative architecture – that is to understand as a compliment to the planning- idea by connecting all specialists in a very early stage and developing the building in an iterative process.

The geometrically very consequent designed building is in its internal addition quite different.

The west part of the building is shaded by a textile-glassy wrapper, like using an umbrella, while the eastern site is covered using a glass- facade with internal shade- systems due to the heavy eastern winds. At the front sides, steel-constructions can be used as well for solar- power- fields as for advertisements of companies.

The operator had always exact ideas for the use- demands, which our office transformed in a flow diagram.

Form follows function – in this words one can explain the visible result. As our Client wanted us

to create a multi- functional building, we translated form and function not only for the rooms according to the flow diagram, but also for the complex technical and physical building system.

This building should work as a communal financed (tmz Erfurt floor- plan)

“incubator” for private technology and media- companies.

An essential feature of the developed solutions is the possibility to be able let increase individual units and to be able let "shrink" too to lose without the cohesion or to be restricted by continuous removals- as one can read in the floor- drawings.

This had to be considered for the rooms for office, lab and production purposes that are designed after the functional orders and can become most extremely individual and equipped technically flexible. Necessary conference and media fields are arranged in the object, that can be made to the users available. Conference- rooms with the usual infrastructure and a cafeteria complement the program.

For our client it was also important not to project a "show-case" with structural- glassing- facade or a post- modern building. The demands on his building were to get an expression for the application of materials which are raked to particularly the function and the claim of a technology and media center. Using these demands, we developed a high- tech- building, very functional and flexible as one of the first buildings world wide with a textile facade.

Climate-Technical preliminary investigations to the building and the façade

Aspects for the company-economical, flexible useability and the intelligent contact with optimized ecological and economic building- concepts stood in the foreground:

(ventilation diagram tmz Erfurt)

Activation of the building masses, Thermal Building Optimization, optimal

daylight use and daylight guidance, natural ventilation beside the demands on significant and high-innovative architecture language had to play a supporting role.



(picture: thermic diagrams tmz Erfurt)

While designing, thermal computer simulations and planning influenced themselves mutually. These technical investigations and the intelligent utilisation of the construction physics had a most extremely positive influence on the building and use costs. In this connection the technology and media center in Erfurt got included in EU - solar supporting-program Jülich.

(physically activated building- masses tmz Erfurt)

Operation and building control system, use of the building masses, use of geothermal heat, solar power use form the "intelligence" of the building - intelligence in the sense of the intelligent contact with the construction physics and additional use of the modern building guiding and computer technique. To that some examples can be called catchword-like:

- Use of the geothermal heat / earth cold by means of earth spikes and heat pump
- Installation of cool ceilings, concrete heart activation and air radiator in direct combination with the geothermal sources
- Concrete heart activation for the environmental conditioning of the building (Cooling / heating)
- Rainwater use
- Photovoltaics plants for house-technical energy supply and demonstration and experimental purposes
- natural ventilation of all units except for the assembly rooms
- Flexibility through multi-purpose Installation in sub- centres
- comprehensive building control system for the data acquisition and evaluation of building functions

In order to be able to judge the effectiveness of the different computer- calculations correctly from the individual technical disciplines, the simulations were carried out for the fields of thermal and energetic circumstances, aerophysical circumstances and for daylight. And finally, the simulations are now controlled by measurements.

### Facade construction

(western facade tmz Erfurt)

The western facade along the open gangway gallery which works as access walk to the companies` entrances and communication - zone reflects the building-physical considerations as well as the chosen architectural language.

In the West- façade, through the commitment of a textile construction in addition with glass the air temperatures in the maximum was reduced dramatically with positive effects to the climatical conditioning of the building. From thermal viewpoint the west facade offers a heat protection in the summer through their high reflection factor.

(picture: daylightdiagram tmz Erfurt)

Looking at the effects on bordering rooms and the required daylight quotients, the differences to a pure glass facade

deviate only in the field of the windows a little bit, in room depths differences are hardly anymore to be found.



By constructing so, we could fulfill the German "Arbeitsstättenverordnung": a so called "workroom-law" (a law which directs the unlimited outlook), optimise the constructive effects and the use costs while supporting optimal daylight.

(entrance- side tms Erfurt)

Up to now there are not either national or international standards for textile structures. Therefore in Germany the suitability of these constructions has to get a "Zustimmung im Einzelfall" by the "Oberste Bauaufsicht", which means an approval on an individual basis through the Upper construction supervision government. The declarations of the manufacturer referred to the mechanical and fire behaviour of the materials as non-supporting components. The "Obere Bauaufsicht" didn't accept these data. In the present case, for this necessity the tests and the certificate had been additionally carried out by an independent laboratory (Laboratory Blum).

The whole western facade is supported by a steel construction which consists of arch beams and their necessary supportings. The beams, formed of HEA240 were produced on basis of a projected geometry and a statical analysis. This determined beam geometry was the basis of the membrane statics and the membrane cut.

The distances between the arch ties are 5,0 and 2,5 m. In the sections 5,0 m the translucent, multi-layer membrane fields are tightened.

The special-developed textile construction is anticlastic formed and mechanically prestressed. This construction exists out of three layers. An inside membrane (PTFE coated fibreglass laminate), a damming pillow 10 cm strong (covered fibreglass web), a 20 cm part of air and an exterior membrane (PTFE coated fibreglass laminate).

This construction was fixed at the beams through the planned fixing systems with which a regular distance existing between damming pillows and exterior membrane is to be ensured uniformly.

(setting- up façade tms Erfurt)

At the edge, the membrane is taken point-wisely at the lower construction. Only the

upper edge end occurs by steel cable.

(partial facade tms Erfurt)

The heat transition coefficient of the entire construction conducts 1,1 W/m<sup>2</sup>K, light transmittance 22 %.

At a failure (Crack) the intern- as also the exterior membrane can do no damage for the building in the static sense, neither onto lower construction or neighbouring glass fields, nor to human health from falling components. The Membrane- façade is not a necessary construction in engineering sense.

### Connecting-bridges

(connecting-bridges night tms Erfurt)

In the second floor the solitaire buildings are connected by bridges. The construction consists

of steel tube framework in combination with elliptic steel beams.



(construction bridge)

(2 pictures: different behaviour in changing light)

The membrane is a PTFE coated fibreglass laminate and protects people from environmental influences. The steel construction in addition with the prestressed membrane prevents a self-oscillation fanned through wind and in doing so, the textile construction works as vibration damper.

(elements of bridge)

### Summary

aspects we allow to increase the usability opposite normal office buildings around approx. 25 % .

Through the optimization of the outlines from use (picture: tms Erfurt night vision)

The building enables the settling companies to present themselves with a highly innovative image. On the one hand this is allowed with an excellent and significant address, on the other hand it meets, as an essential criterion, all functional orders. (tms Erfurt facade and connecting-bridge)







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