

TAUNUSTURM
FRANKFURT / GERMANY



TISHMAN SPEYER

INTELLIGENT BY DESIGN

Achieving the highest standards through
innovation and partnership

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OVERVIEW

WHAT IS TAUNUSTURM?

TaunusTurm is a new landmark building in the heart of Frankfurt's banking district. A joint project between Tishman Speyer and Commerz Real AG, the 170 m (560 ft) high office tower provides 60,000 sq m (645,800 sq ft) of prime, contemporary office space across 40 floors. The adjacent residential tower comprises 44 luxury apartments across 3,800 sq m (40,900 sq ft).

TaunusTurm achieves the highest standards of sustainability, enhancing the surrounding area and making a positive contribution to the wider urban environment.

VISION

TaunusTurm has been built with the future in mind and is a bold statement for Frankfurt. It is an exceptional building that aligns with Tishman Speyer's overall commitment to create properties of enduring value around the world. Accessible, efficient with resources, and offering a comfortable, high-quality work and living space, TaunusTurm delivers on this vision.

MAJOR INNOVATIONS

Innovation was a driving principle of the project and can be seen through many aspects of the design and construction process. Academic and industry experts were consulted to optimize technical solutions, and a pioneering partnership with the key general contractor helped expedite the development.

TaunusTurm is designed for LEED® (Leadership in Energy and Environmental Design) Platinum Core & Shell certification.

CONNECTING WITH THE COMMUNITY

The project has social benefits too. It creates a new cultural destination for the city by providing additional gallery space for the MMK (Museum für Moderne Kunst/Museum for Modern Art) within the TaunusTurm complex. In addition, the restoration of the former city ramparts upgrades the area and makes the adjoining green space easier to reach.

15%

BETTER THAN
ENERGY
REGULATIONS

20%

ENERGY
SAVINGS DUE
TO 100% LED
LIGHTS

44%

BETTER THAN
POTABLE WATER
EFFICIENCY
BASELINE



NEW GALLERY
FOR MMK
MUSEUM



DESIGN

AN EXEMPLARY LOW-ENERGY BUILDING

TaunusTurm epitomizes the latest thinking in environmental design and construction. It combines iconic architecture with modern building technology, and integrates sustainability with urban planning. By adopting a new partnership model, the development sets a new standard in design efficiency.

STANDARDIZATION AND FLEXIBILITY

TaunusTurm has been designed to offer flexible office space that can be tailored to a tenant's requirements quickly and cost-effectively. Close collaboration between the architects and engineers led to standardized layouts and pre-installation of mechanical and electrical systems, without compromising the aesthetics of the design.

PARTNERSHIP FOSTERS DESIGN EFFICIENCY

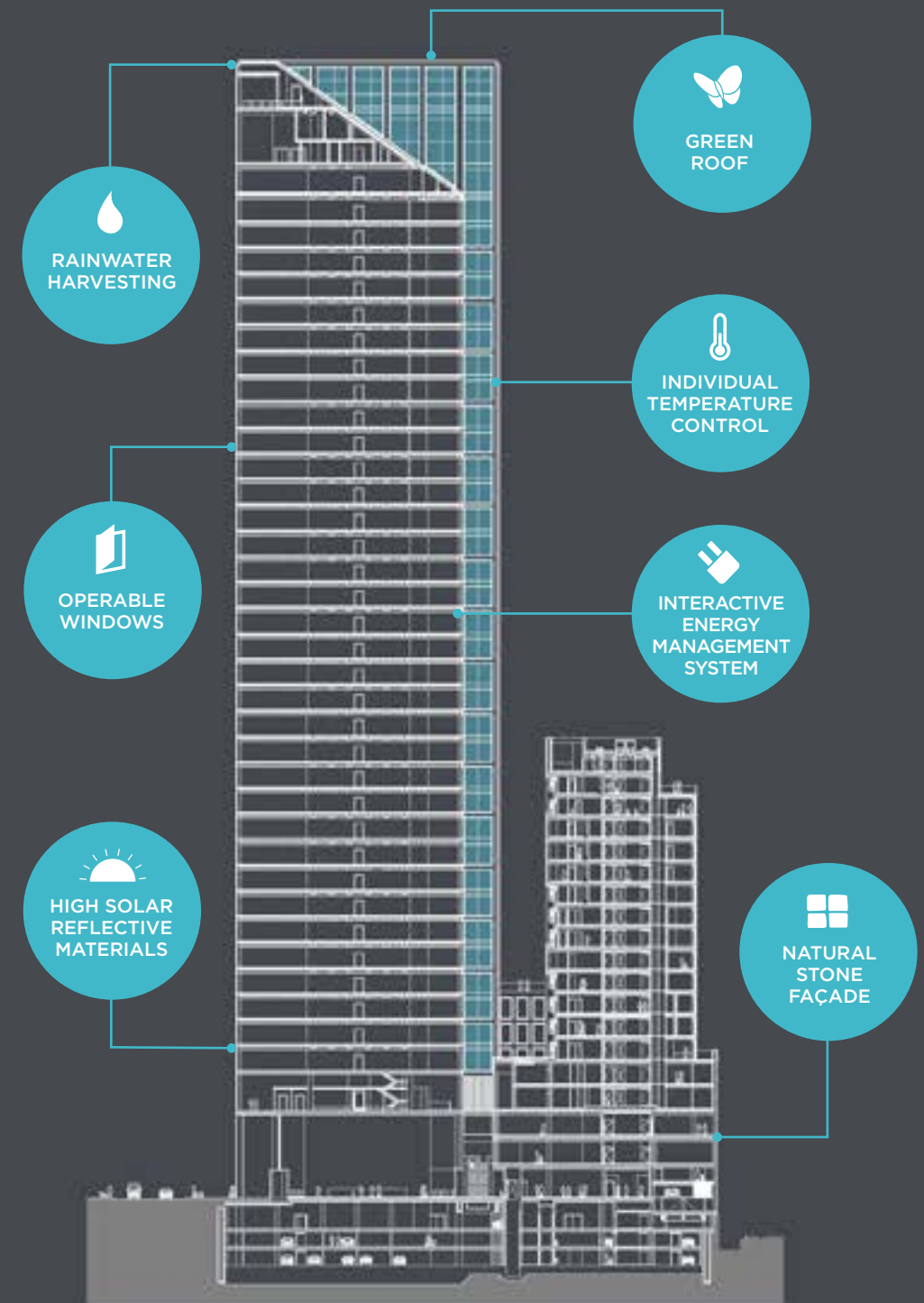
Tishman Speyer entered into a groundbreaking partnership with the key general contractor, Züblin, involving them from the beginning of the design

development phase. This meant the contractor could influence the design and ensure construction constraints were considered, eliminating the need for costly redesign. It also enabled the contractor to provide a fixed price offer after the detailed design phase.

SUSTAINABLE CONSTRUCTION

Sustainable construction practices and attention to detail improved the environmental credentials of the development and underpinned the building's design. This can be seen in the extensive use of sustainable building materials and sustainability measures such as the modular, high-performance heated and chilled ceilings, the intelligent elevator system, and the operable windows.

The building has been designed to fit seamlessly into the city's landscape and enhance the local urban environment.





CONSTRUCTION

COMPLEX CONSTRUCTION IN AN INNER-CITY ENVIRONMENT

The construction of TaunusTurm involved 75 different trades and 100 subcontractors, with up to 550 people working on the construction site. A method of continuous improvement known as Fast Track Planning was used during construction. The planning team adjusted the building plans throughout the construction phase, resulting in a building of the highest construction quality.

OPTIMIZED PROCESSES

An innovative partnership model was set up with the key general contractor to cover engineering, procurement and construction. This contractual arrangement helped enhance the schedule, increase the overall quality of the building, improve safety standards, and reduce procurement costs.

A MODULAR APPROACH

The majority of the building was constructed with modular, prefabricated components, which were delivered as close to the point of installation as possible. Using prefabricated elements had numerous advantages, including improved quality control of components, more reliable scheduling, a significant reduction in waste caused by over-ordering, better use of space on site, and improved safety standards.

MAXIMIZED INTERNAL SPACE

To achieve the highest levels of technical excellence, academic and industry specialists were consulted throughout the design phase. An example of this can be seen in the column design. A reduction in column diameter led to a significant increase in the amount of space available to rent and more natural light, and overall helps create a more attractive workspace. The percentage of usable space is also increased by the efficient integration of technical installations.

To add greater flexibility for prospective tenants, ceiling panels can be removed to create a two-story atrium.

MANAGED SITE-SPACE DEMAND

Building within an inner-city environment posed several construction challenges, particularly with regards to storage space. Tishman Speyer appointed a dedicated logistics team to manage this aspect of the construction.

A monorail system was installed to facilitate the transport of prefabricated components, such as the façade elements, which weighed more than 2.5 tons.

OVER
90%
OF WASTE
DIVERTED FROM
LANDFILL

OVER
20%
OF MATERIALS
FROM RECYCLED
SOURCES

20%
OF CONSTRUCTION
MATERIALS
SOURCED
LOCALLY



RESIDENTIAL

OVERVIEW

The 70 m (230 ft) high residential tower, located next to the office tower, is Tishman Speyer's first residential building in Europe and comprises 44 luxury apartments across 3,800 sq m (40,900 sq ft). The block provides a unique living experience for its residents, being the only modern, high-rise residential building in Frankfurt. It is also unusual in that it houses an annex of the MMK (Museum for Modern Art) on the second floor, with the MMK bookshop and café situated on the ground floor.

ADVANCED DESIGN AND TECHNOLOGY

Apartments are fitted with state-of-the-art kitchens and bathrooms. Each has a home automation system that allows residents to manage their apartment's energy system remotely, and a combination of sub-metering and energy management software enables accurate monitoring. Under-floor heating powered by Frankfurt's municipal heating system keeps energy costs down, and under-floor air distribution helps improve thermal comfort and ventilation.

HEALTHY LIVING

Most apartments have terraces, many with views of the river and parkland beyond. The reception area opens out onto the park, giving residents easy access to the surrounding green space. The building is designated as non-smoking.

ENVIRONMENTAL FEATURES

The residential tower contributes to the overall LEED® Platinum Core & Shell certification of TaunusTurm. In addition to energy-saving design features, residents also benefit from dedicated, secure bicycle parking.



ACCESSIBLE
GREEN SPACE



REMOTELY
CONTROLLED
ENERGY SYSTEM

100%
HEATING FROM
MUNICIPAL
SYSTEM



TECHNICAL INSIGHTS

INTERIOR DESIGN: MAXIMIZING COMFORT

Greater control is given to occupants to create the highest standard of environmental indoor comfort.

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HEATING AND COOLING: INNOVATION & EFFICIENCY

The building features an innovative energy system with low primary energy demand and energy-efficient operation.

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LED LIGHTING: BRIGHT SAVINGS

The use of LEDs lowered costs for building occupants and reduced the overall carbon footprint of the building.

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PROCUREMENT: EFFICIENCY THROUGH PARTNERSHIP

Efficient construction processes, saving costs and time, were facilitated through an innovative partnership.

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ELEVATOR DESIGN: MINIMIZING ENERGY CONSUMPTION

Improved air tightness of the elevators reduces energy consumption.

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MODULAR CONSTRUCTION: FLEXIBILITY AND EFFICIENCY

Modularity enables flexible usage and customized fit-out, while maximizing time and cost efficiencies during construction.

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CONTEXTUAL DESIGN: ENHANCING THE SURROUNDINGS

Integrated thoughtfully into its surroundings, the building enhances the broader urban environment.

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ENERGY MONITORING: EMPOWERING THE USER

Improved visibility and control for building owners and facility managers enables better management of energy consumption.

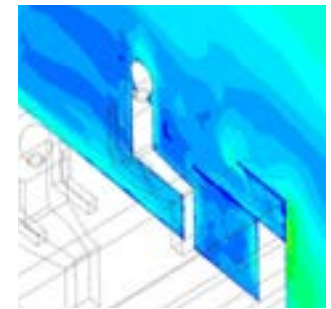
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TECHNICAL DESIGN: ADVANCED ENGINEERING

Technical design was optimized through the incorporation of high-end engineering methods and computational simulations.

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INTERIOR DESIGN: Maximizing Comfort

Giving office workers the ability to influence their environment is a positive step forward. While it's something we take for granted in our homes, simply being able to open a window and adjust the temperature makes a big difference to comfort levels at work.

OBJECTIVE

To construct a building with the highest standard of environmental indoor comfort, flexibility and control for occupants.

IN BRIEF

Every aspect of the indoor environment was designed with these objectives in mind:

- Occupants can directly influence indoor conditions, and thereby improve comfort, as all windows in the office tower can be opened manually.
- Individual room temperature control panels are provided in each office.
- Views of the city and urban landscape can be seen through the glass façade.
- Flexible space allows for customized tenant fit-out to specific requirements, with innovative and elegant interior design.
- Thermal simulations, computational fluid dynamics simulation and high-end engineering design were applied to maximize comfort.

OUTCOME

- A modern, flexible and comfortable working environment.

KEY INSIGHTS

- Advanced technology can be integrated into modern, flexible environments to enhance the occupants' comfort and control.



View through glass façade



Hybrid heating and cooling ceiling



Local temperature control

HEATING AND COOLING: Innovation and Efficiency

The onsite cooling system is highly flexible; facility management can make a judgment about which operational mode to use depending on external factors, such as the weather. This ability to be responsive to current conditions gives operators control over costs, without compromising on tenant comfort.

OBJECTIVE

To construct a building with a highly efficient energy system that has low primary energy demand.

IN BRIEF

The energy system was designed with the following features:

- Modern, hybrid heating and cooling ceiling system to reduce energy consumption by up to 35% compared to conventional chilled ceilings.
- Guided air exhaust system on the inside of the façade, between the glass and sunblind, to improve ambient temperature in summer and winter. The ceiling cooling system is supported by a ventilation and air extraction system.
- Laboratory tests were carried out for different chilled ceiling systems to determine the best product to avoid draft effects, optimize the air distribution, and ensure optimal comfort.
- The building is heated with district heat (low primary energy factor of 0.7), providing a low-cost heating source for the absorption chillers, reducing use of the chillers and resulting in energy savings.
- The building has four major chillers: two absorption chillers, which are run on district heat, and two screw chillers.

Cooling towers on the roof provide free cooling, as follows:

- The absorption chillers, which require hot water or a heat source to produce cold water for cooling purposes, use the municipal heating steam as a heat source.
- While deploying energy from the steam, the steam condenses to water. This water is still quite hot when it leaves the absorption chillers, so it can be used to preheat the return water from the building's heating circuit. By doing so, the energy required for heating purposes is reduced and costs can be saved.
- The energy system is configured in such a way that it uses the sprinkler tanks (capacity 900 cu m, or 31,780 cu ft) for thermal storage, and these are chilled during nighttime hours. This configuration maximizes flexibility in system operation.
- In summer, when high cooling loads occur, the storage can be used to reduce peak cooling loads, providing up to 1 megawatt of additional cooling for up to 6 hours. In winter, with low cooling loads, it allows the chillers to run at their optimum operating point or even to switch off completely.

OUTCOME

- Innovative energy system that uses intelligent design in combination with existing technology to drive performance.
- Energy efficiency is 15% better than required by German energy regulations (EnEV).

KEY INSIGHTS

Existing technology still offers opportunities for improved efficiency when it is used in new ways, and has the advantage of lower costs. As such, it is worth looking to find innovative ways to modify existing systems ahead of investing in new technology.



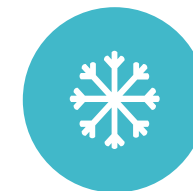
Energy system installation

KEY METRICS



35%

REDUCTION
IN ENERGY
CONSUMPTION



6 hrs

ADDITIONAL
COOLING EACH DAY
FROM THERMAL
STORAGE

LED LIGHTING: Bright Savings

The decision to install the LED lighting system offers measurable savings to tenants. But LEDs do not just save on energy and costs, they make the building far easier to maintain. For us, this delivers on our goal of integrating sustainability into the building, making it more attractive to prospective tenants.

OBJECTIVE

To reduce operational costs and the overall carbon footprint of the building, making TaunusTurm an attractive, energy-efficient choice for prospective tenants.

IN BRIEF

LED lights were selected for their longer lifespan and greater energy efficiency compared to standard fluorescent light sources, and have been used within the building as follows:

- Architecturally designed and energy-efficient LED lighting systems have been installed in the lobby and arcade area. The installations for other areas will occur during tenant fit-outs.
- Flush linear lights using prism technology will be used for office lighting, adding to user comfort.
- After tenant fit-out, almost all of the areas above ground will be equipped with highly efficient LED lights.

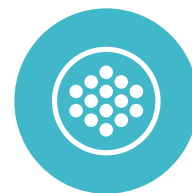
OUTCOME

- While the initial investment required for LED systems is more than for standard lighting, this is offset by an approximate 20% reduction in annual energy costs.
- The payback period is estimated to be 3.5 years, with the benefit gained by the tenants via a combination of reduced maintenance costs and lower energy bills.

KEY INSIGHTS

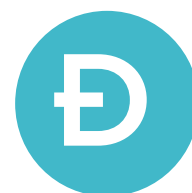
LED lighting systems could become standard installation practice in future construction projects as they provide a benefit for building tenants and thus increase a building's attractiveness. The higher investment costs of LED lighting systems are offset by operational and energy savings for tenants. In addition, the range of LED lighting systems now available offers flexible design opportunities.

KEY METRICS



100%

LED LIGHTS
THROUGHOUT



20%

REDUCTION IN
ANNUAL COSTS



20%

ENERGY SAVINGS



LED lights in lobby

PROCUREMENT: Efficiency Through Partnership

The partnership we set up with Züblin, our key general contractor, has set a precedent for future construction projects. Their early involvement led to far greater efficiencies within the construction process, and eliminated the need for redesign because they could incorporate expertise from the design development phase into later stages.

OBJECTIVE

To optimize the construction process and save costs through early involvement of the general contractor.

IN BRIEF

The innovative partnership set up with the key general contractor (GC) meant they were directly involved from the beginning of design development, which had numerous benefits:

- The contract set up with the GC was updated throughout the construction process and enabled a favorable, fixed price to be agreed to after the detailed design phase, resulting in greater cost certainty for the development.
- Due to the early involvement of the GC, Tishman Speyer only commissioned the architect and planner up until the end of design development, at which point they were able to hand over project planning to the GC.
- This also meant construction constraints could be factored into the design at an early stage, which saved on time and costs.

OUTCOME

- Cost savings achieved in comparison to standard procurement.
- Optimized construction process resulted in efficient knowledge transfer and time savings.

KEY INSIGHTS

Cost reduction and improved construction processes can be achieved by involving the contractor at an early design stage.



A partnership approach

ELEVATOR DESIGN: Minimizing Energy Consumption

Identified as a significant cause of unnecessary energy consumption in buildings, our efforts were focused on minimizing air infiltration in the elevators. Our research enabled us to optimize the elevator design and select the most appropriate manufacturer. As a result, we have achieved significant energy savings, reduced costs and emissions, and provided new empirical metrics for elevator analyses.

OBJECTIVE

To reduce energy consumption by selecting the best-performing elevators.

IN BRIEF

Lack of air tightness in elevators increases energy consumption and noise factors. To eliminate these issues, Tishman Speyer:

- Commissioned a research project to evaluate elevator air tightness, as appropriate studies were not available.
- Enlisted the Imtech Research and Development Department, Hamburg, to test various elevator door options in a measuring chamber, simulating air infiltration for each option.
- Calculated energy savings potential through optimized elevator technology, including simulation of energy reductions.

OUTCOME

- Optimized elevator design and identified best elevator manufacturers.
- Reduced energy demand of the building due to less air infiltration.

KEY INSIGHTS

Focused research can drive optimal design, as shown by the testing carried out for TaunusTurm. This has set a precedent for elevator design in future construction projects.



Elevator shaft

KEY METRICS



20%

REDUCTION IN
PRIMARY ENERGY
DEMAND



26%

RELATED ENERGY
SAVINGS FOR
HEATING SYSTEM



20%

REDUCTION
IN CO₂



Elevator lobby



Elevator interior

MODULAR CONSTRUCTION: Flexibility and Efficiency

We were looking to deliver efficient, sustainable design without sacrificing on quality or flexibility. This quality is immediately evident as you enter the building: The main lobby rises to an impressive 13 meters (42 ft), and its natural stone tiles extend from the interior to the walkway outside, linking the inside of the building to the parkland beyond and creating a sense of depth and space.

OBJECTIVE

To design an attractive building suitable for flexible usage and customized fit-out, while maximizing time and cost efficiencies during construction.

IN BRIEF

Standardization, prefabrication and a modular approach were key to achieving the dual goals of flexibility and efficiency during construction. As is standard in the German market, Tishman Speyer is also responsible for tenant fit-out; this allows seamless design and integration with the base building, thus driving efficiencies at all levels.

Construction:

- Focus on standardization of layouts to optimize the use of standard-size mechanical equipment (for example, the ceiling panels are all the same size).
- Positioning of partition walls is possible every 1.35 m (4 ft) within the ceiling grid, without needing to modify the ceiling panel size.
- A large proportion of pre-fabricated elements were used, such as columns, beams and ceiling panels, increasing resource efficiency and speeding up construction time.
- To save on time and costs, all floor tiles were purchased during base building construction. These were stored, ready for installation, beneath each raised floor as part of the construction process. This eliminated the need to move the tiles through the building at a later stage, which saved time during fit-out.

Tenant fit-out:

- Estimated tenant fit-out is 2.5 months per floor, with a contractual agreement in place setting an upper limit of six months for six floors.
- Office areas have been designed to maximize flexibility. The building core houses all equipment for building services; the remaining area is fully customizable, allowing for a myriad of office configurations.
- Tenant areas have pre-installed mechanical and electrical systems that provide enough flexibility to accommodate most conceivable floor layouts without the need for major changes to the pre-installed HVAC system.

OUTCOME

- Overall construction time was significantly reduced with the structural work for one floor completed every four days.
- Rapid tenant fit-out is achievable.
- Flexible usage of office space caters to a broader range of tenant requirements, making the building more marketable.
- Tenant areas can be reconfigured during occupancy.

KEY INSIGHTS

The lessons learned on optimizing construction processes through a modular approach can be replicated on future projects, particularly with regards to project management, procurement and logistics.



Packaged tiles

KEY METRICS



2.5

MONTHS FOR
ONE FLOOR FOR
TENANT FIT-OUT



4

DAYS FOR
STRUCTURAL
WORK ON ONE
STANDARD FLOOR

CONTEXTUAL DESIGN: Enhancing the Surroundings

“The Museum für Moderne Kunst (MMK) has at last acquired the additional exhibition space it so urgently needs and has so long desired. The MMK’s major collection of works, which until now could be shown only piecemeal, can now be presented to the public in a larger and more permanent setting.”

Dr. Susanne Gaensheimer, Director of the Museum für Moderne Kunst (MMK)

OBJECTIVE

To design a building that is sympathetic to its surroundings, enhances the broader urban environment and makes use of its position to maximize occupant comfort.

IN BRIEF

The design principles considered the building in the context of its immediate surroundings, its location within the city and the impact of these factors on tenants:

- The adjacent “Wallanlagen” (former city ramparts) have been upgraded as part of the project. A new promenade and landscaped area link TaunusTurm to the ramparts and create a public park, incorporating additional trees.
- The landscape design creates a visual connection between the building’s interior and exterior, further enhanced by using the same stone inside and outside the building.
- Several cultural events have already taken place and more are planned to integrate TaunusTurm into Frankfurt’s city center.
- The entrance lobby faces the park, giving occupants attractive views and easy access to the adjoining green space.
- TaunusTurm is easily reached by public transport. Frankfurt’s Central Station is a five-minute walk, and the international airport is 15 minutes by public transport.
- The building is well placed for ready access to surrounding public facilities such as restaurants, shopping areas, accommodation and leisure activities.

OUTCOME

- Sympathetic integration of the building within the city environment enriches the immediate surroundings and forms the basis for a community of mutual interaction, going beyond an office building sitting purely within its own walls.

KEY INSIGHTS

By considering the design of a building in the context of its physical environment and its broader social purpose, it is better placed to contribute to the economy and serve the wider community more usefully. Such measures also help to enhance quality of life for occupants.

KEY METRICS



4,000 square
meters

OF CITY RAMPARTS UPGRADED
(43,000 SQ FT)



TaunusTurm and surrounding city environment



TaunusTurm and surrounding parkland

ENERGY MONITORING: Empowering the User

Everything about the energy-monitoring system is designed to enable building operators to minimize their energy use, thereby reducing their carbon footprint and minimizing their costs. Real-time information, and the ability to visualize the cost implication of decisions, helps make this possible.

OBJECTIVE

To enable building owners and facility managers to understand, manage and minimize their energy consumption, and thus reduce energy costs and environmental impact.

IN BRIEF

Extensive sub-metering, data collection and an energy-management system are used to monitor energy use and improve energy management as follows:

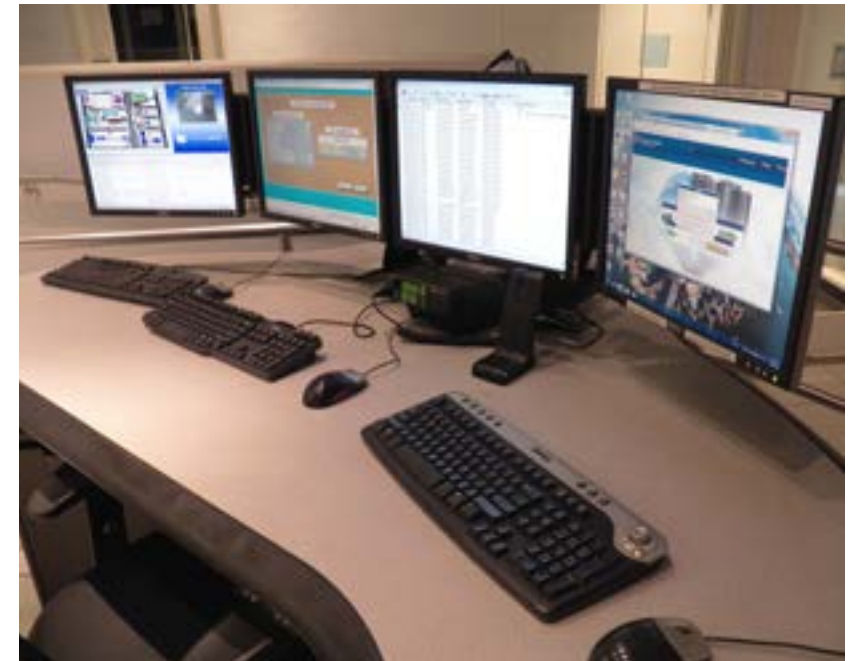
- Extensive sub-metering, with up to four sub-meters installed per floor, enables detailed energy monitoring.
- Energy-management software processes data from the sub-meters to give insight into energy use.
- An external contractor maintains the meters, bills tenants and interprets the energy data, offering advice on ways to drive down energy costs.
- The energy-management system includes a visualization tool, presenting real-time information on average energy prices for each kWh of cooling provided. Facility managers can use this information to decide which cooling system to use based on cost factors.

OUTCOME

- Energy usage is visible through the sub-metering and immediate action can be taken to maximize efficiency.
- Informed decisions can be made to determine the best cooling system to use at any given time.

KEY INSIGHTS

Sub-metering could become standard practice for future construction projects as a tool to enhance energy efficiency and to manage energy costs.



Operating desk for building managers

TECHNICAL DESIGN: Advanced Engineering

High-end engineering methods and computational simulations, supported by expert advice from academics and industry partners, have resulted in a technical design that fulfills the vision for TaunusTurm. It sets a new standard for environmental design and construction, which ensures maximum occupier comfort with integrated flexibility.

OBJECTIVE

To maximize operational efficiency and occupier comfort through rigorous testing and analysis of design criteria.

IN BRIEF

With input from academic and expert partners, multiple theoretical analyses were conducted in the following areas:

- Carried out theoretical analyses of occupier comfort in the lobby area using computational fluid dynamics (CFD). This resulted in a solution that achieved thermal comfort for reception staff without the need to heat the whole lobby area.
- Evaluated the fire protection concept using CFD simulations.
- Conducted thermal building simulation to identify energy-conservation measures and maximize thermal comfort.
- Carried out a feasibility study for geothermal energy usage in collaboration with the Technical University of Darmstadt, which led to the conclusion that this method of energy generation was not appropriate.
- Evaluated air circulation around the building and perfusion through the building using advanced engineering analysis methods and CFD calculations to evaluate wind loads and air filtration.
- Tested numerous elevator doors to determine air tightness and relative energy demand.

OUTCOME

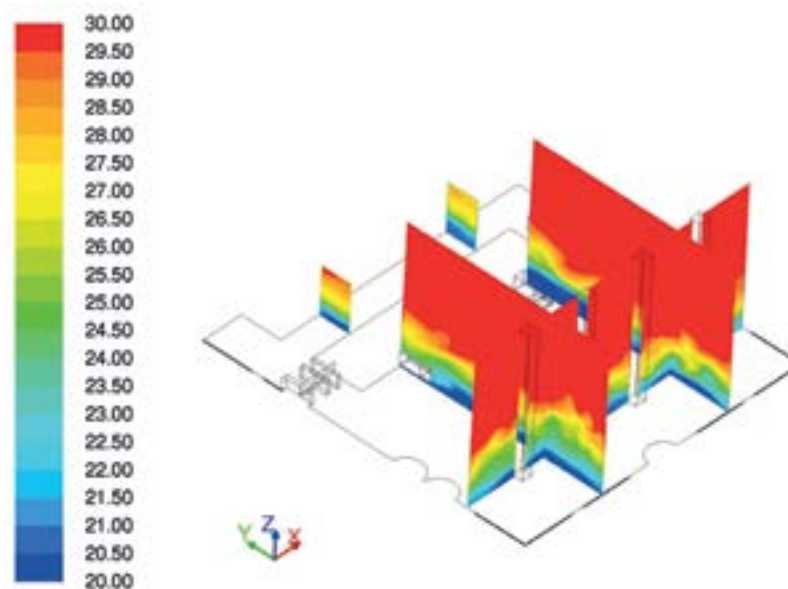
- Optimized design of building structure and technical systems.
- Theoretically verified occupants' comfort through thermal simulations and CFD analysis.

KEY INSIGHTS

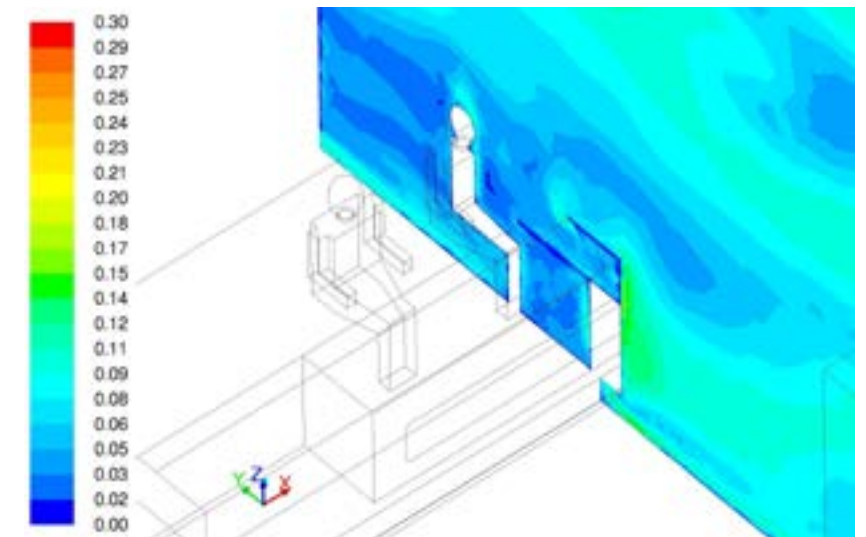
High-end analytical engineering methods, in consultation with academic and industry experts, can be used to maximize operational efficiency and improve comfort factors.



TaunusTurm lobby



CFD simulation of lobby - Temperature profile



CFD simulation of lobby - Air velocity profile