

# NEW ECB PREMISES



EUROPEAN CENTRAL BANK

EUROSYSTEM



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## NEW ECB PREMISES

**Photos:** From market hall to new premises of the European Central Bank (ECB): Until 4 June 2004 fruit and vegetables were sold on this site in Frankfurt's Ostend district. Thereafter, the City of Frankfurt am Main carried out the initial removal works before handing the site over to the ECB on 1 May 2005. The preliminary construction works were carried out in 2008. Then, in spring 2010 the main construction works were launched. From 2011 visible progress was made on the construction of the office tower alongside the restoration and conversion of the *Grossmarkthalle*. With the installation of the antenna in March 2013, the office tower reached its full height. The *Grossmarkthalle* is now an integral part of the new ECB premises and the new building ensemble can be seen from numerous locations in the city.

## Introduction

Grand visions provided the inspiration for the two building projects from different eras that now form a single entity in Frankfurt's Ostend: the *Grossmarkthalle* and the new premises of the European Central Bank (ECB). Grand, visionary ideas and bold decisions necessitate a distinct form of building, and on that basis, the *Grossmarkthalle* was built between 1926 and 1928 to serve as a central location for buying and selling fruit and vegetables in Frankfurt and its surrounding area. As an industrial building, it heralded Frankfurt's ascent to the rank of metropolis during the 1920s. A 200 km distribution area required a correspondingly large structure, which is why Martin Elsaesser, who was Director of Town Planning

for the City of Frankfurt am Main at the time, designed the *Grossmarkthalle* as the world's largest, free-spanning reinforced concrete structure. The "*Gemieskirch*" (or vegetable church, as it was dubbed locally) was the city's tallest building and towered over what was then "New Frankfurt".

The initial vision behind the construction of the ECB's new premises was that of a single European market with its own currency. In 1992 a decision was taken on the future location, namely Frankfurt am Main, and it is there that the ECB was established in 1998, initially in rented office space. After careful consideration, the site of the *Grossmarkthalle* was deemed suitable in 2001 for the guardians of





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the euro to now build their own office space. The ECB's move in the autumn of 2014 means that it is now managing the currency of one of the largest economic areas in the world from its new premises in Frankfurt's Ostend.

The design developed by Vienna-based architects COOP HIMMELB(L)AU is no less visionary or unique than that of the *Grossmarkthalle*. The distinctive glass office tower, which is linked to the market hall via an entrance building, serves as a landmark in Frankfurt's Ostend, creating a counterpoint to the high-rise buildings in the city centre. The new building ensemble is a notable addition to Europe's architectural heritage.

The *Grossmarkthalle* itself forms an integral part of the ECB's new premises and houses the more public areas of the ECB, having retained its fundamental appearance after the careful repair and restoration of its original substance. The construction procedures in-

involved in converting an industrial and utility building into a public institution with an array of functions required the highest level of care. From the outset, all decisions on the design, as well as its further development, were discussed in detail and taken in close cooperation with both the City of Frankfurt am Main and the historic preservation authorities, with due consideration of the results of the in-depth analysis of the building's historic substance.

A key element of the ECB's aim to produce a sustainable building was its efficiency in terms of energy and water consumption. The energy design for its new premises includes various measures that ensure that they are 30% more efficient than stipulated by the *Energieeinsparverordnung* (German energy saving directive) of 2007, which was the version in force during the planning phases.

The following texts and pictures explain the various elements of their design for the new

ECB premises, from the integration into the urban context to the challenges of retaining the original substance of the *Grossmarkthalle* and the construction of the new building. The aim is to describe what the new premises look like today and how the various building elements are being used.

This brochure can be downloaded in PDF format from the ECB's website at [www.ecb.europa.eu/ecb/premises](http://www.ecb.europa.eu/ecb/premises), where detailed information on the New ECB Premises project is also available.

**1+2** The site of the *Grossmarkthalle*, which is no more than a 15-minute walk from Frankfurt's city centre, has been converted to give it a new use. The New ECB Premises project was launched long before the ECB was assigned its new supervisory tasks. The ECB therefore decided to continue to rent the Eurotower in order to house its supervisory staff.



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## Finding the right location and design

**When the Maastricht Treaty (Treaty on European Union) was signed in 1992, it was decided that the ECB would be located in Frankfurt am Main.**

The ECB is a relatively young European institution, having been founded only in 1998. In the same year, following a recommendation by the European Court of Auditors to all European institutions that it is much more cost-effective in the long term to own premises than to rent office space, the ECB launched an extensive search for a suitable site on which to build its own offices. After a thorough investigation of 35 sites in Frankfurt am Main, it decided in 2001 to purchase the site of the *Grossmarkthalle* from the City of Frankfurt am Main. The site is located in Frankfurt's Ostend district, close to the city centre.

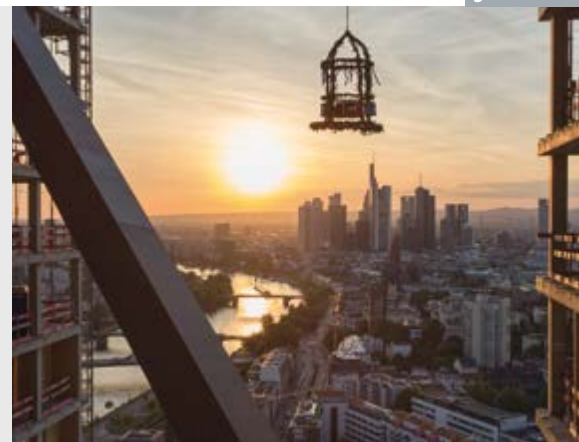
In November 2002 the ECB launched an international urban planning and architectural design competition for its new premises. In addition to fulfilling numerous functional and technical requirements, the architects were required to retain the fundamental appearance of the *Grossmarkthalle*, a listed building, and incorporate it into their designs for the

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new ECB premises. In February 2004 an international jury awarded first prize to the Vienna-based architects COOP HIMMELB(L)AU. Second prize went to ASP Schweger Assozi-

ierte from Berlin and Hamburg, and third prize to 54f architekten + ingenieure from Darmstadt in cooperation with T. R. Hamzah & Yeang from Malaysia. Following a revision phase, during which all three prizewinners fine-tuned their designs, the Governing Council of the ECB confirmed the decision of the international jury. Subsequently it commissioned COOP HIMMELB(L)AU to refine its design in an optimisation phase in order to ensure the best possible use of the *Grossmarkthalle* and to take into account additional requirements specified by the City of Frankfurt am Main.





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3 During the first two competition phases (2003 and 2004), the optimisation phase (2006) and the planning phase (from 2007 to 2009), a number of changes and improvements were made to the design.

4 The topping out ceremony on 20 September 2012 marked the halfway point of the construction phase, which started in February 2010 and came to an end in autumn 2014.

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## Planning and construction phases

Permission to begin the preliminary construction works was granted in 2008. The remaining construction works were tendered in a series of packages and lots. This procedure was successfully completed in spring 2010, marking the start of the main construction works. In 2014 the construction of the new ECB premises was finished and operations commenced.

Once COOP HIMMELB(L)AU had adapted the design chosen in 2005 to the functional, spatial and technical requirements, as well as to the specified budget, the project entered into the preliminary planning phase in 2006 and, finally, the detailed planning phase in 2007. During the planning phases, the design was continuously fine-tuned and checks were carried out to ensure that it was kept in line with the overall budget.

In October 2007 the design was submitted to the relevant authorities of the City of Frank-

furt am Main for planning permission. On 22 October of the same year, the City gave the go-ahead to start the preliminary construction works in the first quarter of 2008. On 6 May 2008 Petra Roth, Lord Mayor of the City of Frankfurt am Main at the time, handed over the building permit for the entire new premises project to Jean-Claude Trichet, then President of the ECB.

The execution planning phase, i.e. the planning of each step in the construction of the building ensemble, took place in parallel to the second tendering procedure for the construction works at the beginning of 2009. Prior to that, a first tendering procedure for a general contractor to construct the ECB's new premises had been closed on 25 June 2008 because it did not produce an economically viable result. Under the second tendering procedure, the construction works were divided up into packages and lots.

That enabled medium-sized companies, too, to submit competitive tenders and allowed specialised companies to be found for each trade.

The main construction works then began in spring 2010, with the laying of the foundation stone on 19 May that year.

The topping out ceremony on 20 September 2012 marked the completion of the main structural works.

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## The new ECB premises – architecture and design

The design of the Vienna-based architects COOP HIMMELB(L)AU comprises three architecturally interlinked elements: (i) the *Grossmarkthalle* (Frankfurt's former wholesale market hall), (ii) the office tower, and (iii) an entrance building that connects the two other elements. The building ensemble also includes an underground car park and ancillary buildings such as the entry control points and the logistics centre. The total gross floor area of the new ECB premises amounts to approximately 185,000 m<sup>2</sup>.

The competition brief and final decision focused on the functionality and sustainability of the new premises, and these key aspects continued to play an important role in the subsequent design and implementation phases. The structural and spatial design of the new premises has created a working environment that meets various functional requirements

and facilitates open communication, thus promoting teamwork and interaction at every level. At the same time, the structural and spatial flexibility of the design means that changing requirements can be adapted to with little effort.

### The *Grossmarkthalle*

The *Grossmarkthalle* was built between 1926 and 1928, on the basis of the design of Martin Elsaesser, Director of Town Planning for the City of Frankfurt am Main at the time. Until 4 June 2004 it housed a wholesale fruit and vegetable market.

The former market hall, which has been a listed building since 1972, formed an integral part of the design for the ECB's new premises. Having been fully restored, the building has retained its fundamental appearance and now houses the more public areas of the ECB. The new main entrance leads to the hall area, which contains semi-public facilities, such as a

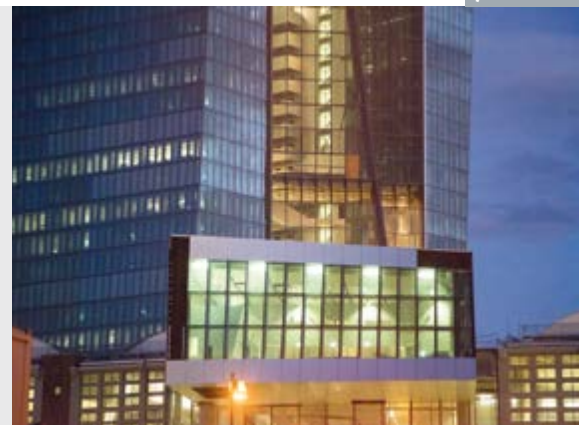
visitor centre, the lobby, a cafeteria, a conference area and a staff restaurant. The new facilities have been integrated into the hall at an angle, based on a "house-in-house" concept. This has not only provided access to parts of the *Grossmarkthalle*, but has also created manifold spaces between the outer shell of the hall and the structures inside it.

### Office tower

To the south of the *Grossmarkthalle*, two polygonal towers are joined by a glass atrium to form an office tower, which soars to a height of 185 m. The north tower has 45 floors, while the south tower has 43. The top office floor is at level 41, above which there are the services floors.

With its height and distinctive silhouette, the new high-rise complements Frankfurt's skyline. The concept behind the glazed atrium between the two office towers is one of a "vertical city", with interchange platforms and





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bridges creating the impression of urban streets and squares. The interchange platforms enable people to change from the express lifts to the local lifts and divide the atrium into three sections of varying height (between 45 m and 60 m). They can be reached via sets of stairs leading from the respective floors above and below, making it easy for staff to move between the two towers and communicate with each other on an informal level.

The two towers house the vast majority of workplaces at the new premises (maximum 2,900) and internal meeting rooms. The large council meeting room and the offices of members of the ECB's decision-making bodies are located on the upper office floors.

All floors offer a high level of flexibility to allow for a variety of office configurations, from single offices to larger offices that can accommodate 10 to 12 people. The offices are located along the outer facades of the towers, and on every floor there is a kitchenette and communal area.

### Entrance building

The entrance building marks the main entrance to the ECB on Sonnemannstrasse, creating an aesthetic and functional link between the office tower and the *Grossmarkthalle*. With its asymmetrical design, inclined facades and generously proportioned windows, it forms a clearly identifiable main entrance to the ECB from the north of the site.

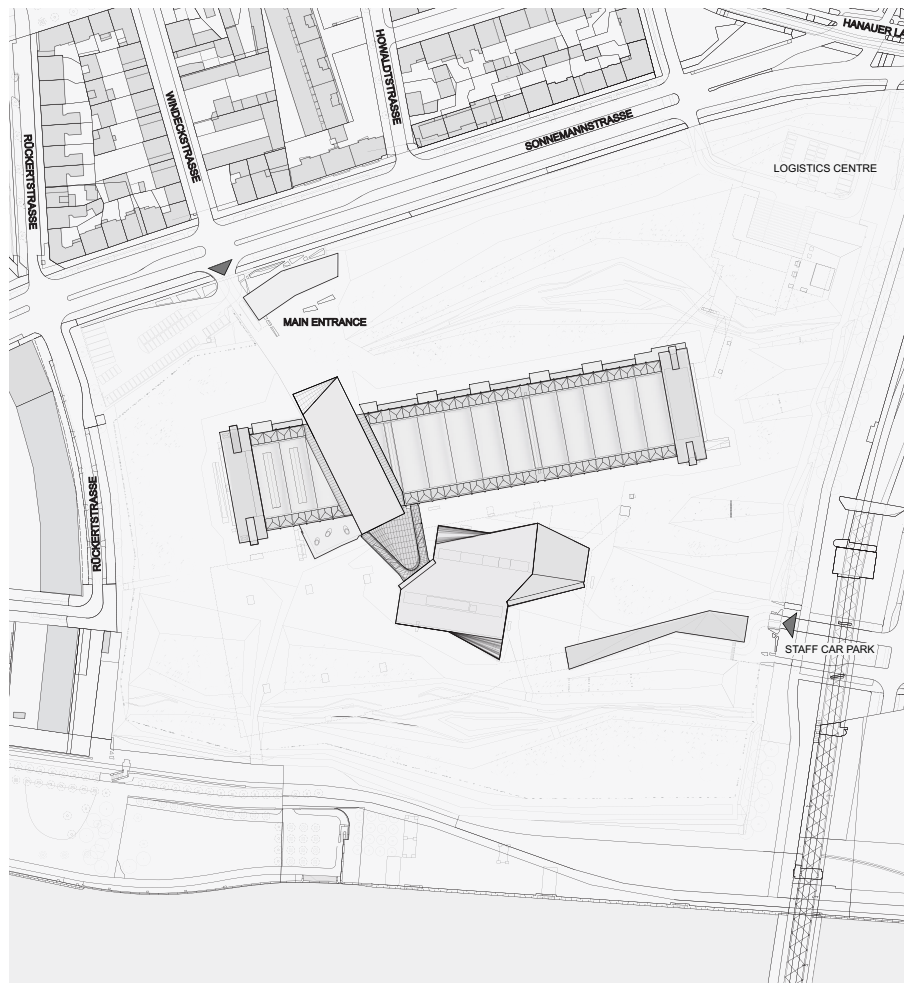
With its height and distinctive silhouette, the new high-rise complements Frankfurt's skyline.

The entrance building itself houses the press centre, from where the ECB's press conferences are broadcast. The two-storey press centre is accessible via a lobby, above which there are temporary workstations for journalists. There is also a second auditorium next to the large press conference room.

1 The conversion of the *Grossmarkthalle* and its incorporation into the design concept makes for a truly unique building ensemble, with the entrance building providing a visual link between the office tower and the market hall, and marking the main entrance to the north of the site.

2-5 The *Grossmarkthalle* has been converted to house the more public areas of the ECB. The market hall is accessed via the main entrance. The lobby and exhibition areas, as well as a visitor centre, staff restaurant, cafeteria and conference area have been integrated into the hall on the basis of a "house-in-house" concept.







# Urban integration

The new ECB premises on the site of the *Grossmarkthalle* create a visible urban landmark, with the office tower extending Frankfurt's high-rise skyline to the east. The massive *Grossmarkthalle* stretches across the site, dominating the cityscape of the surrounding area and the adjoining banks of the river Main.

The horizontal market hall structure and the office tower blend together to form a prominent urban building ensemble that shapes not only the local area, but also the entire cityscape. At the local area level, the new ECB premises are an important link between Frankfurt's Ostend and the river Main, while in the overall urban context, they foster the perception of Frankfurt as a "city on the river". The presence of the ECB in the Ostend is helping to change the area from an industrial district into a district with a more service-oriented infrastructure.

Prior to the start of the construction works, the functional buildings that used to surround the *Grossmarkthalle*, namely the temporary huts to the north, the *Importhalle* (import hall) to the south and the annexe buildings to the east and west, were removed. This has provided an uninterrupted view of the *Grossmarkthalle*, which – together with the fact that the office tower is the only high-rise in the area – means that the building ensemble serves as a new landmark in Frankfurt's cityscape.

The alignment of the atrium between the two towers of the office tower creates a reference to the collection of high-rises in the centre of Frankfurt. The western side of the atrium looks out towards the high-rise banks in the city centre, while the eastern side looks out towards the *Osthafen* (eastern harbour) and Offenbach.

Visitors can access the ECB via Sonnemannstrasse on the northern side of the site, while staff can enter the underground park via Mayfarthstrasse, which has been slightly re-routed and connects the site to the east. Goods can be delivered via the new access



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road for lorries to the underground logistics centre in the north-eastern corner of the site.

## Urban regeneration

The conversion of the 12 hectare site of the *Grossmarkthalle* constitutes one element of the further development of the Ostend district, which is just outside the city centre. Urban regeneration and change is one aspect of sustainability, which is why the predominantly paved area around the *Grossmarkthalle*, where

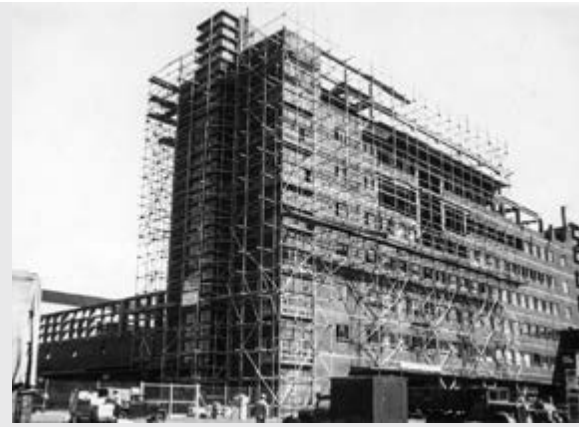
The presence of the ECB in Frankfurt's Ostend is helping to change the area from an industrial district into a district with a more service-oriented infrastructure.

lorries used to park and unload, has been converted into a large, green, landscaped area. Together with the other parks in the surrounding area – such as the *Grüngürtel* (Frankfurt's green belt) and the *Mainuferpark* (an area of parkland along the banks of the river Main), as well as the nearby *Hafenpark* (a new park based on the theme of "sport and movement") and *Ostpark* (the park in Frankfurt's Ostend district) – it contributes to the creation of a "green lung" for the city of Frankfurt.

1 A feasibility study – carried out jointly with Frankfurt-based architects Jourdan & Müller in 1999 – concluded that the site of the *Grossmarkthalle* was eminently suitable for the construction of the new ECB premises and that the old market hall itself could be put to good use.

2+3 The area around the *Grossmarkthalle*, which was predominantly paved, has been turned into a green parkland area on the basis of a design developed by Vogt Landscape Architects.

4 After careful restoration, the fundamental appearance of the *Grossmarkthalle* has been retained. The construction procedures involved in the conversion of an industrial and utility building into the headquarters of a public institution with an array of functions required a high level of care and were agreed with the City of Frankfurt am Main and historic preservation authorities. The location of the entrance building was deliberately chosen as such, as it meant altering only parts of the building that were built after 1945, instead of parts of the original substance dating back to 1920s.



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## The Grossmarkthalle – architecture and construction

**1+4** Covering a huge surface area and rising to a height of eight storeys, the *Grossmarkthalle* was an eye-catching structure that dominated the Ostend at the time of its construction.

**2** Large parts of the *Grossmarkthalle* were damaged during the Second World War air raids and were subsequently reconstructed in the 1950s.

**3+5** A wholesale market operated out of the hall for over 80 years, before moving to the *Frischezentrum*, a new complex in the district of Kalbach.

**5+6** The cavernous interior space of the hall served to ensure a constant temperature at all times. At night, the doors and gates of the hall were opened to let the warm air out and cold air in.

**7** One of the old “coffee break bridges” that extended from one side of the hall to the other, providing space for kiosks and smaller stands selling food and drink.

**The *Grossmarkthalle* was built between 1926 and 1928, on the basis of the design of Martin Elsaesser, Director of Town Planning for the City of Frankfurt am Main from 1925 to 1932. With a length of 220 m, a width of 50 m and a maximum height of 23.5 m, the market hall used to house a wholesale fruit and vegetable market that served not only Frankfurt, but also the entire Rhine-Main region.**

From 1928 to 2004 the building was used by Frankfurt's wholesalers who sold fruit and vegetables for distribution within an area of 200 km. At the time of its construction, it was one of the largest industrial and utility buildings in the Weimar Republic. In 2004 the wholesale market moved to the new *Frischezentrum* (fresh produce centre) in the north-west of the city.

The *Grossmarkthalle*, a state-of-the-art functional building from the classical modern era, has been a recognised cultural monument since 1972. It was built with a new type of structural framework that made it one of the largest free-spanning, prestressed reinforced concrete halls in the world at the time.

In 1991 the City of Frankfurt am Main decided to sell the *Grossmarkthalle* in response to the changes in wholesale trading arrangements and to ensure that the building was preserved for posterity.

Following a feasibility study into the conversion of the market hall and site, the ECB decided in 2001 to purchase the site and use it as the location for its new premises. It was agreed that the *Grossmarkthalle* would retain its fundamental appearance and that it be an integral part of the building design.





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In 2002 the City of Frankfurt am Main and the ECB signed the purchase agreement for the site, which then became the property of the ECB at the beginning of 2005. Before any restoration work on the *Grossmarkthalle* could be carried out, it was necessary to conduct an analysis of the condition of the building. The results of this analysis were then used as a basis for deciding on the requisite renovation measures.

The entire *Grossmarkthalle* site originally comprised several elements.

The *Grossmarkthalle* itself consisted of a market hall with an eight-storey wing building at either end. The western wing building housed the wholesalers' offices and checkout area, while the eastern one contained additional stalls on the first floor and cold storage rooms above.

The two wing buildings were linked to two four-storey annexe buildings, which were split into restaurants, flats and the customs area.

On the southern side of the hall, there were a number of railway tracks. This was because, during the construction works and while the hall was in use, the bulk of goods – in

particular tropical fruits – were delivered by train.

At the same time as the *Grossmarkthalle* was being built, two further buildings were erected between the banks of the river Main and the *Grossmarkthalle*: the *Importhalle*, which was used primarily for the import of tropical fruits, and a building for the City of Frankfurt's catering service. Later on, more halls were built on the site, e.g. the *Hallenhöfen* to the north of the site. These temporary structures were built to enable the market traders to continue selling their goods after the end of the Second World War; as a third of the *Grossmarkthalle* itself had been destroyed and as its undamaged parts were used mainly by the US military. The reconstruction of the *Grossmarkthalle* was completed in 1954.

Under the agreement with the historic preservation authorities, the *Grossmarkthalle* and its two wing buildings have retained their fundamental appearance. As part of the New ECB Premises project, the market hall and its two wing buildings have been carefully restored.

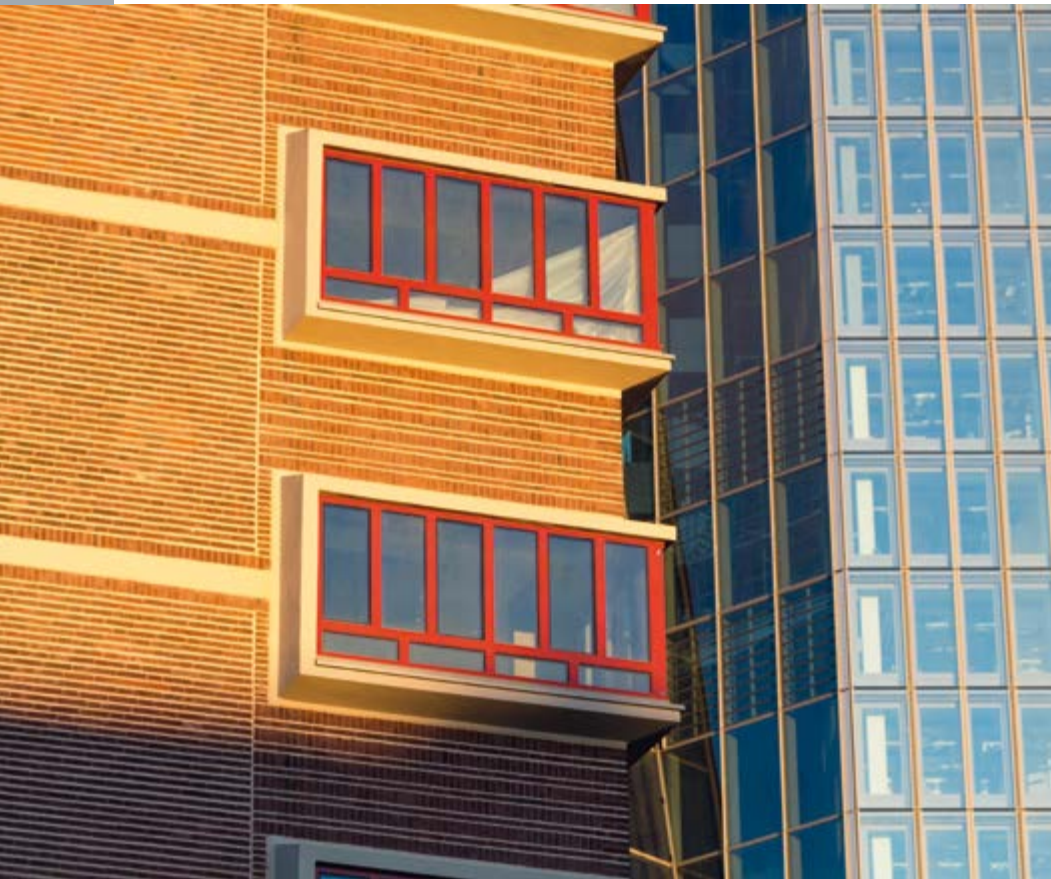
This restoration work included the dismantling of former alterations to the buildings and the resurrection of certain construction elements that had been concealed over time. Further-

It was agreed that the *Grossmarkthalle* would retain its fundamental appearance and that it be an integral part of the building design.

more, surfaces and colours have been restored to match the original 1928 design, using the appropriate materials.

The location of the entrance building in the *Grossmarkthalle* was determined on the basis of the original substance of the roof shells. During the 1950s five of the 15 roof shells were rebuilt using the traditional rib construction method. As their structural framework thus differed from that of the original roof shells, the historic preservation authorities agreed to the removal of these shells and structural frameworks to make way for the entrance building.





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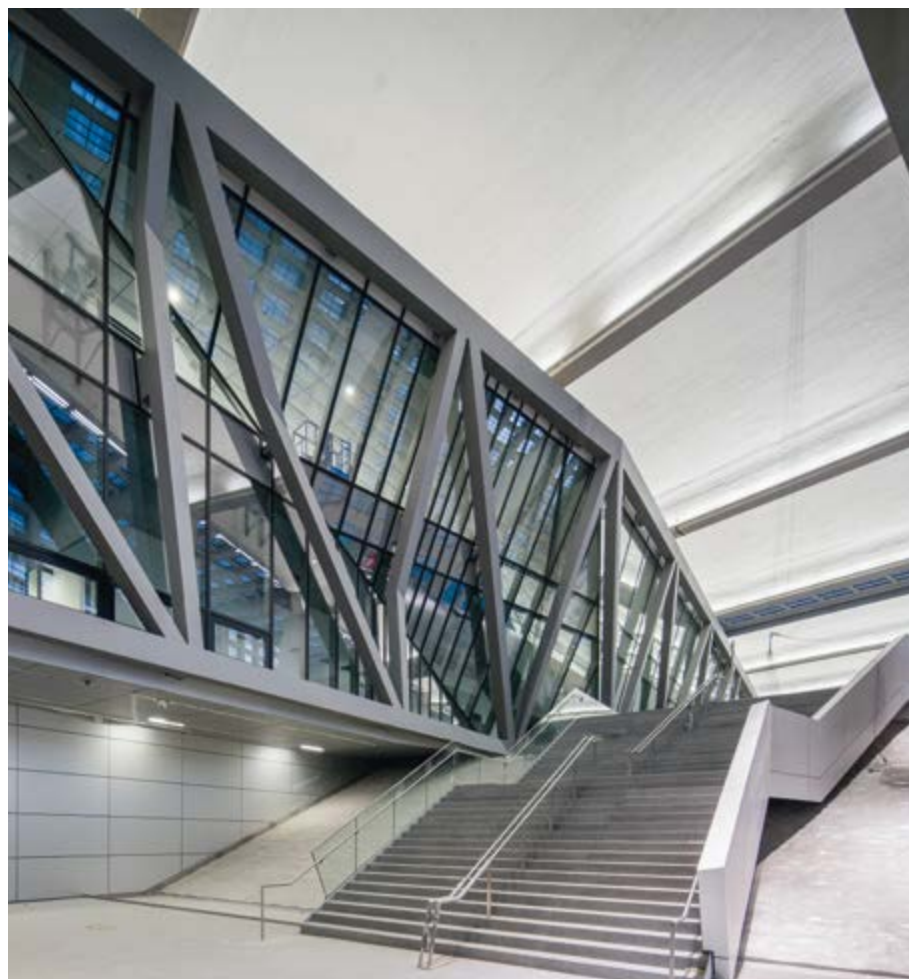
1 The characteristic brick facade of the *Grossmarkthalle* has been restored to its former splendour.

2 The structural renovation of numerous columns and other building elements required repair work on the concrete. In some cases, the concrete was stripped down to the steel, which was then treated with an anti-corrosion coating and covered with a new layer of concrete.

3 The windows of the staircases in the two wing buildings have been repaired and, in some cases, the original steel window frames have been retained.

4 The concrete surfaces inside the hall have been restored to their original appearance and covered again with an eggshell-coloured coating.

5+6 The concrete roof shells were in good condition. On the inside, they only required repair work on the surfaces, while on the outside the waterproof covering and insulation had to be replaced.



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# Renovation and restoration of the *Grossmarkthalle*

**For decades, only minor maintenance or repair work had been carried out on the *Grossmarkthalle*. It was therefore essential that the substance of the building be thoroughly renovated and restored in order to ensure its structural stability in the future.**

With a view to drawing up a restoration concept, building restorers and structural designers (engineers) carried out thorough analyses and restoration trials on the *Grossmarkthalle* from 2005 to 2007. Taking care to ensure that the building's substance was damaged as little as possible, the engineers assessed the level of renovation that the structural framework would require, while the building restorers searched for original surfaces and evaluated their condition. This brought various patterns of damage to light that needed to be treated with a range of different

measures. At the start of the analysis process, the design team also studied the record drawings that were still available, as well as the plans for the reconstruction measures that had been implemented by the wholesalers over the years.

The restoration measures were essentially divided into two different categories: (i) structural renovation work, which included the renovation of the concrete, the beams, the roof shells and the brickwork, and (ii) restoration work, which focused on the areas that were to be restored to their original 1928 design. Together, the restoration work and the structural renovation work formed the basis of the overall restoration project.

In turn, the structural renovation work was based on three damage patterns that were classified according to the level of intervention needed: (i) very minor damage, which required only superficial touching-up and cleaning measures, (ii) medium-scale damage, which could be rectified with repair work to certain areas of the building's substance, and (iii) major damage in which the building's substance had been impaired to such an extent that the materials needed to be replaced.

At the first level of intervention, it was sufficient, for example, to clean the bricks and restore them to their original colour. At the second level of intervention, a certain amount of repair work to the materials was necessary, such as filling any holes or blemishes in the bricks and concrete. There was no need, however, to repair the steel in the concrete or refill entire wall surfaces.

At the third level of intervention, the concrete, for example, was damaged through to the steel. This meant that the steel needed to be stripped from the concrete, cleaned and then treated with an anti-corrosion coating. The steel was then covered with a new layer of concrete.

In some areas of the hall, it was also necessary to remove and replace individual bricks or even entire walls. In the summer of 2008, as part of the preliminary construction works, the facades of the *Grossmarkthalle's* annexe

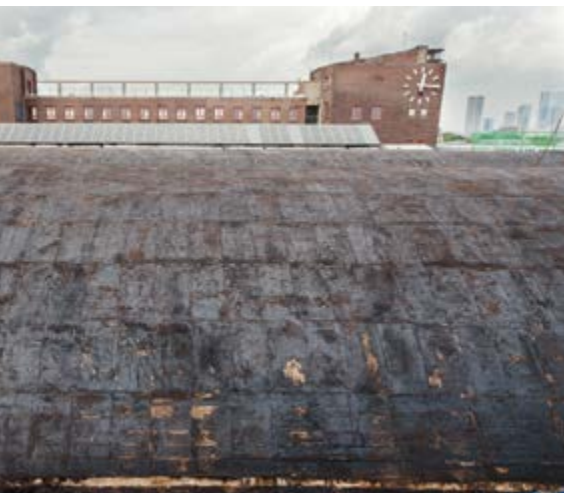
buildings (two four-storey apartment blocks) were removed, brick by brick. Each brick of these facades was cleaned individually and then used to repair the damaged areas of the *Grossmarkthalle's* facades from 2010.

The aim of the subsequent restoration work was to restore any remaining surfaces, wherever possible, to their original state. Restoration work also always involves taking into account the prevailing construction rules and regulations (such as the *Energieeinsparverordnung* (German energy saving directive)). Among other things, this had an impact on the windows

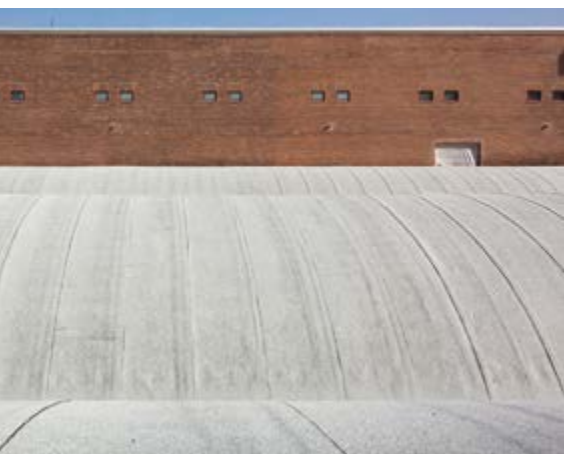
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of the *Grossmarkthalle*, which used to consist of steel frames with single glazing. As part of the restoration work, these were replaced with insulated multiple-glazed windows that are more energy-efficient but have a similar profile and appearance to the original windows. This elaborate design was selected from a range of sample windows and agreed to by the historic preservation authorities.

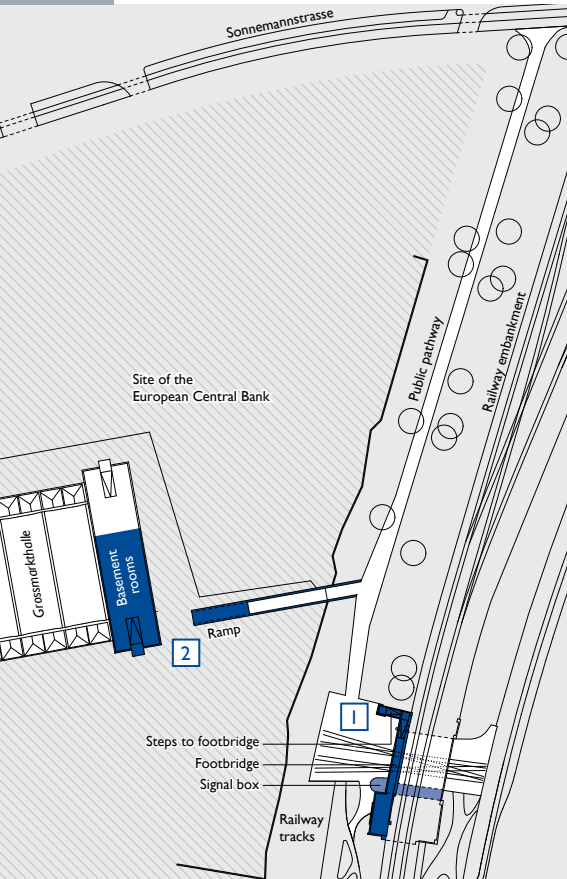
Inside the wing buildings, only a few surfaces have been preserved in their original state. For example, parts of the staircases and the check-out area are still in their original form, while the original decorative brick pattern in the foyer of the western wing building was discovered under the plaster and subsequently restored. If it was found that surfaces needed to be added to, this was done using neutral, subtle materials that were in keeping with the original materials.



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## Memorial on the site of the *Grossmarkthalle*

The years from 1941 to 1945 constitute a very dark chapter in the history of the *Grossmarkthalle*, as the basement of its eastern wing building was used as an assembly point for the deportation of Jewish people. Here, more than 10,000 members of Frankfurt's Jewish population boarded trains that transported them to concentration camps.

In 2001 the ECB and the Jewish Community Frankfurt had already decided to launch an international competition to design a memorial. The competition was then organised by the City of Frankfurt am Main between 2009 and 2011, in close cooperation with the Jewish Community Frankfurt and the ECB.

The winning design, developed by architects KatzKaiser, successfully homes in on available fragments of history, creating a story that symbolises the complexity of the deportations without diverting attention from the actual

site. This holds true both for the bureaucratic process behind the crime and the crime itself, i.e. the deportation.

### Pathway, signal box and railway tracks on public land 1

The part of the memorial accessible to the public lies in the strip of land to the east of the *Grossmarkthalle*, where a pathway for pedestrians and cyclists has been created between the Ostend district and the river Main. This new public pathway, together with the old railway tracks and a signal box that stands beside it, serves as a reminder of the deportation of Jewish women, men and children. A stepped footbridge has also been preserved. Here, people bade farewell to their loved ones or simply looked on with idle curiosity.

### Ramp and basement rooms on the site of the ECB 2

A concrete ramp runs from the eastern border of the site down to the basement rooms in the *Grossmarkthalle*, demarcating the old basement entrance and forming a break in the landscape. The ramp is flanked by two concrete walls. A pane of glass at the site border enables people to look down to the basement entrance and peer into the "depths of history". The basement room in which people were held before being deported has largely been left in its original condition to form an authentic part of the memorial.

To give visitors and passers-by an insight into the deportations from a range of perspectives, the various components of the memorial are engraved with testimonies from victims and observers. The aim is that people will chance upon this information on a walk through the green belt, without making a special trip to see the memorial.



# Sustainability

**Sustainability in construction takes into account not only environmental issues, technical efficiency and functional requirements, but also reuse and social aspects.**

With a view to ensuring the sustainability of its new offices, the ECB, in collaboration with an independent institute, carried out a number of comprehensive studies on the offices that it was renting. These studies included an assessment of the level of office comfort by measuring the temperature and air movement in the rooms, as well as an analysis of how much energy was used and where. The information obtained through these studies was then used as a basis for creating an energy concept for the ECB's new premises.

Energy efficiency and sustainability issues were important considerations during the architectural design competition and at all stages of the evaluation procedure, as well as during the planning phases. In 2002, within the framework of the international urban planning and architectural design competition, the ECB defined the functional and spatial programme, and set specific targets for energy consumption. One of the key messages to the architects participating in the design competition was the desire for an integrated design process. This means that the architect works together with a structural engineer and an energy and climate designer from the very outset, in order to optimise the energy efficiency and sustainability of a building. As part of the development of the design concept for the new ECB premises, economic, ecological and social aspects had to be weighed against future operating costs, maintenance costs and energy consumption.

## Sustainability and reuse

The reuse and conversion of the *Grossmarkthalle*, which is an integral part of the ECB's new premises, will also contribute to the sustainability of the overall building design. Upon purchasing the site, the ECB undertook to retain the fundamental appearance of the



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market hall and to work closely with all local authorities during the planning and implementation phases. When the annexe buildings were dismantled, the bricks of the facades were carefully removed by hand for precisely this purpose, and then cleaned and preserved. This enabled the requisite restoration work on the hall to be carried out with original building materials. Owing to the cooperation with the

Energy efficiency and sustainability issues were important considerations during the architectural design competition and at all stages of the evaluation procedure, as well as during the planning phases.

historic preservation authorities and the energy conservation authorities of the City of Frankfurt am Main, it was also possible to design replacement windows for the concrete grid facade that are more energy-efficient but have a profile similar to that of the original windows. This ensured the sustainability of the historic substance of the *Grossmarkthalle* and, by fulfilling prevailing energy efficiency requirements, made it possible to use old and new building elements in a sustainable manner.



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6 Damaged areas in the brickwork were repaired using the bricks collected during the dismantling of the annexe buildings. The facades of the annexe buildings were removed by hand as part of the preliminary construction works, and the bricks were carefully washed and preserved.

7 Painstaking efforts were made to restore and clean the concrete grid facades on the northern and southern sides of the *Grossmarkthalle*.

# Energy design



From the outset of the design competition, it was the ECB's stated aim that its new premises should be 30% more energy-efficient than stipulated by the *Energieeinsparverordnung* (German energy saving directive) of 2007. To achieve this aim, various possibilities were analysed, particularly with regard to the facades and technical systems. The resultant energy design has the following features.

## Rainwater harvesting

The roof of the *Grossmarkthalle* covers an area of approximately 10,000 m<sup>2</sup>. A system for collecting rainwater has been installed, so that the water can be used to irrigate the gardens when it has not rained enough and to flush toilets in the *Grossmarkthalle*.

## Recycled heat

The waste heat generated by the computer centre is fed back into a ceiling heating system in order to heat the offices. The new ECB premises are connected to the highly energy-efficient combined heat and power system of the City of Frankfurt am Main.

## Efficient insulation

The insulation of the surface areas of the *Grossmarkthalle*, e.g. the roof and windows, has been improved. Furthermore, the new facilities such as the staff restaurant and conference area have been built into the market hall as separate "house-in-house" elements with their own internal facades. Consequently, they have their own microclimate. There is no air conditioning in the large open spaces in the *Grossmarkthalle* so that no energy is used to heat or cool these areas.

## Natural ventilation of offices

In addition to the central ventilation systems, motorised ventilation elements have been incorporated into the building facades, which allow the direct natural ventilation of offices, thereby satisfying users' desires for fresh air without the use of mechanical ventilation. As

a result, people also have a better idea of what the weather is like outside.

## Efficient solar protection and low-energy lighting

In order to prevent the buildings from absorbing too much heat from the sun, highly efficient sun screens/glare shields have been integrated into the facades. Another way to save energy is to make use of natural light. The offices are fitted with daylight sensors so that the lights switch off automatically when there is sufficient daylight. With regard to artificial lighting systems for the offices, atrium and *Grossmarkthalle*, extensive research was carried out to ensure that these areas are lit sufficiently and efficiently at all times of the day. In general, the walls between the offices and the corridors are made out of glass, so that some

There is no air conditioning in the large open spaces in the *Grossmarkthalle* so that no energy is used to heat or cool these areas.

daylight also reaches communal areas such as the corridors and kitchenettes.

## Use of geothermal energy for heating and cooling

In order to further reduce energy costs, geothermal loops were incorporated into the pile foundations of the high-rise, which descend about 30 m until they hit Frankfurt's bedrock. These loops can be connected to a water circuit and heating pumps in the heating centre in order to extract heat from the ground in the winter, and coolness from the ground in the summer.

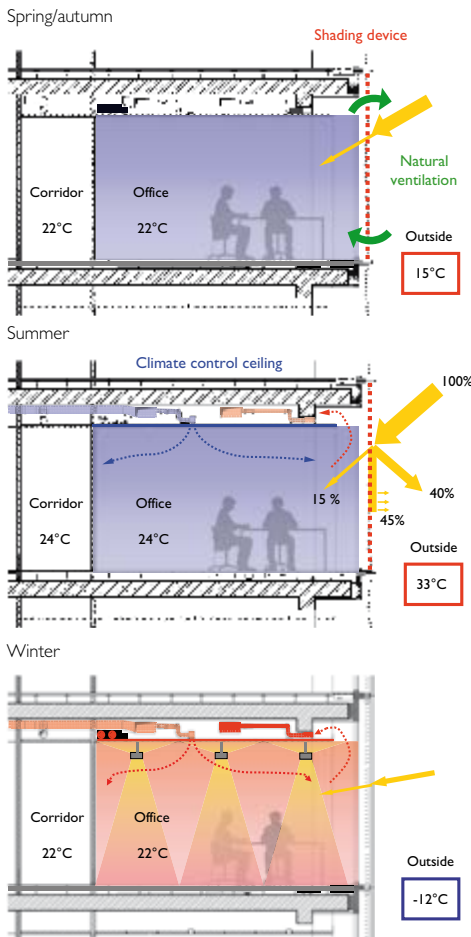
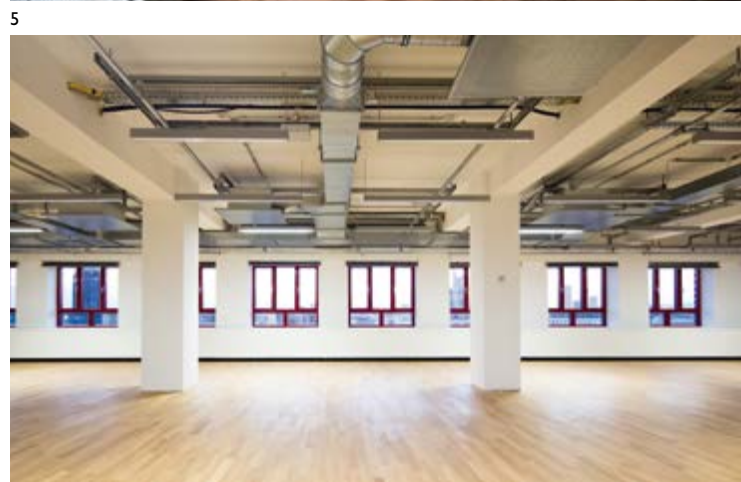
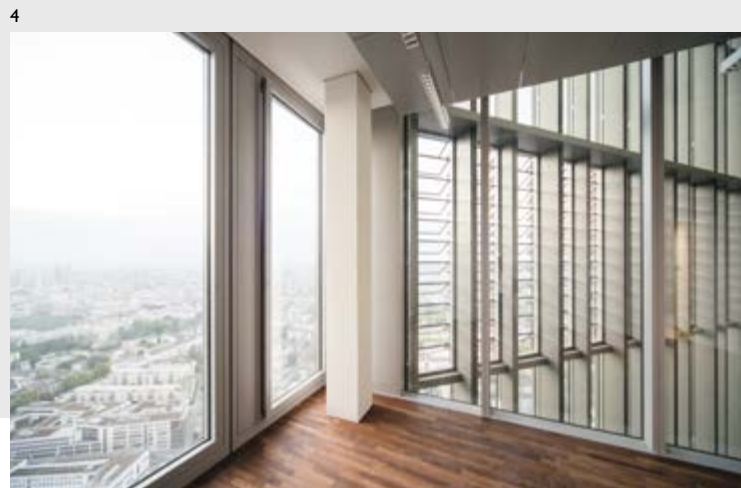


Diagram showing how the air conditioning system and glass facade of the office tower function at different outdoor temperatures. In spring and autumn, the offices can be ventilated without the use of mechanical means.





1 The roof shells of the Grossmarkthalle have been fitted with a new waterproof covering and new insulation. Rainwater collected in the gutters will be used to irrigate the gardens and as service water.

2 The staff restaurant was also designed on the basis of a "house-in-house" concept and integrated into the western end of the Grossmarkthalle as a separate enclosed element.

3 Pipes forming part of a water circuit are attached to the pile cage and can be connected to the heating pumps in the heating centre. The use of geothermal energy will help to reduce the energy costs of the new premises.

4-6 The effectiveness of the insulation and the facades, as well as the possibility to ventilate the offices with fresh air, will significantly enhance energy efficiency throughout the building ensemble.





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**1+3** In May 2011 the first of 14 steel plates was built into the high-rise. The large steel trusses of the atrium were then attached to these steel plates to create a single static structure out of the two towers.

**2** The glass panels that run the entire height of the atrium facade are supported by a steel grid framework.

**3+4** Both the interchange platforms and the large steel trusses stabilise the two relatively slender towers of the high-rise.

**5+6** The roof shells of the *Grossmarkthalle* were constructed during the 1920s using a state-of-the-art method for spraying concrete (the Torkret process). They have a 15 m span and extend for approximately 43 m. At their vertex, they are only about 7 cm thick.

## Structural frameworks

The overall structural framework of the office tower consists of reinforced concrete structures in the two towers and a vertical steel frame in the atrium between them. Aside from the twisting of the high-rise and the torsion of its facades, the installation of this steel frame is a particular element of the office tower's structure.

At the time of its construction, the *Grossmarkthalle* was the largest, prestressed reinforced concrete hall in the world. The roof shells were constructed using a state-of-the-art method for spraying concrete (the Torkret process). By contrast, the entrance building and the "house-in-house" building elements in the *Grossmarkthalle* are steel-framed structures.

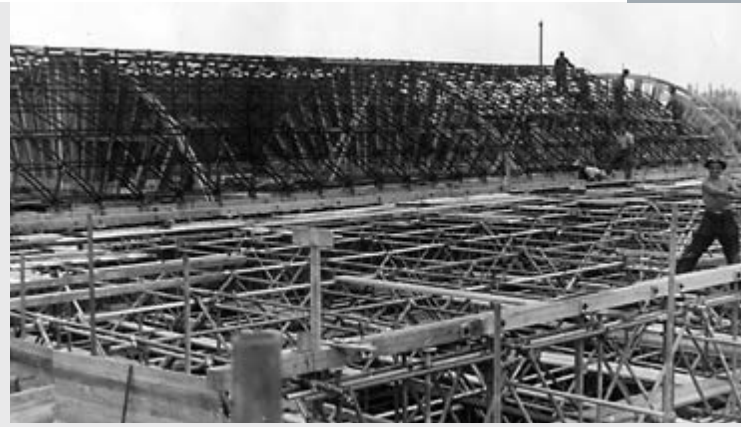
### Office tower

The new office tower is a skeleton structure of reinforced concrete. The sculptural appearance of the office tower presented the structural engineers with various challenges. The way in which the building twists, and its inclined facades, mean that every floor is different, and thus was formed and poured separately. Furthermore, the overhangs of the facade, which measure 12 m at its most extreme point, meant that the lattice of supports could not be the same throughout and had to be varied: for example, at the corners of the towers, columns were installed at an angle so that the loads could be absorbed by the floors below. The lift cores immediately adjacent to the atrium function as bracing elements. This enables the floor space on the office floors to be used efficiently. All of the lifts face the atrium, the open space and view making it easy for people to work out where they are and where they have to go when they exit them.





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### Atrium

The structural framework of the atrium is a feature of its overall design. It consists of clearly visible, angled steel trusses that stabilise the two towers and accentuate the, in parts, up to 60 m high open spaces of the atrium. The atrium also has four interchange platforms, which, in addition to serving as communal areas and "informal meeting points", serve as structural support for the two towers. The combination of diagonal steel trusses and interchange platforms creates a vertical framework.

### The Grossmarkthalle

In 1926, when the *Grossmarkthalle* was being designed, the use of ferroconcrete (today, reinforced concrete) as a thin-skin structural element was a new method of construction. In general, reinforced concrete facilitates the construction of economic structural frameworks with slender profiles. Furthermore, in contrast to wood or steel structures, reinforced concrete structures do not require additional fire protection, as would be necessary if steel and wood were used. They also require far less maintenance than steel and wood structures.

When planning the *Grossmarkthalle*, the City of Frankfurt am Main had launched a design competition for the construction of the market hall – allowing participants to choose which material they wanted to use, be it reinforced concrete, steel or wood.

The aim was to build the hall as efficiently and cost-effectively as possible. The winner of the competition was the construction company, Dyckerhoff & Widmann, which proposed a reinforced concrete structure. The market hall was to have a thin-skin structural framework, with a roof consisting of 15 free-spanning concrete shells constructed using the Zeiss-Dywidag method.

The concrete shells function as thin-skin structural elements that – in contrast to a wooden joist ceiling – transfer load not just in one direction but in two. Each concrete shell has a 15 m span and a length of approximately 43 m.

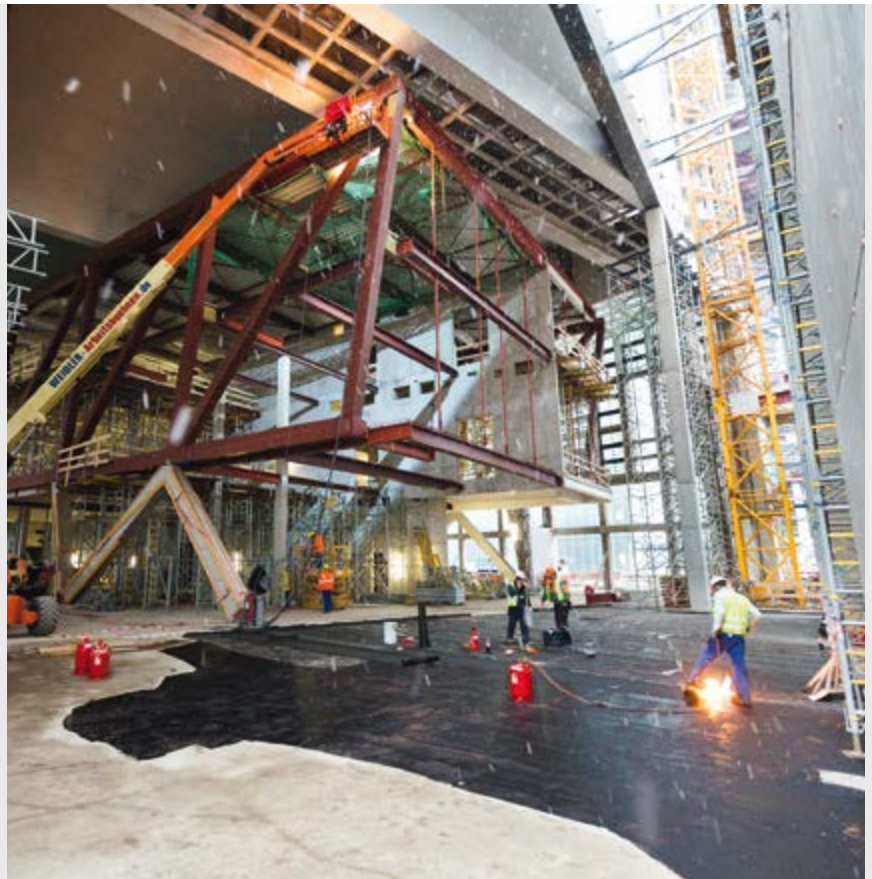
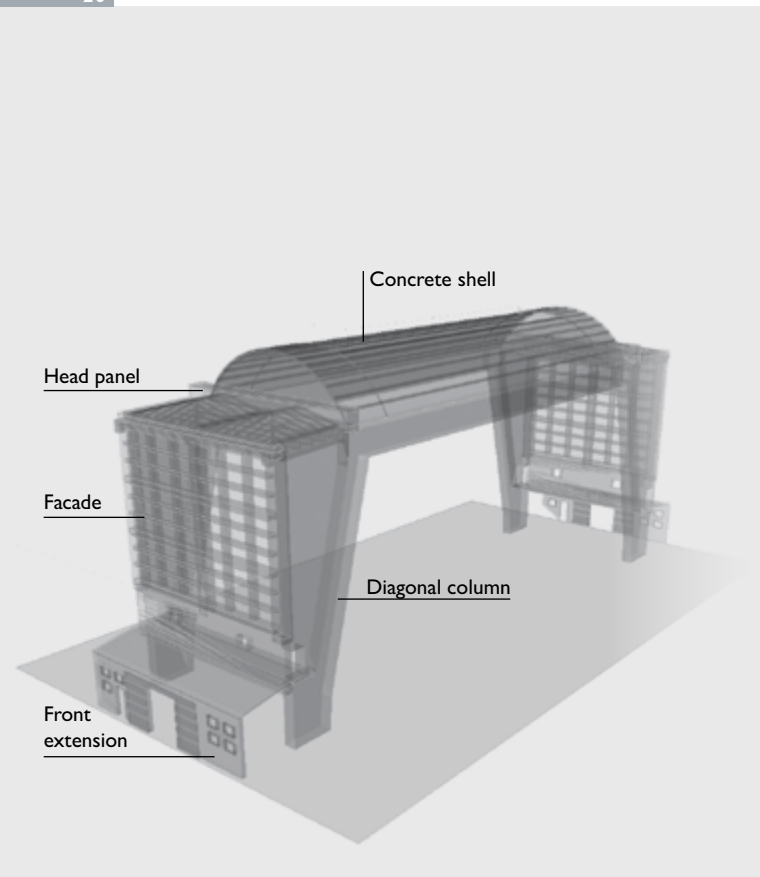
At their vertex, the shells are only around 7 cm thick. Their slender profile was rendered possible by the Zeiss-Dywidag system. This

system was pioneered by Walter Bauersfeld, in collaboration with the engineers Mergler, Dischinger and Finsterwalder, in the construction of the spherical dome for a planetarium in Jena in 1924: its slender profile meant that the

The structural framework of the atrium is a feature of its overall design. It consists of clearly visible, angled steel trusses that stabilise the two towers and accentuate the, in parts, up to 60 m high open spaces of the atrium

dome was a very light structure that could therefore be erected on top of the roof of an existing building.

The use of the Zeiss-Dywidag method for the construction of the roof of the *Grossmarkthalle* required the input of relatively less material and resulted in a light, reinforced concrete structure that spanned the hall area freely and elegantly.



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There were three stages in the development of reinforced concrete that played a key role in the construction of the structural framework for the *Grossmarkthalle*.

First, formwork methods had been further enhanced, and research had been undertaken on using concrete as a composite building material. For example, the use of the new (Zeiss-Dywidag) formwork method meant that the structural framework could be constructed exactly as planned on paper. The purpose of formwork is to prevent the concrete framework from distorting, both before the concrete has set and during stripping. It therefore also counteracts the impact of unforeseen forces on the structure.

Second, there had also been new developments in production engineering, namely the Torkret process. This involves applying highly fluid concrete to the formwork via a hose using compressed air. The concrete then sets with time.

Third, theories had by that time become so advanced that it was possible to calculate the

size of the load that would be placed on the structural framework and the effect that it would have on its dimensions. In view of the fact that the construction of the *Grossmarkthalle* was going to involve many innovative construction techniques, the structural calculations and designs were also simulated in a

The conference area has been integrated into the *Grossmarkthalle* using an external steel skeleton framework on the basis of a “house-in-house” concept.

model. The model used was a 1:3 replica of a section of the hall, which was subjected to the real load. The trials established that the shells were strong enough.

#### New building elements in the *Grossmarkthalle*

The conference area has been integrated into the *Grossmarkthalle* using an external steel skeleton framework on the basis of a “house-in-house” concept. The angled supports and

joists of the framework surround the meeting rooms in the conference area. Based on a deconstructivist design, this large structural framework also displays kinks and distortions that make the static system a design feature of the new building elements.

#### Entrance building

In keeping with the conference area in the *Grossmarkthalle*, the entrance building is a steel skeleton, i.e. a reinforced concrete composite structure, that projects outwards and upwards from the *Grossmarkthalle* and houses the press centre. It consists of a lattice of steel trusses that are over 1 m in height, thus defining the visual appearance of the new premises at the main entrance. As in the conference area, the ceilings consist of reinforced concrete. The steel skeleton of the entrance building is covered with aluminium sheets and therefore not visible.





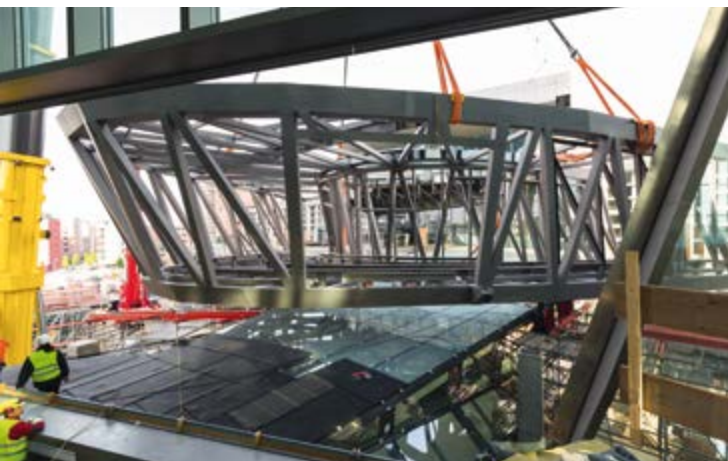
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1 Diagram of the structural framework of the *Grossmarkthalle*.

2-4+7 Both the conference area, which has been integrated into the market hall, and the entrance building, which projects outwards from it, are steel skeletons, i.e. reinforced concrete composite structures, and are clearly visible

as new elements of the overall building ensemble.

5 The so-called loop is a spatial framework construction and provides a walkway for ECB staff directly from the office tower to the staff restaurant and conference area. The individual components of the loop were assembled into

steel truss girders and then mounted on concrete pillars.

6 The office tower is supported by a piled raft foundation system. In 2008, 97 foundation piles and geothermic devices were inserted into the ground to a maximum depth of 37 m. The foundation plate is approximately 3 m

thick. For the reinforcement of the concrete (i.e. the incorporation of steel rods), approximately 4,200 tonnes of steel were required. The casting of the foundation plate needed to be carried out in segments. For each segment, the concrete had to be poured continuously.





## Facades

**1-3** The energy-efficient “shield hybrid facade” of the office tower, which consists of three layers, offers all the energy-related advantages of a conventional double-glazed facade and allows for the direct natural ventilation of the rooms by means of vertical, floor-to-ceiling ventilation slats.

Extensive repair work was carried out on the brick facades of both wing buildings. Any bricks that were damaged were replaced with those collected during the removal of the annexe buildings. All the joints of the brickwork were raked out and, in keeping with the original design, filled with two different colours of mortar – a pale mortar for the horizontal joints and a dark mortar for the vertical joints.

**4** The surface of the *Grossmarkthalle*’s concrete grid facade has been restored and new windows with thermal insulation glass have been fitted.

The interplay between old and new is clearly the result of the expressive design of the *Grossmarkthalle*, on the one hand, and the modern shaping of the office tower and entrance building, on the other. The office tower is covered entirely with glass panels. This fills the high-rise with light, in particular the atrium, which, depending on the angle of incoming daylight, is translucent from one side to the other. The *Grossmarkthalle*, by contrast, has a more muted appearance, given its concrete grid facade and brick walls.

The entrance building is covered with aluminium sheets and glass panels. The various elements of the building ensemble complement one another with their contrasting features and come together to create a remarkable whole.

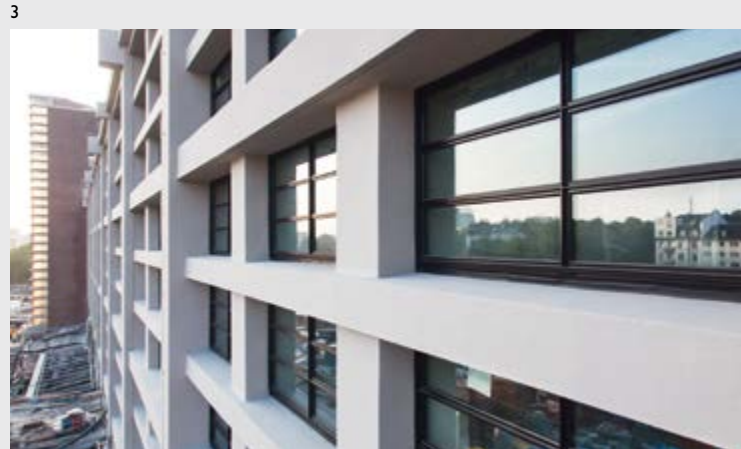
### *The Grossmarkthalle*

Martin Elsaesser used a few select materials in the construction of the *Grossmarkthalle*, paying particular attention to the colour scheme. The combination of exposed concrete and bricks gives the building its distinctive outer appearance.

The light grey surfaces of the concrete grid facade on the northern and southern sides of the hall, as well as the concrete bands that separate each floor of the wing buildings, are still visible.

As part of the renovation works, almost all of the windows were replaced. New steel window frames were fitted with double glazing with panes of glass 10 mm apart. This meant that they had to be constructed in such a way that they were as narrow as the old ones, but strong enough to support double glazing. For the staircase windows in the two wing buildings, it was actually possible to fit new window panes into the old steel frames. Above the





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concrete grid facade, glass gable roof constructions have been mounted between the roof shells and the eaves, forming a shield over the horizontal glazing. They function in the same way as the original gable roof constructions, allowing rainwater to drain off towards the eaves.

The brick facades of the ground and first floors of the market hall itself have been removed and replaced with rows of windows, in order to let in more natural light.

The windows on the northern side have been fitted with thermal insulation glass, while those on the southern side have been fitted with glass that provides both solar protection and thermal insulation.

The brickwork of the outermost wall of the front extension on the northern side of the *Grossmarkthalle* has been restored in full. Three of the original windows have been restored and fitted with new glass, while the others have been replaced with new ones consisting of narrow steel frames and a single pane of glass. In terms of appearance, these new windows resemble the original ones. The

original steel bars have also been restored and mounted in front of the three original windows.

The brick facades of both wing buildings have been thoroughly cleaned and restored. The burnt bricks of the exterior facade and the interior front ends of the hall have retained

The combination of exposed concrete and bricks gives the *Grossmarkthalle* its distinctive outer appearance.

their natural red-brown colour. In order to emphasise the horizontality of the *Grossmarkthalle*, Martin Elsaesser paid particular attention to the layout of the joints between the bricks in his design and its subsequent realisation. The horizontal joints, which are, on average, 2.8 cm wide, have pale pointing, while that used for the vertical joints of only around 1 cm is dark grey in colour. The vertical joints are therefore barely noticeable against the red-brown bricks. The result is that the brick walls have a harmonious striped pattern.

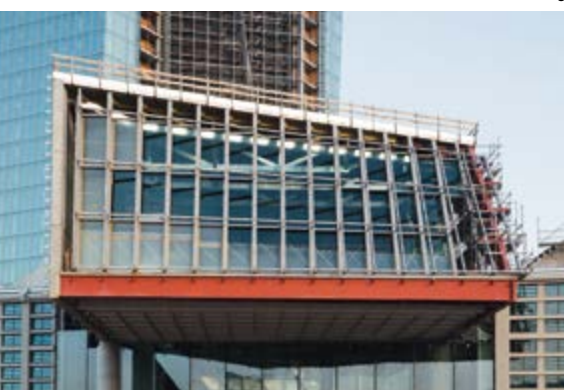
In the eastern wing building, in agreement with the historic preservation authorities, space

was created in the brickwork for rows of windows, so that its facade is now similar to that of the western wing building. As the cold storage rooms used to be located in the eastern wing building, its facade had no windows.

In keeping with the original design, the concrete surfaces of the columns inside the hall have been covered with an eggshell-coloured limewash, which complements the red-brown bricks of the interior facades of the wing buildings.

#### New building elements in the *Grossmarkthalle*

In accordance with the “house-in-house” concept envisaged by the architects COOP HIMMELB(L)AU, the conference area and the staff restaurant have been integrated into the *Grossmarkthalle* as separate enclosed elements. These have a structural framework of steel posts and beams, and individual facades consisting of thermal insulation glass, as – given the purpose of the *Grossmarkthalle* back in the 1920s – it had been designed in such a way as to maintain a constant room temperature of 12-14 degrees without the use of technology.



The new building elements are therefore enclosed units with their own temperature regulation system.

#### Office tower

The office tower is covered entirely with glass panels, creating a dynamic interplay between light and shadow at any time of the day. The kinks and torsion of its glass facades mean that the light of the sun and reflections of cloud patterns are always different. A combination of different geometries makes the office tower look like a large crystal, with oblique western and eastern facades, and hyperbolic paraboloid surfaces on the northern and southern facades. A hyperbolic paraboloid surface is essentially a concave curved surface that is produced by moving an open-down parabola along a fixed open-up parabola. However, it is important to ensure that the hyperbolic paraboloid surface can be produced through two sets of straight lines.

It is this principle that formed the basis for the design of the facade for the high-rise. The tower facades consist of flat glass panels, 90% of which are identical. Each one runs the entire height of each storey, so that only the vertical fixings are visible. The result is a homogeneous curved glass surface made up of flat panels.

These surfaces have been covered with a state-of-the-art, triple-layered "shield hybrid facade", which is a refined synthesis of classic facade constructions, combining the functions of box windows, double-glazed windows and double facades. In order to meet various requirements relating to fire prevention, the reduction of radar reflection, the cleaning of the facades and solar protection, a special type of glazing was chosen, consisting of solar protection glass on the outside and thermal insulation glass on the inside. Aluminium blinds have been fitted between the two panes of glass to enhance the level of solar protection.

There is air conditioning in the offices, but there is also the possibility of natural ventilation through the use of a new opening mechanism, whereby the slats move out horizontally from their frames. This mechanism is "hidden" behind the outer facade and supplies the offices with fresh air through the gaps that it creates. If the ventilation slats are open, the air conditioning in the offices automatically shuts down in order

to conserve energy. The opening mechanisms are motor-driven and allow users to control the width of the ventilation gaps.

#### Atrium facade

The glass panels of the facade of the atrium, which connects the two polygonal towers, are attached to a customised steel grid that is strong enough to bear the weight of the glass panels along the full height of the atrium and is

A combination of different geometries makes the office tower look like a large crystal.

therefore clearly visible through them. In line with the design concept, the glazing of the atrium is neutral in colour and transparent. This enables people to see straight through the atrium and view the high-rise as two separate towers. The roof of the atrium is also made of glass in order to further enhance the impression of a translucent atrium. Owing to the carefully thought-out placing of the coating on the glass and the various layers of solar protection, it absorbs less than 10% of the energy from the sun, though the sky can still be seen through it.

The juxtaposition of the smooth and shiny surfaces of the interior metal facade, the diagonal steel trusses and the glass lifts within the atrium underline the modern appearance of the high-rise.

#### Entrance building

The entrance building is covered predominantly with aluminium sheets that create an intricate lattice of narrow seams and distinguish it clearly from the *Grossmarkthalle*.

The facade of the end of the entrance building that projects out of the *Grossmarkthalle* towards *Sonnemannstrasse* is curved in two directions, which, in contrast to the facade of the office tower, was not produced using flat glass panels, but rather using panels with a shell-shaped curvature. The press conference room is located behind this large panoramic window.

The facade of the entrance area underneath the press conference room is largely composed of glass panels, as is the walkway to the high-rise.

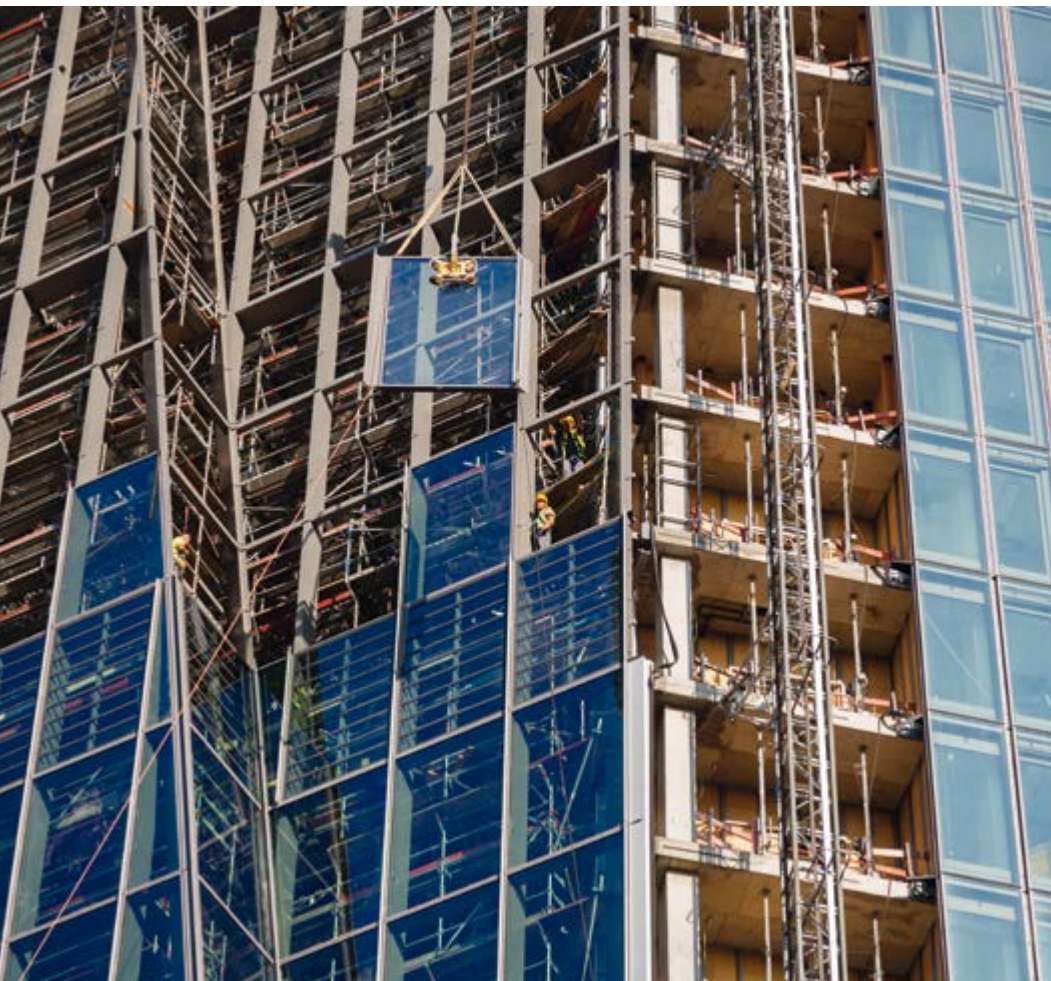




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**1+2** The windows of the office tower consist of box-type units fitted with opening mechanisms at the side, allowing the ventilation slats of the facade to move out horizontally from their frames.

**3+5+7** On both sides of the atrium, there is a kink running through the facade of flat glass panels, enabling mediation between the geometries of the two towers. Furthermore, the kink absorbs any expansion/contraction in the two towers so that there is no tension in the facade.

**4+6** The glass facade of the press centre consists of a hyperbolic paraboloid surface, necessitating glass panels that are curved in two directions. This large window is angled towards the city.

**7** Both above and below the interchange platforms, the facade panels of the atrium are fitted with slatted glass to allow smoke to escape in the event of a fire.





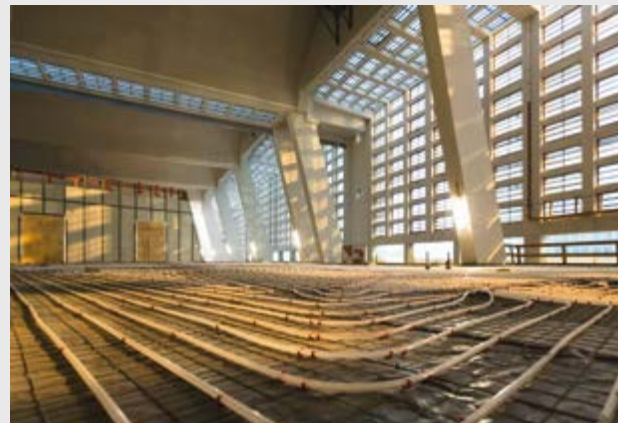
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## Technical infrastructure

**In general, the technical infrastructure of a building comprises all the installations it needs to meet the requirements of functionality, well-being and fire protection.**

The category of “well-being” refers to the mechanical services, which include the cooling and heating systems for the air conditioning in the offices, the integrated ventilation systems, building control systems and lift systems. The category of “fire protection” includes primarily fire alarm and smoke extraction systems, and escape route lighting, while the category of “functionality” essentially covers the supply of electricity, including the emergency power supply, as well as the installation of sanitary facilities.

### Mechanical services

**Climate control ceilings:** The offices in the high-rise are equipped with “climate control ceilings”. These are capable of both heating

and cooling via suspended ceiling elements containing water pipes. Cold water runs through these pipes during the summer and warm water during the winter, enabling the offices to be cooled or heated from above. There is therefore no need for any radiators that form a window parapet. Furthermore, this type of system is extremely quiet and does not cause a draft in the offices. On the one hand, climate control ceilings enable people to adjust the temperature according to their personal preferences. On the other hand, they use less energy than a full air-conditioning system and therefore play a key role in the sustainable energy design of the premises and in enhancing efficiency.

**Ventilation slats:** There is air conditioning in the offices of the high-rise, but there is also the possibility of natural ventilation, outside conditions permitting. To make this possible,

an independently controlled opening mechanism (*Parallel-Abstell-Lüftungselement (PALE)*) was developed, whereby the ventilation slats of the facade move out horizontally from their frames. This mechanism is “hidden” behind the outer facade and supplies the offices with fresh air through the gaps that it creates. If the

There is air conditioning in the offices of the high-rise, but there is also the possibility of natural ventilation, outside conditions permitting.

ventilation slats are open, the air conditioning in the respective office automatically shuts down, which helps to conserve energy. Motor-driven opening mechanisms allow users to control the width of the ventilation gaps.

**Underfloor heating:** The atrium of the office tower and the *Grossmarkthalle* are fitted





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with underfloor heating so that they remain at a pleasant temperature.

There are water pipes in the flooring of the interchange platforms in the atrium and in that of the large open areas within the *Grossmarkthalle*. These pipes also have either cold or warm water running through them, depending on the season.

As a result, staff and visitors to the ECB can still enjoy comfortable temperatures at floor level, with no energy being required to heat or cool the high open spaces.

### Lifts

The office tower has a total of 16 lifts. While the north tower has been fitted with four TWIN lift systems, the smaller south tower has three. These are supplemented by a conventional single lift system, and by a goods lift that would also serve as a passenger lift in the event of a fire. In addition, there are five “express lifts” in the atrium.

The special feature of TWIN lifts is that the shaft contains two cars – one on top of the other – that travel independently of each other. In order to ensure a minimum distance

between the lift cars in every operating mode, a four-level safety concept is in place. Such a lift system has the advantage of being highly space-efficient, i.e. comparatively less space is required for the shaft, as the lift cars can be arranged vertically instead of horizontally.

The express lifts travel at a speed of six metres per second (21.6 km/hour) and only stop at the interchange platforms within the atrium. Both the lift cars and the shafts consist of glass panels, providing a view into the open spaces of the atrium, which are up to 60 m high.

In order to make taking the lift an effortless and efficient process, there are terminals in front of each landing where passengers input the floor they require. In contrast to the conventional two-button control panel, this system computes the quickest connection between the floors once the desired destination has been entered, i.e. passengers do not select their destination in the lift car, but via a panel outside, which then directs them to the appropriate lift.

The *Grossmarkthalle* has been equipped with 16 new lifts so that it is easy to move between the different areas. A set of lifts in the

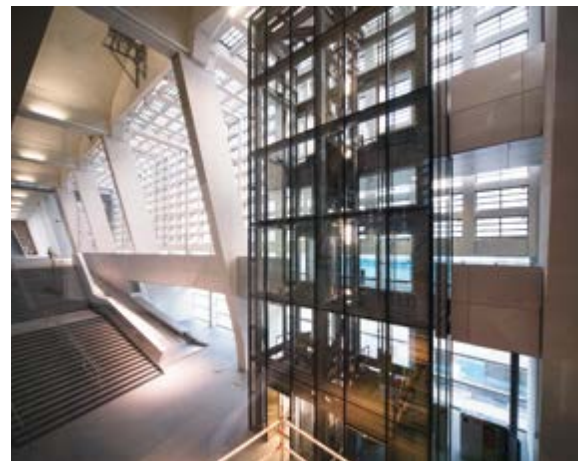
**1-6** The structural and spatial design of the new premises creates a working environment that meets various functional requirements. Modern workplaces facilitate open communication and thus promote teamwork and interaction at every level. The flexibility of the design means that changing requirements can be adapted to with little effort.

**2** As is the case with most high-rise buildings, the office tower also requires facade access equipment for cleaning the glass panels and carrying out any necessary repair work. This equipment, which consists of large crane systems and cradles, is stored out of sight in two troughs in the roof area. When needed, the cranes and cradles are hoisted out of the troughs using a lift table and then lowered onto the facade.

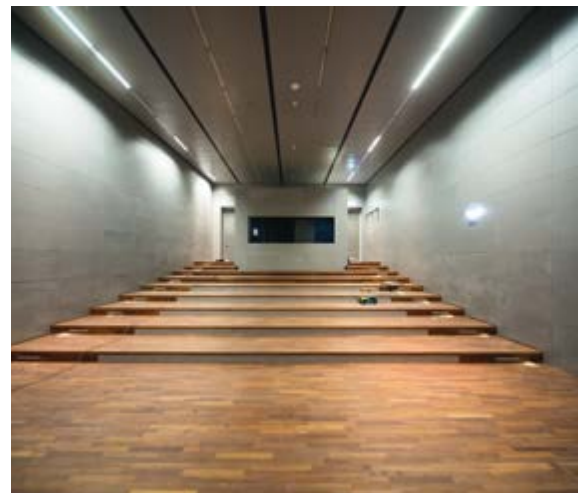




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lobby leads directly to the press centre in the entrance building, while another set links the lobby to the conference area in the *Grossmarkthalle*.

### Paternoster

When it was built, the eight-storey *Grossmarkthalle* was the tallest building in Frankfurt and was equipped with a paternoster or “cyclic passenger lift”, which was a popular type of lift system at the time. In Frankfurt, there are still five paternosters in working order, but the one in the *Grossmarkthalle* is unusual: like the express lifts in the office tower, the paternoster's lift cars are made out of glass, enabling people to see out through the bay windows in the northern facade of the western wing building. For technical reasons, however, this passenger lift was taken out of operation, even when the *Grossmarkthalle* was still being used as a wholesale fruit and vegetable market.

Although the installation of this type of lift has been prohibited since 1974, they may still be operated in listed buildings. The historical paternoster has been overhauled and reactivated. It has 16 cars in total, which are attached to a two-tonne chain that rotates continuously over large cogwheels in the roof and cellar. These cogwheels have been restored using the traditional sand casting process so that they retain their original appearance.

### Fire protection

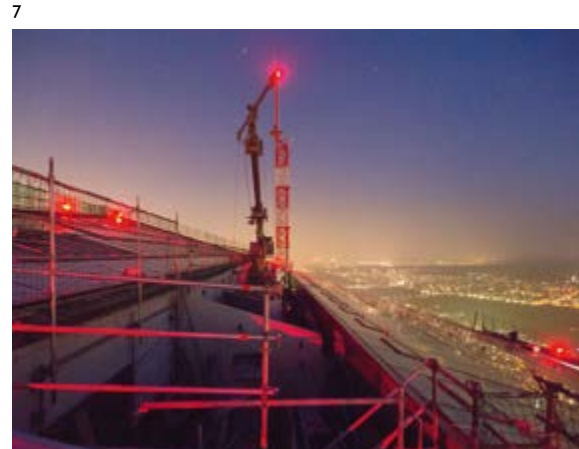
The building complex required a carefully thought-out and coordinated fire protection concept, with the ultimate aim of moving members of staff and visitors to safety as quickly as possible in an emergency situation.

One of the technical challenges in this regard was the high open spaces in the atrium. In the event of a fire, glass slats fitted into the facade both above and below the interchange platforms will open, enabling the spaces to be cleared of smoke. The height of the open spaces also necessitated a special type of smoke detection system, as conventional smoke detectors would react too slowly, owing

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to their limited operating range. It was therefore decided to use a linear detector that would cover the entire open space. This kind of detector transmits laser beams to various heights, which are reflected in several mirrors. If a beam is not reflected in one of the mirrors, an alarm is sent to a central computer, indicating the presence of smoke. Several measures and systems are then triggered automatically. The slats are opened, creating a chimney effect and enabling the smoke to be extracted quickly.

In the event of a fire in the *Grossmarkthalle*, smoke will be extracted via a set of ventilators in the gables of the roof shells. At the same time, elements of the facade at ground floor level will open automatically, creating a chimney effect and thereby a stream of fresh air to drive the smoke upwards as quickly as possible for the safety of staff and visitors.



**1-3** The paternoster in the western wing building of the *Grossmarkthalle* has been restored in keeping with the original design and reactivated.

**3** To create an elegant official entrance to the market hall, Martin Elsaesser introduced a decorative fishbone design for the brickwork in the foyer of western wing building. This brickwork was uncovered and then repaired. The paternoster is located next to the stairs.

**4** As a fire protection measure, smoke extraction systems have been fitted into the gables of the roof shells.

**7-8** With the installation of the antenna in March 2013, the office tower reached its full height of 200.53 m.



7 As a reminder of the industrial past of the *Grossmarkthalle* and the area around it, the market hall is surrounded by a border of paving stones. This border consists of old paving stones removed from around the site and new modern ones. It has been deliberately faded into the parkland area.

Before creating the design, the landscape architects analysed the site in great detail in order to fully understand its qualitative attributes, and decided to make the landscape of the river Main a central element of the landscape design for the park. The basic idea was that of abstracting the typical terrain of natural flood plains, i.e. the particular topography of a river landscape, with its troughs and plateaus, backwaters, undercuts and slopes, is abstracted to create geometric forms. The result is a parkland area consisting of a stylised river landscape that runs in the same direction as the river Main.

The continuous landscape incorporates the *Grossmarkthalle*, the new high-rise and essential functional equipment and structures without losing its character as a park and identifiable landscape. The vegetation both enhances and questions the impression of a river landscape with a combination of typical river plant life and exotic plants that appear strange in such a habitat. Nevertheless, most of the trees are deciduous, enabling people to experience the different seasons. Vogt Landscape Architects deployed three concepts of tree arrangement: rows of trees, clusters of trees and solitary trees. Meadows with widely spaced trees alternate with dense woods, natural hedges, typical riverbank formations and rows of trees, which reiterate the form of river valleys. The topography repeatedly provides vistas of the various zones and the river Main. The observer's view varies and is open, framed or conducted both from inside and outside the area.





5



6



7

Vogt Landscape Architects have created a park that appears to have grown naturally, although everything has, of course, been planned and thought through in great detail. This also applies to the necessary security features, which are incorporated into the landscape as walls and fences. These are embedded in layers in the park so that, wherever possible, the green space is not perceived, either from the outside or from the inside, as enclosed, but primarily as an open parkland area. The fence, which partly follows the undulation of the landscape, consists of vertical metal rods that are close to one another so as to stop anyone from climbing over or walking through. The aim was to reduce the impact of a visual barrier and not to cut the ECB off from its surroundings, thereby allowing pedestrians to see the *Grossmarkthalle* and the site through the fence.

Together with the parks in the surrounding area – such as the *Grüngürtel* (Frankfurt's green belt), the *Mainuferpark* (an area of parkland along the banks of the river Main), the nearby

*Hafenpark* (a new park based on the theme of "sport and movement") and the *Ostpark* (the park in Frankfurt's Ostend district) – the landscape around the ECB's new premises has contributed to the creation of a "green lung" for the city of Frankfurt.

The continuous landscape design incorporates the *Grossmarkthalle*, the new high-rise and essential functional equipment and structures without losing its character as a park and identifiable landscape.





## ■ GENERAL DATA

Site area	120,000 m <sup>2</sup>
Gross floor area	185,000 m <sup>2</sup>

## ■ Building ensemble

Grossmarkthalle (architect: Martin Elsaesser; built 1926-28), with a new entrance building  
Office tower (comprising the north tower, south tower and atrium)  
Two entry control points (north and south) and a logistics centre

## ■ OFFICE TOWER DATA

Floor space per storey per tower	700 m <sup>2</sup> to 1,200 m <sup>2</sup>
Maximum height	185 m

## ■ GROSSMARKTHALLE DATA

### Market hall

Floor area	220 m × 50 m = 11,000 m <sup>2</sup>
Maximum clear height	23.5 m

### Wing buildings

Floor area	15 m × 65 m = 975 m <sup>2</sup>
Height	Approx. 32.5 m

## ■ ARCHITECTS AND PLANNERS

### Architect

COOP HIMMELB(L)AU, Vienna

### Planners

ARGE IFFT-ML / Prof. Schott – Prof. Lange  
Arup GmbH  
AS&P – Albert Speer & Partner GmbH  
B + G Ingenieure, Bollinger + Grohmann GmbH, together with Grontmij BGS Ingenieurgesellschaft mbH  
Bartenbach LichtLabor GmbH  
canzler ingenieure  
ComConsult Beratung + Planung GmbH  
Dorsch Consult  
Ebert-Ingenieure GmbH & Co. KG  
Grandjean & Kollegen  
HHP Süd, Beratende Ingenieure GmbH  
Jappsen Ingenieure GmbH  
Krebs und Kiefer – Beratende Ingenieure für das Bauwesen GmbH  
Prof. Katzenbach & CDM Consult  
Scholze Ingenieurgesellschaft mbH  
SHI Schad-Hölzel Beratende Ingenieure  
Vogt Landschaftsplaner GmbH  
Wolfgang Sorge Ingenieurbüro für Bauphysik GmbH  
unit-design GmbH







TIMELINE	
2002	Purchase of the <i>Grossmarkthalle</i> site in Frankfurt
2002-2004	International urban planning and architectural design competition
2004-2005	Revision phases
2006-2009	Planning phases
October 2007	Submission of the building plans
13 November 2007	Entry into force of building plan No 830
Spring 2008	Start of preliminary construction works
6 May 2008	Issuance of building permit
Spring 2010	Start of main construction works
May 2010	Laying of the foundation stone
September 2012	Topping out ceremony
2014	ECB moves into its new premises





# The tasks of the European Central Bank and the Eurosystem

"We at the European Central Bank are committed to performing all central bank tasks entrusted to us effectively. In so doing, we strive for the highest level of integrity, competence, efficiency and transparency" (quoted from the mission statement of the European Central Bank).

The Eurosystem, which comprises the European Central Bank (ECB) and the national central banks of the Member States whose currency is the euro, is the monetary authority of the euro area.

The primary objective of the ECB is to maintain price stability for the common good. Without prejudice to the objective of price stability, the ECB supports the general economic policies of the European Union (EU), with a view to contributing to the achievement of the objectives of the Union.

The main task of the Eurosystem is to carry out the ECB's monetary policy, i.e. all measures adopted by the Governing Council of the ECB – for example, changes to the key ECB interest rates – and implemented by the Executive Board, including foreign exchange operations and the holding and managing of the official reserves of the euro area countries. The Eurosystem also has the task of promoting the smooth operation of payment systems.

Acting also as a leading financial authority, the Eurosystem aims to safeguard financial stability and promote European financial integration.

From November 2014 the ECB will take on new banking supervision tasks as part of a Single Supervisory Mechanism (SSM).

The SSM will create a new system of financial supervision comprising the ECB and the

national competent authorities of participating EU countries. Among these EU countries are those whose currency is the euro and others whose currency is not the euro but who have decided to enter into close cooperation with the SSM.

The main aims of the SSM will be to ensure the safety and soundness of the European banking system and to increase financial integration and stability in Europe.

The ECB will be responsible for the effective and consistent functioning of the SSM, cooperating with the national competent authorities of participating EU countries.



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