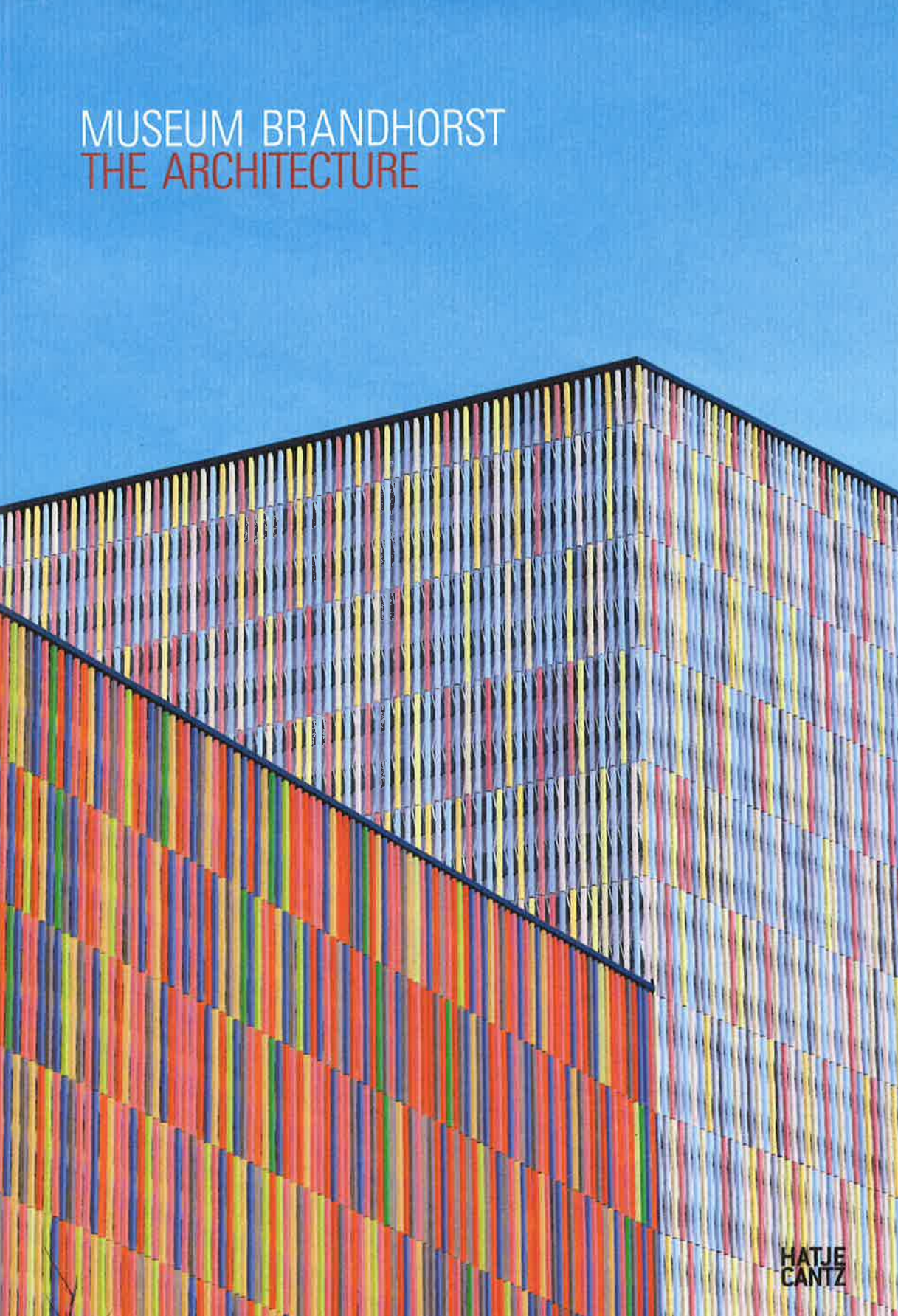
MUSEUM BRANDHORST
THE ARCHITECTURE



HATJE CANTZ

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Edited by
Bayerische Staatsgemäldesammlungen

Copyediting Joann Skrypzak
Translations Laura Schleussner
Graphic design Margarethe Hausstätter
Production Angelika Hartmann, Hatje Cantz
Reproductions LVD Gesellschaft für Datenverarbeitung mbH
Printing Dr. Cantz'sche Druckerei, Ostfildern
Binding Conzella Verlagsbuchbinderei, Urban Meister GmbH, Aschheim-Dornach
Typeface DIN, Univers
Paper Maxisatin, 170 g/m²

Printed by

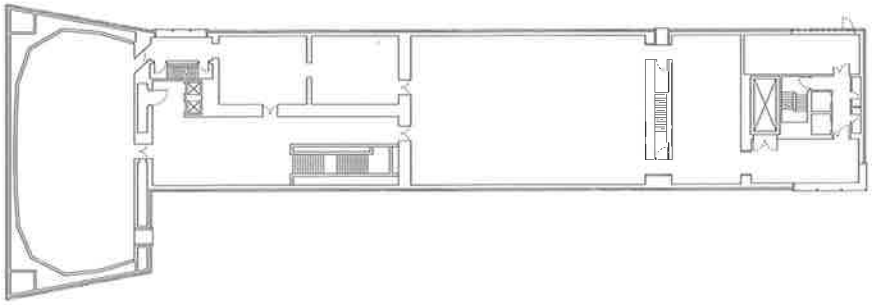
Published by
Hatje Cantz Verlag
Zeppelinstrasse 32
73760 Ostfildern
Germany
Tel. +49 711 4405-200
Fax +49 711 4405-220
www.hatjecantz.de

Hatje Cantz books are available internationally at selected bookstores.
For more information about our distribution partners,
please visit our homepage at www.hatjecantz.com.

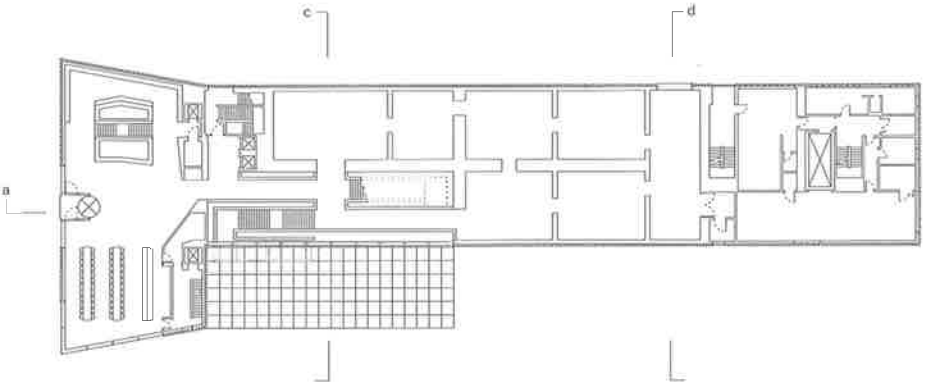
ISBN 978-3-7757-2355-8 (English)
ISBN 978-3-7757-2354-1 (German)

Printed in Germany

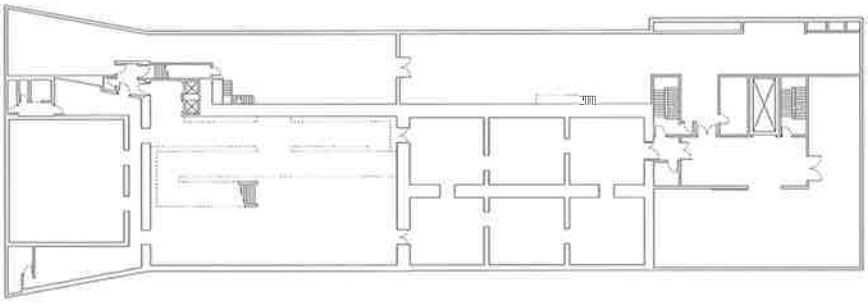
Image Credits



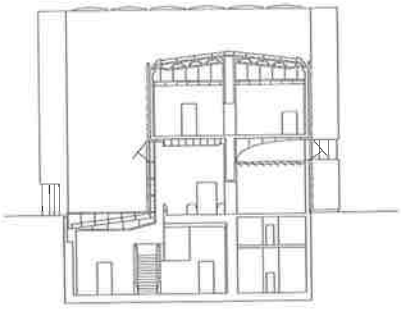
Upper level



Ground level



Lower level



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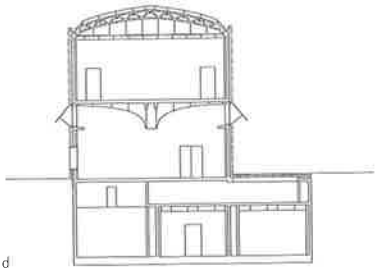

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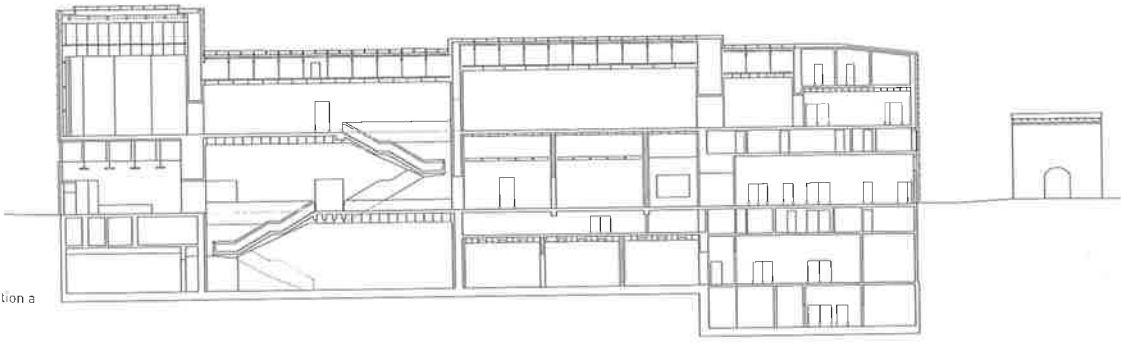


Section a

THE MUSEUM BRANDHORST: A TECHNICAL VIEW

ANDREAS BURMESTER

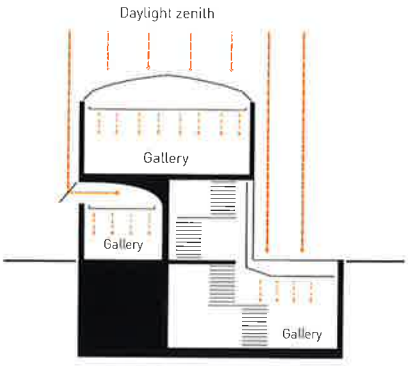
All three of the Munich Pinakothek museum buildings were architectonic and technical milestones of their respective eras. The Museum Brandhorst is equally innovative, with its exterior and interior form inspired by the necessities of its function. The 97-meter longitudinal construction, the southern segment extending 16 meters into the earth, the 23-meter high "head" of the building, the scarcity of visible windows, and the façade made of ceramic rods are only half the picture. Behind them—and largely concealed—lie complex technical systems, which provide lighting and climate control for the building, offer fire protection and security systems, and are capable of mastering the logistical demands of the museum's daily operation.

LIGHT

As in the case of the Pinakothek buildings, the Museum Brandhorst uses as much daylight as possible to illuminate the galleries. Natural light is alive; it is pure color and thus unparalleled, without rival. The light in all the gallery spaces illuminates the walls and floors homogeneously; the corners of the rooms are clearly perceptible. A special type of glass blocks direct sunlight and filters both thermal radiation and harmful ultraviolet rays. In the space below the roof, motorized louvers make it possible to dim the diffused daylight and to further darken the gallery space when the museum is not open. Lamps mounted beneath the blinds add artificial light when natural light conditions are insufficient. This is all palpable to the visitor but nonetheless invisible, since laylight ceiling elements spanned with semi-opaque synthetic fabric block the view into the area beneath the roof.

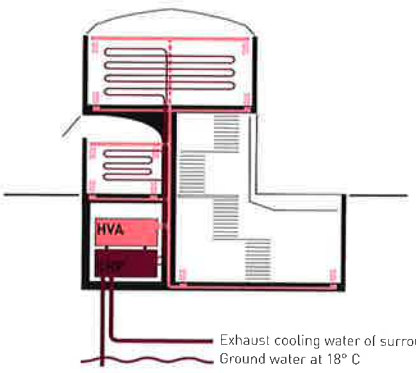
The ground floor adopts the motif of sidelight entering from above in the form of a continuous window strip. Glares are avoided through suspended laylight ceiling elements that diffuse the light. The visitor can discern a parabola-shaped light-reflecting ceiling, which receives its light from reflector elements that are fastened to the exterior façade. This system makes it possible to better utilize diffuse solar rays and saves resources.

Although the patio on the lower floor is supplied with daylight from over seven meters above, the six small galleries and the multimedia room located here are purposely situated underground: all are equipped with dimmable artificial lighting, which provides ideal conditions for light-sensitive art or works requiring a low-light setting.

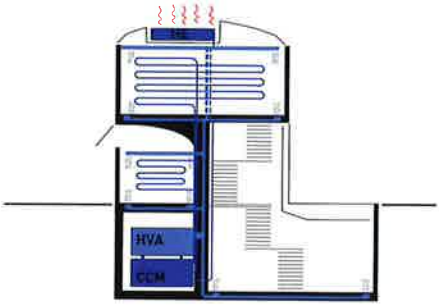


Daylight usage

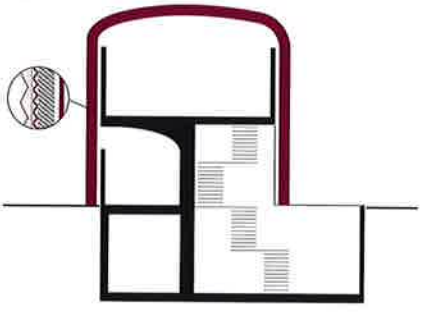
HVA Heating, ventilation, air conditioning
CHP Compression heat pump
HE Heat exchanger
CCM Compression cooling machine



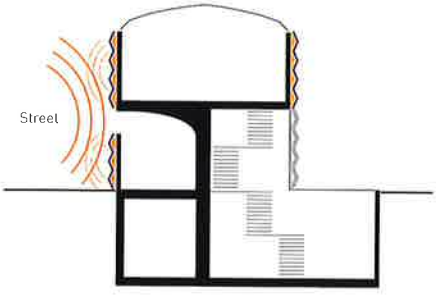
Heating through activated walls and floors



Cooling



Thermal insulation



Noise absorption

CLIMATE

Maintaining stringent climate control requirements guarantees the long-term preservation of the valuable works of art on view. For this reason the building was constructed as stably as possible from the standpoint of structural physics. The indoor climate ranges from a relative humidity of 50 ± 2 percent and a room temperature of 20 ± 1 degrees Celsius (68 ± 1 degrees Fahrenheit), and thus provides an extraordinarily stable environment.

The innovative air handling concept aims at having heating and cooling originate from the walls and floor. All external walls, most interior walls, and even the floors are equipped with a thermal activation system that uses given structural components of the building. Aside from a few exceptions, such as the Kunsthaus Bregenz, this represents a novelty in museum construction. A system of pipes built into the aforementioned structures carries water that serves as both a heating and cooling medium. Simulations show that, given a thermal load of twenty visitors per hundred square meters, surface temperatures range between 18.5 and 20.5 degrees Celsius (65.3 – 68.9 degrees Fahrenheit). The thermal inertia of the wall mass is advantageous from a conservation perspective since it is incapable of sudden shifts in climate.

The Museum Brandhorst is also blazing new trails in terms of its energy supply: the neighboring Pinakothek der Moderne cools its huge air conditioning system with ground water and sends the warmed cooling water back into the ground water. Today the ground water in the Maxvorstadt district measures temperatures of up to 23 degrees Celsius (73.4 degrees Fahrenheit)—and over the years temperatures have demonstrated a tendency of being on the rise. Since high ground water temperatures are harmful for the ecology over the long term and also represent unutilized energy potential, the Museum Brandhorst withdraws the cooling water from the Pinakothek der Moderne with heat-exchange energy and uses it to pre-warm the necessary fresh air—air for breathing—and to operate its heat pumps. The concept not only lowers the temperature of the ground water, but also makes the building largely independent of the municipal district heating network, which it would only make use of in an emergency. Through heat recovery the Museum Brandhorst achieves a savings of around 26 percent of the electrical energy and up to 50 percent of the thermal energy used by a building with conventional climate control. In short, this means 356 tons fewer CO_2 emissions per year!

Regulating humidity—and also temperature in peak load periods—is the work of seven air conditioners, which are located in a technical block extending throughout the two basement levels of the museum from the south to the northern end of the "head." As with the Pinakothek der Moderne, the planning team opted for an upward displacement air-conditioning system, which introduces air into a space at low velocity. Air enters the rooms through floor grates. Spaces between the laylight ceiling elements enable the slowly warming and thus rising

air to flow into the area under the roof, where it is drawn out and circulated back into the air-conditioning system. Simulations showed that, given the presence of twenty visitors per hundred square meters, there was a homogenous distribution of relative humidity with stable values ranging from 48 to 51 percent.
The low-velocity air current with a speed between 0.04 and 0.26 meters per second prevents unprotected surfaces from assuming an electric charge and helps the surfaces of the exhibited works of art, which are usually not behind glass, stay clean for longer periods of time. It also hinders drafts and bothersome ventilation noises. In contrast to conventional air conditioning systems, reduced air circulation and variable amounts of fresh air save additional energy. Air pollutants such as particulate matter and ozone, which could irreversibly damage the exhibited works of art, are removed from the air through careful filtering processes. The air handling concept used for the Museum Brandhorst is approximately 35 percent more economical in terms of construction costs and 43 percent more economical in terms of operating costs than comprehensive air conditioning systems in comparable buildings.

SECURITY AND INFRASTRUCTURE

Located in and behind the walls, ceilings, and door coverings is a range of security-related equipment, which fulfills legal fire and theft protection requirements. Security glass, a monitored exterior façade, and a sophisticated access monitoring system round out the complex security concept.
Limited resources demand technological systems that are easy to maintain. For example, the shading and dimming louvers, the artificial lighting, and parts of the thermal activation system are easily accessible in the upper floor via a level of grated flooring in the space beneath the roof. Two visitor elevators, toilets on every floor, and utility rooms meet the needs of visitors and facilitate necessary daily operations. In addition to the large, 6-meter deep transportation elevator, a temporary elevator can be put to use when necessary, to move paintings up to 12 meters wide from the lower level into the upper gallery floor—a one-of-a-kind construction worldwide.

ACOUSTICS AND HIDDEN COMPONENTS

Through acoustic plaster and sound absorbent wall panelling in the multimedia and video area the Museum Brandhorst has made a clear acoustic separation between areas in which films, video works, or other new media works with accompanying sound are presented and those that demand a quiet atmosphere.
The real acoustical innovation, however, is the previously mentioned façade made of over 36,000 differently colored ceramic rods, which are installed in front of a layer of horizontally folded colored, perforated sheet metal. In addition to having an aesthetic function, it also serves as a sound-absorbing element. This

reduces the traffic noise coming from Türkenstrasse and Theresienstrasse, and thus significantly contributes to reducing noise levels in the neighborhood as a whole.

The technology housed in the Museum Brandhorst is largely invisible. Whereas the walls of other museums are covered with fire extinguishers, light switches, telephones, cameras, loudspeakers, cables, and alarm buttons, all these technical components have been hidden from sight to the greatest extent possible. Almost every room has over thirty different technical functions, of which only the air vents, emergency exit signs, tiny light and climate sensors, and surveillance cameras in the ceiling are visible.

In short, the ingeniously hidden as well as pioneering technological systems of the Museum Brandhorst represent innovation, ecological compatibility, and sustainability. They offer the sensitive works of the Brandhorst Collection an optimal environment from the standpoint of preventive conservation. A successful balance of form and function is achieved.