



HOW ART
IS ILLUMINATED

Title image
Guggenheim Museum Bilbao, Bilbao | ES
Architecture: Frank Gehry



Isabel Zumtobel
Director Arts & Culture, Zumtobel Group

“Museums are more than places of preservation. They are vibrant spaces where art and culture reveal their impact, touch people, and make time perceptible.”

“Every exhibition is a dialogue between the artwork and the world, between past and present. Light plays a silent but crucial role in this. It reveals details, draws the eye, creates atmosphere – without pushing itself into the foreground. Good lighting makes art visible, tangible, and comprehensible. It preserves, emphasises, and tells stories. Invisibly curating in every room.”

Contents



MKM Museum Küppersmühle, Duisburg | DE
Architecture (Expansion 2016–2021): Herzog & de Meuron

Voices from Art & Culture	6
Trends	8
Visitor Journey	10

Lighting Knowledge

Perception	12
Preservation	14
Technology	16
Museum Areas	18

Lighting Tools

Lighting Objects	20
Wallwashing	22
Framing	24
Illuminated Ceilings	26
Infrastructure	28
Scientific Studies	30

Lighting that tells Stories



“Light defines shapes. It makes the structures of artwork visible, enlivens an exhibition, and enhances architecture. With the exceptional light from Zumtobel, we repeatedly experience how atmosphere and form unfold at night in our pavilions. Light creates a balance between open and closed spaces, between the interior and the exterior.”

Hans Ulrich Obrist
Artistic Director, Serpentine Galleries, London

“I actually paint at night and mix many colours. Since having Zumtobel’s luminaires in my studio, I see exactly the same colours the next day that I saw at night under artificial light. The colour rendering is precise – and that is a pure joy for my work.”

Otobong Nkanga
Artist, Nigeria





“Without light there is no colour, no texture, no depth. Light brings spaces to life – it reveals their soul, their heart, and their passion.”

Markus Dochantschi
Founder and President, studioMDA, New York

“Light is one of the highlights of the Fondation Beyeler. It illuminates the exhibition rooms designed by Renzo Piano in such a way that the works of art are optimally displayed. Previously the artwork was only visible during the day. Now, thanks to a sophisticated lighting concept and Zumtobel’s luminaires, even at night and in bad weather, when you enter the museum, you feel as comfortable inside as you do outside. We can control the artificial lighting system so that it looks like daylight.”

Sam Keller
Director Fondation Beyeler, Basel



Four Perspectives on the Museum of Tomorrow



St. Arbogast Water Castle, Götzis | AT
Architecture: Christian Lenz, Artist: Fridolin Welte



Serpentine Pavilion, London | UK
Architecture: Lina Ghotmeh (2023)

Sustainability

Collecting, preserving, researching and communicating – the classic tasks of a museum are also a promise for the future. They serve not only to protect art, but also to protect our planet. Sustainability is one of the central guiding principles of modern museum work and shapes it far beyond short-term developments. Art and culture account for eight percent of public spaces, and for around twenty percent of power consumption. Optimising large consumers can make the greatest contribution. Supported by funding programmes, museums thus apply a role model function for entire regions.

Diversity

Diversity describes the perception and appreciation of differences and similarities – regardless of origin, age, religion, gender or ideology. Museums live up to this diversity and create places of encounter where cultures, generations and perspectives come together. Zumtobel also sees diversity as an attitude that connects and strengthens the collective spirit – in the work environment, in projects, and in the designed spaces.



Palazzo Zabarelli, Padova | IT
Architecture: Enrico Bano

Inclusion

Inclusion means that people with disabilities no longer have to adapt their lives to existing structures. What is needed are structures that enable equal access for all people, regardless of physical or age-related limitations. Together with Technische Hochschule Ostwestfalen-Lippe and Büro Happold, Zumtobel has conducted a study that examines how people with different visual impairments perceive spaces. The results show ways in which light breaks down barriers and promotes participation.



Muzej Apoksiomena, Mali Lošinj | HR
Architecture: Idis Turato and Saša Randić

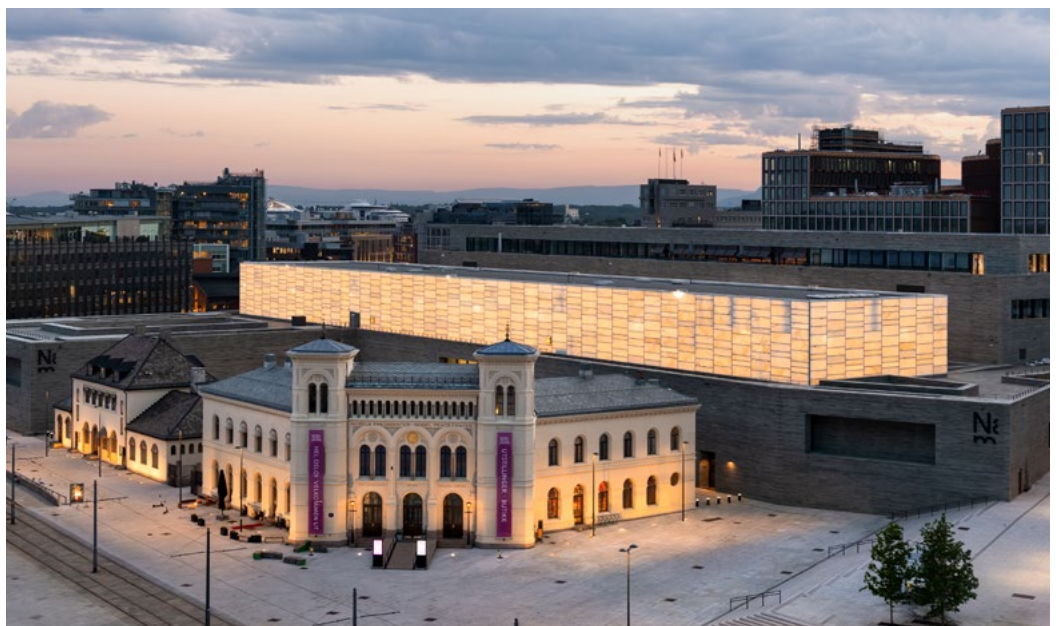
Digitalisation

Digital technologies are transforming the perception of art and opening up new ways of communication. Lighting is increasingly becoming a medium of information, making spaces interactive and enabling immersive exhibitions. With a single system, visitors can navigate through the space, plan their tour individually, and access information on their devices. Only about five percent of art collections are publicly accessible. The connection between archive and audience via digital interfaces creates new approaches and makes hidden knowledge visible. Museums can also generate direct feedback by seeing how long and where people move throughout the building – all in compliance with data protection regulations, of course.

Light Connects Places and Moments

Architecture in the Urban Space

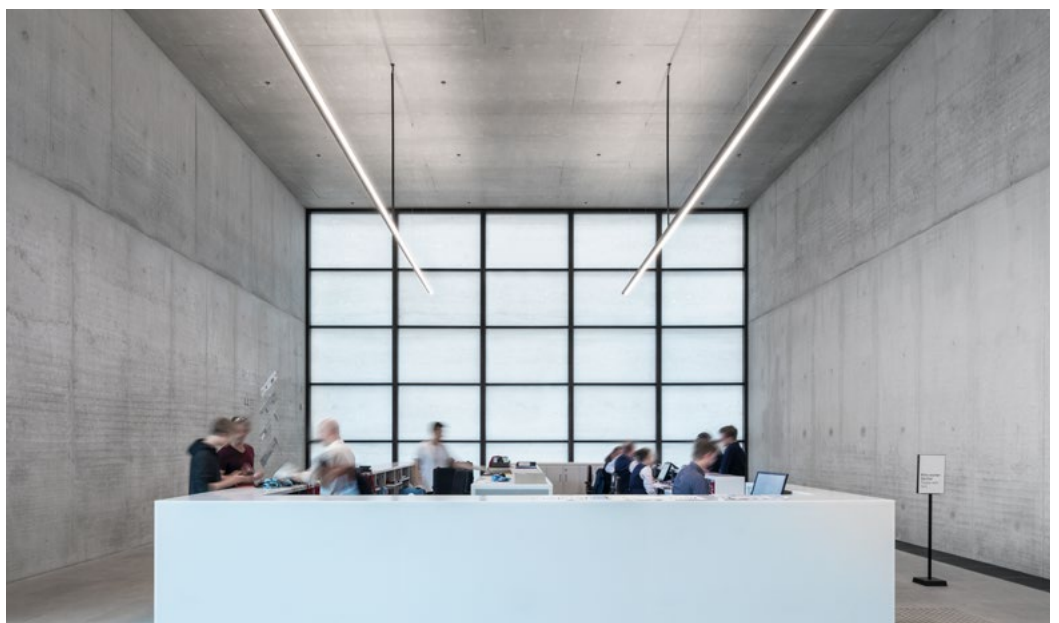
The first impression of a museum is formed in the public space. Its facade shapes the cityscape, offers orientation and becomes a social and cultural landmark. Lighting conveys far more than just brightness – it sends a message. Light highlights architectural details, guides the eye, and offers a glimpse of the atmosphere that awaits inside – even from outside. It creates recognition and awakens curiosity.



Oslo National Museum | NO
Architecture: Kleihues + Schuwerk

Interior Architecture

Interior architecture can be a major reason for visiting a museum. Flexible lighting concepts make it possible to specifically stage new and historical elements while invoking emotion. They direct focus, create depth, and provide orientation. The interplay of brightness and colour is decisive, preserving the perception of material and structure.



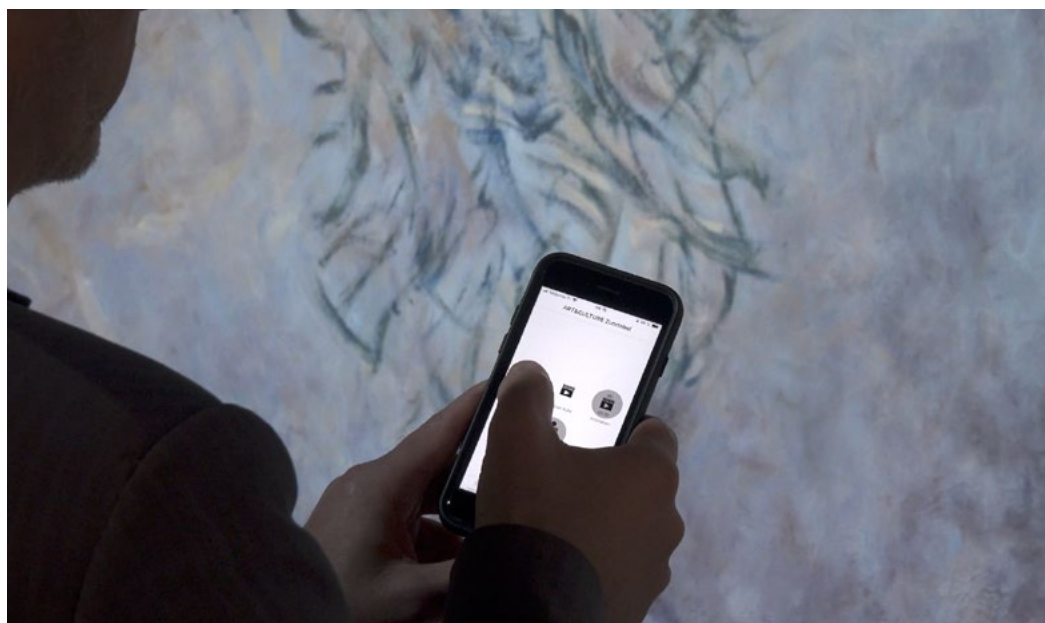
James Simon Gallery, Berlin | DE
Architecture: David Chipperfield Architects Berlin



Palazzo Zabarelli, Padova | IT
Architecture: Enrico Bano

Perception of Art

Standing in front of an original artwork remains a unique experience even in a globalised world. Lighting is a significant contributor in making this encounter intense and at the same time respectful. It makes it possible to grasp a work in all its facets while maintaining both its history and sensitivity. High-quality glare-free lighting, with precise colour rendering and controlled contrast, creates the appropriate visual atmosphere. In this way, the message of the art becomes tangible, while its substance is preserved.



Zumtobel Group Light Forum, Dornbirn | AT
Architecture: Snøhetta

Digital mediation

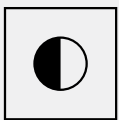
Innovative technologies are expanding the role of light. Modern systems can not only illuminate, but also convey information. Visitors can use a single system to find their way around the space, plan their tour and access digital content. As museums on average only show around five percent of their collection objects to the public, these smart lighting solutions create a new connection between the archive and the public. Light becomes a tool that makes hidden works accessible and knowledge visible.

Light planes

Shaping Perception

Light influences many levels. Spotlights, luminous ceilings, and wallwashers convey the principles of the sun, sky, and reflection into the interior – for natural vision and balanced perception.

Light shapes the way we experience space and art. Spotlights take on the role of the sun: they create directed light, accentuate shapes, and lend brilliance to surfaces. Light ceilings are reminiscent of the sky. Its diffused light balances contrasts and makes colours appear clear. Wallwashers create the plane of reflection. They lighten up walls and create a pleasant foundation of brightness. The interplay ensures harmony and a relationship of light and shadow, therefore creating authentic perception.



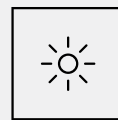
Contrast

Targeted lighting enhances visual perception and ensures balanced contrasts. Where light only hits relevant areas, the pupils open wider, fine details emerge more clearly – and energy is used efficiently.



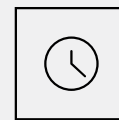
Colour rendering

Each body has its own colours – they only become visible through light. Colour rendering describes how accurately a light source reveals colours and makes them perceptible to the human eye. CRI stands as an abbreviation for Colour Rendering Index.



Illuminance

Illuminance affects both perception and preservation. An object needs at least 20 lux for the eye to perceive its colours. More light improves visibility, but excessive brightness can be blinding.



Time

Another essential factor is time. It determines how long we perceive a work of art and how its effect changes. Time can shape forms, deepen impressions – and also plays a central role in conservation.

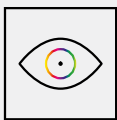


Kunsthaus Zurich | CH
Architecture: David Chipperfield Architects Berlin

Light that Controls and Preserves

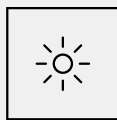
200 Lux for oil on canvas? It is not quite that simple. The protection of works of art does not depend solely on the illuminance. Control over spectrum, brightness, and time is crucial.

Light is both a medium and a risk. It makes art visible, but it can also change it. An adjusted light spectrum reduces UV and IR radiation and thus the potential for damage to sensitive materials. Precisely controlled illuminance avoids overexposure and preserves colours, structures and surfaces. Time-based and usage-based control makes it possible to further limit the amount of annual light – a benefit for the preservation of works of art and for the energy efficiency of museum operations.



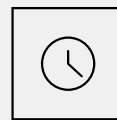
Spectrum

The spectrum describes the distribution of wavelengths within a light source. Excessive UV or IR radiation accelerates the aging of materials. Balanced LED systems reduce this radiation, keep the colour temperature stable and extend the life of the works of art.



Brightness

The illuminance must be compatible with conservation principles. Excessively high levels lead to bleaching effects and material degradation. Modern controls keep the amount of light accurate within the permissible range and at the same time take care of energy efficiency.



Time

The duration of illumination guides the strength at which light impacts an object. The shorter the exposure time, the less damage. Sensors and intelligent controls reduce switch-on times and thus reduce both light exposure and power consumption.



Cultural Web App
for the Planning of
Lighting Solutions



In-depth scientific
information



Palazzo dei Diamanti, Ferrara | IT
Architecture: Biagio Rossetti

Infrastructure that Enables the Future

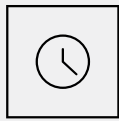
Operation, maintenance and retrofitting become simpler when technology thinks for itself. Networked systems and sophisticated lighting concepts support facility management – for safe operation and sustainable use.

Museums are complex systems with many technical interfaces. IoT-enabled control systems connect lighting, air conditioning and media technology to a centrally controllable network. For the technical staff, this means less effort and a better overview. Cloud-based platforms enable remote maintenance and updates, while QR-based checklists facilitate on-site checks. This ensures that operations remain efficient, safe and future-proof – with technology that simplifies everyday life.



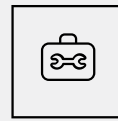
Energy Consumption

Energy efficiency means more than lumens per watt. The crucial factor is how precisely light is used. Optical systems direct it to where it is needed – saving where it is not necessary and meeting the criteria of the funding programs.



Lamp Lifespan

Today, systems shine for 50 000 hours or longer – with a guaranteed 90 percent luminous flux. The values are based on many years of experience and measurements of the first LED system for museums, which is still in operation today.

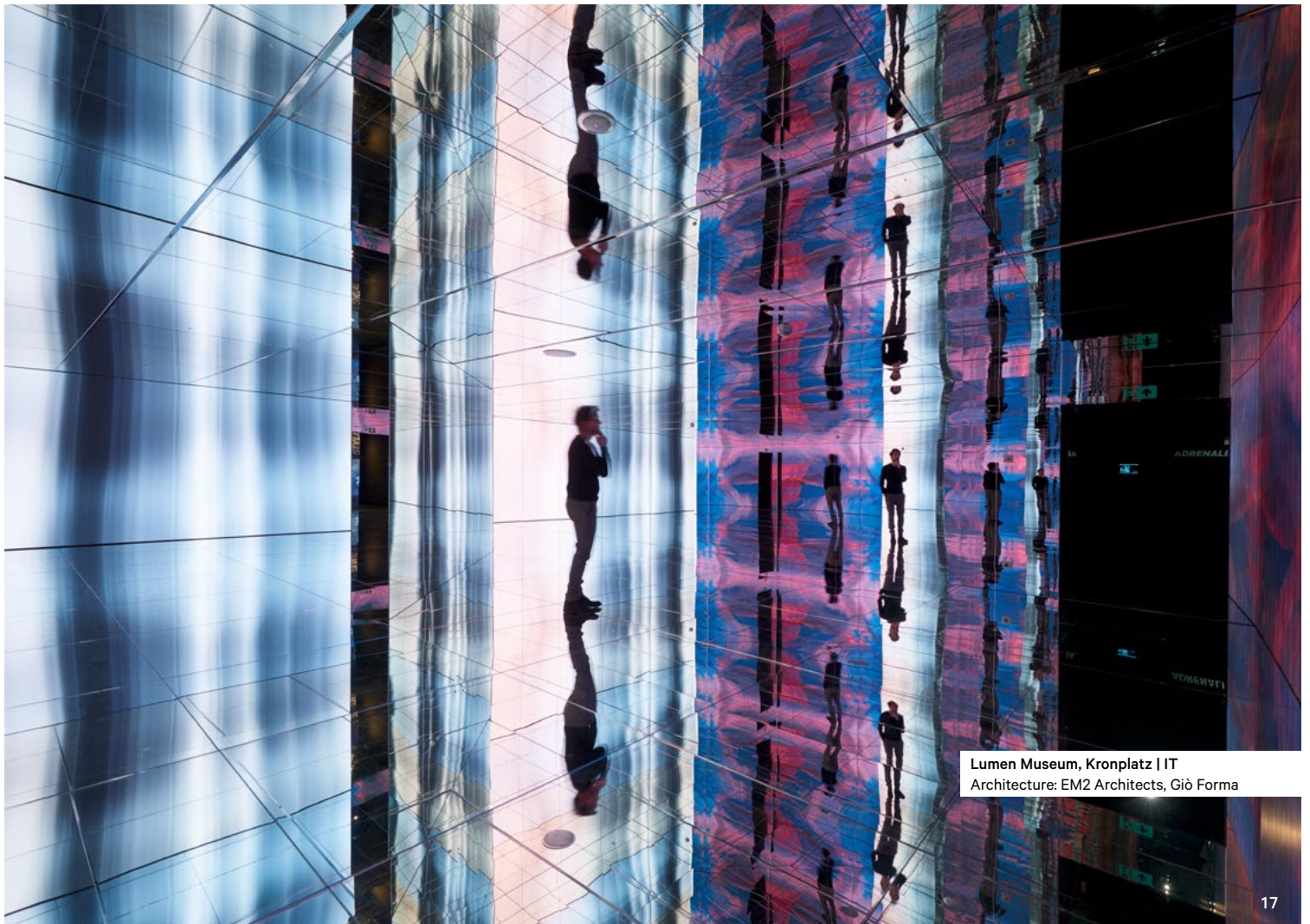


Maintenance

For simple maintenance, luminaires are modular and can be tested or replaced without special tools. Refurbishment kits extend the service life; spare parts are standardised. ESD-safe repairs can be carried out at the factory upon request.



Checklist for
Operation and Maintenance



Lumen Museum, Kronplatz | IT
 Architecture: EM2 Architects, Giò Forma

Lighting that Responds to Requirements

Each area of the museum has its own lighting requirements. Architecture, use, and atmosphere determine how spaces feel – and what solutions they need.

1 EXHIBITION ROOMS

Objective: visibility, atmosphere, object staging
Lighting Character: accentuated, precise, flexible
Lighting Types: spotlights, wallwashers, framers
Requirements: glare-free, UV-free, colour rendering (CRI > 90)

2 FOYER, ENTRANCE AREAS

Objective: reception, orientation, first impression
Lighting Character: bright, inviting, representative
Lighting Types: downlights, suspended luminaires, light direction, if applicable

3 ORIENTATION ZONES, ROUTING

Objective: visitor guidance, legible signage, safety
Lighting Character: even, glare-free
Lighting Types: wallwashers, floor lights, continuous rooflights

4 MEDIA ROOMS, CINEMA ZONES

Objective: visual control for films, VR, interactive stations
Lighting: controllable, highly dimmable, no reflections
Special Feature: RGB or DMX system, black light

5 SPECIAL EXHIBITIONS

Objective: flexible scenography for changing content
Lighting Character: changeable, variable, precise
Lighting Types: tracks, modular luminaires, mobile framers or spotlights

6 DEPOT, COLLECTION, ARCHIVE

Objective: conservation protection and safe handling.
Lighting Character: subdued, low UV and IR.
Lighting Types: LED tray lights, shelf lights, sensor control



Checklists for
Exhibition Areas



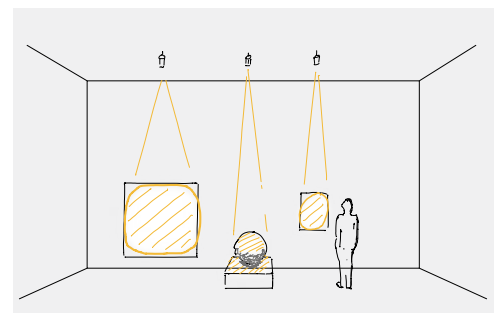


Object Lighting makes Art understandable

Lighting effects are achieved through precise guidance, distribution, and control – for maximum expressiveness with minimum load.

Good lighting makes art legible and vibrant. Beam angle and light distribution determine how shape, material and colour are made visible. Closely bundled spotlights create precise accents, wide-beam optics create uniform surfaces for groups or large-format works. Interchangeable lenses and variable beam angles allow for adaptation to room height and exhibit.

High colour rendering (CRI > 90) shows colours authentically, while clean edge sharpness and low dispersion avoid visual disturbances. Good lighting is characterised by the way it respects the sensitivity of the exhibits: it adjusts illuminance and spectrum in such a way that materials are protected, while details remain visible. This creates light that guides precisely and makes art respectfully accessible.



Rule of thumb for optimal effect:
The distance to the work of art is approximately one third of the room height. Cross-lighting accentuates shapes and structures most effectively.



ARCOS III zoomfocus



VIVO II art



SUPERSYSTEM II



Checklist for Spotlights



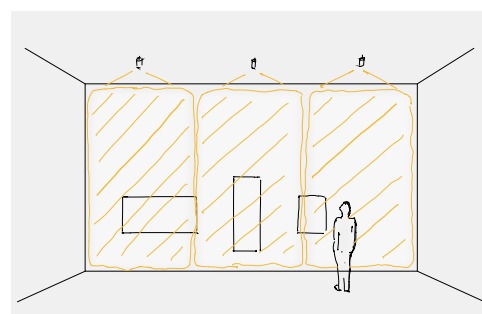
Venice Biennale | IT
Jeffrey Gibson | US

Wallwashers define Perception and Space

Evenly guided light lends depth, creates orientation and allows art to enter into a harmonious dialogue with the architecture.

Wallwashers are among the most important tools in museum lighting. They produce a homogeneous base light that illuminates walls evenly – without stray light on the ceiling or floor. In contrast to spotlights or framers, they do not set accents, but create a calm brightness that guides the eye across the surface in a relaxed manner.

Precise optics direct the light from top to bottom, ensuring a clean wall finish with even distribution. A high colour rendering (CRI > 90) displays colours and materials authentically. Tunable White Technology adjusts the colour temperature for the concept or the curve of the day. Modern systems are dimmable without effort and integrate easily into smart control systems – for light that structures rooms and strengthens the effect of architecture.



Rule of thumb for uniform wall lighting:
The floodlights positioned at a distance of around a third of the room height are aligned so that the light runs from top to bottom and there are no shadows on the ceiling or floor.



ARCOS III zoomfocus



VIVO II art



SUPERSYSTEM
integral



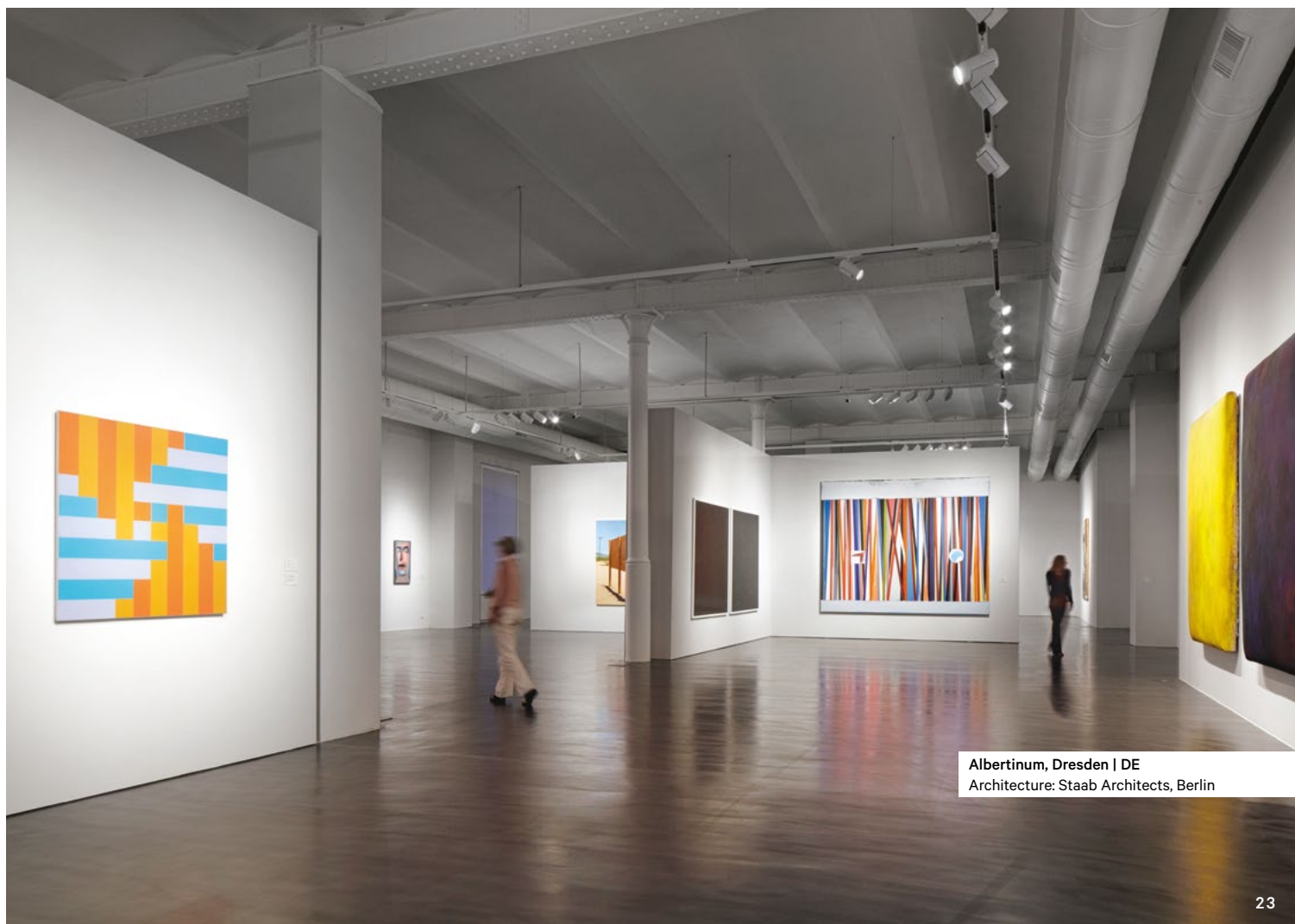
TECTON II



Checklist for
Wallwashers



Aishti Foundation, Beirut | LB
Architecture: David Adjaye



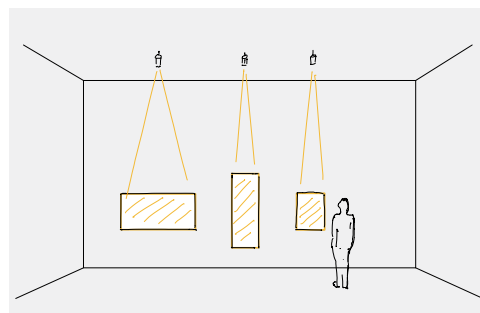
Albertinum, Dresden | DE
Architecture: Staab Architects, Berlin

Framers focus Attention

The most precise museum lighting tools cut the light cone to the accurate shape of an exhibit – for maximum clarity without stray light.

With precise aperture sliders or special optics, the light cone can be adjusted accurately to the shape of a work of art. The light only hits where it should have an effect – without excess radiation, double borders or light clouds. Within the frame, a uniform brightness with clearly defined edges is created.

High colour rendering (CRI > 90) and carefully selected colour temperature ensure colours are displayed authentically, blending harmoniously with the surrounding light. Flicker-free, noiseless technology ensures a calm viewing experience. A precise mechanism ensures consistently accurate focus. High-quality optics and attuned joints allow millimetre-precise alignment, which minimises reflections and creates a glare-free, calm lighting image. Modern framers are compatible with standard power rails, durable and easy to maintain – for precise lighting in daily operation.



Rule of thumb for sharp contours:
The framer is aligned at an angle of approximately 25° to 35° to the image plane. The light field ends with accurate alignment to the object edges, illuminating no further than the frame.



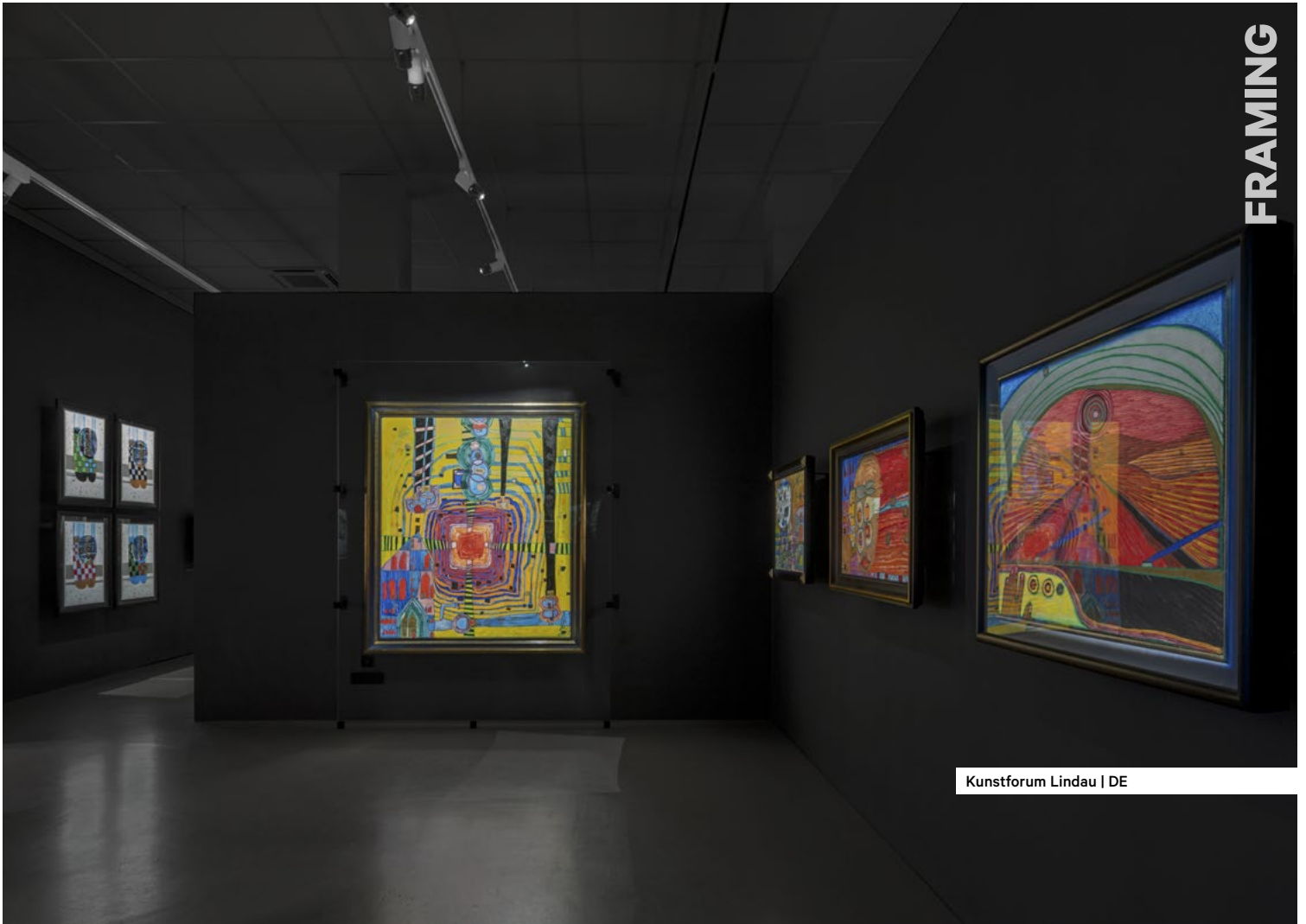
VIVO II art framer



SUPERSYSTEM II



Checklist for
Framers



Kunstforum Lindau | DE



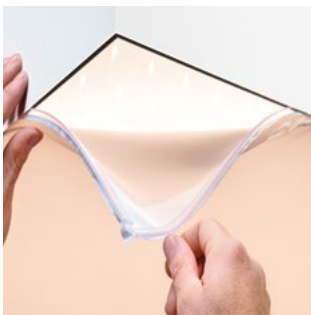
National Museum, Seoul | KR
Architecture: JUNGLIM Architecture

Light Ceilings open the Room

Natural and artificial light ceilings dispense diffused light from above into the room. They convey a sense of spaciousness and connect architectural impact with precise lighting controls.

Skylights and illuminated ceilings use the principle of even, vertically free light guidance. Daylight that enters through skylights creates an authentic, lively effect: colours appear clear, materials natural, the room appears wider and more transparent. At the same time, real daylight requires control – filters, slats and anti-glare systems protect sensitive exhibits from UV and IR radiation.

Artificial light ceilings transfer this principle into a controllable version. Backlit, translucent surfaces create a diffuse, homogeneous light field that can vary in intensity and colour temperature. Illuminated ceilings connect the atmosphere of the natural sky with the precision of modern LED technology – for rooms that look open and remain under complete control at the same time.



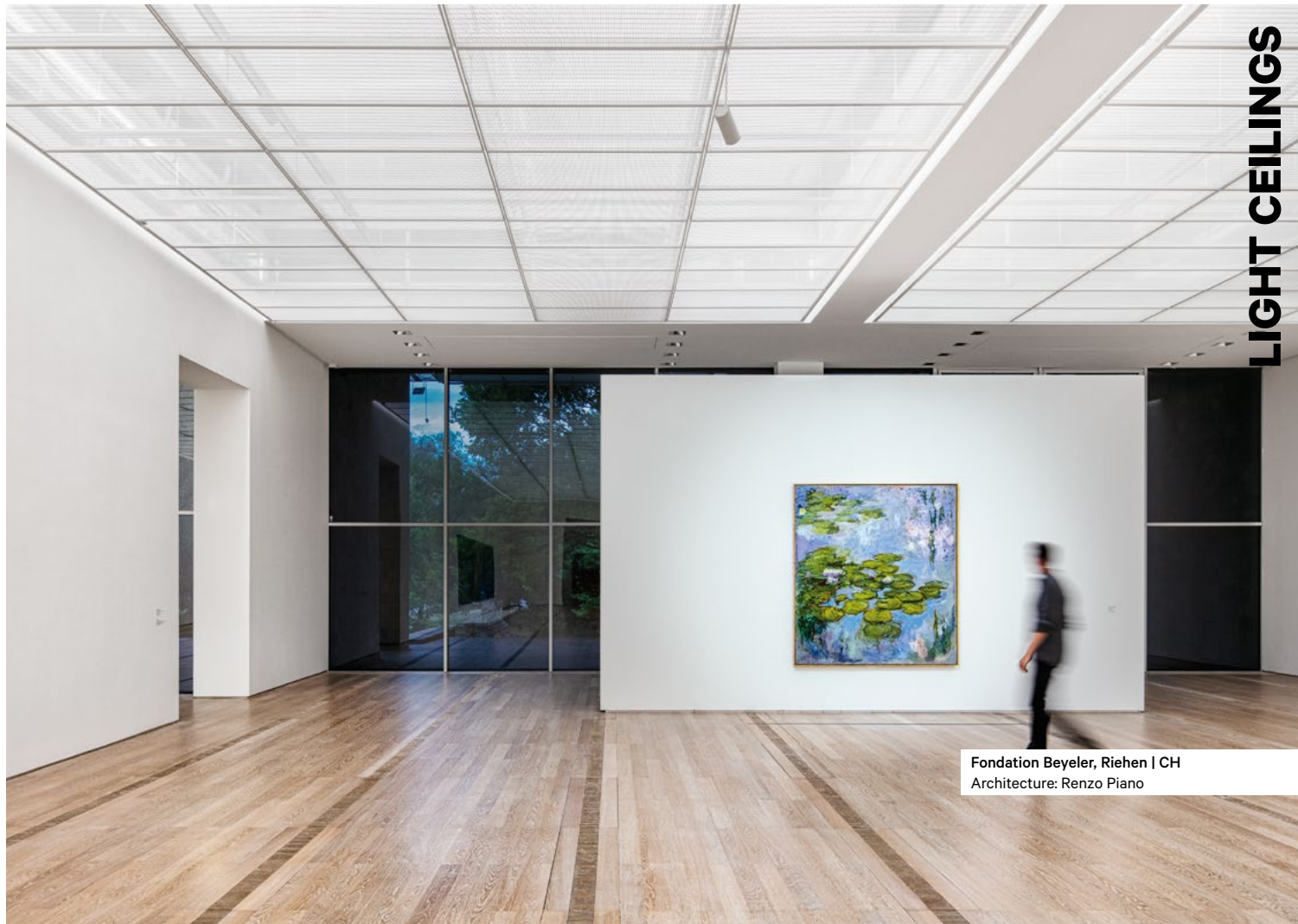
CIELUMA



ONDARIA



LITECOM



Fondation Beyeler, Riehen | CH
Architecture: Renzo Piano



Diözesanmuseum Freising | DE
Architecture: Brückner & Brückner Architects

Technologies facilitate Change

Lighting management systems and emergency lighting form the backbone of museum infrastructure. They connect flexible control and precise scene selection with maximum safety for everyone involved.

Museums need an infrastructure that adapts to change. Intelligent controls make it possible to dim and realign lights or to save scenes for changing exhibitions. At the same time, the lighting concept reacts to daylight, streams of visitors, and conservation requirements – efficiently and in a way that is gentle on the objects.

The emergency lighting complements the network by reliably offering orientation in an emergency and making escape routes visible – even when routes change depending on the situation.

Both systems can be seamlessly integrated into the building management system. Operation and monitoring are performed centrally and intuitively. The result is a networked infrastructure that combines security, efficiency and creative freedom.



TECTON II



SMARTSIGN



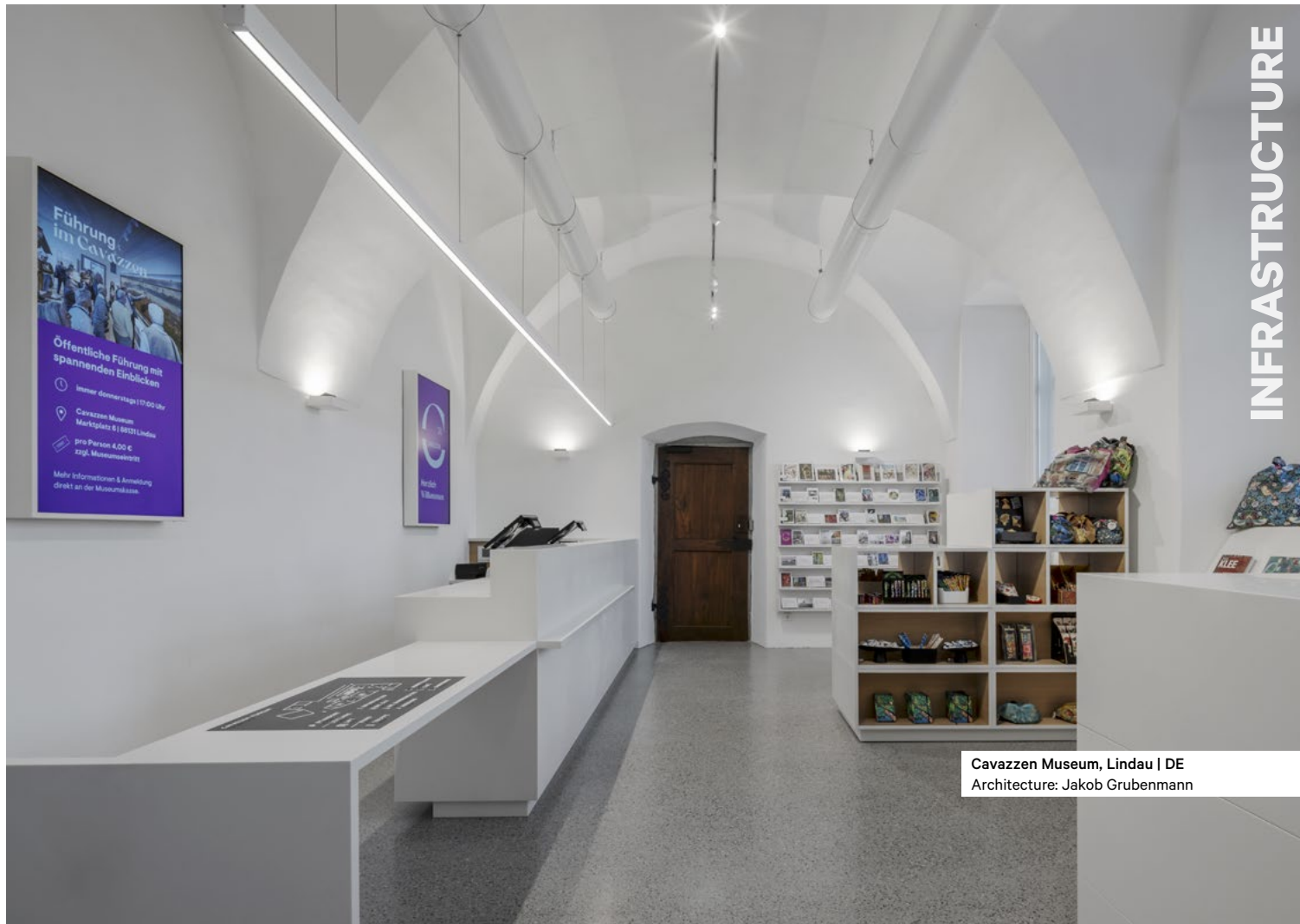
RESCLITE



LITECOM



Decision Matrix
Lighting Controls



Cavazzen Museum, Lindau | DE
Architecture: Jakob Grubenmann



MCBA Cantonal Art Museum, Lausanne | CH
Architecture: Barozzi Veiga

Research in Focus: For the Museum of Tomorrow

Inclusive Lighting: Study by Buro Happold, Paula Longato

Light shapes spaces – but how do visually impaired people experience this effect? Buro Happold investigated two different lighting situations in a museum space. Measurements, observations and interviews showed how light can promote orientation, safety and participation. The results demonstrate impressively that inclusive lighting design goes far beyond mere visibility: it creates accessibility, atmosphere and understanding – for all visitors.



Practical test at the DASA Working World Exhibition Dortmund | DE

Perception of Art: Research Paper (PhD) at the Sorbonne Paris, Viviana Gobbato

Based on two lighting scenarios at the Musée d'Art Moderne de Paris. Research was conducted into how light as a “sensory communication” shapes the museum experience. Visitors described that the light changed their experience: It guided the eye, created atmosphere and promoted exchange.

The realisation: Light has an effect far beyond mere visibility. It supports perception, interpretation and social interaction – and thus becomes a silent partner of art.



Accent Lighting in the Musée d'Art Moderne de Paris | FR



Sculpture Lighting, Museo del Duomo, Milan | IT

Visual Perception of Works of Art: Research Thesis (PhD) at the University of Pisa, Dario Maccheroni

The study examines how light sources, reflections, and contrasts influence the perception of museum visitors. At the National Museum of San Matteo, different lighting scenarios for paintings and sculptures were evaluated. Result: Balanced, neutral lighting with moderate contrast is perceived as pleasant, clear, and authentic. Calm lighting solutions improve readability and deepen the emotional connection to artworks.



Snøhetta exhibition at Light Forum Dornbirn | AT

Damage through Optical Radiation: White Paper, Ralf Müller

The study describes the physical principles of light-related material changes in museums. Colour changes are caused by optical radiation, the influence of which can be assessed via the effective irradiance. It defines the damage potential of a light source. The basis is the guideline CIE 157:2004. The study thus confirms that since the spectral radiation distribution differs depending on the light source, the choice of the right light spectrum is crucial for the conservation protection of sensitive exhibits.

T H E L I G H T



Light for museums, galleries and exhibitions