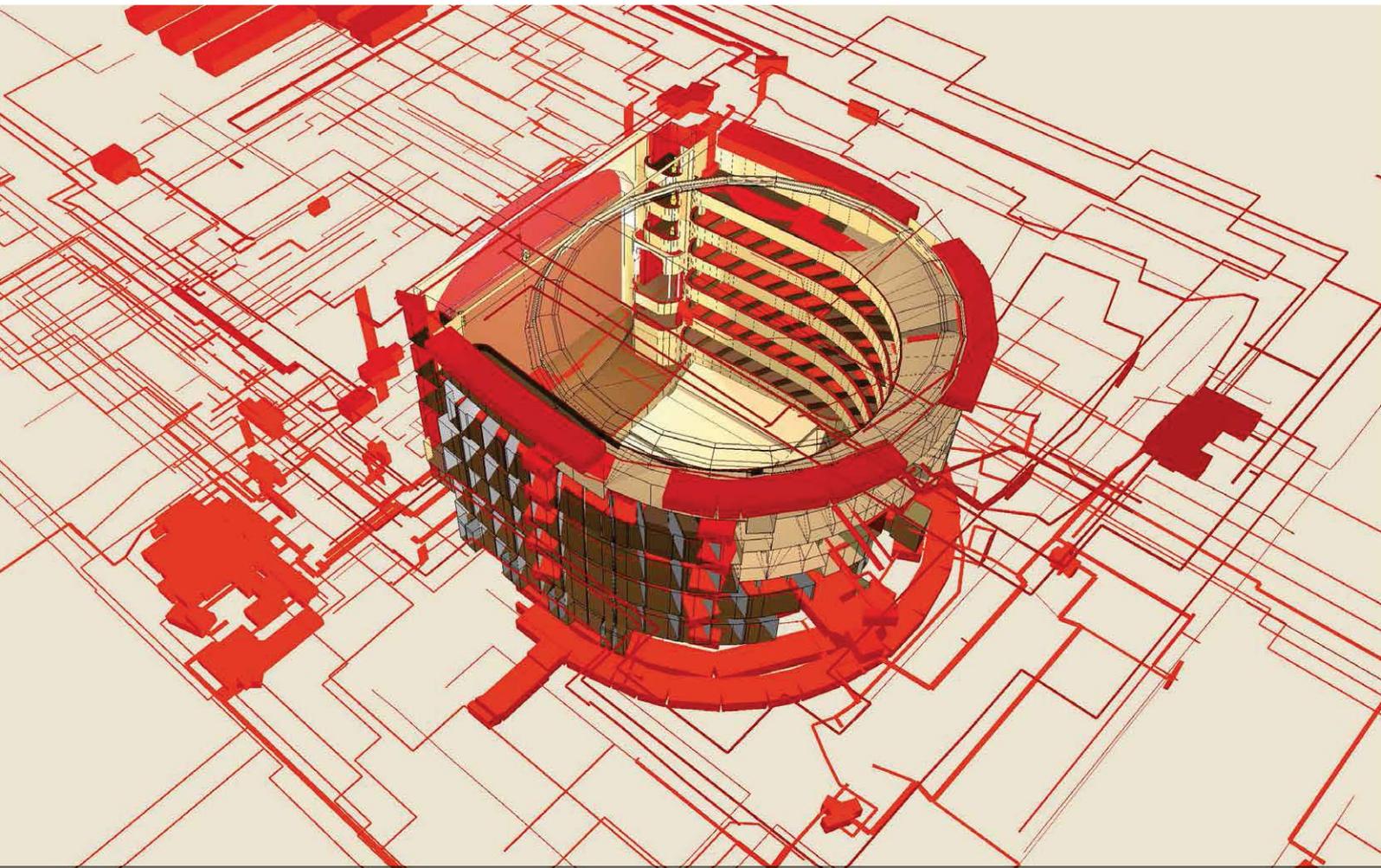


MÜLLER-BBM



Electro-acoustics · Audio technology · Video technology · Communication systems · Cable networking

Electro-acoustics and Audio/Video Technology

www.MuellerBBM.com

Audiovisual Technology of the Highest Standard

Compatible interaction between architecture and technology

Whether for new constructions or when renovating existing structures – Müller-BBM assists and advises constructors and operators alike on the realization of complex electro-acoustic and audio/video systems. Customized systems, meeting the latest technical standards and the highest expectations, are thus produced.

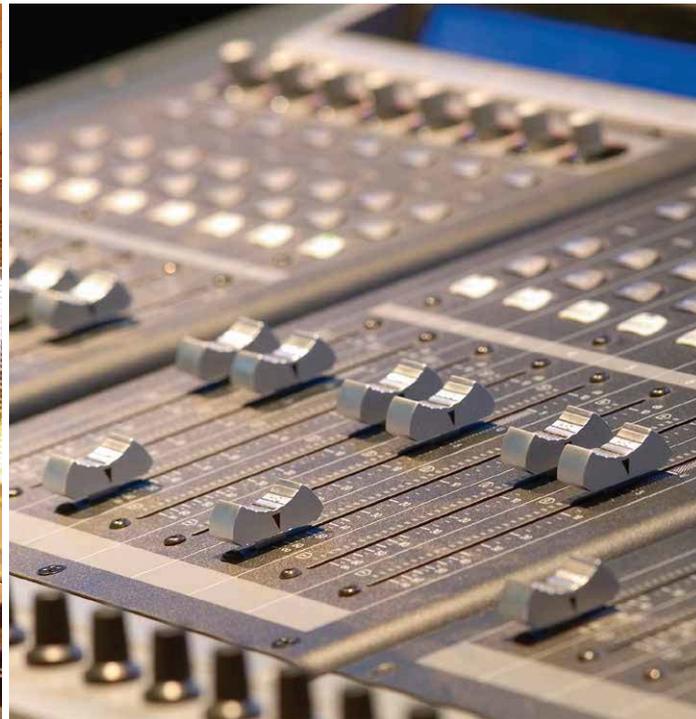
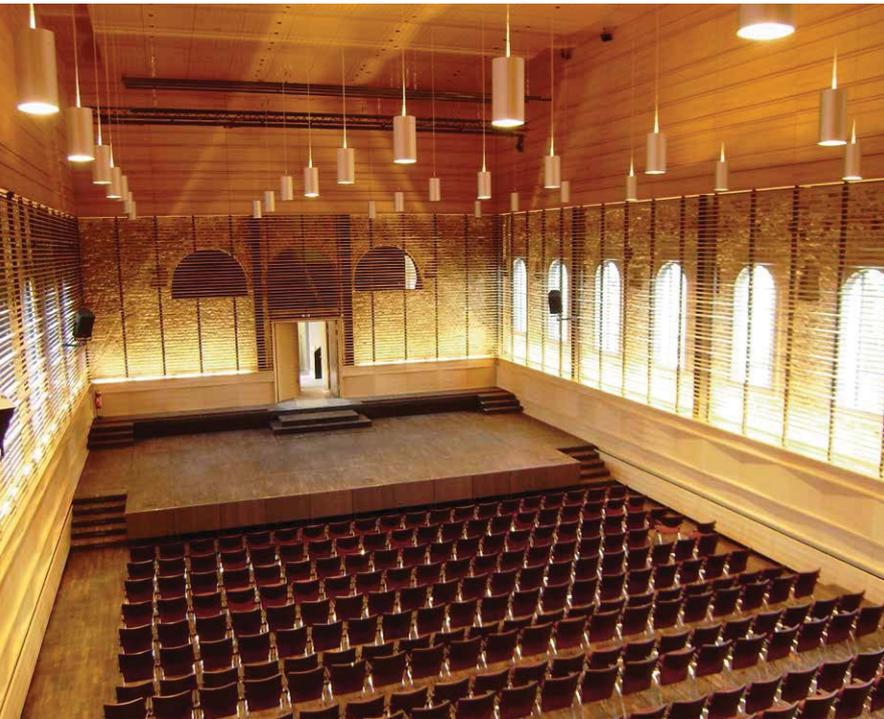
Concert halls

Opera houses

Theaters

Open air theaters

Congress centers

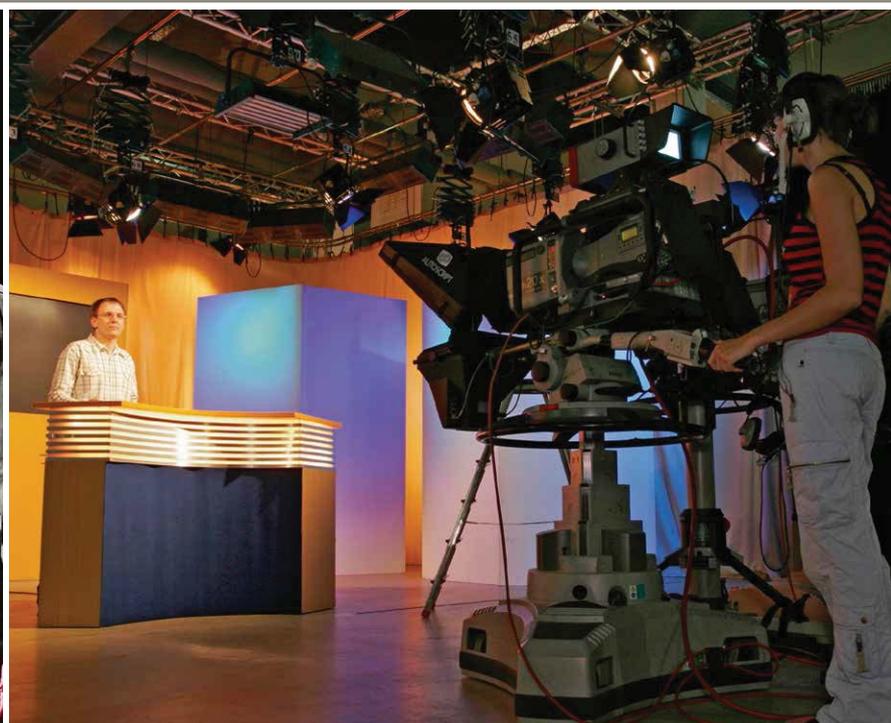


Mediator between client and technology

The engineers of Müller-BBM assist clients and users in the planning of audio/video technology all around the globe. Our engineers guide their clients through a process of constructive, considered and precise collaboration, in these highly specialized, technically ambitious areas, where professional expertise and market awareness are essential for the successful completion of projects.

Thus the professional services provided by Müller-BBM contribute greatly to the overall success of a project.

It is our goal to determine the most efficient and sustainable technology appropriate to the needs and desires of the operators and users. Similarly, the awareness of the high initial investment costs associated with the optimal incorporation of the selected technology into the construction is a further important consideration. The specialists from Müller-BBM take into account the complex technical demands placed on systems and are at all times in total control of the influence exerted by the specific room acoustics in concert halls and theaters upon the electro-acoustic systems.



Every building needs its »own« technology

An essential part of the Müller-BBM philosophy is that our planning and advisory services are carried out independently of specific product identification. This enables the engineers to develop customer-specific solutions while sourcing from the entire spectrum of available products and staying within budget. Throughout the entire planning process particular attention is paid to the economic and technical factors which are determined at the outset of the project: specified budget, schedule and detailed performance criteria.

The client's needs and instructions are the basis for determining the technical and economic planning carried out by Müller-BBM. The experienced planning team provides optimal quality within the boundaries of the technically feasible, even on modest budgets. With Müller-BBM you, as client, profit from a partner capable of assuming the responsibility for the competent planning and site supervision of projects in a highly specialized technical area of expertise. Müller-BBM can also provide additional support during initial commencement of operations and, when so desired, offer technical assistance and advisory services in order to guarantee smooth functioning of the new installations particularly during the first critical events.

Individual Solutions through Competence and Experience

Our paths lead to the goal

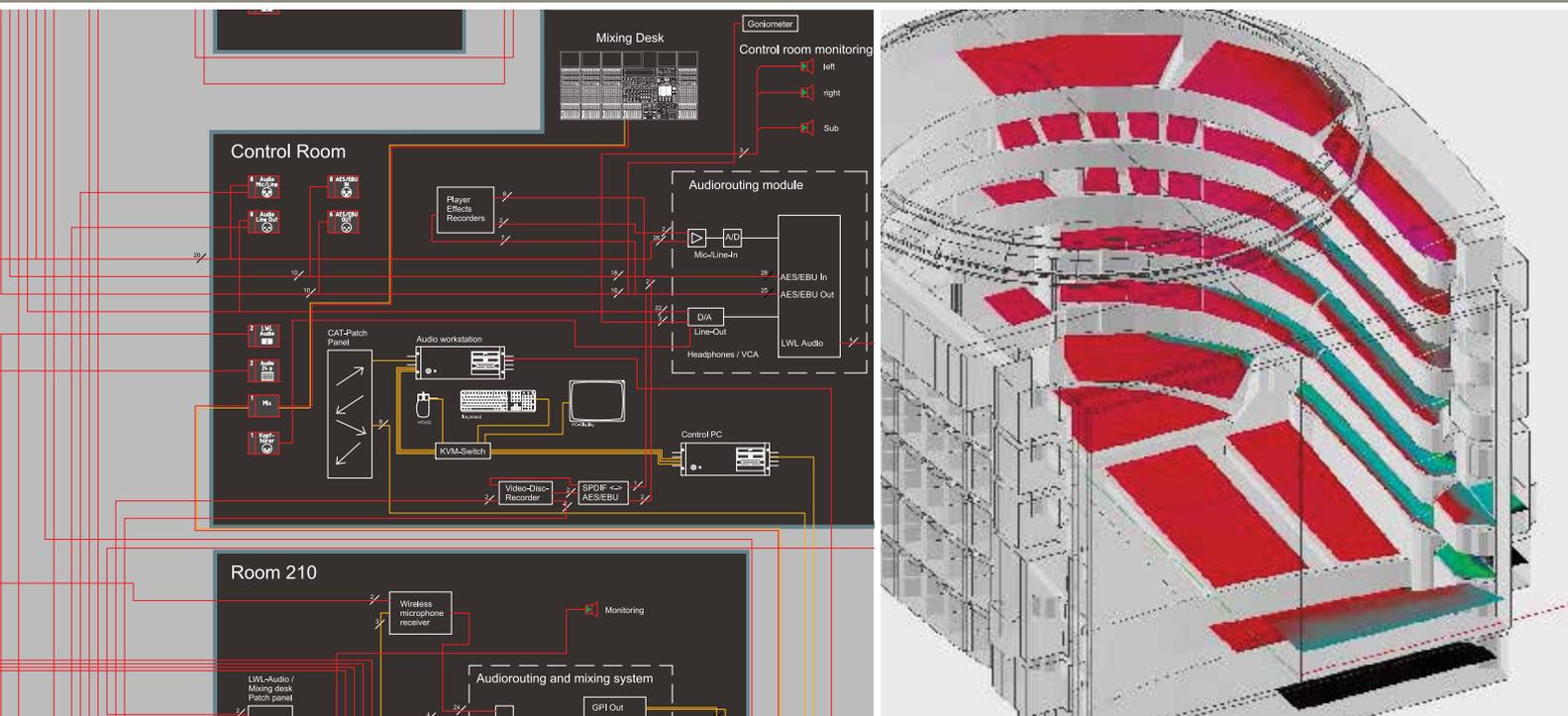
Müller-BBM accompanies and supports your project from the initial conceptual design through all levels of planning and development, specification, bidding, site supervision and final acceptance. Thus, a highly specialized team is available to you through the entire period of the project, to ensure your success.

Concept design

Preliminary design

Schematic design

Design development



Concept and preliminary design

In cooperation with clients and users, the goals of a project are determined during the concept and preliminary design phase. Müller-BBM determines the technical requirements of the electro-acoustic and audio/video equipment and aligns these with the demands of the building in question. In order to plan successfully, it is necessary to fix the budget as exactly as possible at the beginning of the planning process. To achieve the highest possible efficiency, Müller-BBM establishes planning interfaces with all external technical teams as early as possible. During the process of this coordination work, the planning team can produce a technical room schedule which specifies the exact requirements of each space or room.

Computer simulation

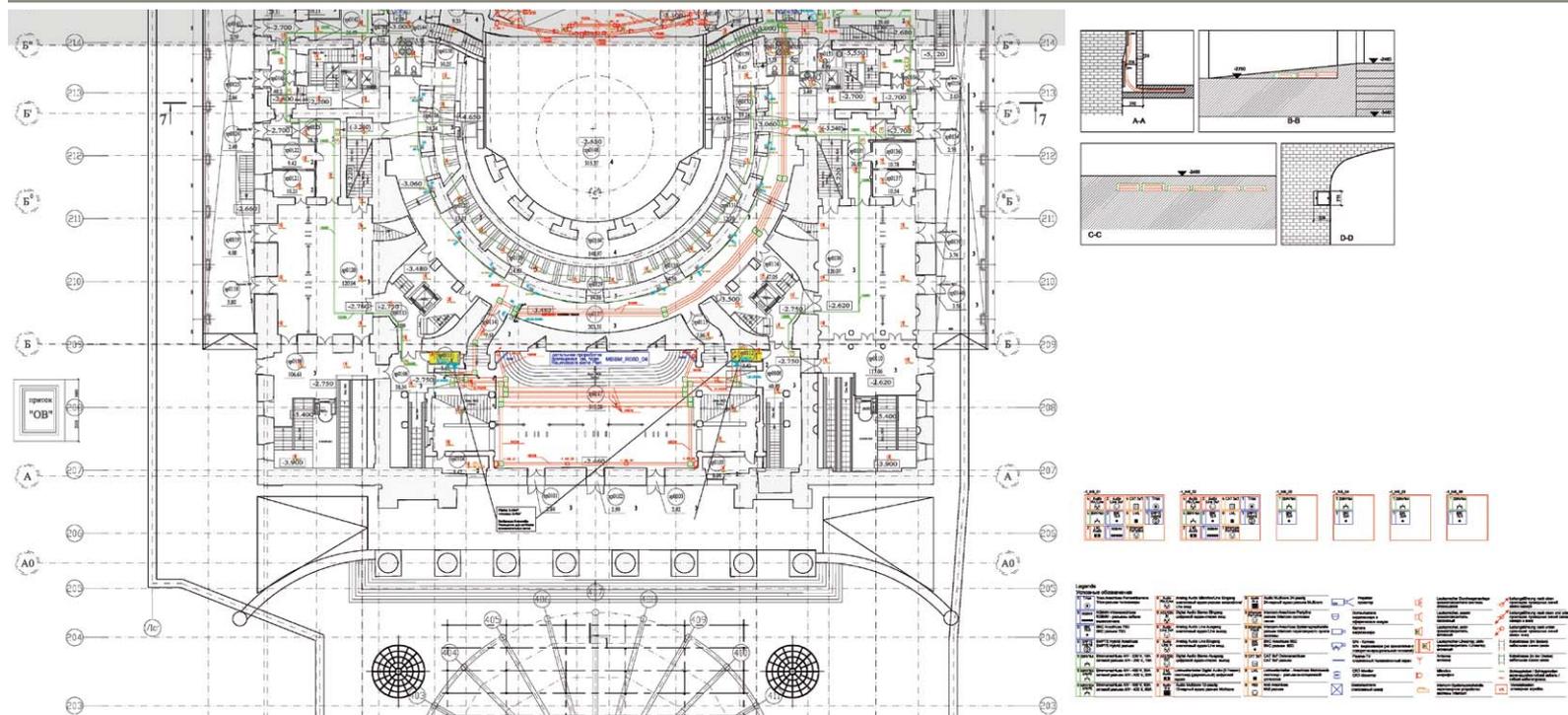
It is difficult, in the field of room and electro-acoustic planning, to present the client with the equivalent of an architectural model, with which the planning alternatives can be experienced, easily imagined or understood. Modern day planning software, however, enables acoustic planners to present computer simulations of various acoustic alternatives even during the earliest stages of the planning process, allowing alternatives to be compared and evaluated. The three-dimensional room modeling programs used are also highly useful tools for the planning of cable paths – the planning of cable routes, empty conduits etc. This information is continually updated during the planning process, allowing calculations of cable lengths and construction materials relevant to every planning stage to be available at all times.

Tender and bidding

Construction design

Site supervision

Final acceptance



Detailed working drawings

Block diagrams and floor plans are essential components of the planning process and represent exactly how different systems interact, thus presenting a complete overview of an entire system. Exact, detailed documentation of a system is also indispensable for future alterations and extensions. This includes the detailed planning of cable paths.

Technical specification and bidding

Complete and detailed preparation of technical specifications is carried out up to and including the equipment level. All formal requirements of public tendering are, of course, strictly adhered to. Extensive and ongoing experience in projects of many types and sizes ensure that the latest techniques and equipment are considered where appropriate. This allows continual and smooth project development while avoiding costly amendments at later stages. Müller-BBM continues to assist the client after completion of the specifications and during the entire process of tendering – from the review of all offers, through discussions with tenderers to the clarification of technical queries and the awarding of contracts.

Comprehensive Project Monitoring from A to Z

Always on call

The planning team for audio/video engineering at Müller-BBM offers a broad range of skills and includes both engineers from the fields of electrical engineering and audio/video technology as well as physicists and sound engineers; experienced experts who can advise and guide all aspects of your project.

High speech intelligibility · Natural sound · Undisturbed operation · Security and redundancy concepts



Site supervision

After the awarding of contracts, Müller-BBM can also be responsible for the detailed checking of workshop and assembly drawings, thereby achieving detailed planning coordination and ensuring accurate execution. Site supervision is carried out in close contact with all associated partners by a specified engineer from Müller-BBM, whose role was determined early in the planning process. Detailed system knowledge and experience allow realistic on-site alternatives to be developed should the necessity arise for planning alterations during the construction process. Deviations from planning or deficiencies are detected, documented and promptly rectified.

Measurement technology

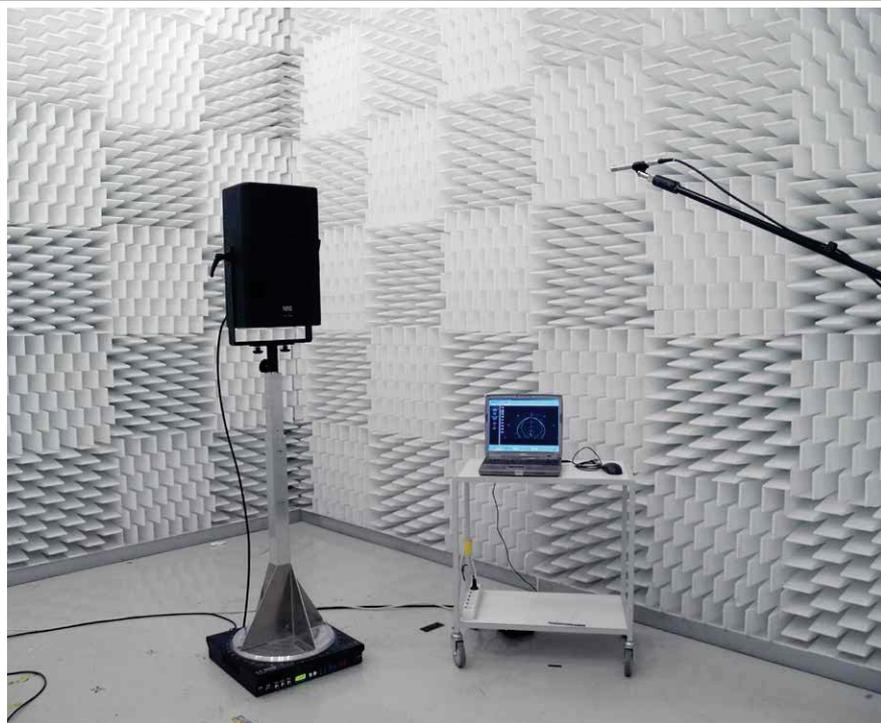
Quality assurance of installed systems is achieved by the specialists from Müller-BBM equipped with a comprehensive range of measuring equipment, which allows every aspect of the technical system to be tested. The most complex electro-acoustic systems can be precisely measured and tested or, for example, the entire audio and video cable network can be technically verified. Quality control can be performed to the exacting requirements of radio and television with the assessment ranging from the measurement of complete systems to simply performing random tests.

High definition

True color

Uniform sound level distribution

Minimization of latencies



Project management

High priority factors during the planning process include adherence to the budget, the time schedule and the specified quality. The Müller-BBM team sets milestones – predetermined intermediate goals at specific points in time – during the planning and execution process and ensures that they are fulfilled. Additionally, highly developed software enables continual control of costs. All cost estimates and calculations are based upon detailed, current prices, which ensure greater accuracy and reliability of the cost estimates.

Quality assurance

Müller-BBM utilizes a quality management system which encompasses all areas of expertise in all locations. It is certified and based upon the standard DIN EN ISO 9001. This system establishes not only customer orientation and management responsibility but also generates the complete planning documentation. This process- and system-orientated approach to quality management ensures continued improvement and extends customer security with regard to the successful completion of projects.

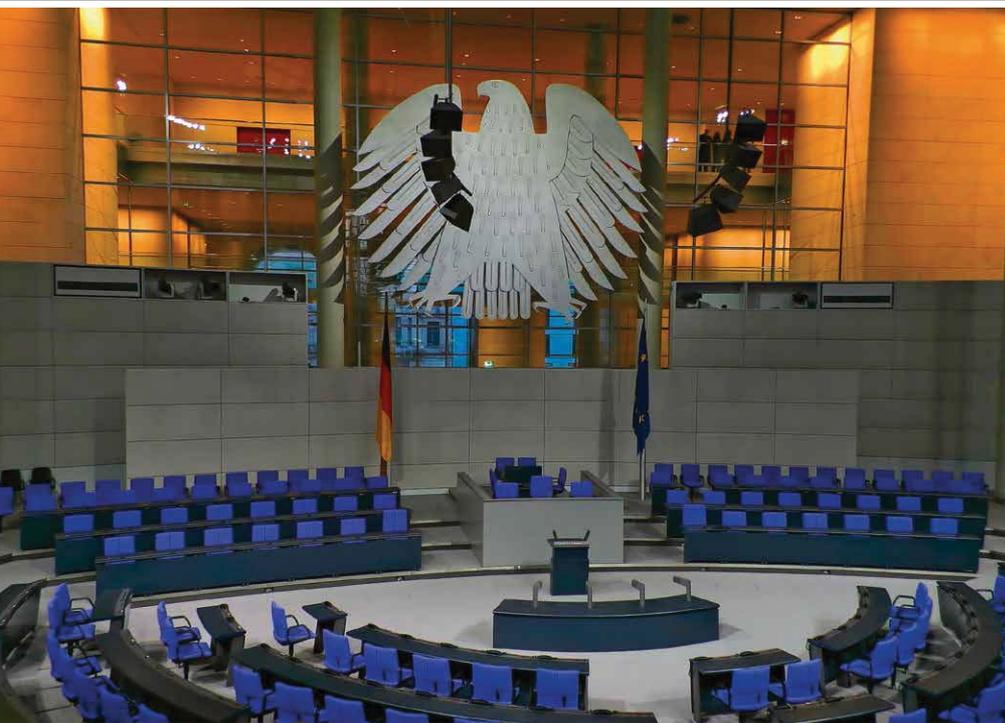


Planning of Audio/Video Technology

50 years of competence and experience

Since our establishment in 1962 we have been involved with the successful planning of cultural and event venues. We support and advise clients, architects and users in all areas of electro-acoustics, audio/video technology and through all phases of the planning process.

Videoprojection · Surtitling · Subtitling · Soundsystems for the hearing impaired · Conference technology

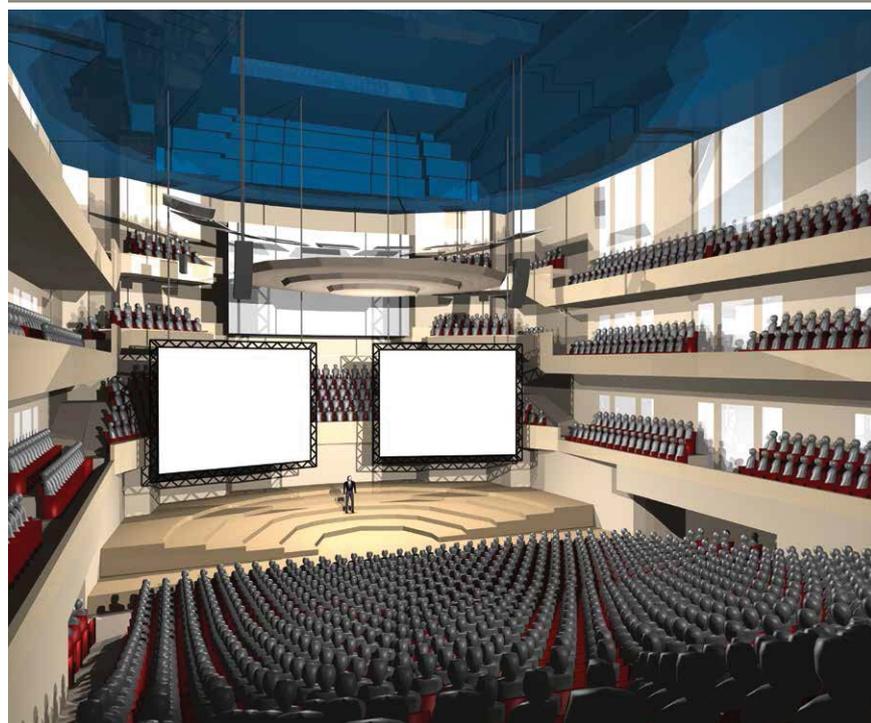


The Reichstag building in Berlin – excellent speech intelligibility for the seat of the German Parliament

The plenary chamber in the German Reichstag building in Berlin, the seat of the German parliament since 1999, has an internal volume of almost 30,000 m³ – a volume which exceeds the majority of large concert halls. In spite of the immense size, optimal coordination of the room acoustic planning and that of the sound system has ensured excellent speech intelligibility for all users of the chamber including the presidium, members of parliament and visitors. The concept of natural localization, whereby the speaker can be correctly localized from every listening position, significantly enhances the effect of naturalness of the audio reproduction. The entire matrix and router system, in addition to the mixing console technology, was designed based upon a principle of total redundancy in order to ensure maximum operational security. The digital and analogue systems can be operated independently or also in parallel.

- Renovation of the Reichstag building for the seat of the German Parliament
- Client: Bundesbaugesellschaft Berlin mbH
- Architect: Foster + Partners
- Planning and construction period 1994–1998
- Building volume 400,000 m³
- Room acoustics, electro-acoustics, building acoustics, laboratory measurements, on-site measurements, thermal building physics
- Planning, site supervision, final acceptance measurements

Sound studio · Surround sound · Electronic room acoustics · Stage managing system · Intercom · Video monitoring



Essen Philharmonic Concert Hall – modern audio and video technology for the Philharmonic

The existing Essen concert hall was renovated between 2003 and 2004 to create a modern contemporary philharmonic hall. The primary use of the large concert hall, which accommodates approximately 1,900 patrons, is for classical music. It is required to provide superlative room acoustics and long reverberation times. The space is equipped with a high-quality line array sound system specifically designed for electronically amplified music, e.g. jazz and pop concerts. The directional characteristics of this system are optimally coordinated with the room acoustics of the concert hall. The loudspeakers are suspended from the ceiling and can be raised to the very top of the hall when the system is not required for classical concerts. The concert hall, in addition to the other subsidiary spaces in the Essen Philharmonic Hall, is fully equipped with a full spectrum of technical systems for audio, video and data signal applications which are interconnected via various matrix and router systems. Thus it is possible that different audio and video technical applications – A/V signal transmission, recordings, video projections etc. – can be flexibly configured.

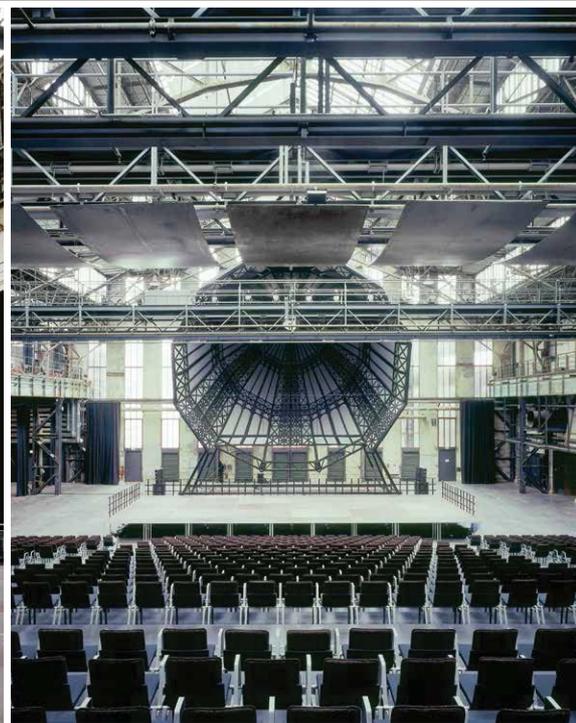
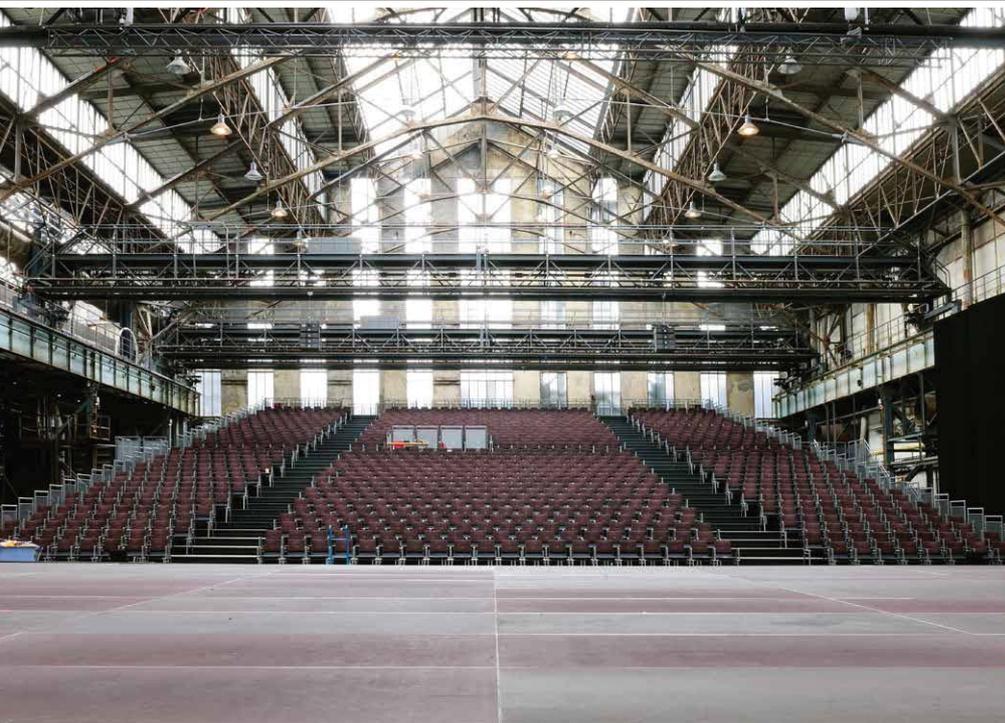
- Complete renovation and extension
- Client: Saalbau und Philharmonie in Essen GmbH & Co. Realisierungsgesellschaft
- Architect: Busmann + Haberer GmbH, Cologne
- Completion 2004
- Seating capacity approx. 1,900 patrons
- Room acoustics, electro-acoustics, audio/video technology, building acoustics, on-site measurements
- Design development, construction design, site supervision, final acceptance measurements, advisory services at initial operation

Integration and Optimization

Comprehensive range of services

Whether classic or modern – we cause spaces to ring true and assist event managers and artists with customized audio-video-technical concepts.

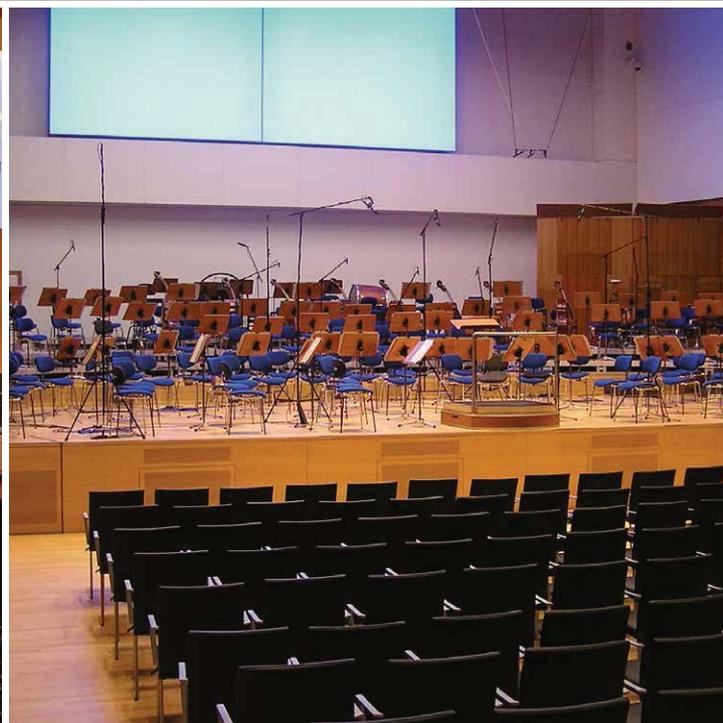
House monitoring system · OB Van/Satelite truck interface · Natural localization · High-power PA-systems



Century Hall Bochum – flexible audio/video technology and electronic room acoustics

The Century Hall in Bochum was converted between 2002 and 2003 to become an »assembly hall for art« and has become the central location for the Ruhr Triennial. Technical sound and stage equipment are accommodated in the overhead crane area and form an essential component of the overall concept. The existing rails were extended by new ceiling bridges to provide mobile, multifunctional structures for the support of stage sets and points of suspension for sound and lighting equipment. Müller-BBM assumed the advisory role for the room acoustic concept in addition to the planning of the entire electro-acoustic system. The sophisticated interaction of the room and electro-acoustics ensures maximum flexibility for a large variety of unique events at the highest artistic level. Integrated into the overall concept is a variable electronic room-acoustic system which, together with the natural acoustics of the hall, provides sound quality of a standard comparable to that of a concert hall.

- Conversion of the heritage listed Century Hall for the Ruhr Triennial
- Client: LEG Landesentwicklungsgesellschaft NRW GmbH
- Architect: Petzinka Pink GmbH & Co. KG, Düsseldorf
- Planning and construction 2001 – 2003
- Building volume approx. 180,000 m³
- Room acoustics, electro-acoustics, building acoustics, external noise protection, electronic room acoustics
- Planning, expert advisory services, measurements



The Mercatorhall in CityPalais Duisburg – modern event technology for multifunctional usage

Erected on an historic location in central Duisburg, the CityPalais Duisburg with the Mercatorhall now represents the new home of the Duisburg Philharmonic and a top class venue center for a variety of events. It includes the large hall with 1,750 seats, a smaller hall for 600 and a highly modern conference area. The goal was the erection of a center with optimal conditions for an as wide a range of events as possible. Comprehensive, variable acoustics allow the large hall to act as a first-class concert hall or host top-quality conferences, shows and ballet performances.

The halls and conference area boast highly modern technical audio and video equipment which, together with the room acoustics, provide faultless speech intelligibility and precise musical reproduction for all types of events and performances.

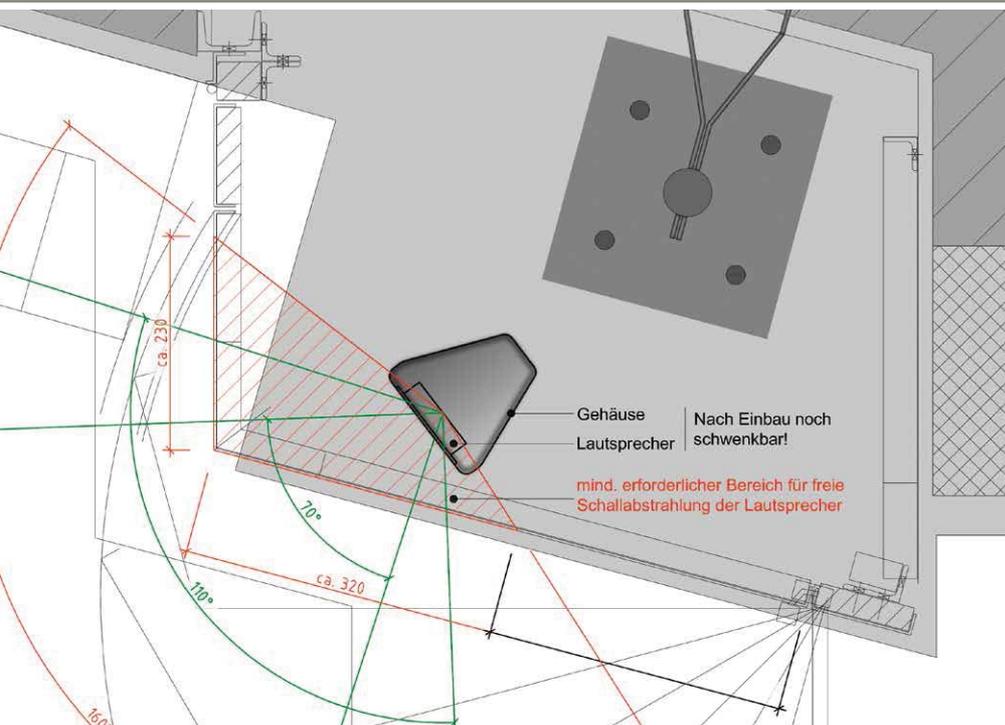
- New construction
- Client: City of Duisburg, Department 61 / Stadthaus
- Architects: Busmann + Haberer GmbH, Cologne and Chapman Taylor Architects, Düsseldorf
- Opened 2007
- Seating capacity large hall approx. 1,750 patrons
- Room acoustics, electro-acoustics, audio/video technology, building acoustics, vibration protection, measurements
- Planning, expert advisory services, site supervision, final acceptance measurements

Experience and Know-how for Optimum Quality

Everything from a single source

When it comes to sound quality and room acoustics, we don't leave anything to chance. Everything is supplied from the one source – by one project manager who competently advises you on all issues – without communication problems, quickly and efficiently.

HD video technology · Digital matrix and router systems · Camera technology · Independent power networking



Staatstheater on Gärtnerplatz, Munich – new sound and audio/video technology in heritage-listed building

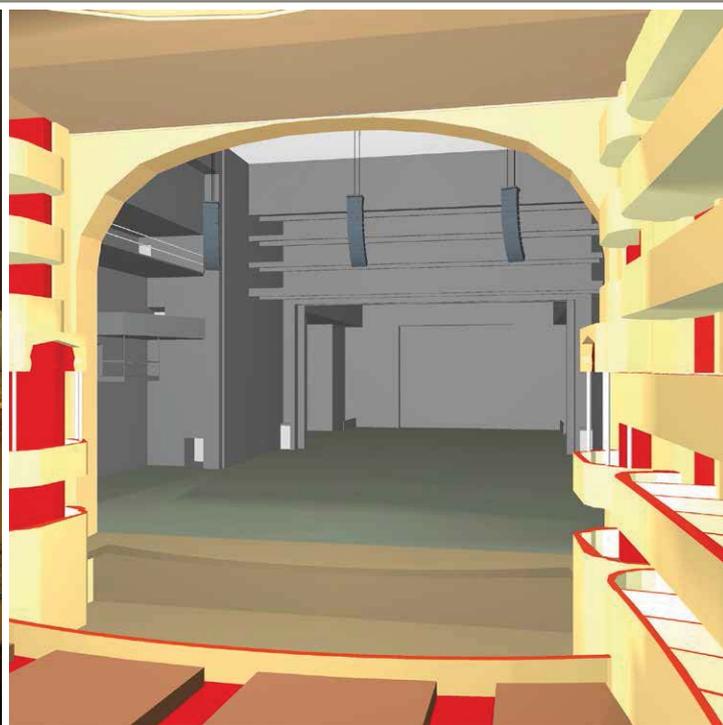
The entire electro-acoustic system of the Staatstheater on Gärtnerplatz was renewed in 2007. In addition to the mixing desk and theatre and stage sound systems, junction boxes and audio wiring were completely renewed. Simultaneously, the electro-acoustic room enhancement system was expanded and the video and monitoring systems extended by new cameras, distributors and a new distribution network.

The heart of the sound system consists of a digital mixing console as well as the matrix and router system, providing a multitude of inputs and outputs. Control is done via two mixing desks – one is built into the central control room while the other is intended for mobile usage. The system enables the storage of setups for individual performances – a huge advantage when one considers the immense range offered in the Gärtnerplatz Theater program.

Special magnetostatic line source transducers were invisibly integrated into the side portals of the theater in combination with sub-woofers – behind sound-transparent cladding in accordance with the heritage listing of the building.

- Renewal of sound system and audio/video technology
- Client: Staatliches Bauamt Munich 1
- Technical measurement analysis of room acoustics, complete planning and site supervision, electro-acoustics and audio/video technology
- Completion November 2007

- Renewal of intercom system
- Completion 2010



State Academic Bolshoi Theater, Moscow – highest quality sound and video technology

The Bolshoi Theater, in the heart of Moscow, is currently being renovated and reconstructed. As part of this process, up-to-date audio and video technology is being integrated into the historical building. The fully-digital audio/video cable network will be fed into all areas of the building allowing a single flick of a switch to record or reproduce sound and visual effects in any desired section of the building. The system also employs audio and video server architecture which coordinates the signals via large digital matrix and router systems. The theater's artistic staff benefits from this superior control concept which simultaneously offers particularly simple operation and easy location of the desired musical or video recordings within the central server for rehearsals or performances.

In addition to the historical theater, the planned system supplies five other historical areas, three ballet rehearsal stages and another stage, located above the audience space, which is also used for rehearsals of other performances. The sound and video projection systems are not only technically but also optically matched to the architecture of the halls and auxiliary spaces, fulfilling the highest expectations for future performances.

- Reconstruction, renovation, historic reconstruction, extension
- Client: Bosch Rexroth
- Architect: Kurortproject Moscow
- Under construction, planned completion 2011
- Theater hall for 2,000 patrons
- Room acoustics, electro-acoustics, audio/video technology, building acoustics, on-site measurements, vibration protection, sound immission protection, external noise protection
- Technical measurement analysis, complete planning of electro-acoustic and audio/video technology

Electro-acoustics and audio/video technology – planning services

Concept and schematic design

- clarification and coordination of basic functions and quality
- coordination of interfaces with all parties involved in planning
- development of a report outlining functional requirements
- description of the equipment systems
- provision of planning guidelines
- description of architectural, structural, mechanical and electrical accommodation required for the audio and video equipment
- realistic cost estimation based on current market prices

Detailed design/design development

- definition of all systems and components, e.g. wiring networks, distribution systems and mobile components
- development of functional diagrams and block diagrams
- acoustic calculations and simulations for sound systems in 3D computer models
- visualization of projection conditions, 2D and 3D computer models
- visualization and graphic illustration of arrangement and installation of technical audio/video systems, e.g. loudspeakers, projectors, junction boxes, racks etc.
- graphic illustration of studios, central control rooms etc.
- determination of essential line routing
- determination of electric requirements and thermal loads
- integration in architectural planning and coordination with other planning consultants
- calculation of dimensions and quantities of equipment
- second cost estimation
- design documents:
 - sketch layouts, standard details,
 - general arrangement drawings,
 - design development drawings
- detailed documentation for preparation of technical specifications according to the requirements of public tendering

Construction design

- planning, development and construction drawings
- planning of cable paths in 3D computer models
- construction drawings:
 - floor plans and section to scale 1 : 50 with appendices for technical audio/video systems, reflected ceiling plans, block diagrams, junction box layouts,
 - details (e.g. for the layout of technical facilities and control rooms),
 - channel and break-through drawings

Preparation for contracts

- checking and evaluation of quotes, compilation of price comparison list
- assistance in responding to bidders' questions
- advise on suitable contractors
- assistance with negotiations with tenderers

Construction services and site supervision

- checking of workshop drawings with regard to consistency with construction drawings
- site supervision with regard to consistency with construction drawings and specifications, in addition to all recognized technical requirements
- control of schedule and budget
- technical approval
- examination of accounts
- assistance with the initial operational training
- determination of deficiencies and supervision of the rectification of deficiencies
- execution of initial measurements
- technical measurements for quality control and acceptance

MÜLLER-BBM

Müller-BBM is an internationally active engineering company with more than 300 employees to be found at eleven locations within Germany and represented by numerous project offices throughout the entire world. Our independent consultants, planners and technical specialists advise our clients and take leading roles in the expert fields of construction, environment and technology. Since the establishment of the company in 1962, we have been successful in the planning of cultural and event venues; concert halls, opera houses, theaters, open air stages, congress centers, plenary chambers, municipal facilities, music conservatories and churches, in addition to collaborating in the planning of sound and television recording studios. We support clients, architects and users in all stages of planning in the field of acoustics and beyond – individually, competently, interdisciplinary, and with a wealth of experience accumulated from a multitude of projects both nationally and internationally.

cover photograph

3D computer model with cable raceway planning –
Bolshoi Theater, Moscow

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Buildings

Room acoustics
Electro-acoustics and multimedia technology
Building acoustics
Thermal building physics
Building climatology
Facade technology
Fire protection
Structural dynamics

Environment

Air quality control
Traffic and environmental noise control
Industrial noise control
Vibration control
Electromagnetic environmental compatibility
Lighting
Safety technology
Harmful substances in buildings
Legally compliant business organization
and management systems

Technology

Vehicle acoustics
Ship acoustics
Railway technology
Industrial plant acoustics
Machinery acoustics
Psychoacoustics
Mobile communication
Product tests

Locations

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Hamburg
Karlsruhe
Nuremberg
Stuttgart
Weimar

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Müller-BBM – comprehensive solutions from a single source!

Planning and consultation in the fields of electro-acoustics and audio/video technology

Müller-BBM supports clients and users in the realization of complex systems in audio and video technology. The synergies of all areas of acoustic expertise from Müller-BBM lead to excellent overall results in planned systems.

Our areas of expertise

- **Comprehensive planning phases**
- **Planning and project documentation**
- **Project management and final acceptance**
- **Measurements for quality control**
- **Support during usage**
- **Planning of event technology**
 - sound reinforcement
 - video projection
 - surtitling and subtitling systems
 - sound systems for the hearing impaired
 - conference technology (interpreters and discussions)
 - sound and video studios
 - networks
- **Planning of stage communication**
 - stage managing systems
 - Intercom
 - house monitoring systems
 - electro-acoustic alarm systems
- **Planning of cable networking**
 - networks and interfaces for radio and television
 - networks for audio/video systems
 - independent power networking for audio/video systems