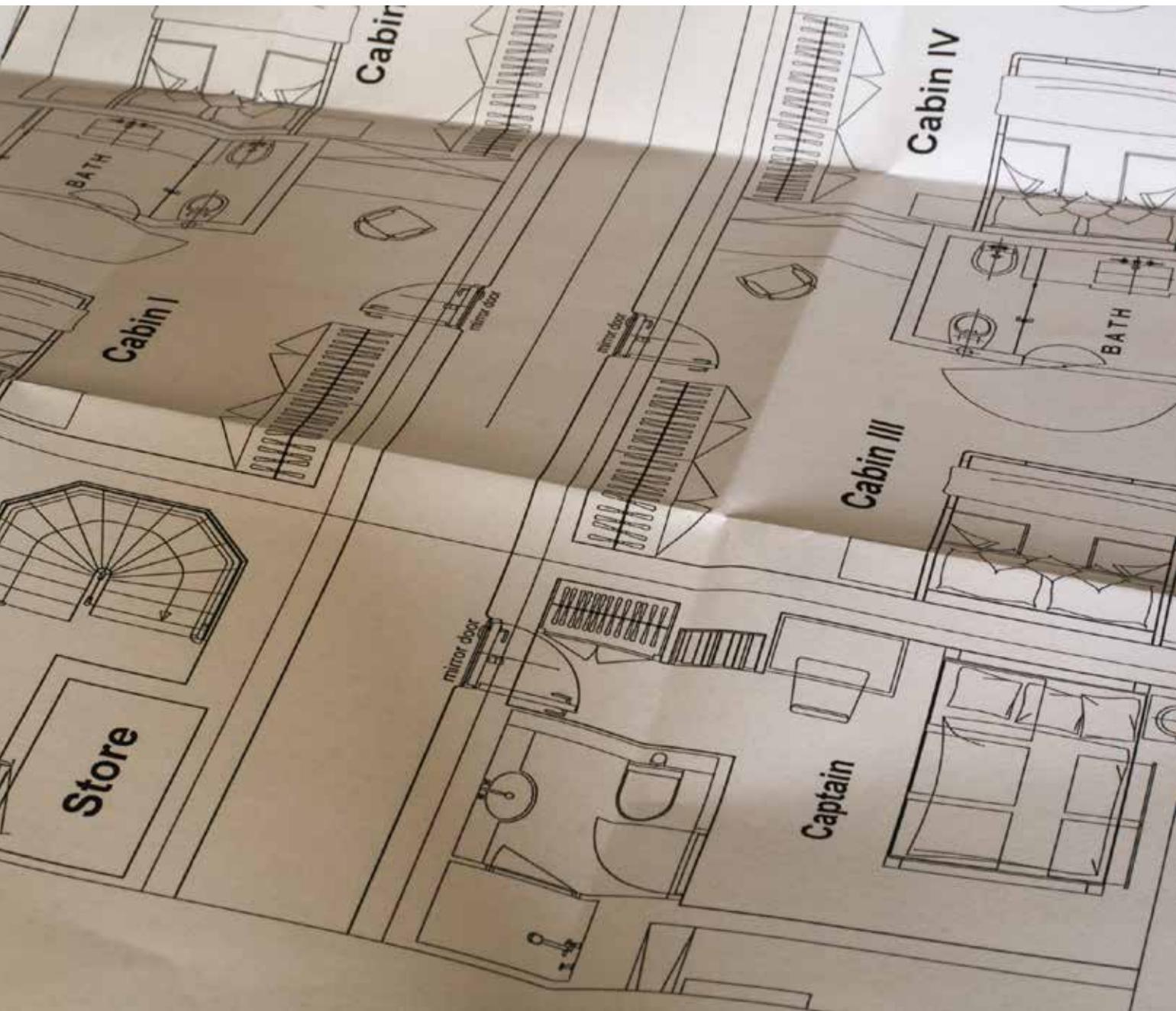




Rheinhold & Mahla

Since 1887



Reliable engineering solutions for complex systems

Engineering Services

Engineering at R&M

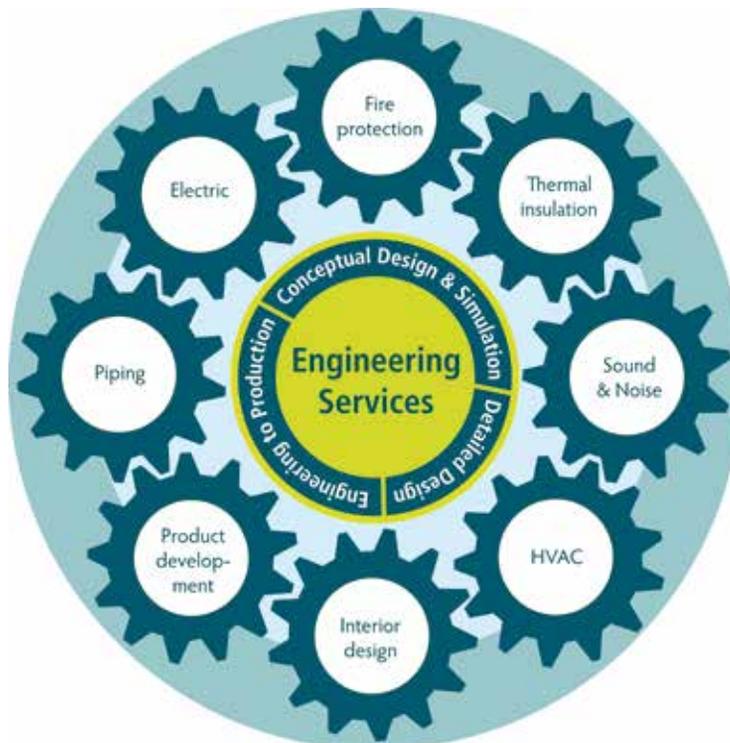
Integrated approach to your project

Top quality engineering is the key when it comes to the successful implementation of a new build, conversion, or repair project. R&M offers a broad range of services for all the operations that the construction of a vessel entails. These include, for example, noise analysis and forecasting, the drafting of complex insulating plans, the development of appropriate heating, ventilation and air conditioning (HVAC) systems, technical drawings of all onboard wiring systems – including a detailed layout of connection interfaces – and the detailed planning and conceptual design of interiors. The needs-oriented development of items for onboard interiors rounds off our portfolio of products and services.

The attention of our engineers, architects, and technicians is constantly focused on cost/benefit optimized solutions, and they are highly qualified in the use of software such as Aveva, Cadmatic, and AutoCAD. Effective control mechanisms for monitoring quality, performance, risk and cost, based on standardized processes that

conform to the DIN EN ISO 9001 quality management system, ensure that your project stays on the right course.

R&M also offers the possibility, in addition to its engineering services, of taking on the production of various outfitting components and the installation of all the above-mentioned systems in order to guarantee our customers, as lifecycle partners, an optimized product implementation time. Our range of turnkey solutions "steel-to-steel" and visual allows our customers to combine optimized interfaces with the best possible service.



Design and planning

Our engineers develop outfitting solutions that fulfill individual design and function requirements. Photorealistic visualizations of interiors replace the construction of elaborate physical mock-ups, significantly reducing the time and expense involved.

- Analysis and calculations
- Design and specifications
- 3D modeling and design
- Photorealistic simulation
- Simulation of sound, temperature, and heat conductivity
- Design of interior fittings

Preparing for production and installation

We apply all the measures needed to ensure the high-quality production and smooth onboard installation of the materials required.

- Production drawings
- Designs and sectional plans
- Installation plans
- Product selection
- Drafting of material lists
- Interface optimization
- Logistics for worldwide shipping
- Trials and approval testing

Overview of our service

A wide range of disciplines under one roof



We regard engineering as an interdisciplinary process designed for the development and creation of technically complex systems. In terms of a vessel's lifecycle, our engineering services identify needs and analyze systems, while developing, testing, and implementing them accordingly. We concentrate our efforts in this respect on the customer's defined requirements regarding the system being developed.

All the potential benefits of world-class engineering are at our disposal. Bringing together the various engineering disciplines under a single roof guarantees optimized communications interfaces, thereby reducing overall operating costs. Cooperation between the various departments involved is simplified, which increases efficiency. The early involvement of Quality Management guarantees that the vessel will be fitted out to consistently high, long-term standards.

Quality and Governance

Only the best quality for our clients. In order to ensure this, work processes and procedures for quality assurance are planned, implemented, and documented with a focus on both the results and the client.

- Certified in accordance with ISO 9001
- State-of-the-art document management system
- Application of the CMMI model for constant optimization (Capability Maturity Model Integration)
- Quality control and budget monitoring based on milestones
- Data encryption

Infrastructure and Interoperability

Better safe than sorry. IT equipment plays an important role in the successful execution of projects. We ensure that our software and programs are compatible with those of our clients in order to achieve the goal expeditiously.

- We work with all standard software programs to ensure interoperability with our clients' existing IT systems: Aveva, AutoCAD, Cadmatic, Cinema-4D
- Guarantee of data security through regular hardware backup, absolute discretion

Execution and Risk Management

Ensuring the success of your project. Our projects are executed according to strict technical and economic criteria. We understand risk management to be an integral part of our project management processes.

- Systematic execution of improvement processes: Kaizen
- Continual check of internal and external project risks
- Compliance with appropriate requirements for work safety and environmental protection
- Clearly defined guidelines for work processes and reporting levels

Interior outfitting

More than just good looks



Interior outfitting contributes significantly to onboard comfort, but it supposes complex requirements in terms of perfect planning. From crew quarters with confined space and room for just a bare minimum of items to luxuriously appointed passenger cabins and public areas such as casinos and restaurants, or a multifunctional theater – each of them has its own outfitting requirements. We can meet them all down to the last detail, thanks to our many years of experience.

R&M offers professional planning and implementation services for ship interiors, covering everything from conceptual design right down to the details of the equipment involved. We create a deck-by-deck equipment installation plan for you, and advise you on your choice of products for panels, walls, ceilings, floors, wet units, and furnishings, including the drafting of a complete materials list and also, on request, the corresponding acquisition and installation.

General insulation

Focusing on energy efficiency and safety



Sustainable fire, noise and heat protection makes a decisive contribution to the optimization of overall energy efficiency on board. R&M has been supplying insulation technology for over a century. Our experts will invest their proven know-how in providing an optimum concept for your project.

From the drafting of categorized plans and the creation of rough floor layouts to the detailed design of insulating elements – we can advise you from the start and can also deal with installation. Our range of services in this respect also includes, in addition to the insulation of walls, ceilings, and floors and other onboard areas, the design of pipe conduits, extraction systems, LPG tanks and pressure vessels of submarines in accordance with the specifications of the corresponding classification bodies.

Overview of our service

A wide range of disciplines under one roof

Structural fire prevention has top priority at R&M. If fire does break out, the use of non-flammable materials is vital for inhibiting its propagation into neighboring areas, while ensuring that escape routes are kept clear and accessible.

Our engineers can create a comprehensive fire-prevention concept for you on the basis of existing regulations, and recommend the

right product for each requirement. Our systems of interior fittings offer significant space savings and reductions in weight, along with fast and reliable installation. The experts in our product development department are also working on steady improvements to "A" and "B" class systems in their efforts to make your vessel even safer.



Heat insulation

Smart energy savings

When it comes to the thermal insulation of rooms, we need to take climatic conditions and energy-saving requirements into account in order to create a pleasant room climate and prevent accumulated condensation. This does not just reduce operating costs; it also relieves pressure on the environment.

Our services in the field of thermal insulation include the design of exterior walls, pipe conduits and extractor systems and the detection of weak points by means of thermography, as well as the investigation of optimization potential for insulation based on the finite element method.

Noise protection

Tranquility guaranteed

If passengers on cruise ships and yachts and the crews of tankers and research vessels have one thing in common, it is their need to relax when on board. A tranquil, low-noise environment means a lot in this respect. A vital element here is to prevent noise spreading from the sound-intensive parts of the vessel.

R&M supplies a range of turnkey solutions designed to ensure that this is so. We can advise you from early stage in the project on optimum solutions for reducing structure-borne noise, cutting down on sound pollution and improving the corresponding insulation measures. We can also carry out measurements of airborne and structural noise on your behalf, design suitable insulation, configure customized noise baffles and draw up a complete technical noise management concept.

HVAC – Heating, ventilation and air conditioning systems

The optimum climate in each area



Ships have different climatic requirements, depending on the part of the vessel. We must endeavor, despite efficient external insulation, to keep the internal temperature constant in a way that guarantees a pleasant level of comfort for passengers. There is also a need to guarantee ideal levels of air humidity and purity, particularly in the areas where the crew live and work. Innovative and well-planned heating, ventilation and air conditioning (HVAC) systems are vital for the smooth operation of onboard machinery, devices and systems, and for the well-being of passengers and crew alike. As a competent supplier of HVAC systems, R&M offers customized, efficient, energy-saving concepts designed to conform to the latest quality management systems.

In terms of basic design, we carry out transmission calculations on your behalf, and draw up an air balance plan and a list of fittings based on the general and sectional plans and the corresponding technical specifications. When it comes to the detailed design phase, we draft various sketches and schematic diagrams and produce a 3D visualization of the AC facilities and/or the complete heating and ventilation system, along with workshop and installation plans of the corresponding duct conduits. We are of course always willing to deal with the installation, commissioning and programming of the control system.

Electrical system

Keeping the lights on

The ever-more complex onboard electrical systems of modern vessels count as one of the ship's key operating elements. Numerous devices and systems of communication, navigation and vessel management need to be supplied with energy. Examples include the "Queen Mary 2", with its 1,500+ miles of wiring. Emanating from the engine room, they supply the entire vessel with energy for its tens of thousands of lights, electronic devices, and other powered items.

Our services in the area of onboard electronics include the 3D modeling of cables and wires and their respective layouts, including the compiling of cable component lists and wiring diagrams for the installation of onboard power supply, control and monitoring systems. We also create connection and wiring diagrams for electrical equipment, along with quantity estimates for the wires and cables required and room-by-room layouts of electrical fittings.

Pipe conduit systems

Complex supply systems, efficiently planned

The pipework systems on board a vessel constitute a highly complex network of different inlet and outlet conduits, including those designed for fire prevention and mechanical engineering purposes. They are as important to the operation of the vessel as, for example, its insulation and electrical systems.

R&M uses its understanding of systems and its many years of experience in the field to create concepts that cover the planning of installations and the layout of pipe conduits, including – if desired – 3-D modeling of drinking water and plumbing systems, water supply and disposal systems (for gray and black water), high-pressure fire extinguishing and sprinkler systems and cleaning systems (such as vacuum suction devices) for new installation on all types of vessel.

Other services in our range include the drafting of coordination plans, component lists and construction scheduling, identification and certification tasks as well as the completion of pressure testing and approval procedures.



Product development

Innovating for the future



Whether it concerns a vessel's floors and decks, or its furnishings and wet units – there is always a need for various maritime products. We always take into account the customer's individual requirements in this respect, in terms of technical product characteristics like noise, weight or ease of installation. The design requirements and usage specifications differ with the type of vessel and the individual desires of each customer.

In order to maximize customer satisfaction, we are always working on new designs destined to enhance and steadily optimize our portfolio of products. We can also work in a project-based manner on the development of products to customer specifications, or on optimizing the manufacturing process or the characteristics of the items concerned. This includes everything from conceptual design, cost calculations and the production of prototypes to the international application of relevant component tests (for fire, noise, etc.) and the obtaining of the corresponding certificates.

Mittelpunkt Mensch

Comfort and safety on board



The R&M Group is one of the world's leading suppliers of customized turnkey solutions for interior outfitting of ships and maritime facilities. The wide-ranging portfolio covers all aspects of the value chain, including engineering, consulting, design, planning, and installation for new builds, conversions, and repairs.

Whether crew or passenger areas, our services include thermal and acoustic insulation, fire prevention, climate control, and ventilation technology, the insulation, and installation of pipe conduits along

with the production and installation of interior systems such as bulkheads and ceilings, decks and doors, cabins, wet units, and furnishings.

You can rely on our expertise. We create the optimum solution for you and ensure that you are not left alone, even after completion.

Photo credits: Neşe Akbıyık ■ Yuri Arcurs ■ Kalle Björkröth ■ pierreblan ■ René Garnrider ■ Holger Martens ■ Alexander Rudolph

R&M Group

engineering@rm-group.com
www.rm-group.com



Rheinhold & Mahla

Since 1887