Marine Engineering and Waterfront Developments
Arup is an independent firm of designers, planners, engineers, consultants and technical specialists offering a broad range of professional services.

Ove Arup founded the firm in 1946 in London. Sir Ove’s ideals and principles were, and are, driving forces within the firm. Foremost amongst his beliefs are ‘total design’ – the integration of the design and construction processes and the interdependence of all the professions involved.

We offer a full range of engineering and consultancy services to help clients overcome their toughest challenges. Our expertise, experience and innovative solutions in ports, harbours and coastal zones help clients respond to the technical, economic, regulatory and environmental forces facing the industry today.

We understand that time, cost and quality are of paramount importance to our clients, while appreciating that projects demand an exceptional management approach which focuses on strategic issues and is capable of delivering real benefits.

“We should justify the trust of our clients by giving their interest first priority in the work we do for them.”

Ove Arup, 1970
Arup in Australasia

Arup is the creative force at the heart of many of the world’s most prominent projects in the built environment. From more than 90 offices in over 38 countries, over 11,000 planners, designers, engineers and consultants deliver innovative projects across the world with creativity and passion.

Arup established a presence in Australasia 50 years ago when entrusted with the structural design of the Sydney Opera House. The firm opened its first office in Sydney in 1963 and its first in Singapore in 1968. We now employ over 1,700 staff working from eight offices across Australia, Singapore and New Zealand and have developed a diverse practice through delivering a wide range of projects for public and private sector clients.

Our experienced staff combine technical excellence and an understanding of local clients and markets with genuine enthusiasm for design and innovation.

We encourage our people to strive for quality, have a willingness to think creatively and to find better solutions for our clients. Clients also benefit from our ability to draw on the firm’s global multidisciplinary service offering to form the best possible project teams to meet their business needs.

Committed to sustainability, we are acutely aware of the responsibility we have in designing and positively influencing the built environment and strive to do the best possible work for current and future generations. Together, we shape a better world.
Arup’s breadth of expertise across a range of engineering disciplines allows an integrated service to be provided.
Our approach and skills

Coastal and esturine zones are home to around 85% of Australia’s population. Arup champions thoughtful waterfront development to ensure our coasts and waterways become desirable places to live, work and play; while protecting and, where possible, enhancing the natural environment.

Waterfront sites provide major opportunities for generating added value to a development. Arup brings fresh thinking to waterfront projects to help promote balanced solutions for our shorelines. Our solutions deliver greater efficiency for our clients, while addressing the needs of stakeholders and coastal communities, and enhancing the environment.

Arup has considerable experience in working with developers, architects and asset owners along waterfront sites, such as marinas and harbour/riverfront developments, applying creative designs at the water’s edge to minimise cost and risk, and maximise returns.

The development of a scheme to take full advantage of its waterfront location is key to maximising the potential of a site. This includes careful integration of development levels and infrastructure with consideration of flood, erosion and sea level rise issues, and accommodating water users to optimise interaction and benefits from the location.

Arup has the ability to take an integrated approach to every project, with a broad range of in-house specialist disciplines.

Our track record in sustainable infrastructure and planning, the expertise of our staff and our understanding of clients’ business models, all underpin solutions that inspire confidence for our clients.
Maritime engineering requires a truly multidisciplinary approach. Arup has dedicated maritime staff based locally in Perth, Brisbane, Sydney, Melbourne, Hong Kong and Singapore. We have significant numbers of skilled maritime staff in London, Ireland, Dubai, Houston and Spain. We utilise our multi-national expertise and capability to regularly support large scale projects. This enables our vast experience on global projects to be accessible for all of our projects around the clock. Complementing our multi-national capability, our local experience, versatility and breadth of skills allow us to work effectively on both small and medium scale projects.

We support our clients through every stage of a project, from vision to realisation, including masterplanning, due diligence studies, feasibility studies, inspections, above and below water assessments, consents, engineering design, project management and construction supervision.

Our multidisciplinary teams are typically comprised of specialists from maritime, naval architecture, geotechnical, energy, water, transport and logistics, environmental and sustainability, civil, infrastructure (including structural), economics, planning, and buildings groups.

Our maritime consultants can provide expert advice across a broad range of services, including:

- Port planning and operations
- Port infrastructure
- Bulk handling terminals
- Coastal engineering
- Waterfront development
- Recreational marine facilities
- Inspection and repair
- Naval architecture
- Renewable marine energy
- Flooding
- Intakes / outfalls

We deliver a total maritime solution.
Waterfront development and redevelopment

Arup has considerable experience of working with developers and architects to develop waterside sites, such as marinas and riverside developments, applying creative designs at the water’s edge to minimise cost and risk and maximise returns.

The location of a waterfront site provides major opportunities for generating added value for a developer. With this opportunity, there are also a number of associated issues often overlooked or underestimated, such as flood defences, ground conditions and statutory controls which can have a major effect on a scheme.

The development of a scheme into its waterfront location is key to maximising the potential of a site. This includes careful integration of development levels and infrastructure with flood defences and accommodating water users to optimise interaction and benefits from the location. We take an integrated approach to every project, liaising with specialist disciplines in order to achieve a superior quality result.

Above Kurilpa Bridge, Brisbane © Christopher Frederick Jones
Recreational marine facilities

As the population continues to grow, there is an increasing need and recognition of the value of designing quality urban places of habitation. This requires a capability not only to meet the technical challenges of the project, but also to provide a sustainable facility which meets user need. Arup’s approach encompasses urban design, planning, transport, landscape, infrastructure, sociology and economics.

Our experience on a range of recreational marine facilities has incorporated specialist skills including sea level rise studies, ship impact studies, berthing and mooring analysis, navigation channel design and ship simulation, hydraulic control structures and canals, masterplanning and structural design. We have worked for private developers and authorities, as well as local councils.
Jetty design

Arup has extensive experience of the design of jetties – including recreational, bulk and LNG – from appraisal of economic viability through to decommissioning, demolition or finding alternative uses.

We offer a fully integrated approach to balance the different physical, construction and operational constraints and work closely with our clients to produce solutions that match their expectations with regard to safety, flexibility, availability and long-term integrity.

Our services include:

- Planning advice and optimising layouts
- Site specific geo-hazard assessment
- Offshore site investigation specification, supervision and interpretation
- Offshore and nearshore wave climate assessment
- Wave loading analysis for piled, gravity based and floating marine structures
- Structural analysis and design
- Materials technology, durability and lifetime asset management strategies
- Foundation design and ground improvement
- Scour assessment and mitigation
- Design for constructability using techniques and methodologies suited to local conditions
- Design using prefabricated elements and design to maximise construction efficiency.
Whether by natural causes or as the result of man-made structures and developments, the coastal and estuarine regions of the world are continually changing.

From managed retreat to beach nourishment and shingle recycling, Arup has been involved in numerous projects aimed at developing either natural shore systems or more traditional hard shore protection schemes, depending on which is the most suitable solution – taking environmental, economic and other factors into consideration.

Our capability covers all stages of project development from concept design and feasibility stage desk studies through to detailed design and construction supervision, numerical and physical modelling and extends to post-construction monitoring. Our coastal expertise combined with close working relationships with established modelling laboratories ensures the greatest value for any project involving coastal engineering.
Project experience

Sea water extract and restaurant jetty, Durban, South Africa
Arup was engaged as marine and structural engineers for the design of a 200m long jetty to house the sea water extract system of a marine park and aquarium project. The structure comprised a precast concrete solution which ensured good quality of the concrete; and a construction methodology that enabled all work to be done from the coastline using incremental installation of the piles and jetty using pre-constructed elements. Arup was again engaged to provide services for the design of a restaurant on the end of the jetty. The structure comprised a lightweight solution to meet the constraints of the original design loads and for ease of construction.

Elizabeth Quay Pedestrian Bridge, Perth, WA, Australia
The Elizabeth Quay development is intended to re-connect Perth CBD with the Swan River. Arup is currently undertaking the design of a pedestrian bridge, to connect the Western Promenade and a new island on the eastern side. In addition to the bridge’s function as an effective means of linking the Western Promenade to the new island, key considerations are aesthetics and satisfaction of marine navigational requirements for transit of Transperth ferries under the bridge to the Quay.

Riverside Project, Perth, WA, Australia
Arup is currently providing civil and structural design, infrastructure design, site development and transport consulting services to the Riverside Project which aims to redevelop a significant part of Perth’s CBD. The Riverside Project will dramatically transform the 40 hectare site at the eastern entry to the Perth Central Business District into a prestigious mixed use, vibrant and bustling community. The design will include various waterscape and streetscape elements to create a safe and inviting atmosphere whilst complementing existing structures.

Fremantle Rail and Traffic Bridges Pier Protection, WA
Arup was commissioned to assist the PTA and MRWA in developing and implementing improvements to vessel impact protection for both bridges. Arup provided structural, bridge, rail, maritime and geotechnical engineering services to develop protection structures from concept through to detailed design. A number of concepts were proposed with the objective of minimising impact on marine traffic and promoting cost effective construction methods. Following a risk review involving a number of stakeholders, a concept for each bridge was taken through to detailed design.
Howard Smith Wharves Restoration Project, Brisbane, Qld, Australia
The heritage listed Howard Smith Wharves site contains multiple buildings, former air-raid shelters and approximately 170m of original timber wharf river frontage. Arup provided a range of refurbishment options and detailed design of the preferred option following a detailed options analysis process. Our design involved retaining and replicating as much of the original structure and materials as possible. This was achieved through rigorous timber research and testing plus consultation with various timber specialists and timber treatment yards.

Wheatstone Tender Design, WA, Australia
Arup provided a tender design for a 1.3km long jetty is to be located in varying water depths of up to 21m. Arup’s scope of work included the geotechnical, structural and maritime engineering design for the alternative design for the jetty. Innovative aspects of the design included a float-over installation of the loading platform which stabbed into large diameter mono-piles. The jetty was re-designed from the concept base design to enable construction of the access trestle using over the top methodology.

William Gunn Jetty, QLD, Australia
Arup was commissioned to carry out inspection and condition assessment of the jetty, and the design of repairs and redevelopment of the jetty. Remediation works included demolition of existing concrete and timber structures, reconstruction of a replacement timber jetty and remediation of a concrete jetty. The project also included the design and construction of an architecturally designed kiosk. Arup added value to the project by introducing a topping slab, which eliminated work directly over the water resulting in significant cost savings and reduced the need for repairs to the soffit.

Waterfront Newstead, QLD, Australia
At 16 hectares, Waterfront Newstead is one of the largest projects in Brisbane’s urban renewal program. We worked closely with our client throughout the transformation of the former industrial site. Our scope included condition assessment and specification of repair works for the existing wharf to provide a 100 year remaining design life.
Project experience

LNG Projects (GLNG, QCLNG, APLNG), Qld, Australia
As part of an Engineering Procurement and Construction contract with John Holland, Arup undertook tender and detailed design of various loading jetties and materials offloading facilities in Gladstone. Each project required detailed knowledge and sound understanding of the marine climate, bathymetry, and geology, as well as vessel berthing and mooring arrangements. Through investigation of the geological profile, berthing and mooring of vessels and operations of the facilities, we produced cost-effective design solutions meeting the needs of the client’s construction sequencing and methodology.

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Tolo Harbour Marina, Hong Kong
Arup provided services including site review and analysis including preliminary wind/wave climate assessment, marine traffic, environmental assessment and marina sizing and layout for this proposed new 300 berth marina with water sports centre, clubhouses and eco-tourism centre.

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Walsh Bay Wharves, NSW, Australia
Arup provided multi-disciplinary engineering services for the redevelopment of the 17ha historic Walsh Bay area into a residential, cultural, retail and commercial precinct, including four finger wharves, shore sheds, a new theatre, and apartment buildings. We were involved throughout the lifecycle of the redevelopment, including early dilapidation studies and underwater scuba investigations, and scope including façade, structural, civil, maritime, geotechnical, seismic, fire, acoustics, materials and risk management services.

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Gardens by the Bay, Marina East, Singapore
Arup provided multi-disciplinary services, including maritime engineering, for this 30ha park including landscaped areas, water features, berthing facilities, a combined public transport system, several footbridges and buildings.

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Project experience

National Maritime Museum, Falmouth, Cornwall, UK
Arup carried out the engineering design for the redevelopment of the National Maritime Museum Cornwall (NMMC) and four commercial buildings. An integrated and comprehensive service was provided by Arup from feasibility stage, through to detail and specialist design, to the supervision of the construction works. Services included the detailed design of a new sea wall and marine piling. This included the creation of a watertight, floor to ceiling glass viewing gallery, from which visitors have a spectacular view of the seabed and underwater life.

The Havre des Pas Bathing Pool Refurbishment, Isle of Jersey
Arup designed the new café, the pool repairs and the new elegant reinforced precast concrete jetty access to the island pool. The engineering design drew heavily upon Arup maritime engineering expertise to address the challenges of construction in the sea. The heavily exposed footbridge was cast in sections on land with epoxy-coated reinforcement. The structural performance has withstood the ravages of several storms in recent years and the facility is proving ever popular with residents and holiday makers alike.

Cape Grace, Monte Carlo Sea Land Coastal Development, Monaco
Arup was commissioned by Monte Carlo Sea Land for a Private Public Partnership bid for reclamation of land in the Mediterranean Sea. The development will comprise mixed-use commercial and residential space, two hotels, an iconic building, and a marina and canal, fully-integrated with existing facilities. Arup supervised specialist maritime physical and numerical modelling and was able to demonstrate that the proposed island design, comprising a mix of reclamation and platform structure, minimized impact on the surrounding coastal zone.

Turner Contemporary, Margate, UK
A proposed designs for the Art Gallery was for the structure to be founded in the sea. Arup supported Snøhetta Architects in the development of designs that suited the marine environment. We carried out a maritime engineering assessment identifying key risks and developed strategies for mitigating them. We specified and supervised a modelling study to quantify wave conditions and the impact on the coastal processes. Relevant statutory bodies were consulted regarding the requirements for construction below the high water line.
Lewis Macdonald – Senior Maritime Engineer, Perth
Lewis is a chartered, senior maritime engineer based in Arup’s Perth Office. He has 8 years’ experience of maritime projects within Australia and globally. His project work includes a variety of technical, managerial and advisory roles for projects from concept design through to construction. Lewis has specialist maritime engineering knowledge in areas including structural design, wave loads and overtopping, ship impact assessment, physical and numerical modelling, as well as inspection and repair. He is experienced in the planning and design of waterfront developments, marinas, coastal protection, jetties and quays, breakwaters, sea walls, ports and harbours.
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David Dack – New South Wales Maritime Business Leader
David is a chartered, senior maritime engineer with 10 years professional experience working in Australia and the UK in both a management and technical role. He is experienced in the design and planning of waterfront developments, jetties, marinas, quay walls, breakwaters, seawalls, dock walls, flood defence walls, foreshore rehabilitation works, dredging and beach nourishment, ports and harbours. David has a particular interest and appreciation on the integration of maritime works to waterfront developments from concept design and planning through to construction.
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Gary Lucas – Australasian Maritime Business Leader
Gary has delivered a wide range of maritime projects across Australia, Asia and the Pacific Islands. These projects have included feasibility studies and detailed design for waterfront urban development and redevelopments, small craft infrastructure, wharves and container terminals, as well as inspection and repair of maritime infrastructure. As the Maritime Business Leader for Arup in Australasia, Gary’s responsibility is to capitalise on the firm’s global capability to deliver a broad range of maritime projects in the region to our clients.
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