



Ocean  
Alliance  
Canada



# Naval/Ship Architect

BNOS PROFILE



Funded by the  
Government of Canada's  
Future Skills Program



## ROLE OVERVIEW

As a Naval Architect, you will lead the design and analysis while overseeing the construction, modification, and maintenance of marine vessels and offshore structures. You apply principles of engineering, hydrodynamics, and materials science to develop hull forms, structural frameworks, and integrated onboard systems that meet performance, safety, and regulatory requirements.

You may work on a wide range of vessels including commercial ships, naval vessels, ferries, offshore platforms, and specialized marine craft. With responsibilities including feasibility analysis, hull and system design, hydrostatic and stability assessment, performance testing of vessels and structures. You will also need to collaborate with multidisciplinary teams including marine engineers, shipbuilders, and classification societies to ensure that vessel designs are optimized for operational reliability, spatial efficiency, environmental sustainability, and lifecycle cost-effectiveness.

Naval Architects play a critical role in enabling safe, innovative, and efficient maritime operations within the oceans economy, supporting the transportation, defense, offshore energy, and marine research sectors.

## EDUCATION AND EXPERIENCE

- A bachelor's degree in an appropriate engineering discipline is required.
- A master's degree or doctorate in a related engineering discipline may be required.
- Licensing by a provincial or territorial association of professional engineers is required to approve engineering drawings and reports, and to practise as a Professional Engineer (P.Eng.).

## INDEX OF POTENTIAL TITLES

- Marine Engineer

## NATIONAL OCCUPATIONAL CLASSIFICATION

2139 – Urban and land use planners

## STRATA LEVEL

3B – Other Engineers



## TECHNICAL COMPETENCIES

### HULL AND STRUCTURAL DESIGN

Develops and designs hull shapes, internal frames, and load-bearing structures using CAD and Finite Element Analysis to achieve structural integrity, stability, buoyancy, and operational efficiency.

- Designs complete hull and superstructure according to specifications and test data to conform with standards of safety, efficiency, and economy.
- Analyzes design proposals and specifications to establish basic characteristics of craft, such as size, weight, speed, propulsion, displacement, and draft.
- Develops 2D and 3D CAD models based on blueprints and technical requirements to support accurate structural representation and fabrication planning
- Conducts stability and weight distribution analyses on hull structures to ensure vessel balance, safety, and performance under various loading conditions.
- Performs hydrostatic and load tests on hull designs to validate structural integrity, buoyancy, and compliance with regulatory and performance requirements.
- Leads the development of innovative hull configurations for new vessel types to enhance performance, efficiency, and competitiveness in specialized marine applications.

### MARINE SYSTEMS DESIGN

Develops and integrates mechanical and electrical systems including propulsion, HVAC, and auxiliary components into vessel designs to ensure operational reliability, spatial optimization, and compliance with industry standards.

- Designs the layout of interior vessel spaces including cargo holds, passenger areas, ladder wells, and elevators to optimize spatial efficiency and ensure compliance with design and safety standards.
- Inspects marine equipment and machinery to develop work requests and job specifications to support maintenance planning, system upgrades, and operational readiness.
- Establishes the arrangement of boiler room equipment, propulsion systems, HVAC, refrigeration, piping, and other functional systems within vessel plans to ensure integration, accessibility, and safe operation.
- Compiles mechanical system schemes including engines, propulsion, and HVAC to support system integration and ensure design coherence.
- Evaluates machinery layouts for propulsion and auxiliary systems to optimize space usage, safety, and maintenance access.
- Integrates subsystems into vessel designs in accordance with engineering standards and vessel requirements to ensure performance reliability and regulatory compliance.
- Oversees the integration of new propulsion technologies such as hybrid or electric systems to improve energy efficiency, reduce emissions, and support innovation in vessel design.



### STABILITY AND HYDROSTATIC ANALYSIS

**Conducts hydrostatic, hydrodynamic, and stability calculations using analytical tools and modeling techniques to ensure vessel performance, safety, and regulatory compliance in all operating conditions.**

- Oversee construction and testing of prototype in model basin and develop sectional and waterline curves of hull to establish center of gravity, ideal hull form, and buoyancy and stability data.
- Performs hydrostatic calculations for intact and damaged conditions to assess vessel buoyancy, trim, and freeboard under all load scenarios.
- Develops stability booklets and loading manuals based on regulatory and class society requirements to ensure operational safety and compliance during vessel loading and operations.
- Analyzes tank arrangements and liquid movements including ballast, fuel, and water tanks to predict effects on vessel stability and motion response.
- Simulates vessel behavior in various sea states and load conditions using computational modeling tools to evaluate seakeeping, roll damping, and hydrodynamic response.
- Evaluates longitudinal and transverse weight distributions during all design and operational phases to ensure structural equilibrium and minimize excessive trim or heel.
- Recommends design modifications based on hydrodynamic and stability assessments to optimize vessel safety, efficiency, and maneuverability in service conditions.

### PERFORMANCE TESTING

**Plans, coordinates, and analyzes performance testing and sea trials to validate vessel systems and structural performance, ensuring design objectives and safety criteria are achieved prior to commissioning.**

- Analyzes and compares design variants with respect to their calm waterpower demand to reveal the degree of quality compared to other similar vessels in the database.
- Implements standardized performance assessments to offer design improvements for vessels in development.
- Applies standardized performance assessments to provide third-party assessments for efficiency purposes.
- Tests the electronic equipment on board using standardized testing to ensure ship works properly and performance is as expected.
- Evaluates performance of craft during dock and sea trials to determine design changes and conformance with national and international standards.
- Monitors the operation of marine equipment during acceptance testing and shakedown cruises to confirm design performance and support commissioning decisions.
- Determines test conditions, sequences, and phases for vessel and system trials to ensure thorough evaluation and alignment with test objectives and protocols.



## TECHNICAL COMPETENCIES

### FEASIBILITY ANALYSIS

**Produces a feasibility analysis of the practicality of a proposed project[s] including the economic viability, associated costs and benefits, and technical and time constraints of the project to ensure projects are completed on time and on budget.**

- Analyzes technical and economic data related to vessel designs and modifications to assess the feasibility of product proposals and ensure alignment with project objectives and client requirements.
- Reviews work requests against historical ship project data to verify cost reasonableness and ensure the economic viability of proposed repair or upgrade actions.
- Evaluates the time, resource, and material requirements for new vessel designs or retrofits to determine whether project goals are achievable within budgetary and scheduling constraints.
- Assesses trade-offs between design options, materials, and technologies to support cost-effective decision-making and improve buildability.
- Prepares preliminary risk assessments for new shipbuilding projects or system upgrades to identify technical, financial, and operational risks prior to design finalization.
- Develops cost-benefit analyses for alternative propulsion or structural solutions to ensure selection of optimal design pathways based on lifecycle performance and cost.
- Collaborates with procurement and construction teams to validate material availability and lead times to confirm project timelines are realistic and feasible.
- Supports investment or budgetary proposals with documented technical justifications and return-on-investment estimates to gain stakeholder approval for new marine projects.

### ENGINEERING DESIGN

**Responsible for the technical aspects of the planning and design of engineering project[s] to ensure project is constructed in a safe, efficient, and effective manner.**

- Prepares engineering plans, estimates, construction schedules, and contract specifications including special provisions to support the safe, timely, and cost-effective execution of marine projects.
- Directs the preparation of product and system layouts, detailed schematics, and technical drawings to ensure accuracy and completeness in design documentation for vessel systems and structures.
- Conducts analytical, environmental, operational, or performance studies on marine systems and structures to develop technically sound and compliant engineering designs.
- Procures materials and components required for marine equipment repair to ensure timely availability and suitability of resources for ongoing engineering and maintenance work.



### COLLABORATION

**Engages in professional collaborative efforts with other members of the team, including sharing information and expertise, utilizing input from others, and recognizing others' contributions to work towards a common goal.**

- Confer with research personnel to clarify or resolve problems and to develop or modify designs.
- Liaises with intra-departmental teams to establish priorities and provide technical support.
- Work in partnership with other practitioners, both internal and external, to execute projects.
- Works cooperatively with multiple stakeholders, demonstrating a willingness to consider alternative approaches, ideas, or insights.

### COMMUNICATION

**Positively directs outcomes by delivering communication that results in a better understanding of goals and objectives and that capture interest, and gain support for immediate action.**

- Act as liaisons between ships' captains and shore personnel to ensure that schedules and budgets are maintained, and that ships are operated safely and efficiently.
- Maintain contact with, and formulate reports for, contractors and clients to ensure completion of work at minimum cost.
- Prepare technical reports for use by engineering, management, or sales personnel.

### ATTENTION TO DETAIL

**Reviews completed work by monitoring and checking information, organizing tasks and resources efficiently, or all areas involved towards the completion of an objective.**

- Catches and corrects own errors or omissions, where applicable, to ensure efficiency and safety
- Provides accurate and reliable feedback when reviewing others work to ensure consistent deliverables.
- Maintains a checklist of tasks to ensure that all processes are followed, and small details not overlooked



## LEGAL, POLICY, & REGULATORY COMPETENCIES

### REGULATORY COMPLIANCE:

Adheres to specific regulations, codes, and legislation within a defined jurisdiction to ensure the health and safety of others.

- Researches system layouts, drawings and schematics to review constructability and help resolve technical issues to ensure production complies with national and international standards.
- Records facility operations to ensure compliance with standards and regulations.
- Notifies necessary parties of containment or quality issues to ensure appropriate measures are taken.
- Clearly communicates the regulatory compliance requirements to employees to ensure employees have the requisite information to perform duties safely and effectively.
- Perform monitoring activities to ensure that ships comply with international regulations and standards for life-saving equipment and pollution preventatives.
- Coordinate activities with regulatory bodies to ensure repairs and alterations are at minimum cost and consistent with safety.



## ENVIRONMENTAL COMPETENCIES

### ENVIRONMENTAL REQUIREMENTS

Uphold requirements to ensure equipment and systems follow regulations, standards, and best practices for environmental purposes.

- Use appropriate simulation technology to assist in the design of vessels in order to improve efficiency and reduce production and lifecycle maintenance costs.
- Assess environmental compliance of systems to ensure designs and their construction follow Construction Specifications Canada.
- Participate in the development and oversight of testing and commissioning of new designs and systems for the reduction of emissions.
- Address risk items for the design and outfitting of hull and other vessel requirements to ensure the structural integrity of ships following environmental standards.
- Propose design and process improvements related to vessel emissions and fuel consumption to reduce the impact on the environment when possible.