

2. PROJECT DESIGN

Project design typically proceeds from a feasibility project through an outline project to a contract project. Project design by Deltamarin is based on the principle of total coordination: besides the general arrangement several other items are included and coordinated together. These items include arrangements, structure, accurate weight, compartmentation and stability, machinery arrangement and all this fitted into a good hull form ensuring efficient performance.

Efficient overall configuration with excellent performance for the specific shipping task.

We carry out about 40-80 projects every year. And many of them are built. That is an unbeatable track record. Check our references.

Outline Project

The idea of an outline project is to produce the first inquiry documentation for the Owner, and thus to secure comparable proposals from the shipyards.

The prepared project material is of preliminary nature and prepared for first price estimates.

Short-listing of yards can be made.

Good references and extensive statistics ensure quick, reliable and state of the art/ novel projects.

Contract Project

Contract project is prepared to guarantee the required capacities, capabilities, characteristics, quality, etc. of the final product, the ship, to the Owner.

Competition between the short-listed shipyards is based on the contract project.

The material is adequate for the Owner and the shipyard to sign a newbuilding contract.

Documentation may include several specific and special items and studies included as enclosures, depending on each specific case, i.e. ship type, shipyard, etc.

Extensive experience and references ensure high quality end result and minimum pressure for changes and cost overruns.

Following design tools are used:

- CATIA 3-D CAD for product model designs and 3-D models
- Delmia simulation systems
- Autocad/Microstation 2-D CAD for drawings
- NAPA-Software for hull form and stability calculations
- DELTA-AVEC
- Extensive statistics

Typically several options are included in the project design work: examples are interior and exterior 3-D models, safety and ship function simulations as well as different machinery configurations.

2.1 Outline Project

The final contents for each specific project are defined together with the Client.

Typical scope for an Outline Project is the following:

1. Definition of Main Dimensions

Main dimensions will be defined taking into account the required capacities, service speed, weight and normal iterative design process.

2. General Arrangement (GA)

GA of the vessel will be prepared with all the major spaces, systems and equipment located and named. The GA will be in accordance with the latest rules and the Owner's requirements. A tonnage calculation will be prepared. Life saving and escape ways will be checked.

3. Machinery Arrangement (MA)

MA will be either a separate one or shown in the GA. All main components and spaces will be shown.

4. Preliminary Midship Section (MS)

Preliminary Midship Section will be prepared for reliable weight calculation purposes. The target is to achieve continuous structures and low structural weight.

5. Lightweight Calculation

Lightweight will be calculated utilising General Arrangement, Midship Section, specified equipment, references and extensive statistical data. Weight calculation will be verified using latest reference vessels and extensive statistics.

6. Specification

An outline specification will be prepared. The specification will include all the necessary chapters and items in approximately 80 pages. Deltamarin's or the Client's standard can be applied.

7. Hull Form

Hull form will be prepared utilising good references and experience from model tests and full-scale measurements of similar reference vessels.

8. Loading and Stability

Watertight compartments and preliminary tank arrangement will be defined. Typical loading conditions will be defined and calculated. Intact stability will be calculated and a preliminary study of damage stability will be prepared.

9. Speed and Power

Speed-power prediction will be prepared based on the defined hull form and model tests of good reference vessels. Electric and heat load will be estimated.

10. 3D Exterior Model

3-D Exterior Model will be prepared for coordination and presentation purposes. See also chapter 8.1.

2.2 Contract Project

Contract Project is the most essential phase of a newbuilding project. A well-defined contract documentation ensures fluent process at the yard and an end product as intended.

Following items are typically included in the Contract Project:

- General Arrangement, Machinery Arrangement and other related drawings will be finalised in accordance with the Owner's and the Yard's requirements and discussions.
- Specification will be extended to ca. 250 - 350 pages and it will also include preliminary system diagrams for most important systems, 15-20 pieces.
- Midship section and weight calculations will be finalised and the longitudinal strength will be checked according to the final General Arrangement.
- Hull form will be updated based on the lightweight calculation and the dead-weight distribution. Lines plan, body plan and all necessary hydrostatic data will be included.
- Shaftline arrangement and appendage plan will be developed.
- Stability calculations will be updated, including all the required damage cases.
- Trial speed-power prediction will be updated, resistance characteristics will be calculated and optimum propeller diameter will be defined.
- Electric and heat balance will be calculated and one-line electrical diagram will be prepared.
- Escape way calculations and analyses will be prepared.
- Canal crossings (e.g. Panama) will be checked as needed.
- Manoeuvring capabilities will be calculated for defining rudder size and thruster power.
- 3-D Exterior Model will be updated or prepared for coordination, visualisation and presentation purposes. The Model can be easily extended into superstructure and interior spaces. See also chapter 8.

Additional items, e.g. coordination of model tests, specific critical structural analysis and design, noise and vibration study, functional simulations, architect specification, material and price estimates, etc., can be included in the contract project.

Detail contents to be agreed upon with the Client before the start-up of the work.

Selected References:

- ✓ Selected references of project work for different ship types are presented in separate reference booklets.

2.3 3D Project Work Based on Product Model

Deltamarin is moving into project design work based on product model. The complete design is performed in a 3-D environment using CATIA software, and stored in a common database called the product model.

The product model contains all project design information, including general arrangement, structure, specification, system components, areas, volumes and all other relevant information, everything in one single model, well coordinated.

The product model is built starting from large, rough entities. Then, as design evolves, the model sharpens gradually, ultimately containing all design details of the complete vessel. Thus it is easy for the Owner to define the scope he needs for each particular case. Of course the scope of the work is typically defined as explained in chapters 3.1 and 3.2.

The main benefits for the Owner of having his project designed with 3-D in a product model are:

- Better coordination of space and design disciplines leading to more efficient use of space and less confusion.
- More accurate weight control and thus better distribution of superstructure volumes at earlier design stage.
- Early stage visualisation of the vessel and various parts of it enabling the Owner to better evaluate the project.
- As all information is stored into a common database, listing various items of interest is easy and efficient.
- Fluent and efficient shift between different phases in the design process.
- Accurate data for cost estimation.
- Accurate data for supplier inquiries.

The figure below describes the design process based on product model and the increasing amount of information. A life-cycle model principle is created.

In the product model all is based on one model. For example, the common change over from 2-D to 3-D design between basic and detail design phases is omitted, and all the different disciplines are using the very model, which is continuously updated.

