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Development of Technical Documentation of Small Vessels

Abstract

The development of technical documentation of vessels provides that the design, construction and conformity assessment is clearly understood and meets the competent requirements. This paper presents the development process of technical documentation for a small vessel, i.e. a motorboat of project category B (navigation on the high seas), whose hull length is within the range from 2.5 m to 24 m, according to the given norms. For example, the paper will present a boat intended as a polyvalent workboat in service on the Adriatic Sea, whose documentation has been prepared according to standards, i.e. the requirements of the Croatian Register of Shipping (HRN EN ISO Standards) [1].

Keywords: Technical documentation, Small vessel, Croatian Register of Shipping

1. Introduction

Every year, we witness a growing small vessels market and the need for polyvalent workboats. The Adriatic Sea is a well-known tourist destination, and nautical tourism is one of the most growing branches. Due to climate, most of the income is made during summer; therefore, the idea of a polyvalent workboat is that it's capable of fishing and can be used as passenger transport during summer. This paper's short overview includes structural members assessment, stability calculation, weight management, and essential systems evaluation.

Figure 1. Polyvalent boat render

2. General

The material used for the construction of polyvalent vessel hull plating is glass fibre reinforced polyester resin. Bulkheads are made of water-resistant plywood, while all internals are made of wooden core lined with fibreglass laminate which complies with relevant ISO rules [2]. Since the hull is made of glass fibre, there is a need to design and construct a mould for the vessel hull. Mould for hull manufacturing can be used from previous builds of a similar vessel when no significant changes are needed for the new build. Standard equipment for the hull, machinery, firefighting and safety equipment etc., comply with national rules "Ordinance on amendments to the Ordinance on Boats and Yachts" [3]. For additional customer requests for the outfit, manufacturers must comply with the national rule "Ordinance on Boats and Yachts", Annex 6, Technical Documentation [4]. All rules for which a vessel must comply are defined in Annex 1 of the mentioned national rules.

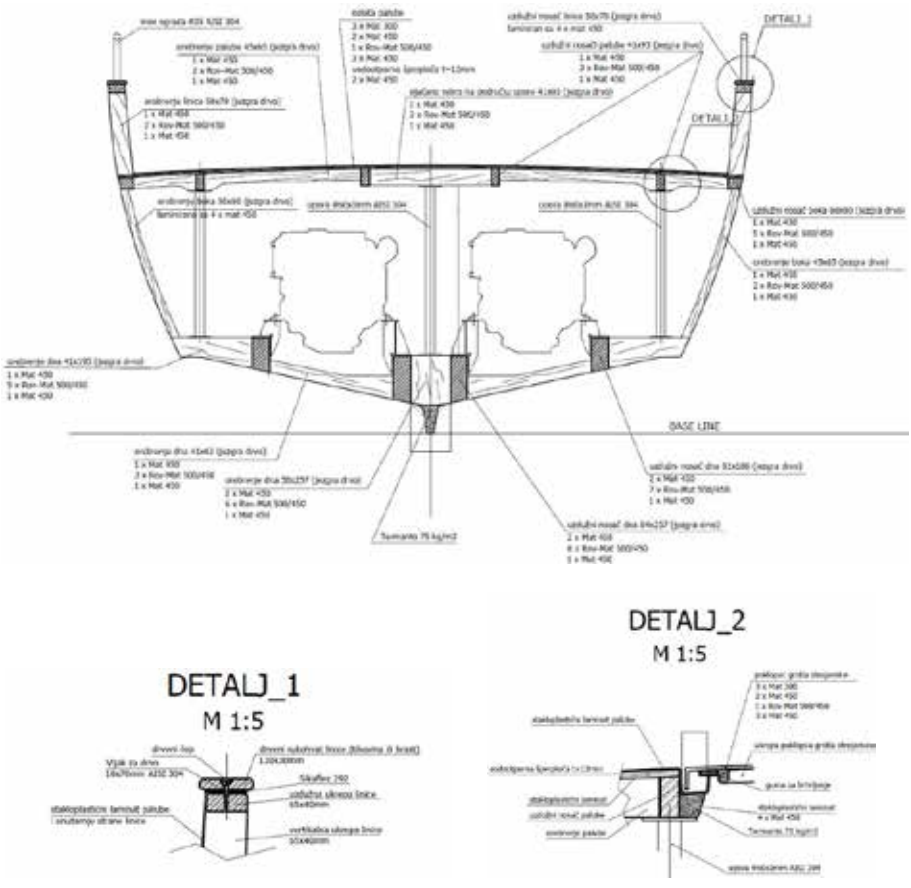


Figure 2. Midship section

3. Stability assessment

Calculations have to be made for the worst-case scenario during their exploitation for polyvalent vessel stability. Because of construction and size, small vessels are more exposed to the effects of large waves, strong winds and more intense sea conditions. Vessel will be used to transport crew, fishing equipment, and fish itself. The stability calculation case with full fish tanks is used as the worst-case scenario. Downflooding opening requirement seeks to establish that there is no non-watertight opening in the hull or superstructure that may be submerged during navigation and which is a potential hazard for flooding the vessel's interior. The requirement applies to all openings except those that are watertight, openings in the hull that are permanently closed, openings in the side of the superstructure, which must be closed during navigation and marked

with a special mark and specified in the user manual and engine exhaust parts that are watertight. All elements have to comply with HRN EN ISO 12216 [5]. The stability calculation must comply with HRN EN ISO 12217-1 rules for design category B [6]. During calculation, special consideration must be taken for resistance to waves and wind and minimum opening area for deck drainage.

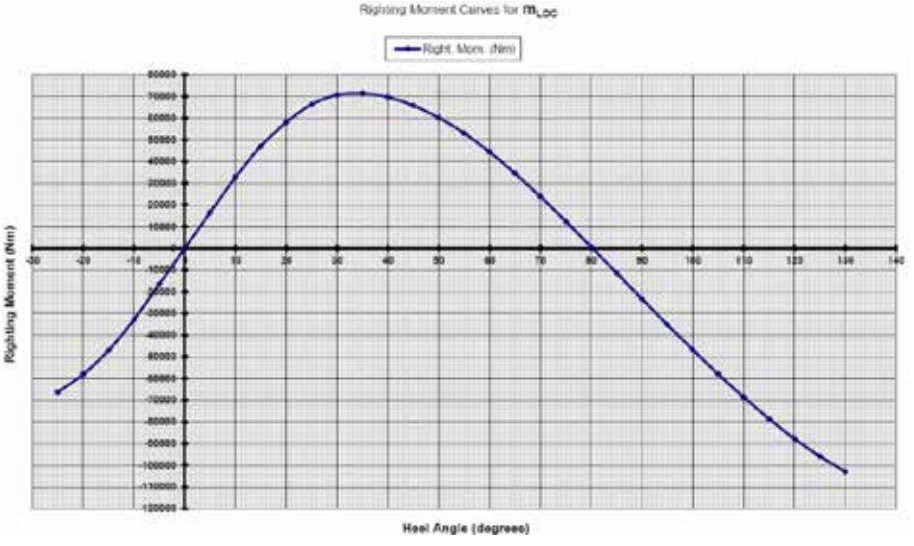


Figure 3. Righting moment curve

4. Systems

Term "systems" for a vessel is defined as all needed systems necessary for the vessel to operate. All systems have to comply with ISO rules and regulations. Systems needed for one polyvalent vessel are fuel, exhaust, cooling, bilge, black and grey, and fresh water systems.

For fuel system, fuel tanks, and testing relevant standard used is ISO 10088 [7]. Fuel tanks are made of stainless steel, and they have to be grounded so that the connection is made to the vessel hull with a maximum resistance of 10 Ω. Foundations for fuel tanks have to be made so that they need to be separated from the surface, which can cause sparking.

The exhaust system is designed so that the exhaust position is located 150mm above the waterline.

The engine cooling system is open type design with a seacock positioned aft of the engine.

The Bilge system is designed with three immersed bilge pumps in compliance with ISO 8849 [8] rules with hull valve per ISO 9093-1 [9]. After installation, a complete bilge system must be tested for pressure 1.5 times higher than operating pressure.

The Black and grey system is designed according to ISO 8099 [10], with one black/gray tank and macerator pump that fits the vessel's need. The black/grey water tank has a vent connection so that it is connected from the pipe to the filter and the hull. A vent is used to prevent unpleasant odours in the boat cabins. Since the tank needs to be emptied, it contains a direct discharge through the opening on the deck.

The freshwater system complies with ISO 9093-1 [9], the freshwater tank is located aft, and the system is equipped with a water heater. For the water to be clean for the consumers, it must pass through a fine particle filter, pipes with ball valves and one main valve that allows water to pass to the consumer. A freshwater tank contains vents that prevent water from taking on unsuitable conditions. Hot water supply is performed, so that part of the pipe from the drinking water tank is bought to the boiler and goes to the consumers. After installation, the water system must be tested for pressure 1.5 times higher than the operating pressure.

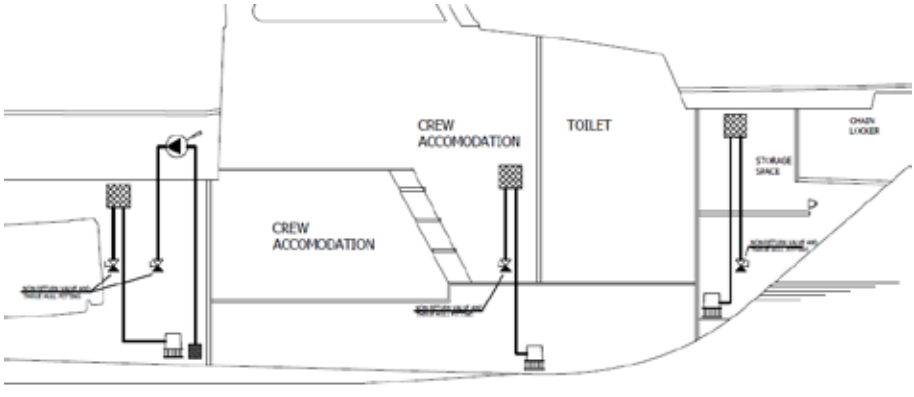
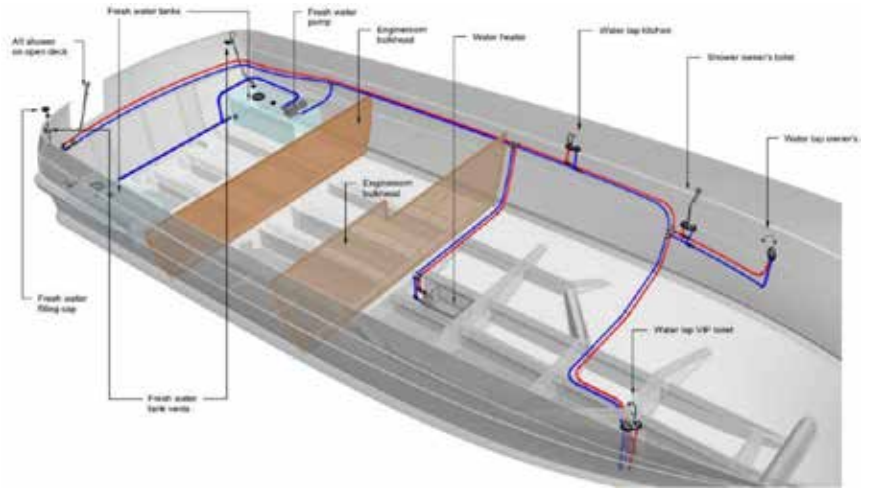


Figure 4. Bilge system



Figures 5. Fresh water system

5. Conclusion

This paper describes the procedure and relevant rules and guidelines for preparing technical documentation of the polyvalent vessel. General characteristics define documentation prepared in advance, focusing on the purpose of the vessel and equipment it will contain. Documentation for polyvalent vessels has to consider rules that apply to different operating types, e.g., stability of workboats and passenger boats. The content of this paperwork is a guideline for preparing and selecting applicable rules and regulations, and it can serve in the early stages of the design.

6. Acknowledgements

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7. References

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