Estimating Coating Costs for Ships

Simple Methods for Estimating Ship Surface Areas

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The cost of coatings for ships continues to be a major cost driver both for new construction and ship maintenance. The price for new coating systems is escalating due not only to escalating oil-based products, but also to increased expensive coating technologies required to address both environmental legislative requirements and for minimizing maintenance costs.

To estimate coating costs, the area of surfaces must be determined. The following provides several methods for doing this on a parametric basis.

1.0 Estimating Exterior Hull Bottom Surface Area below the Waterline:

SPAR has developed an approach to estimating the surface area below the waterline for anti-fouling bottom coatings. The modeling has provided very simplistic, yet fairly accurate results. The model provides options for selecting the type of bottom cross-sectional profile depending on the ship type:

- Flat Bottom
- Flat Bottom with Rounded Bilges
- Circular Round Bottom
- V-Bottom

For example, patrol boats, cutters and frigates mostly can be characterized by either V-shaped or rounded cross-sections. Tankers and bulk carriers generally utilize a flat bottom with rounded bilged.

The surface area model slices in cross-section the hull into 100 segments along the length of the ship. Figure 1-1 illustrates the segmenting of the hull from stem to stern along the waterline. The hull beam and the draft at each segment can vary according to the hull design.

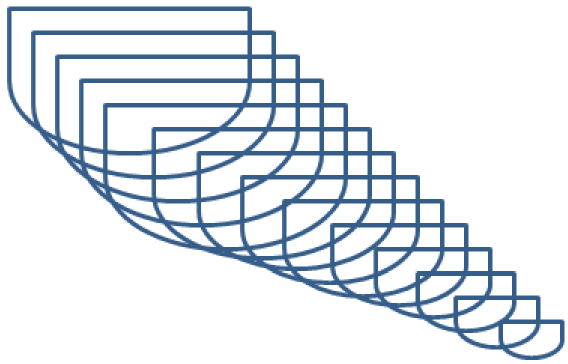

Figure 1-1: Segmenting the Hull Form below the Waterline

The following figures illustrate these basic hull bottom cross-sections and the equations used to develop both the displacement and the exterior surface area of the hull bottom, where

$$\Delta LWL = LWL/100$$

B = Beam

T = Draft

R = Radius where applicable.

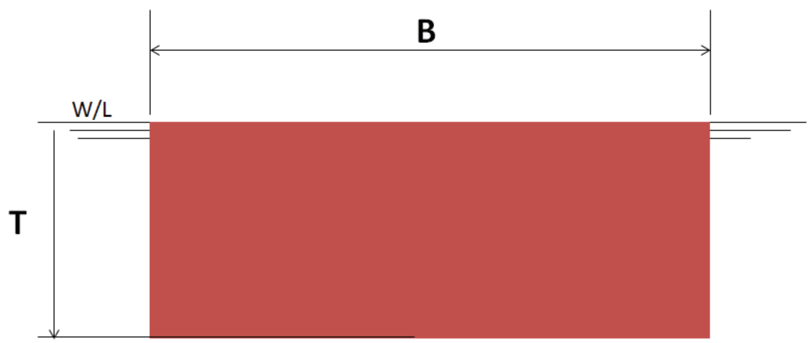

Figure 1-2: Flat Bottom Cross Section

$$\text{Segment Exterior Surface Area} = (2T + B) \times \Delta LWL$$

$$\text{Segment Transverse Cross Sectional Volume} = (T \times B) \times \Delta LWL$$

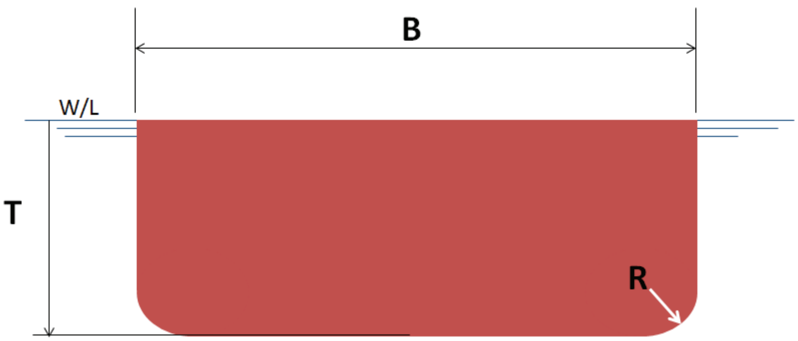

Figure 1-3: Flat Bottom with Rounded Bilge Cross Section

Segment Exterior Surface Area = 2{[T-R] + [2πR/4] + [(B/2 – R]} x ΔLWL

Segment Transverse Cross Sectional Volume= {[T – R] B + [$\pi R^2/2$] +R [(B/2) – R]} x ΔLWL

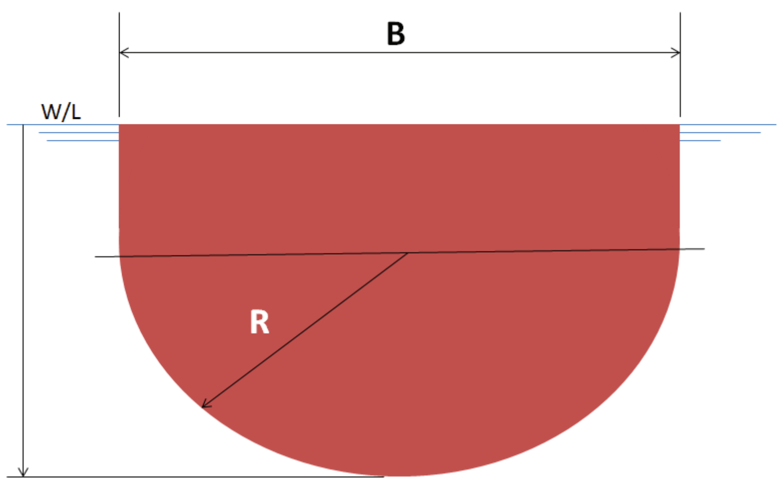

Figure 1-4a: Round Bottom Cross Section (T> 0.5 B)

Bottom Radius = B/2

Segment Exterior Surface Area = {2[T – R] + πR} x ΔLWL

Segment Transverse Cross Sectional Volume= {[T – R]B + $\pi R^2/2$} x ΔLWL