KC#776Q

Attachment to IACS KC Question about M_R in 10/1.5.1.4 of CSR BC Rule

1. When Figure 4 in 10/1.3.3.3 is taken as a model for calculation, the maximum bending moment M_R can be calculated as follows:

$$M_R = C_{R2} \cdot (f_1 + f_2/2) + C_{R3} \cdot f_3, \qquad \text{in N m}$$
$$\approx C_{R2} \cdot f_1 + C_{R2} \cdot f_2/2$$
$$= C_{R2} \cdot f_1 + Q_1 \cdot f_2/2$$

$Q_1 = C_{R2}$, in N

C_{R2} : Partial rudder force, in N, of the partial rudder area A_2

C_{R3} : Partial rudder force, in N, of the partial rudder area A_3

f_1 : As defined in Fig 10

f_2 : As defined in Fig 10, referring to centre of area A_2,

f_3 : As defined in Fig 4, referring to centre of area A_3,

A_3 : Area as defined in Fig 4

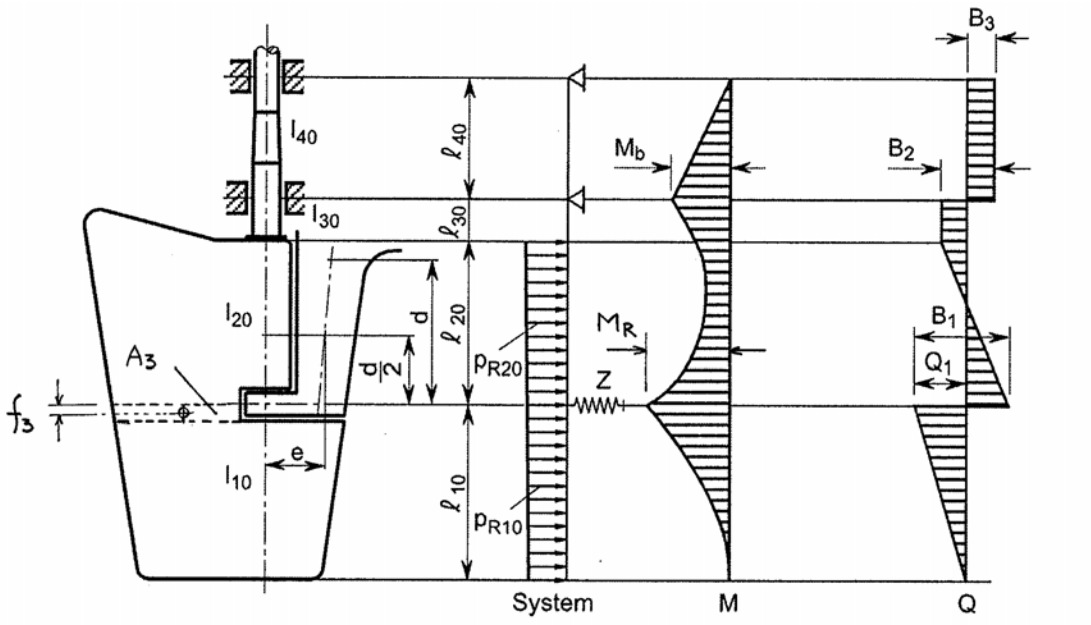

Figure 4: Semi-spade rudder (with 1-elastic support)

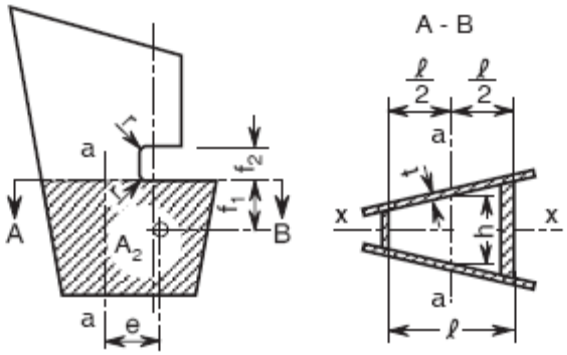

Figure 10: Geometry of rudder

2. Therefore, B_1 in the equation of M_R in 10/1.5.1.4 of CSR BC Rule should be changed to Q_1.

KC#776A

Technical Background

Calculation of the rudder body moment M_R, CSR-BC, CH10, Sec1 [5.1.4]

The cross section under consideration is the lower end (A-B) of the cut out for the pintle.

Two bending moments act simultaneously in this section:

1. Partial rudder force C_{R2} of the partial rudder area A_2 below the cross section under consideration (see figure 1) with the lever f_1
2. Horizontal bearing force B1 with the lever $f_2/2$.

$$M_R = \underbrace{C_{R2} f_1}_{1.} + \underbrace{B_1 \frac{f_2}{2}}_{2.} \text{ in N.m}$$

Figure 1 – Forces on ruder body