**Steering Gear**

**Principle Particulars:**

LBP = 70.8 m

LWL = (1+.0167) x 70.8 = 72m

B = 11.4 m

T = 4.4 m

**Particulars of Rudder:**

b= height= 3.2

c= breadth

Rudder Area, A = 8.52 m2

Aspect Ratio = 1.2

Rudder Stock:

Dt  = 4.2 x

= 4.2 x

= 100 mm

**Force and Torque Calculation:**

Rudder Force,

= v = v­0 for ahead condition

k1= = 1.067

k2 = 1.1 (ahead condition)

k­3= .8 (rudder outside the propeller jet)

kt= 1(normally)

CR = 132 x 8.52 x 102 x 1.067 x 1.1 x .8 x 1

= 105599.2 N

Rudder Torque, QR= CR x r

Again, r = c () for ahead condition

Kb = = .2

r = 2.27x (.33 x 0.2)

= 0.15 m

QR = 105599.2 x .11

= 11615.912 Nm

This value is for ahead condition.

Now, for astern condition,

Taking 40% of 10 knot yields 4 knot which is below 5 knot. So as per instruction 6 knot is taken for calculating astern condition.

= 132 x 8.52 x 62 x 1.067 x 1.4 x .8 x 1

= 48383.63

Rudder Torque, QR= CR x r

Again, r = c (𝛼 × 𝐾𝑏)

𝛼 = .33 = for ahead condition

Kb = Af /A= 0.2

r = 2.27 x (.33 x 0.2)

= 0.15 m

QR = 105599.2 x .11

= 11615.912 Nm

Which is still greater than astern condition. Therefore, value for ahead condition is taken and previous calculation is taken as final result. And previous calculation is given below:

= v = v­0 for astern condition

CR = 132 x 3.14 x 72 x 1.067 x 1.4 x .8 x 1

Here, other than k2 all the coefficients are as same as the ahead condition.

Therefore, CR= 24300 N

Rudder Torque, QR= CR x r

Again, r = c (𝛼 × 𝐾𝑏)

𝛼 = .33 = for ahead condition

Kb = Af /A= 0.2

r = 2.27 x (.33 x 0.2)

= 0.15 m

QR = 105599.2 x .11

= 11615.912 Nm

=12 kN

**Steering Gear Arrangement Selection:**

From 12 kN-m torque result we end up with Hydroster’s MS Series Piston type hydraulic steering gear arrangement .

And the design-model is “MS-25-35”

This particular model is capable of delivering 12 kN of working torque at working pressure wth α = 35°

And design torque is 25 kN with the angle, α = 35°