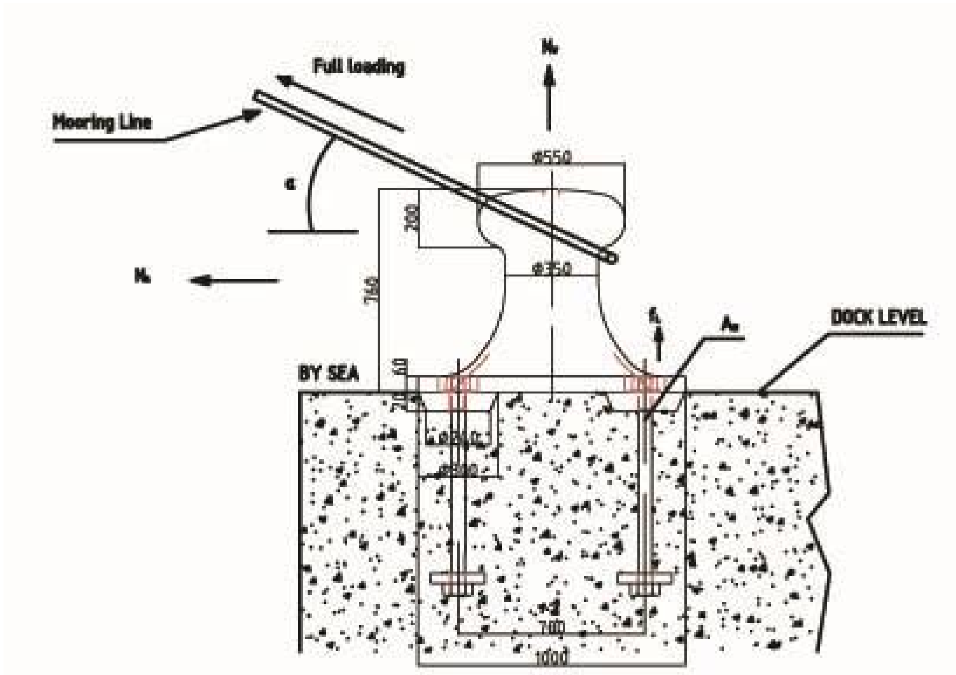
Calculation for bollard

100T Bollard

Subject: GLENTECH 100 TONS BOLLARDS Document No.: 698-MC-01 rev.a



$\frac{Nv}{A}+\frac{Mmax}{W} \leq [\sigma]$

$$\frac{Nh\ Smax}{bIz} \leq [\tau]$$

A=cross sectional area of bollard（mm^2）

W= elastic section modulus (mm^3)

M_{max}=maximum value of Bending moment (N.mm)

S_{max}=static moment (mm^3)

$[\sigma]=\frac{\sigma b}{N s}$

σb= tensile strength of bollard material (Mpa)

$[\tau]=\frac{\tau}{Ns}$

τ = shear strength of bollard material (Mpa)

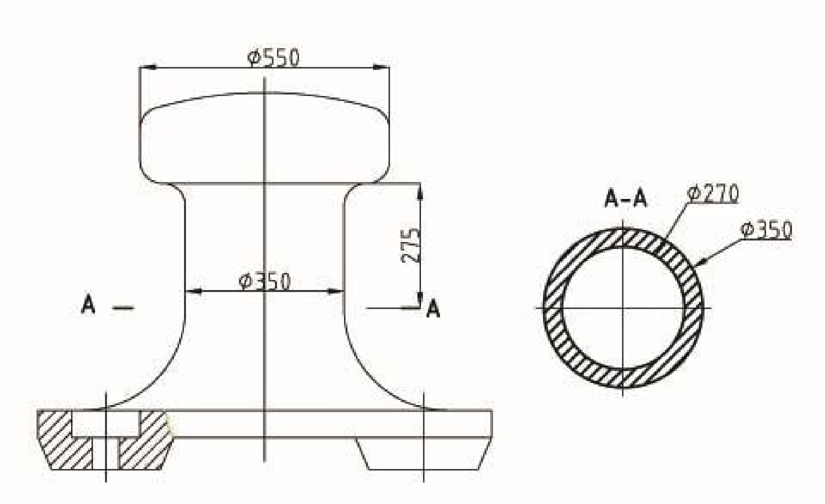
Ns= safe factor

Detailed calculations to demonstrate:

1. 100T Bollards:

Request:

Minimum safety factor against deformation shall be 2.0



Calculations to demonstrate:

Bollards material : QT450-10 equal to Astm a536-65-45-12

σ_b = 450 Mpa

$\sigma_{0.2}$=310 Mpa

WhenMooring Ling α =30°

$(Nv/A+M_{max}/W) \leqslant [\sigma_{0.2}]$

A=38955 mm^2

Nv=490X10^3 N

N_h=-849X10^3 N

H=275mm

M_{max}=233475X10^3 N.mm

Wx=2718554mm^3

σ=12.5+85.9= 94.8Mpa$\leqslant \sigma_{0.2}$=310/2=155Mpa

and against break is 3.0

σ =12.5+85.9= 94.8Mpa$\leqslant \sigma_b$=450/3.0=150Mpa