NATIONAL UNIVERSITY OF ENGINEERING

COLLEGE OF MECHANICAL ENGINEERING

PROFESSIONAL SCHOOL OF NAVAL ENGINEERING

2016

Design of a Pursue Seine Fishing Vessel. Naval Architecture and Marine Engineering Design

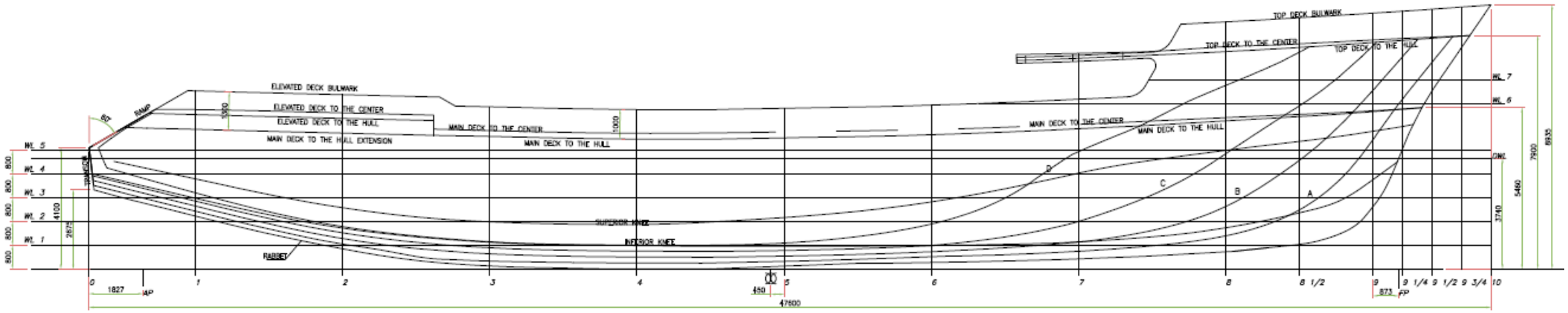
COURSE:	**NAVAL PROJECTS II**
PROFESSOR:	**OSCAR BERNABE**
STUDENTS:	**EDWARD VALERO**
	ERICK UCEDA
	ROBERTO NUÑEZ

LIMA-PERU

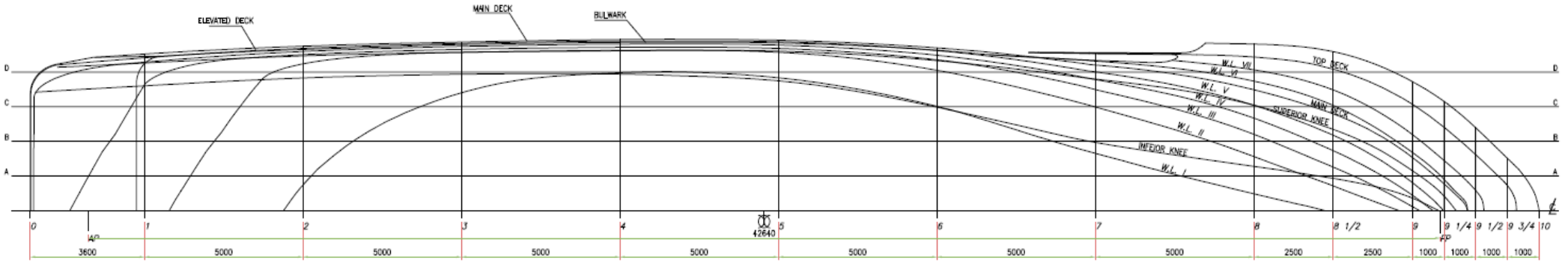
CONTENT

1. NAVAL ARCHITECTURE – SHAPE LINES AND GENERAL DISPOSITION

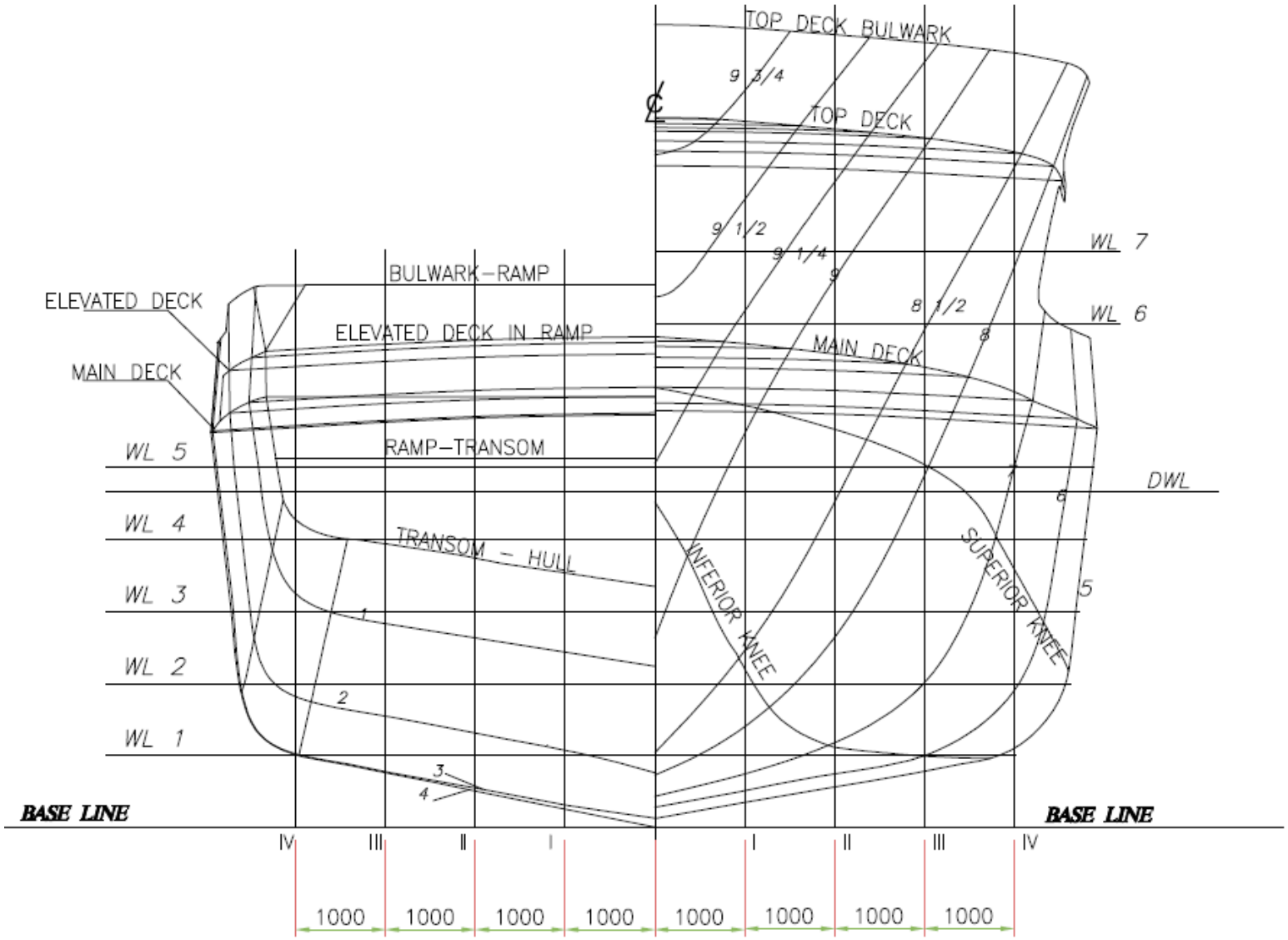
1.1. SHAPE LINES



LONGITUDINAL ELEVATION

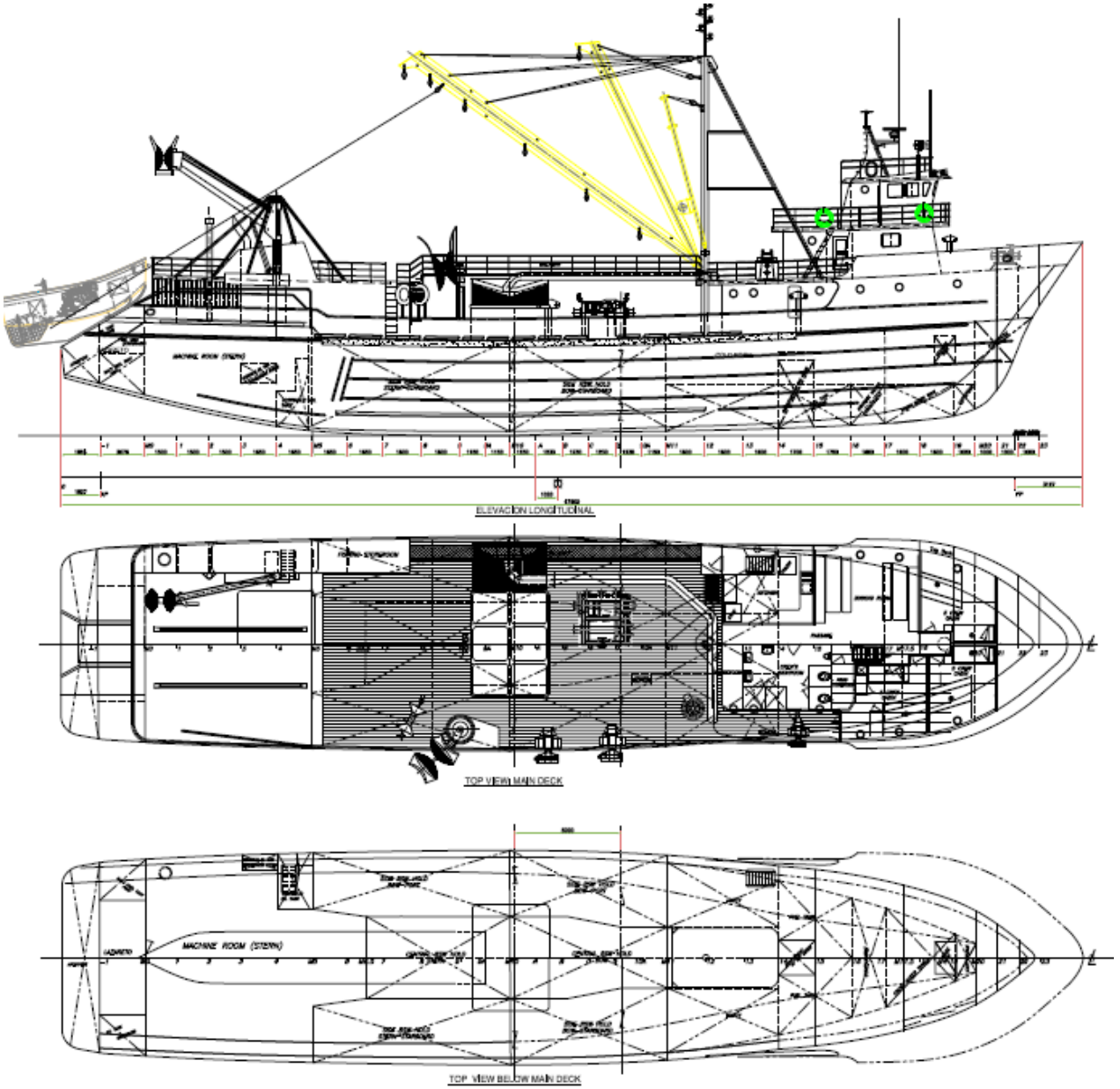

ELEVATED DECK
MAIN DECK
BULWARK
W.L. VII
W.L. VI
W.L. V
W.L. IV
W.L. III
W.L. II
W.L. I
TOP DECK
MAIN DECK
SUPERIOR KNEE
INFERIOR KNEE
D
C
B
A
0
AP
1
2
3
4
42640
5
6
7
8
8 1/2
9
FP
9 1/4
9 1/2
9 3/4
10
3600
5000
5000
5000
5000
5000
5000
5000
2500
2500
1000
1000
1000
1000

TOP VIEW



CROSS SECTION

1.2. GENERAL DISPOSITION



2. NAVAL ARCHITECTURE - STRUCTURE CALCULATION

2.1. MAIN DIMENSIONS

MAIN CHARACTERISTICS	
OVERALL LENGTH	47.6 m
LENGHT BETWEEN P.P.	42.64 m
BREADTH	9.9 m
DEPTH	4.4 m
VELOCITY	13 knots

The structure of this vessel will be longitudinal, with a separation between its main reinforcements of 0.5 m, and its secondary reinforcements of 1.5 m.

OTHER CHARACTERISTICS TO BE USED	
BLOCK COEFFICIENT	0.575
MATERIAL K FACTOR	1
“P0” LOAD	10.45 Kn/m2
n1 (Longitudinal)	1.6
n2 (Longitudinal)	4.8

To make our structural calculations, we will start by obtaining the thicknesses of the exterior hull plates, decks and superstructures.

Then we will get the minimum section modulus required for the main and secondary reinforcements also depths that will be used in our boat.

Finally, considering the midship section modulus, we will choose reinforcements with higher section modulus than the previously found value.

To carry out these calculations we will use the GERMANISCHER LLOYD "GL" CLASSIFICATION AND CONSTRUCTION REGULATIONS for deep-sea fishing vessels.

2.2. EXTERIOR HULL PLATES THICKNESS

For calculating the thickness of the plates GL divides the hull into 3 zones.

STRUCTURAL AREAS		X/L
MIDDLE AREA	M	[0.1-0.3]
STERN AREA	A	[0.3-0.7]
BOW AREA	F	[0.7-0-9]

2.2.1. BOTTOM

Bottom plates thickness will be calculated with the following formulas:

MIDDLE AREA:

$$t = n_1 * a * \sqrt{P_B * k} + t_K \ mm$$

Where we get:

t = 6.76 mm

EDGE AREAS

Thickness will be calculated:

$$t_1 = 1.26 * a * \sqrt{P_B * k} + t_K \ mm$$

$$t_2 = (1.5 - 0.01 * L) * \sqrt{L * k} + t_K \ mm$$

We will take the greater of those 2 thickness values, from where we obtain that the minimum thickness for both cases will be given by t2.

t = 7.02 mm

FORE END BOTTOM PLATES

Thickness will be calculated:

$$t = 2.6 * a * \sqrt{L * k} * f_2 + \Delta_t \ mm$$

Where: $f_2 = 1$

Where we get:

t = 9.17 mm

SUMMARY

BOTTOM THICKNESS SUMMARY		
MIDDLE AREA		
t	6.76	mm
t real	8	mm
STERN AREA		
t	7.02	mm
t real	8	mm
BOW AREA		
t	9.17	mm
t real	9.5	mm

2.2.2. SIDE PLATES

For the calculation of these thicknesses, the load on the sides will be P_S.

Where:

$$P_S = 10 * (T - z_A) + p_0 * \left[0.5 - \frac{z_A}{2 * T}\right] + b$$

$$P_S = p_0 * (1 + b) * k$$

The greater of both will be used.

So:

STRUCTURAL AREAS	Ps
MIDDLE AREA	34.9423846
STERN AREA	28.8153846
BOW AREA	42.3953846

MIDDLE AREA

The thickness of the side plate of this zone will be calculated with the following formula.

$$t = n_2 * a * \sqrt{P_S * k} + t_K + 0.5 \ mm$$

Where we get:

t = 5.04 mm

EDGE AREAS

Thickness will be calculated:

$$t_3 = 1.26 * a * \sqrt{P_s * k} + t_K \ mm$$

Where stern area thickness will be:

t = 5.35 mm

And bow area thickness will be:

t = 5.69 mm

SUMMARY

Side thickness Summary		
Middle area		
t	5.04	mm
t real	6.4	mm
Stern area		
t	5.35	mm
t real	6.4	mm
Bow area		
t	5.69	mm
t real	6.4	mm

2.2.3. DECK PLATES

DECK THICKNESS

Deck plate thickness will be calculated with the following formula:

$$t = (5.5 + 0.02 * L) * \sqrt{k} \quad para\ t_{min} = 6\ mm$$

Where we get:

t = 6.34 mm

STERN RAMP THICKNESS

Stern ramp thickness will be calculated with the following formula:

$$t = (8 + 0.1 * L) * \sqrt{k}$$

Where we get:

t = 12.3 mm

SUMMARY

Deck thickness Summary		
Decks		
t	6.34	mm
t real	6.4	mm
Stern ramp		
t	12.3	mm
t real	12.5	mm

2.3. STIFFENERS CALCULATION

2.3.1. BOTTOM, SIDE, DECK LONGITUDINALS.

For the calculation of the section modulus of the longitudinal stiffeners, the following formula shall be used:

$$w = 0.8 * k * a * l^2 * p$$

Where "p" can be:

$$p = P_B \ \ for\ the\ bottom$$

$$p = P_S \ \ for\ the\ side$$

$$p = P_D \ \ for\ the\ deck$$

$$P_D = \ p_0 \frac{10 * T}{(10 + z - T) * H}$$

From where we get the following section modulus:

SECTION MODULUS		
LONGITUDINALS STIFFENERS		
Bottom	51.12	cm3
Side	38.15	cm3
Deck	7.2	cm3

2.3.2. BOTTOM STIFFENERS

FLOOR PLATE

Floor Plate Section Modulus will be calculated with the following formula:

$$w = c * T * a * l^2$$

Where:

$$c = 7.5 \ \ machine\ room$$

$$c = 4.5\ In\ other\ compartments$$

$$a = 1.5$$

$$l_{min} = 0.7 * B$$

Floor plate section modulus for both conditions is:

SECTION MODULUS		
FLOOR PLATES		
Machine room	261.87	cm3
Others	157.12	cm3

GIRDER

Girder Section Modulus will be calculated with the following formula:

$$w = c * T * a * l^2$$

Girder section modulus for both conditions is:

SECTION MODULUS		
GIRDERS		
Machine room	158.7	cm3
Others	95.22	cm3

SUMMARY

Stiffener dimensions to be chosen are:

1.1. Side stiffeners
1.2. Deck stiffeners

Beams and lenghts section modulus shall be calculated with the following formula:

$$w = 0.8 * P_D * a * l^2$$

Where:

$$l_{Beam} = \frac{B}{4}$$

$$l_{lenght} = \ 1.5$$

Section modulus for both conditions is:

SECTION MODULUS		
DECK		
BEAMS	158.7	cm3
LENGTHS	95.22	cm3

2.4. LOWER BULKHEAD

2.4.1. TRANSVERSE BULKHEADS

Transverse bulkhead thickness shall be calculated with the following formula:

$$t = c_p * a * \sqrt{h * k} + t_K$$

Where

$$t_{min} = 6\sqrt{k}$$

$$t = 6\ mm$$

So the lower bulkhead thickness will be 6.4 mm.

2.4.2. CORRUGATED BULKHEADS

Transverse bulkhead thickness shall be calculated with the following formula:

$$t = c_p * a * \sqrt{h * k} + t_K$$

Where: $a = 0.3\ mm$

$$t_{min} = 6\sqrt{k}$$

$$t = 6\ mm$$

So the corrugated bulkhead thickness will be 6.4 mm.

2.5. STIFFENERS CHOSEN

LONGITUDINALS STIFFENERS		W	
BOTTOM	120x12.7 Plate	59.9	cm3
SIDE	100x12.7 Plate	41.35	cm3
DECK	90x8 Plate	22.08	cm3
TOP DECK	70x8 Plate	13.85	cm3

FLOOR PLATES	
MACHINE ROOM	T 300x8x100
OTHERS	L 300x8x50

GIRDERS	
MACHINE ROOM	9.5 mm Plate

FRAMES		W	
ALL	L 250x90x8	370.62	cm3

BEAMS		W	
ALL	L 150x75x8	237.02	cm3

2.5.1. BULKHEAD STIFFENERS:

$$w = 0.55 * k * a * l^2 * p$$

Where we get a section modulus of:

$$w = 99.28\ cm3$$

For which we will choose a stiffener of:

BULKHEAD STIFFENERS		W	
BOTTOM	L 120x80x8	100.66	cm3

2.5.2. DEPTHS

Steel depths section modulus will not be less than:

$$w = c * h^3 * (b + l)k$$

Where:

$$c = 1.6$$

$$h = 4\ m$$

$$b = 3\ m$$

$$l = 4.5$$

Where we get:

$$w = 768\ cm3$$

The depths we will choose for the machine and cold room will be SCH 40 88.9 mm diameter Steel pipes.

3. MARINE ENGINEERING – VESSEL SYSTEMS

3.1. GOVERNMENT SYSTEM

3.1.1. BLADE AREA

SIZE OF BLADE AREA ACCORDING TO GL				
$A = c_1 \,.\, c_2 \,.\, c_3 \,.\, c_4 \, \frac{1{,}75 \,.\, L \,.\, T}{100} [m^2]$				
C_1	1	Vessel type factor (in general)		
C_2	1	Shovel type factor (in general)		
C_3	1	Profile type factor (Naca profile)		
C_4	1	Disposition factor (within the water stream)		
L	42.7	Length between perpendiculars (m)		
T	3.74	Draught of the vessel		
		Min. Blade area	2.79	m^2

SIZE OF BLADE AREA FOR OFFSHORE SHIPS			
$A = \frac{L.T}{30}$			
L	42.7	Lenght between perpendiculars	
T	3.74	Draught of the ship	
Min. blade area		5.32	m2

SIZE OF BLADE AREA FOR OFFSHORE SHIPS			
$A = \frac{T.L}{100}(0.75 + \frac{150}{L+75})$			
L	42.7	Lenght between perpendiculars (m)	
T	3.74	Draught of the ship (m)	
Min. blade area		3.23	m2

SUMMARY

SIZE OF BLADE AREA ACCORDING TO GL	2.79	m^2
BLADE AREA SIZE FOR OFFSHORE VESSELS	5.32	m^2
SIZE OF BLADE AREA FOR STABILITY	3.23	m^2
SIZE OF BLADE AREA ACCORDING TO IMO	3.5	m^2
AVERAGE BLADE AREA	**3.71**	**m^2**

DIMENSIONS OF THE BLADE WITH PRACTICAL DATA				
$h^2 = \frac{A_p}{0.6}$	A_p	3.71	Area of the shovel	m^2
	h	2.49	Height of the shovel	m
	h_{chos}	2.5	Height of the chosen blade	m
$L_R = \frac{A_p}{h}$	L_R	1.49	Width of the blade	m
	L_{Rchos}	1.5	Width of the chosen blade	m
$C = L_{Rchos}$	C	1.5	Middle width of the blade	m
$x_{min} = 0.22\ C$	x_{min}	0.33	Minimun distance to the axis	m
$x_{max} = 0.28\ C$	x_{max}	0.42	Maximum distance to the axis	m
$x_{chos} = 0.25\ C$	x_{chos}	0.38	Chosen distance to the axis	m
$A_p = h_{chos} . L_{Rchos}$		**3.75**	**Blade area**	**m^2**

SIZE OF BLADE AREA FOR OFFSHORE SHIPS			
$A = \frac{T.L}{100}\left(k_1.\frac{B}{L}.C_b + k_2\right);\ k_1 = \frac{54}{7{,}2 - \frac{t.V}{L}};\ k_2 = 0{,}0008\frac{B}{T}.\left(\frac{L}{B.C_b}\right)^2$			
B	9.9	Breadth of the ship (m)	
Cb	0.7	Block coefficient	
t	10	Time to go from 35°b. to 35°e (s)	
V	13	Speed of the ship (knt)	
L	42.7	Lenght between perpendiculars (m)	
T	3.74	Draught of the ship (m)	
k_1	12.9948		
k_2	0.0804		
Min. blade area		3.5	m^2

The area of the blade will be 3.75 m^2 with a height of 2.5 m and a width of 1.5 m.

3.1.2. BLADE FORCE IN FORWARD AND BACKWARD CONDITION

BLADE FORCE IN FORWARD CONDITION				
$C_R = 132.A.V^2.K_1.K_2.K_3.K_T; \quad K_1 = \frac{\Lambda+2}{3}; \quad \Lambda \leq 2; \quad \Lambda = \frac{b^2}{A_T}$				
$A = A_P = A_T$	3.75	Area of the surface of the blade		m^2
$V = V_O$	13	Speed of ship advance		knt
h_{chos}	2.5	Height of the chosen blade		m2
Λ	1.67	Blade shape ratio		--
K_1	1.22	Coef. Depending on the dimensions		--
K_2	1.1	Coef. For the forward condition		--
K_3	1	Coef. For the condition within the stream (common)		--
K_T	1	Coef. Related to the material (ASTM 136)		--
		FORCE ON THE BLADE: C_R	**112469.5**	**N**

BLADE FORCE IN BACKWARD CONDITION				
$C_R = 132.A.V^2.K_1.K_2.K_3.K_T; \quad K_1 = \frac{\Lambda+2}{3}; \quad \Lambda \leq 2; \quad \Lambda = \frac{b^2}{A_T}$				
$A = A_P = A_T$	3.75	Area of hte surface of the blade		m^2
$V = V_a = 0.4V_o$	5.2	Speed of ship advance		knt
h_{chos}	2.5	Height of the chosen blade		m
Λ	1.67	Blade shape ratio		--
K_1	1.22	Coef. Depending on the dimensions		--
K_2	1.4	Coef. For the backward condition		--
K_3	1	Coef. For the condition within the stream		--
K_T	1	Coef. Related to the material		--
		FORCE ON THE BLADE: C_R	**22902.88**	**N**

For calculations, the greatest value of force on the blade will be taken.

3.1.3. BLADE TORQUE IN FORWARD AND BACKWARD CONDITION

BLADE TORQUE IN FORWARD CONDITION				
$Q_R = C_R.r;\quad r = c(\propto -k_b);\quad K_b = {}^{A_F}/_{A}$				
C_R	112469.5	Force on the blade for advancement.		N
$c = L_{Rchos}$	1.5	Blade middle width		m
α	0.33	Coef. For the forward condition		---
$X = X_{chos}$	0.38	Chosen distances to the axis		m
$h = b_{chos}$	2.5	Height of chosen blade		m
$A_F = X.b$	0.9375	Surface area of the blade to the bow		m2
$A = A_P$	3.75	Blade area		m2
K_b	0.25	Blade balance factor		---
r	0.12	Radius for the forward condition		m
$r_{min} = 0.1\ c$	0.15	Minimum radius for the forward condition		m
		Torque on the blade: Q_R	**16870.43**	**N.m**

BLADE TORQUE IN BACKWARD CONDITION				
$Q_R = C_R.r;\quad r = c(\propto -k_b);\quad K_b = {}^{A_F}/_{A}$				
C_R	22902.88	Force on the blade for regression		N
$c = L_{Rchos}$	1.5	Blade middle width		m
α	0.66	Coef. For the backward condition		---
$X = X_{chos}$	0.38	Chosen distances to the axis		m
$h = b_{chos}$	2.5	Height of chosen blade		m
$A_F = X.b$	0.9375	Surface area of the blade to the stern		m^2
$A = A_P$	3.75	Blade area		m^2
K_b	0.25	Blade balance factor		---
r	0.62	Radius for the backward condition		m
		Torque on the blade: Q_R	**14085.27**	**N.m**

For the calculations, the greater value of the torque on the blade will be taken.

3.1.4. DIAMETER OF THE BLADE SHAFT OR WICK OF THE HELM

DIAMETER OF THE BLADE SHAFT OR WICK OF THE HELM					
$D_t = 4{,}2\sqrt[3]{Q_R.k_r};\quad k_r = \left(\frac{235}{R_{eH}}\right)^{0.75};\quad R_{eH} > 235$					
R_{eH}	331.5	SAE 1020 Steel Creep Effort		N/mm^2	
R_m	449.1	SAE 1020 Steel Traction Effort		N/mm^2	
$R_{eHmax} = 0.7\ R_m$	314.37	SAE 1020 Steel Maximun Creep Effort		N/mm^2	
k_r	0.8	Material factor of blade shaft		---	
Q_R	16870.43	Torque on the blade in critical condition		N.m	
		Shaft diameter: D_t	100.16	mm	3.94
		Chosen shaft diameter	114.3	mm	4.5

A 4.5-inch blade shaft diameter was chosen because the flange would be welded to the shaft. (NOTE: The chosen diameter is 1.1 times Dt, if there is no commercial shaft approaching the nearest one)

3.1.5. DIAMETER OF BARON SHAFT

DIAMETER OF THE BLADE SHAFT OR WICK OF THE HELM					
$D_1 = 0{,}1.D_t\sqrt[6]{1+\frac{4}{3}(\frac{M_b}{Q_R})}\,[cm];\quad M_b = \frac{h_R}{10.C_r}P_r;\quad C_r = \mathrm{b}.\frac{R^2}{A_R}.$					
C_R	112469.5	Force on the blade in critical condition		N	
h	2.5	Height of chosen blade		m	
b	1.5	Width of chosen blade		m	
A_p	3.75	Chosen blade area		m	
C_t	0.6	Constant			
		Bending moment: M_b	46862.29	N.m	
Q_R	16870.43	Torque on the blade in critical condition		N.m	
D_t	114.3	Diameter of the calculated blade shaft		mm	
		Shaft diameter: D_1	17.12	cm	6.74
		Chosen shaft diameter	171.19	mm	
		Chosen shaft diameter	190.5	mm	7.5

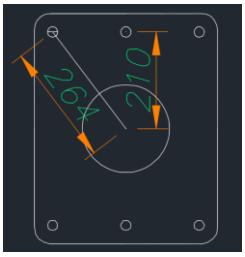
A 7.5-inch blade shaft diameter was chosen because the flange would be welded to the shaft. (NOTE: The chosen diameter is 1.1 times D1, if there is no commercial shaft approaching the nearest one)

BARON SHAFT DIAMETER CALCULATION SUPPPORT				
$\sigma_V = \sqrt{\sigma_b^2 + 3\tau^2} \le \frac{118}{k_r}\left[N/_{mmn^2}\right];\ \tau = \frac{5{,}1.Q_R}{D_1^3}\left[N/_{mmn^2}\right];\quad \sigma_b = \frac{10.2.M_b}{D_1^3}\left[N/_{mmn^2}\right].$				
k_r	0.8	Material factor for the baron shaft		---
Q_R	16870.43	Torque on shovel in critical condition		N.m
D_t	19.05	Diameter of the selected baron shaft		cm
M_b	46862.29	Bending moment of blade		N.m
Down higher that above		Torsion Effort: τ	12.45	N/mm^2
		Flexion Effort: σ_b	69.14	N/mm^2
		Combined effort: σ_V	72.42	N/mm^2
		Maximum Combined Effort	146.78	N/mm^2
As: $118/k_r > \sigma_V$ → The calculation of the diameter of the baron axis is sustained				

3.1.6. DIAMETER OF THE COUPLING BOLTS AND COUPLING FLANGE THICKNESS

To calculate the distance from the bolt shaft to the bolt system an average will be taken with the corresponding measurements (SEE PLAN)

D1	**210**	**mm**
D2	**264**	**mm**
D3	**264**	**mm**
e	**246**	**mm**



DIAMETER OF THE COUPLING BOLTS					
$d_b = 0{,}62\sqrt{\frac{D^3.k_b}{k_r.n.e}}\ [mm]$					
D	114.3	Diameter of blade shaft		mm	
n	6	Number of bolts (Minimum equal to 6)		---	
$R_{cH(b)}$	331.5	SAE 1020 Steel Creep Effort (Grade 8)		N/mm^2	
K_b	0.8	Material factor for bolts		---	
$R_{cH(r)}$	331.5	SAE 1020 Steel Creep Effort		N/mm^2	
K_r	0.8	Material factor for blade shaft		---	
e	246	Distance from bolt shaft to bolt system		mm	
		Bolt diameter: **d_b**	19.72	mm	0.78
		Diameter chosen: **d_b**	22.23	inch	7/8.

THICKNESS OF THE COUPLING FLANGE					
$t_f = 0{,}62\sqrt{\frac{D^3.k_f}{k_r.n.e}}\ [mm]\ ;\ t_{fmin} = 0{,}9.d_b[mm]$					
t_{fmin}	37.1475	Minimum thickness of coupling flange		mm	
D	114.3	Diameter of blade shaft		mm	
$R_{cH(f)}$	331.5	SAE 1020 Naval Steel Creep Effort		N/mm^2	
K_f	0.8	Material factor for coupling flange		---	
$R_{cH(r)}$	331.5	SAE 1035 Steel Creep Effort		N/mm^2	
K_r	0.8	Material factor for blade shaft		---	
n	6	Number of bolts (Minimum equal to 6)		---	
e	246	Distance from bolt shaft to bolt system		mm	inch
		Flange thickness: **t_f**	19.72	mm	0.776
		Thickness chosen: **t_f**	25.4	mm	1

3.1.7. THICKNESS AND HEIGHT OF THE BLADE REINFORCEMENT PLATE

THICKNESS OF THE BLADE REINFORCEMENT PLATE					
$t' = \frac{t_f}{3} + 5\ [mm]\ where\ t_f < 50mm; t' = 3\sqrt{t_f}\ [mm]\ \ where\ \ t_f \geq 50mm$					
t_f	25.4	Thickness of the coupling flange		mm	inch
		Reinforcement Thickness: **t**	13.47	mm	0.53
		Thickness chosen: **t**	15.875	mm	5/8.
HEIGHT OF THE BLADE REINFORCEMENT PLATE					
$h = 5.t_f\ [mm]\ ;\ \ h_{min} = 300\ [mm]$					
t_f	0.8	Thickness of the coupling flange		mm	
		Height Thickness: **t**	127	mm	
		Height chosen: **t**	300	mm	

3.1.8. THICKNESS OF THE BARON SHAFT LOWER CASE

THICKNESS OF THE BARON SHAFT LOWER CASE					
$t_c \geq 0.03D_{eb} + 7.5\ \ [mm]$					
D_{eb}	190.5	Diameter of the baron shaft lower case		mm	
		Case thickness: t_c	13.22	mm	0.52
		Chosen thickness: t_c	15.88	mm	5/8.
		Chosen thickness: t_c	0.625	inch	

In this case the thickness of the jacket coincides with the dimensions of the mixed horn of catalogs, otherwise the jacket should not be less than the specified thickness and must be machined to fit in the commercial mixed horn.

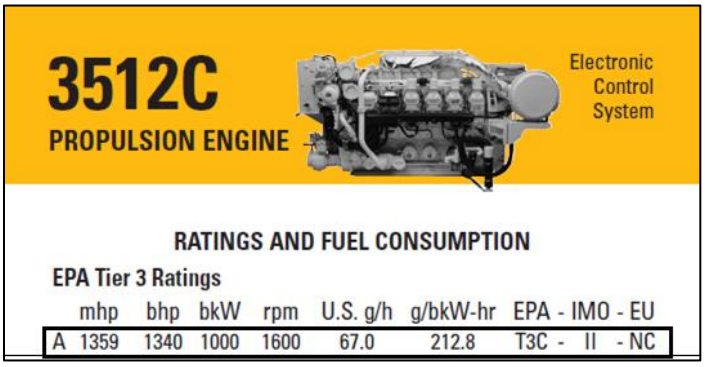
3.2. PROPULSION SYSTEM

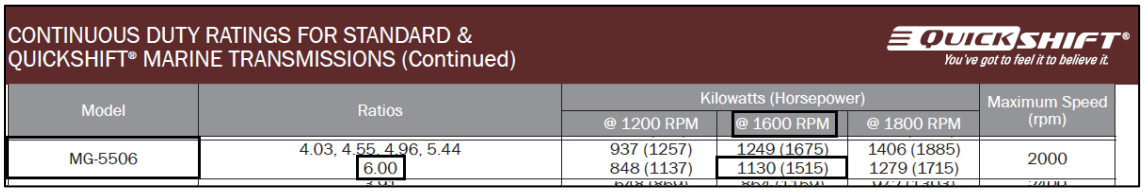
3.2.1. MOTOR, BOX AND PROPELLER SELECTION

According to the CATERPILLAR rule to calculate power and propeller we need the data in port output and the maximum load

	Port Output	Maximum Load
DRAUGHT (T)	2.464 m	3.74 m
MASTER SECTION COEFFICIENT (C_{SM})	0.63	0.842
PRISMATIC COEFFICIENT (C_{pris})	0.792	0.689
WATERLINE (LWL)	42.054 m	44.019 m
WATERLINE (LWL)	137.97 feet	144.42 feet
DISPLACEMENT	502.7 ton	956.7 ton
TRIMMING	0 m	0 m
VELOCITY	13 knt	13 knt
FROUDE NUMBER	1.03	1.007

With the mentioned data, we find that the power required to move the ship at 13 knots in port output condition is 1300 HP.





CAT 3512 C ENGINE	**1340 HP 1600 RPM**

TWIN DISC MG5506 BOX	**1515 HP RATIO 6:1**
SHAFT RPM	**266.67**
MASTER SECTION COEFFICIENT (C_{SM})	0.63
PRISMATIC COEFFICIENT (C_{pris})	0.792
WATERLINE (LWL)	137.97 inches
DISPLACEMENT	502.7 ton
Va	10.8
Bp	25.5

These data give us the characteristics of the propeller.

BLADES NUMBERS	**3**
DIAMETER	**101''<>2565.4 mm**
PITCH	**66'' <>1676.4 mm**
PITCH-DIAMETER RATIO	**0.65**
EFFICIENCY	**0.615**

3.2.2. MINIMUM TAIL SHAFT DIAMETER

$$d \geq F \cdot k \cdot \sqrt[3]{\left[\frac{P_w}{\left[n \cdot \left[1-\left(\frac{d_i}{d_a}\right)^4\right]\right]} \cdot C_w\right]} \leq d_a$$

CAT 3512C@1600RPM ENGINE					
Engine power	**1340**	**BHP**	**1000**	**kW**	
			950	**kW**	**[In the shaft]**

TWIN DISC MG5506 BOX	
Box ratio	**6**

Rm	673.7	Tensile strength of material [N/mm^2] SAE 1045
F	100	Factor corresponding to the type of propulsion

k	1.26	Shaft type factor
Pw	949.658	Rated power transmitted by the shaft [kW]
Cw	0.67	Material Factor
n	267	Shaft Revolutions [RPM]

d	168.5	mm	177.8	mm
	6.63	Inch	7	inch

We will use a 7-inch diameter for the tail shaft. (See plan)

3.2.3. MINIMUM THICKNESS OF CASE

$$s = 0{,}03 \cdot d + 7{,}5$$

	d	s	Units
Tail shaft	177.8	12.83	mm

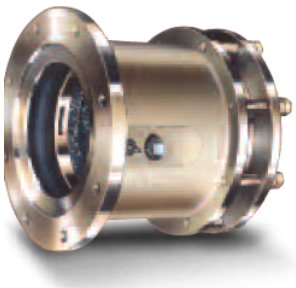
For the cable gland part, we will use a 14.29 mm case and for the part of the case a 15.875 mm thick case. (See Plan)

3.2.4. CABLE GLAND SELECTION

Casquillo de bocina del prensaestopas de proa

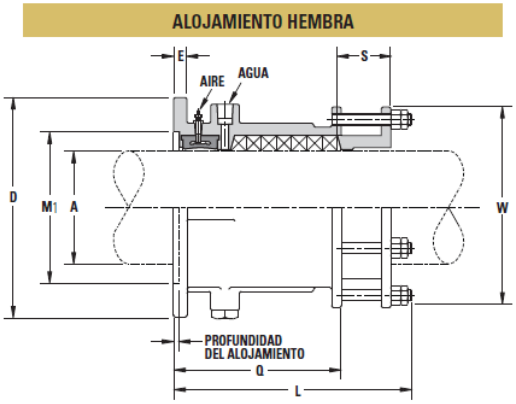
Modelo 1788

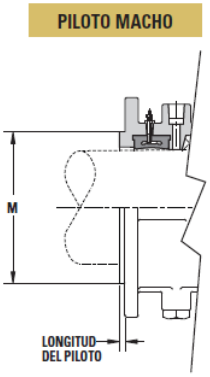
Servicio de agua con anillo obturador de aire



DIMENSIONES: PILOTO MACHO / ALOJAMIENTO HEMBRA

Tamaño del diámetro del eje	Piloto macho	Alojamiento hembra
2-1/2" – 5-3/4"	3/16"	3/16"
6" – 15"	1/4"	3/8"





ESPECIFICAR CUANDO SE HAGA EL PEDIDO:
Número de modelo: **Aleación:** Bronce (estándar) o aluminio **Diámetro del eje:** En pulgadas o en milímetros **Configuración:** piloto macho o alojamiento hembra

Diámetro exterior del ciclo de la camisa o eje	CÓDIGO	Diámetro de la brida	Grosor de la brida	Diámetro del piloto macho	Diámetro del alojamiento hembra	Longitud	Longitud general	Longitud del rodamiento	Diámetro de la brida del rodamiento	Diámetro exterior de la empaquetadura	Tamaño de empaquetado	Número de anillos	Número de orificios	Tamaño de broca	Diámetro de los pernos	Espaciado entre orificios
A		D	E	M	M1	Q	L	S	W	Empaquetado			Información de perforación			
8 203,20	0800	14 -7/8 377,83	7/8 22,23	10 -1/4 260,35	10 -3/8 263,53	11 -1/8 282,58	15 -5/8 396,88	3 -1/2 88,90	13 -5/8 346,08	10 254,00	1 25,40	7	8	13/16 20,64	13 -1/8 333,38	45/45
8 -1/8 206,38	0818	14 -7/8 377,83	7/8 22,23	– –	10 -3/8 263,53	11 -1/8 282,58	15 -5/8 396,88	3 -1/2 88,90	13 -5/8 346,08	10 -1/8 257,18	1 25,40	7	8	13/16 20,64	13 -1/8 333,38	45/45
8 -1/4 209,55	0814	15 -1/4 387,35	7/8 22,23	11 279,40	10 -3/4 273,05	11 -1/8 282,58	15 -5/8 396,88	3 -1/2 88,90	14 355,60	10 -1/4 260,35	1 25,40	7	8	13/16 20,64	13 -1/2 342,90	45/45

3.3. UNLOADING AND FIRE SYSTEM

The unloading system has been designed with the basic specifications set by the ABS, and as it has been linked with the fire system and it has been considered the most critical point, the system against fire. Following the provisions imposed by DICAPI in the "SAFETY RULES FOR SHIPS AND BOATS DEDICATED TO INLAND NAVIGATION.

DICAPI in the "SAFETY RULES FOR SHIPS AND BOATS DEDICATED TO INLAND NAVIGATION", Chapter 8, rule 6.1, states: "... amount of water reaching a pressure of 0.2 N / mm2 ... capable of pumping water at a speed of 2 M / s ". In rule 6.3 it says: "... the diameter of the nozzles shall not be less than 12 mm for vessels of 24 m in length or more ...".

In order to determine the pump to be used, the minimum requirements set by DICAPI will be taken into account**.**

$$POT = \frac{Ge \times Q \times ADT}{75 \times n}$$

Where:

POT = Pump power.

Ge = Specific Gravity of Fluid

Q = Flow

ADT = Total dynamic height (m)

n = Efficiency

In order to determine the flow rate, the data provided by DICAPI have been taken into account.

$$Q = A \times v$$

Dónde:

A = Area of the pipe.

v = Flow velocity

$Q = (\pi \times (38.1m)^2) \times 2.25m/s,$

$Q = 0.01026m^3/s,$

$$\boldsymbol{Q = 36.98m^3/h.}$$

The output flow for a python will be 36.9 m3 / s. With two firepower, it will have a flow of 73.8 m3 / s.

It has been considered the use of two pumps that will act as fire pumps each with a flow of 36m3 / h. The calculated total dynamic height of the whole system is 15m. The efficiency of the pump has been considered in 62% considering the mechanical and electrical losses.

With all these data we calculate the Fire Pump:

$$POT = \frac{(1Kg/l) \times (10l/s) \times (15m)}{75 \times 0.62};$$

$$POT = 3.23HP.$$

The fire pump will be 3.23HP.

For the auxiliary fire pump, it is being considered a motor pump that manages to replace these two electric pumps, therefore the flow that must deliver must be the same as the previous two. For this reason the data of the motor pump should be the following: A flow of 72m3 / h, the dynamic height of 15m, and an efficiency of 62%.

$$POT = \frac{(1Kg/l) \times (20l/s) \times (15m)}{75 \times 0.62};$$

$$POT = 6.46HP.$$

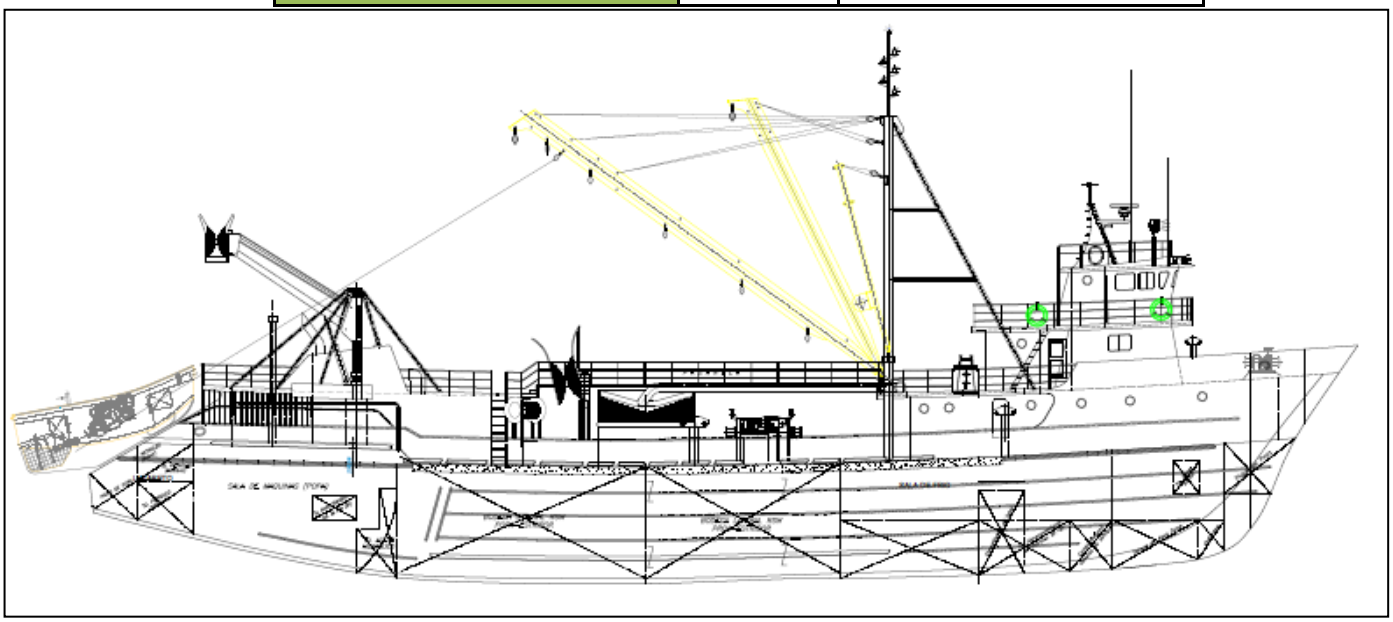
4. NAVAL ARCHITECTURE – TRIM AND STABILITY BOOKLET

4.1. GENERAL DESCRIPTION

OVERALL LENGTH	47.6 m
BREADTH	9.90 m
DEPTH	4.40 m
VELOCITY	13 knt
AUTONOMY	10 days
CREW	18 and captain
STORAGE CAPACITY	450 m3

DESCRIPTION	WEIGHT	Mto(KG) (KG*WEIGHT)	Mto(lcg) LCG*WEIGHT
	(kg)	ton-m	ton-m
TOTAL HULL	284100.297	769103.239	415073.717
TOTAL SUPERESTRUCTURE	25027.056	201974.923	-293901.483
TOTAL SYSTEM AND EQUIPMENT	112270.5	276165.418	802806.737
BOAT IN LIGHTWEIGHT	421397.853	1247243.58	923978.971

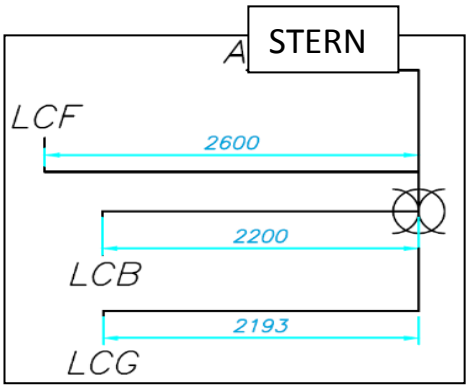
KG	2.960	m from L.B.
LCG	2.193	m a stern of Sec. Med.



4.2. LAYING IN THE SEA

Element	%	Weight T.(Kg)	Weight x %	KG	M V (kg.m)	LCG	M L (kg.m)
Light weight	-	421397.853	421397.853	2.960	1247243.580	2.193	923978.971
Panga	-	0.000	0.000	5.733	0.000	22.702	0.000
Wet Red	-	0.000	0.000	5.895	0.000	12.917	0.000
Supply of food	-	0.000	0.000	2.391	0.000	-7.682	0.000
Crew and effects	-	0.000	0.000	6.252	0.000	-14.828	0.000
Tk. Of Freshwater port	0	5210.000	0.000	1.626	0.000	-16.738	0.000
Tk. Of Freshwater starboard	0	5210.000	0.000	1.626	0.000	-16.738	0.000
Oil storage tank port	0	10195.000	0.000	1.401	0.000	-12.013	0.000
Oil storage tank starboard	0	10195.000	0.000	1.401	0.000	-12.013	0.000
Side warehouse Stern Port	0	78957.000	0.000	2.452	0.000	6.801	0.000
Side warehouse Bow Port	0	71055.000	0.000	2.452	0.000	-1.433	0.000
Central warehouse Stern	0	88090.000	0.000	2.384	0.000	5.542	0.000
Central warehouse bow	0	82646.000	0.000	2.384	0.000	-2.000	0.000
Side warehouse Stern Starboard	0	78957.000	0.000	2.452	0.000	6.801	0.000
Side warehouse Starboard bow	0	71055.000	0.000	2.452	0.000	-1.433	0.000
Total			421397.853		1247243.580		923978.971

KG	2.960	m from L.B.
LCG	2.193	m to Stern of SM



HIDROSTATIC CURVES DATA		
Displacement	421.398	Ton
Middle Draft	2.210	m
MTC	7.620	Ton-m/cm
LCB	2.200	m to stern
LCF	2.600	m
BMt	4.440	m
KB	1.440	m
KMt	5.880	m
GM	2.920	m
BML	75.160	m
KML	76.600	m
TPC	3.120	Ton/cm

LWL= **42.700**

KG = **2.960** **m**

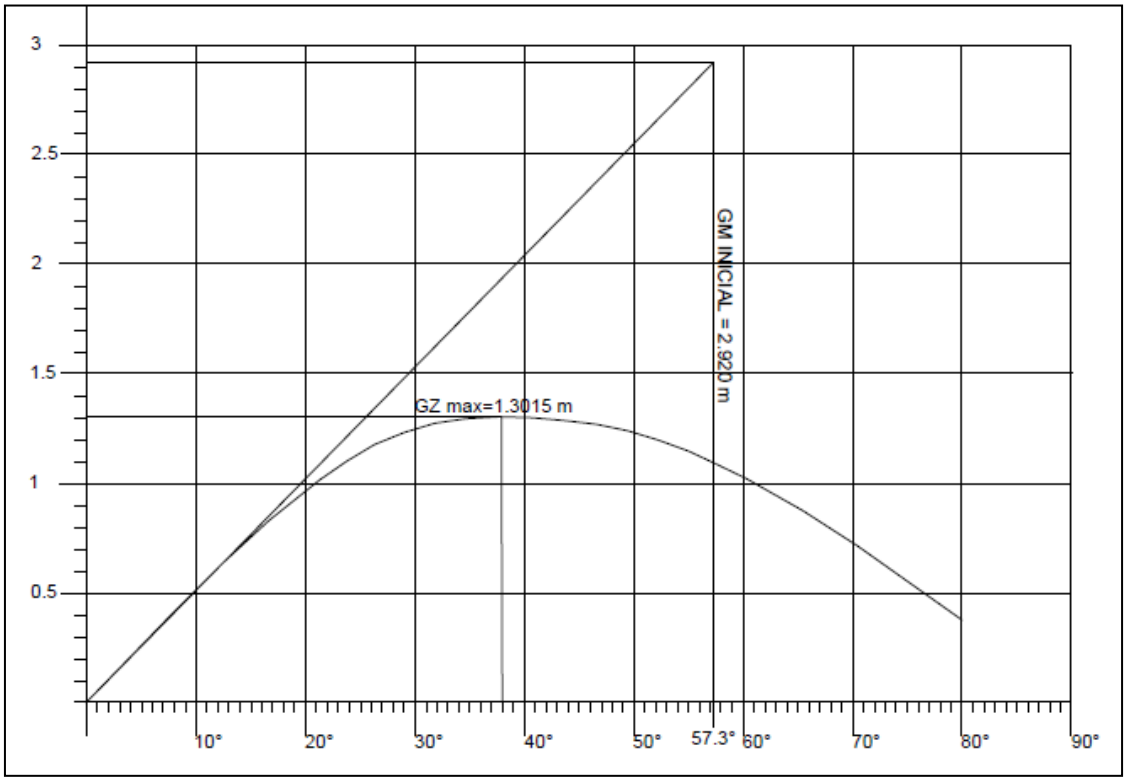
LCG = **2.193** **m**

(Respect to baseline)
(To Stern of middle section)

t = DESP x (LCB-LCG) / MTC	=	0.406	cm
dh pr = t x (0,5 + LCF / L)	=	0.228	cm
dh pp = t x (0,5 -LCF / L)	=	0.178	cm
H pr = CALADO + dh pr	=	2.212	m
H pp = CALADO - dh pp	=	2.208	m

From the data: trim by the bow

KG real(m)	DEGREES	KN(m)	GG(m)	GZ
2.960	0	0	0.00	**0.00**
2.960	10	1.03	0.00	**0.52**
2.960	20	1.98	0.00	**0.97**
2.960	30	2.73	0.00	**1.25**
2.960	40	3.23	0.00	**1.33**
2.960	50	3.5	0.00	**1.23**
2.960	60	3.59	0.00	**1.03**
2.960	70	3.51	0.00	**0.73**
2.960	80	3.29	0.00	**0.38**



CRITERIA OMI

The following is a comparison between the criteria established by IMO and our current values.

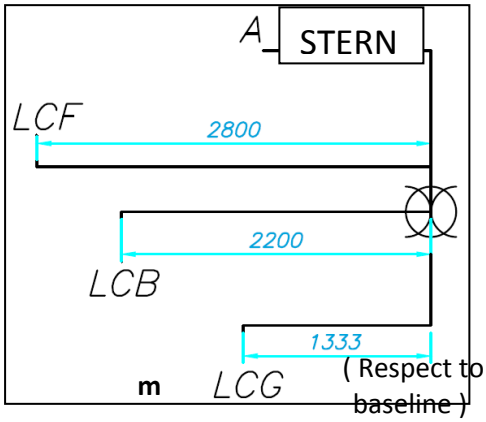
OMI Criteria	Permitted	Current	CONDITION
Área 0 – 30°	≥ 0.055 m-rad	0.4744	SATISFIES
Área 0 – 40°	≥ 0.090 m-rad	0.6021	SATISFIES
Área 30° – 40°	≥ 0.030 m-rad	0.1277	SATISFIES
GZ (Ø=30°)	≥ 0.2 m	1.25	SATISFIES
Max angle of GZ		38°	SATISFIES
GM	≥ 0.35 m	2.92	SATISFIES

SATISFIES OMI CRITERIA.

4.3. CONDITION 1: 100% CONSUMABLE AND 0% LOAD

Element	%	Weight T.(Kg)	Weight x %	KG	M V (Ton.m)	LCG	M L (Ton.m)
Light weight	-	421397.853	421397.853	2.960	1247243.580	2.193	923978.971
Panga	-	1300.000	1300.000	5.733	7452.900	22.702	29512.600
Wet Red	-	9500.000	9500.000	5.895	56002.500	12.917	122711.500
Supply of food	-	1000.000	1000.000	2.391	2391.000	-7.682	-7682.000
Crew and effects	-	1900.000	1900.000	6.252	11878.800	-14.828	-28173.200
Tk. Of Freshwater port	100	5210.000	5210.000	1.626	8471.460	-16.738	-87204.980
Tk. Of Freshwater starboard	100	5210.000	5210.000	1.626	8471.460	-16.738	-87204.980
Oil storage tank port	100	10195.000	10195.000	1.401	14283.195	-12.013	-122472.535
Oil storage tank starboard	100	10195.000	10195.000	1.401	14283.195	-12.013	-122472.535
Side warehouse Stern Port	0	78957.000	0.000	2.452	0.000	6.801	0.000
Side warehouse Bow Port	0	71055.000	0.000	2.452	0.000	-1.433	0.000
Central warehouse Stern	0	88090.000	0.000	2.384	0.000	5.542	0.000
Central warehouse bow	0	82646.000	0.000	2.384	0.000	-2.000	0.000
Side warehouse Stern Starboard	0	78957.000	0.000	2.452	0.000	6.801	0.000
Side warehouse Starboard bow	0	71055.000	0.000	2.452	0.000	-1.433	0.000
Total			465907.853		1370478.090		620992.841

KG	2.942	m from L.B.
LCG	1.333	m to stern of SM



(Respect to baseline)

(To stern of middle section)

HIDROSTATIC CURVES DATA		
Displacement	465.908	Ton
Middle Draft	2.350	m
MTC	8.180	Ton-m/cm
LCB	2.200	m to stern
LCF	2.800	m
BMt	4.180	m
KB	1.520	m
KMt	5.700	m
GM	2.758	m
BML	73.080	m
KML	74.600	m
TPC	3.213	Ton/cm

LWL= **42.700**

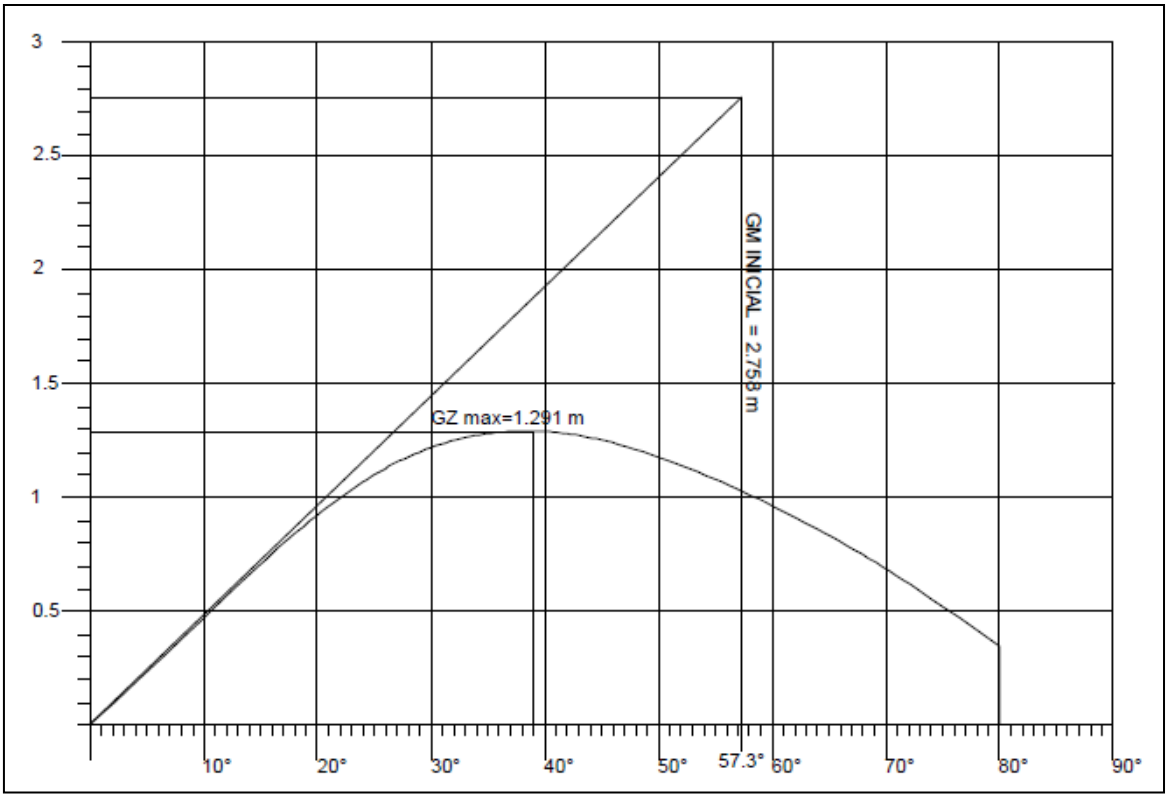
KG = **2.942** **m**

LCG = **1.333** **m**

t = DESP x (LCB+LCG) / MTC	=	49.389	cm
dh pr = t x (0,5 + LCF / L)	=	27.933	cm
dh pp = t x (0,5 -LCF / L)	=	21.456	cm
H pr = CALADO + dh pr	=	2.629	m
H pp = CALADO - dh pp	=	2.135	m

From the data: trim by the bow

KG real(m)	DEGREES	KN(m)	**GG(m)**	**GZ**
2.942	0	0	0.00	**0.00**
2.942	10	0.98	0.00	**0.47**
2.942	20	1.93	0.00	**0.92**
2.942	30	2.69	0.00	**1.22**
2.942	40	3.18	0.00	**1.29**
2.942	50	3.43	0.00	**1.18**
2.942	60	3.51	0.00	**0.96**
2.942	70	3.45	0.00	**0.69**
2.942	80	3.24	0.00	**0.34**



CRITERIA OMI

The following is a comparison between the criteria established by IMO and our current values.

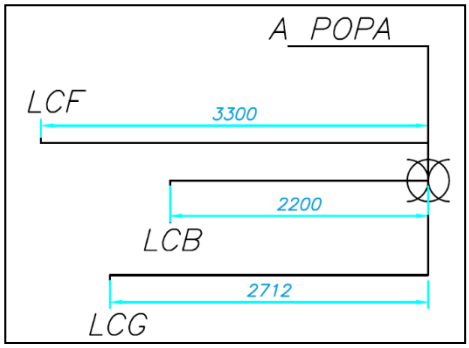
OMI Criteria	**Permitted**	**Current**	**CONDITION**
Área 0 – 30°	≥ 0.055 m-rad	0.3527	SATISFIES
Área 0 – 40°	≥ 0.090 m-rad	0.5753	SATISFIES
Área 30° – 40°	≥ 0.030 m-rad	0.222	SATISFIES
GZ (Ø=30°)	≥ 0.2 m	1.21	SATISFIES
Max angle of GZ		39°	SATISFIES
GM	≥ 0.35 m	2.758	SATISFIES

SATISFIES OMI CRITERIA.

4.4. CONDITION 2: 75% CONSUMABLE AND 25% LOAD

Element	%	Weight T.(Kg)	Weight x %	KG	M V (kg.m)	LCG	M L (kg.m)
Light weight	-	421397.853	421397.853	2.960	1247243.580	2.193	923978.971
Panga	-	1300.000	1300.000	5.733	7452.900	22.702	29512.600
Wet Red	-	9500.000	9500.000	5.895	56002.500	12.917	122711.500
Supply of food	-	1000.000	1000.000	2.391	2391.000	-7.682	-7682.000
Crew and effects	-	1900.000	1900.000	6.252	11878.800	-14.828	-28173.200
Tk. Of Freshwater port	75	5210.000	3907.500	1.626	6353.595	-16.738	-65403.735
Tk. Of Freshwater starboard	75	5210.000	3907.500	1.626	6353.595	-16.738	-65403.735
Oil storage tank port	75	10195.000	7646.250	1.401	10712.396	-12.013	-91854.401
Oil storage tank starboard	75	10195.000	7646.250	1.401	10712.396	-12.013	-91854.401
Side warehouse Stern Port	80	78957.000	63165.600	2.452	154882.051	6.801	429589.246
Side warehouse Bow Port	0	71055.000	0.000	2.452	0.000	-1.433	0.000
Central warehouse Stern	0	88090.000	0.000	2.384	0.000	5.542	0.000
Central warehouse bow	0	82646.000	0.000	2.384	0.000	-2.000	0.000
Side warehouse Stern Starboard	80	78957.000	63165.600	2.452	154882.051	6.801	429589.246
Side warehouse Starboard bow	0	71055.000	0.000	2.452	0.000	-1.433	0.000
Total			584536.553		1668864.865		1585010.090

KG	2.855	m from L.B.
LCG	2.712	m to Stern of SM



HIDROSTATIC CURVES DATA		
Displacement	584.537	Ton
Middle Draft	2.690	m
MTC	9.720	Ton-m/cm
LCB	2.200	m to stern
LCF	3.300	m
BMt	3.600	m
KB	1.720	m
KMt	5.320	m
GM	2.465	m
BML	68.480	m
KML	70.200	m
TPC	3.420	Ton/cm

LWL= **42.700**

KG = **2.855** **m**

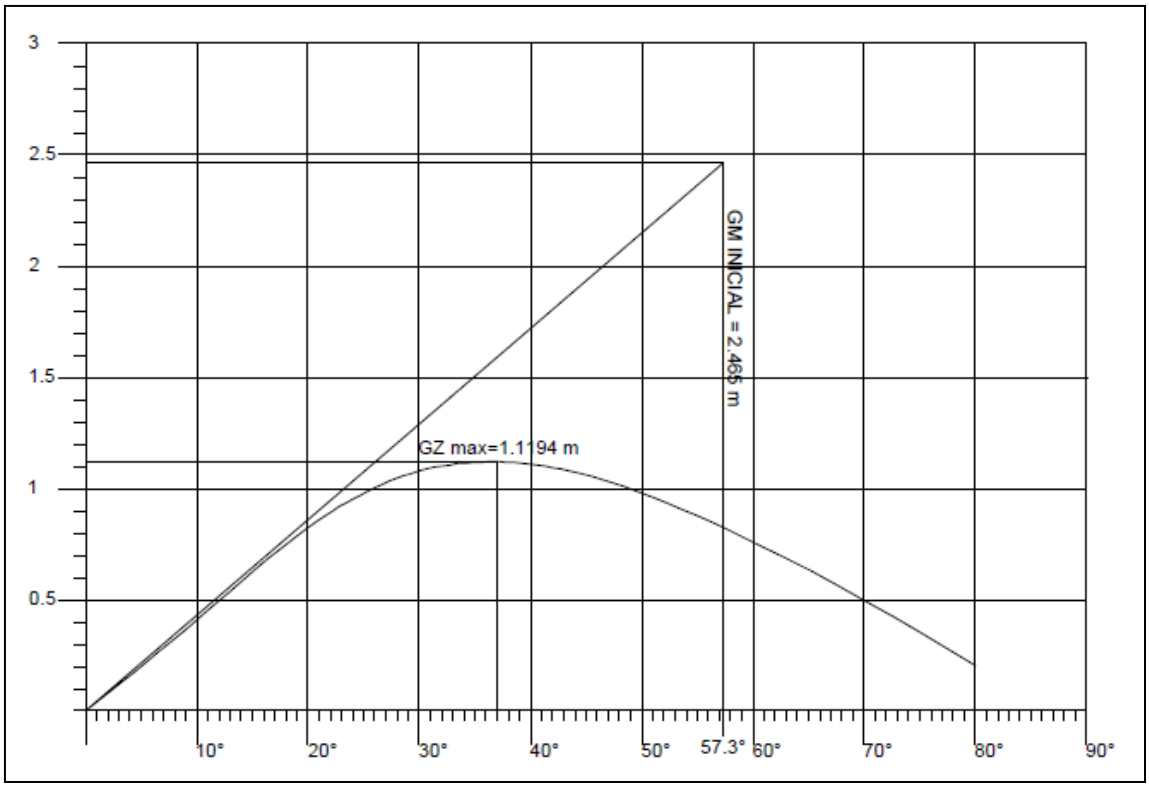
LCG = **2.712** **m**

(Respect to baseline)
(To Stern of middle section)

t = DESP x (LCG-LCB) / MTC	=	30.764	cm
dh pr = t x (0,5 +LCF / L)	=	17.760	cm
dh pp = t x (0,5 -LCF / L)	=	13.005	cm
H pr = CALADO - dh pr	=	2.512	m
H pp = CALADO + dh pp	=	2.820	m

From the data: trim by the bow

KG real(m)	DEGREES	KN(m)	GG(m)	GZ
2.855	0	0	0.15	**0.00**
2.855	10	0.93	0.15	**0.41**
2.855	20	1.85	0.15	**0.82**
2.855	30	2.58	0.15	**1.08**
2.855	40	3.04	0.15	**1.11**
2.855	50	3.28	0.15	**0.98**
2.855	60	3.36	0.15	**0.76**
2.855	70	3.32	0.15	**0.50**
2.855	80	3.16	0.15	**0.20**



CRITERIA OMI

The following is a comparison between the criteria established by IMO and our current values.

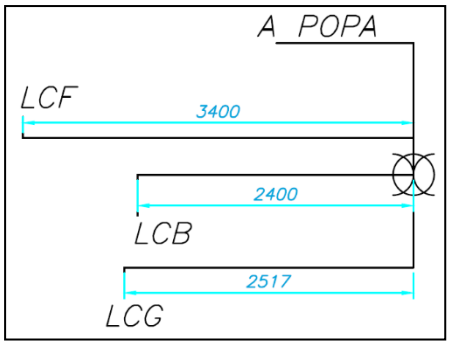
OMI Criteria	Permitted	Current	CONDITION
Área 0 – 30°	≥ 0.055 m-rad	0.3122	SATISFIES
Área 0 – 40°	≥ 0.090 m-rad	0.5067	SATISFIES
Área 30° – 40°	≥ 0.030 m-rad	0.1945	SATISFIES
GZ (Ø=30°)	≥ 0.2 m	1.09	SATISFIES
Max angle of GZ		37°	SATISFIES
GM	≥ 0.35 m	2.465	SATISFIES

SATISFIES OMI CRITERIA.

4.5. CONDITION 3: 50% CONSUMABLE AND 50% LOAD

Element	%	Weight T.(Kg)	Weight x %	KG	M V (kg.m)	LCG	M L (kg.m)
Light weight	-	421397.853	421397.853	2.960	1247243.580	2.193	923978.971
Panga	-	1300.000	1300.000	5.733	7452.900	22.702	29512.600
Wet Red	-	9500.000	9500.000	5.895	56002.500	12.917	122711.500
Supply of food	-	1000.000	1000.000	2.391	2391.000	-7.682	-7682.000
Crew and effects	-	1900.000	1900.000	6.252	11878.800	-14.828	-28173.200
Tk. Of Freshwater port	50	5210.000	2605.000	1.626	4235.730	-16.738	-43602.490
Tk. Of Freshwater starboard	50	5210.000	2605.000	1.626	4235.730	-16.738	-43602.490
Oil storage tank port	50	10195.000	5097.500	1.401	7141.598	-12.013	-61236.268
Oil storage tank starboard	50	10195.000	5097.500	1.401	7141.598	-12.013	-61236.268
Side warehouse Stern Port	100	78957.000	78957.000	2.452	193602.564	6.801	536986.557
Side warehouse Bow Port	0	71055.000	0.000	2.452	0.000	-1.433	0.000
Central warehouse Stern	0	88090.000	0.000	2.384	0.000	5.542	0.000
Central warehouse bow	100	82646.000	82646.000	2.384	197028.064	-2.000	-165292.000
Side warehouse Stern Starboard	100	78957.000	78957.000	2.452	193602.564	6.801	536986.557
Side warehouse Starboard bow	0	71055.000	0.000	2.452	0.000	-1.433	0.000
Total			691062.853		1931956.627		1739351.470

KG	2.796	m from L.B.
LCG	2.517	m to Stern of SM



HIDROSTATIC CURVES DATA		
Displacement	691.063	Ton
Middle Draft	3.060	m
MTC	10.920	Ton-m/cm
LCB	2.400	m a popa
LCF	3.400	m
BMt	3.180	m
KB	1.920	m
KMt	5.100	m
GM	2.304	m
BML	63.280	m
KML	65.200	m
TPC	3.607	Ton/cm

LWL= 42.700

KG = 2.796 m

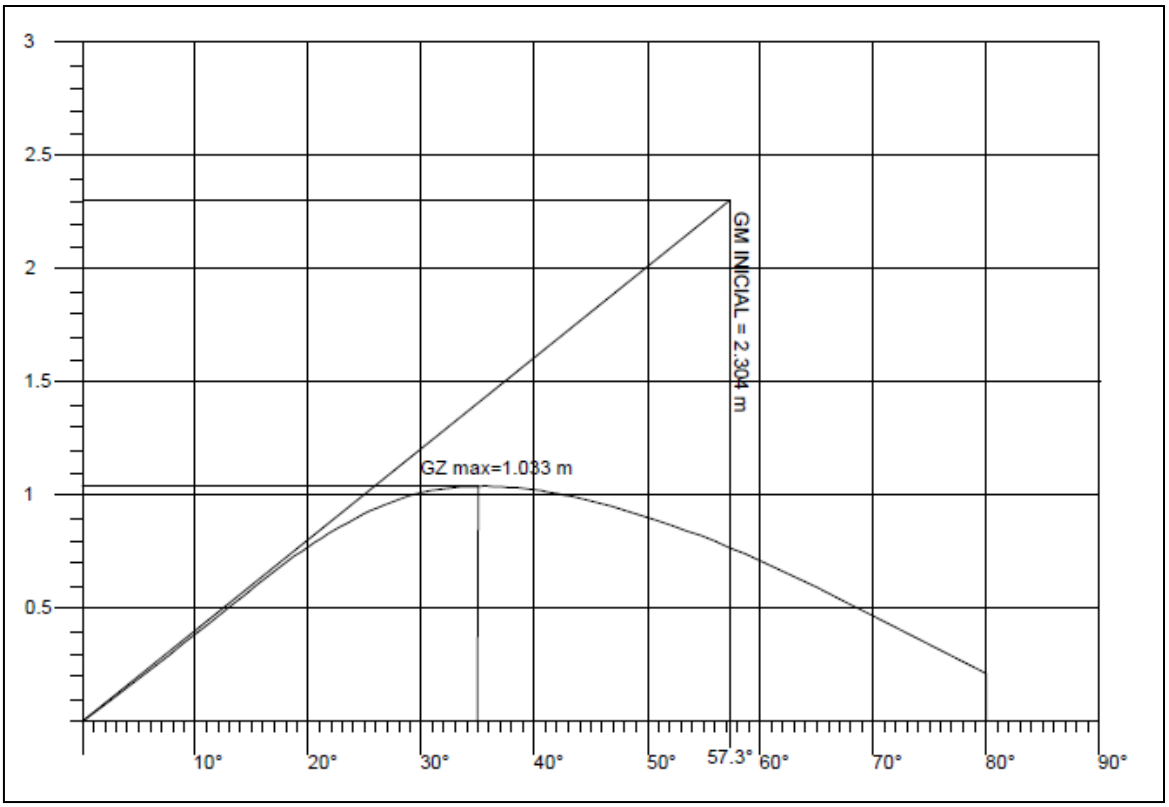
LCG = 2.517 m

(Respect to baseline)
(To Stern of middle section)

t = DESP x (LCG-LCB) / MTC	=	7.399	cm
dh pr = t x (0,5 + LCF / L)	=	4.289	cm
dh pp = t x (0,5 -LCF / L)	=	3.110	cm
H pr = CALADO +- dh pr	=	3.017	m
H pp = CALADO +- dh pp	=	3.091	m

From the data: trim by the bow

KG real(m)	DEGREES	KN(m)	**GG(m)**	**GZ**
2.796	0	0	0.13	**0.00**
2.796	10	0.89	0.13	**0.38**
2.796	20	1.77	0.13	**0.77**
2.796	30	2.47	0.13	**1.01**
2.796	40	2.9	0.13	**1.02**
2.796	50	3.14	0.13	**0.90**
2.796	60	3.24	0.13	**0.71**
2.796	70	3.21	0.13	**0.46**
2.796	80	3.09	0.13	**0.21**



CRITERIA OMI

The following is a comparison between the criteria established by IMO and our current values.

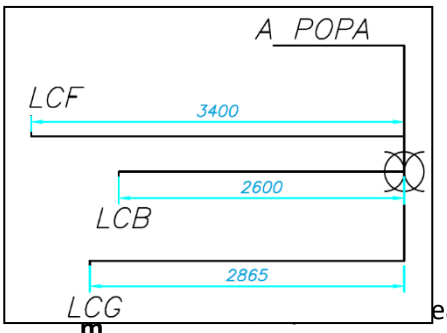
OMI Criteria	Permitted	Current	CONDITION
Área 0 – 30°	≥ 0.055 m-rad	0.2919	SATISFIES
Área 0 – 40°	≥ 0.090 m-rad	0.4724	SATISFIES
Área 30° – 40°	≥ 0.030 m-rad	0.1805	SATISFIES
GZ (Ø=30°)	≥ 0.2 m	1	SATISFIES
Max angle of GZ		35°	SATISFIES
GM	≥ 0.35 m	2.304	SATISFIES

SATISFIES OMI CRITERIA.

4.6. CONDITION 4: 25% CONSUMABLE AND 75% LOAD

Element	%	Weight T.(Kg)	Weight x %	KG	M V (kg.m)	LCG	M L (kg.m)
Light weight	-	421397.853	421397.853	2.960	1247243.580	2.193	923978.971
Panga	-	1300.000	1300.000	5.733	7452.900	22.702	29512.600
Wet Red	-	9500.000	9500.000	5.895	56002.500	12.917	122711.500
Supply of food	-	1000.000	1000.000	2.391	2391.000	-7.682	-7682.000
Crew and effects	-	1900.000	1900.000	6.252	11878.800	-14.828	-28173.200
Tk. Of Freshwater port	25	5210.000	1302.500	1.626	2117.865	-16.738	-21801.245
Tk. Of Freshwater starboard	25	5210.000	1302.500	1.626	2117.865	-16.738	-21801.245
Oil storage tank port	25	10195.000	2548.750	1.401	3570.799	-12.013	-30618.134
Oil storage tank starboard	25	10195.000	2548.750	1.401	3570.799	-12.013	-30618.134
Side warehouse Stern Port	100	78957.000	78957.000	2.452	193602.564	6.801	536986.557
Side warehouse Bow Port	20	71055.000	14211.000	2.452	34845.372	-1.433	-20364.363
Central warehouse Stern	100	88090.000	88090.000	2.384	210006.560	5.542	488194.780
Central warehouse bow	100	82646.000	82646.000	2.384	197028.064	-2.000	-165292.000
Side warehouse Stern Starboard	100	78957.000	78957.000	2.452	193602.564	6.801	536986.557
Side warehouse Starboard bow	20	71055.000	14211.000	2.452	34845.372	-1.433	-20364.363
Total			799872.353		2200276.603		2291656.282

KG	2.751	m from L.B.
LCG	2.865	m to Stern of SM



ea base)
(A POPA de sección media)

HIDROSTATIC CURVES DATA		
Displacement	799.872	Ton
Middle Draft	3.320	m
MTC	11.480	Ton-m/cm
LCB	2.600	m to stern
LCF	3.400	m
BMt	2.900	m
KB	2.080	m
KMt	4.980	m
GM	2.229	m
BML	58.720	m
KML	60.800	m
TPC	3.647	Ton/cm

LWL= 42.700 m

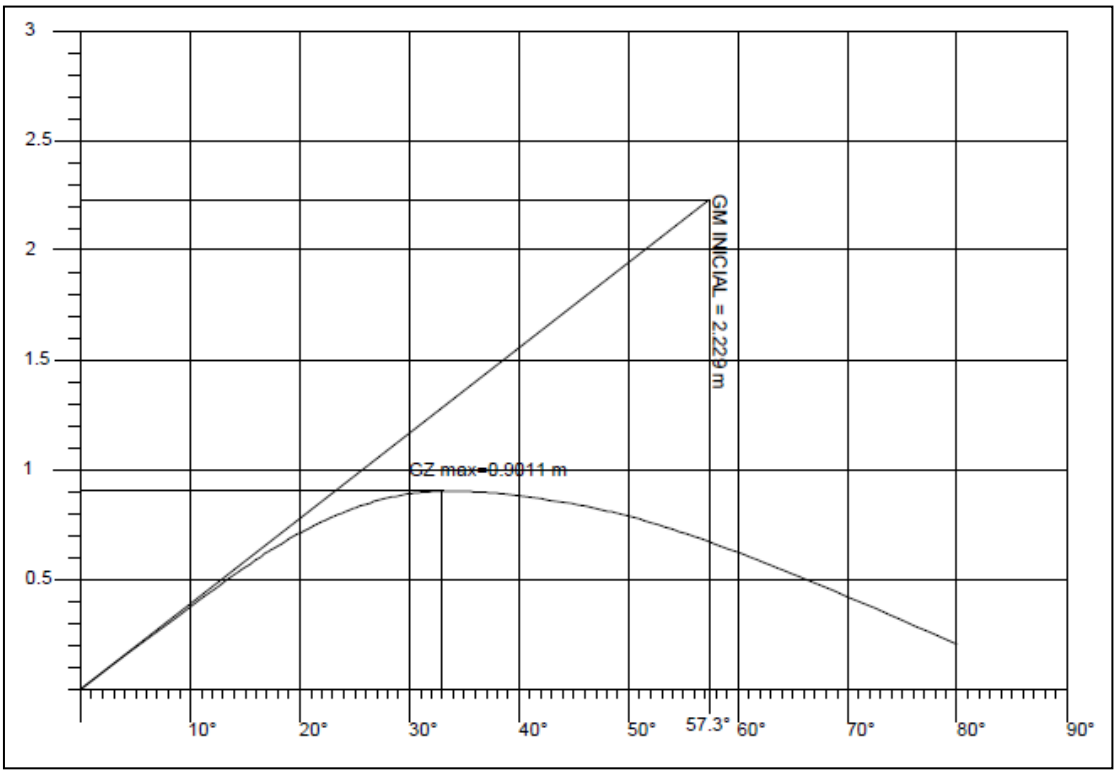
KG = 2.751 m

LCG = 2.865 m

t = DESP x (LCG-LCB) / MTC	=	18.466	cm
dh pr = t x (0,5 +LCF / L)	=	10.703	cm
dh pp = t x (0,5 -LCF / L)	=	7.763	cm
H pr = CALADO - dh pr	=	3.213	m
H pp = CALADO + dh pp	=	3.398	m

From the data: trim by the stern

KG real(m)	DEGREES	KN(m)	GG(m)	GZ
2.751	0	0	0.11	**0.00**
2.751	10	0.87	0.11	**0.37**
2.751	20	1.69	0.11	**0.71**
2.751	30	2.32	0.11	**0.89**
2.751	40	2.72	0.11	**0.88**
2.751	50	2.98	0.11	**0.79**
2.751	60	3.1	0.11	**0.62**
2.751	70	3.11	0.11	**0.42**
2.751	80	3.02	0.11	**0.20**



CRITERIA OMI

The following is a comparison between the criteria established by IMO and our current values.

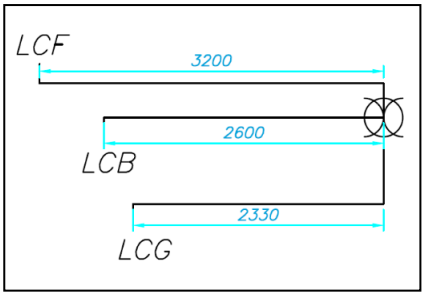
OMI Criteria	Permitted	Current	CONDITION
Área 0 – 30°	≥ 0.055 m-rad	0.2703	SATISFY
Área 0 – 40°	≥ 0.090 m-rad	0.4270	SATISFY
Área 30° – 40°	≥ 0.030 m-rad	0.1567	SATISFY
GZ (Ø=30°)	≥ 0.2 m	0.9	SATISFY
Max angle of GZ		33°	SATISFY
GM	≥ 0.35 m	2.229	SATISFY

SATISFIES OMI CRITERIA.

4.7. CONDITION 5: 25% CONSUMABLE AND 100% LOAD

Element	%	Weight T.(Kg)	Weight x %	KG	M V (kg.m)	LCG	M L (kg.m)
Light weight	-	421397.853	421397.853	2.960	1247243.580	2.193	923978.971
Panga	-	1300.000	1300.000	5.733	7452.900	22.702	29512.600
Wet Red	-	9500.000	9500.000	5.895	56002.500	12.917	122711.500
Supply of food	-	1000.000	1000.000	2.391	2391.000	-7.682	-7682.000
Crew and effects	-	1900.000	1900.000	6.252	11878.800	-14.828	-28173.200
Tk. Of Freshwater port	25	5210.000	1302.500	1.626	2117.865	-16.738	-21801.245
Tk. Of Freshwater starboard	25	5210.000	1302.500	1.626	2117.865	-16.738	-21801.245
Oil storage tank port	25	10195.000	2548.750	1.401	3570.799	-12.013	-30618.134
Oil storage tank starboard	25	10195.000	2548.750	1.401	3570.799	-12.013	-30618.134
Side warehouse Stern Port	100	78957.000	78957.000	2.452	193602.564	6.801	536986.557
Side warehouse Bow Port	100	71055.000	71055.000	2.452	174226.860	-1.433	-101821.815
Central warehouse Stern	100	88090.000	88090.000	2.384	210006.560	5.542	488194.780
Central warehouse bow	100	82646.000	82646.000	2.384	197028.064	-2.000	-165292.000
Side warehouse Stern Starboard	100	78957.000	78957.000	2.452	193602.564	6.801	536986.557
Side warehouse Starboard bow	100	71055.000	71055.000	2.452	174226.860	-1.433	-101821.815
Total			913560.353		2479039.579		2128741.378

KG	2.714	m from L.B.
LCG	2.330	m to Stern of SM



HIDROSTATIC CURVES DATA		
Displacement	913.560	Ton
Middle Draft	3.620	m
MTC	12.000	Ton-m/cm
LCB	2.600	m to stern
LCF	3.200	m
BMt	2.660	m
KB	2.240	m
KMt	4.900	m
GM	2.186	m
BML	53.160	m
KML	55.400	m
TPC	3.687	Ton/cm

LWL= **42.700**

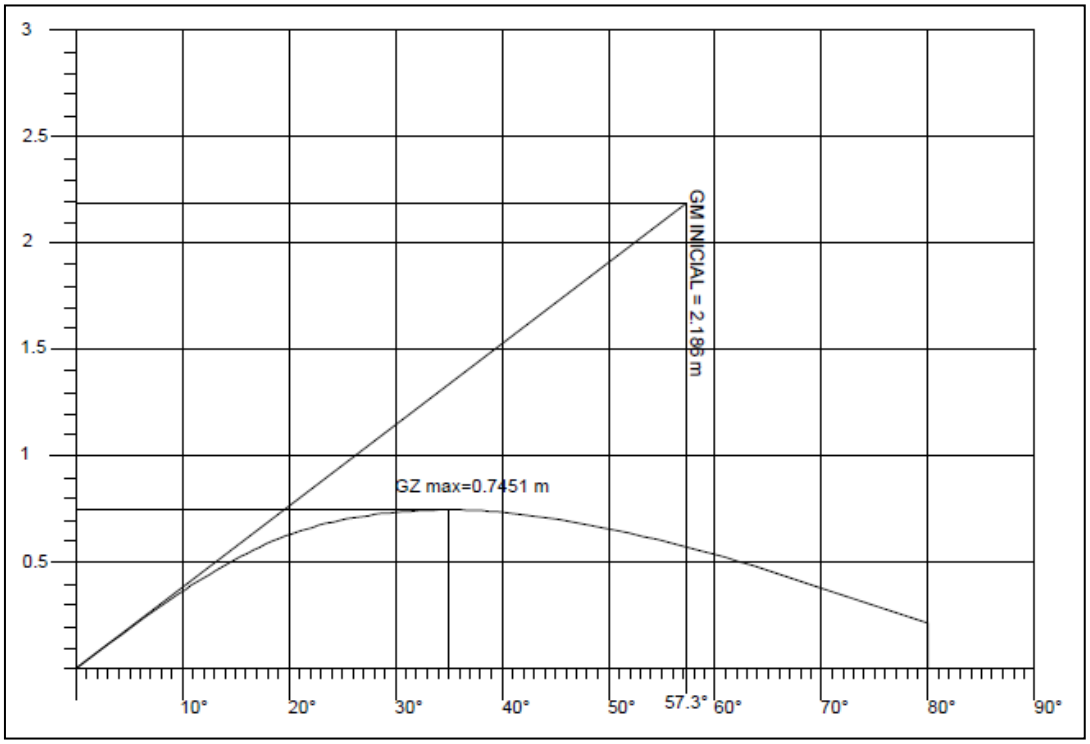
KG = **2.714 m** (Respect to baseline)

LCG = **2.330 m** (To Stern of middle section)

t = DESP x (LCB-LCG) / MTC =	20.543	cm
dh pr = t x (0,5 + LCF / L) =	11.811	cm
dh pp = t x (0,5 --LCF / L) =	8.732	cm
H pr = CALADO + dh pr =	3.738	m
H pp = CALADO - dh pp =	3.533	m

From the data: trim by the bow

KG real(m)	GRADOS	KN(m)	**GG(m)**	**GZ**
2.714	0	0	0.10	**0.00**
2.714	10	0.85	0.10	**0.36**
2.714	20	1.59	0.10	**0.63**
2.714	30	2.14	0.10	**0.73**
2.714	40	2.54	0.10	**0.73**
2.714	50	2.81	0.10	**0.66**
2.714	60	2.97	0.10	**0.54**
2.714	70	3.02	0.10	**0.38**
2.714	80	2.98	0.10	**0.21**



CRITERIA OMI

The following is a comparison between the criteria established by IMO and our current values.

OMI Criteria	Permitted	Current	CONDITION
Área 0 – 30°	≥ 0.055 m-rad	0.2421	SATISFY
Área 0 – 40°	≥ 0.090 m-rad	0.3694	SATISFY
Área 30° – 40°	≥ 0.030 m-rad	0.1273	SATISFY
GZ (Ø=30°)	≥ 0.2 m	0.745	SATISFY
Degree of GZ max		35°	SATISFY
GM	≥ 0.35 m	2.186	SATISFY

SATISFIES OMI CRITERIA.

4.8. SUMMARY OF WEIGHT CALCULATION

4.8.1. HULL AND FRAME ESTRUCTURE

		ÍTEM	DESCRIPTION	VOLUMEN	WEIGHT	KG	XG	Mto(KG) (KG* WEIGHT)	Mto(lcg) LCG* WEIGHT
				m^3	(kg)	m	m	ton-m	ton-m
LINING PLATES		1	PL SIDE HULL5/16''	6.4046	50275.9530	2.1950	3.4570	110355.7168	173803.9695
		2	PL BOTTOM HULL 3/8''	5.8477	45904.1310	0.5460	3.5678	25063.6555	163776.7586
		3	BOW PLANK 1/2''	0.5364	4211.0933	7.0310	-20.5490	29608.1966	-86533.7552
		4	STERN PLATE 3/8''	0.3120	2449.5062	3.5640	20.6790	8730.0399	50653.3377
		5	PL DECK 3/8''	6.2815	49309.4375	4.5120	3.8650	222484.1818	190580.9757
		6	RFZOS, QUILLOTE 5/16''	1.1286	8859.3687	-0.7230	1.3450	-6405.3236	11915.8509
		7	FIN KEEL PLATE 5/16''	0.3904	3064.5615	0.3140	4.9023	962.2723	15023.3998
		8	ZAPATA DE QUILLA 1 ''	0.5856	4596.8423	-0.5430	2.3450	-2496.0853	10779.5951
		9	BOW REINFORCEMENT	0.5460	4286.1000	5.6550	-20.4320	24237.8955	-87573.5952
		10	STERN REINFORCEMENT	0.1638	1285.8300	2.7345	19.3450	3516.1021	24874.3814
TRANSVERSE ELEMENTS	FRAME -0.5	11	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0433	340.0684	4.6150	22.2500	1569.4157	7566.5220
		12	FRAME (T PL. 200X8 ALA. 75X8)	0.0118	92.3819	3.9400	22.2500	363.9848	2055.4982
		13	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0590	462.8988	2.2400	22.2500	1036.8933	10299.4983
		14	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	5.6000	22.2500	84.1922	334.5136
		15	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	2.4000	22.2500	36.0824	334.5136
	FRAME 0	16	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0489	383.9686	5.1920	21.2500	1993.5651	8159.3332
		17	FRAME (T PL. 200X8 ALA. 75X8)	0.0330	258.7486	3.6020	21.2500	932.0123	5498.4069
		18	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0628	492.7894	2.2300	21.2500	1098.9204	10471.7748
		19	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	5.1920	21.2500	78.0582	319.4793
		20	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	2.2180	21.2500	33.3461	319.4793
	FRAME 0.5	21	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0497	390.1010	5.2420	20.2500	2044.9097	7899.5461
		22	FRAME (T PL. 200X8 ALA. 75X8)	0.0362	284.4652	3.5880	20.2500	1020.6610	5760.4195
		23	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0638	500.4846	1.9600	20.2500	980.9498	10134.8132
		24	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	5.2100	20.2500	78.3288	304.4450

		25	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	1.9780	20.2500	29.7379	304.4450
	FRAME M1	26	GRIDDLE 6.4 mm	0.4355	3418.3296	3.4620	19.2500	11834.2571	65802.8448
		27	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0501	393.6618	5.2170	19.2500	2053.7336	7577.9897
		28	FRAME (T PL. 200X8 ALA. 75X8)	0.0387	303.4559	3.4620	19.2500	1050.5643	5841.5257
		29	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0646	507.1907	1.7170	19.2500	870.8464	9763.4209
		30	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	5.1980	19.2500	78.1484	289.4107
		31	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	1.7240	19.2500	25.9192	289.4107
	FRAME 1.5	32	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0512	401.7724	5.1800	17.8500	2081.1811	7171.6377
		33	FRAME (T PL. 200X8 ALA. 75X8)	0.0422	331.5463	3.2730	17.8500	1085.1511	5918.1018
		34	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0657	515.5189	1.3880	17.8500	715.5403	9202.0127
		35	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	5.1750	17.8500	77.8026	268.3626
		36	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	1.3910	17.8500	20.9127	268.3626
	FRAME 2	37	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0519	407.3509	5.1440	16.4500	2095.4133	6700.9230
		38	FRAME (T PL. 200X8 ALA. 75X8)	0.0452	355.1265	3.0990	16.4500	1100.5369	5841.8303
		39	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0666	522.4426	1.0540	16.4500	550.6545	8594.1811
		40	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	5.1350	16.4500	77.2012	247.3146
		41	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	1.0700	16.4500	16.0867	247.3146
	FRAME 2.5	42	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0525	411.8612	5.1080	15.0500	2103.7872	6198.5117
		43	FRAME (T PL. 200X8 ALA. 75X8)	0.0480	376.8471	2.9390	15.0500	1107.5536	5671.5489
		44	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0673	528.5750	0.7780	15.0500	411.2314	7955.0544
		45	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	5.0980	15.0500	76.6450	226.2665
		46	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.7850	15.0500	11.8019	226.2665
	FRAME 3	47	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0529	415.2242	5.0780	13.8500	2108.5084	5750.8549
		48	FRAME (T PL. 200X8 ALA. 75X8)	0.0502	394.0574	2.8130	13.8500	1108.4836	5457.6955
		49	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0679	532.9271	0.5490	13.8500	292.5770	7381.0401
		50	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	5.0450	13.8500	75.8481	208.2253
		51	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.5550	13.8500	8.3440	208.2253
	FRAME	52	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0533	418.1915	5.0520	12.6500	2112.7034	5290.1222
		53	FRAME (T PL. 200X8 ALA. 75X8)	0.0520	407.9048	2.7060	12.6500	1103.7905	5159.9962

		54	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0684	536.6659	0.3620	12.6500	194.2730	6788.8234
		55	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	5.0450	12.6500	75.8481	190.1841
		56	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.3650	12.6500	5.4875	190.1841
	FRAME M4	57	GRIDDLE 6.4 mm	0.3442	2702.2212	2.3730	11.4500	6412.3709	30940.4327
		58	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0538	422.3457	4.5220	11.4500	1909.8473	4835.8583
		59	FRAME (T PL. 200X8 ALA. 75X8)	0.0529	415.6198	2.3740	11.4500	986.6815	4758.8469
		60	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0686	538.6836	0.2330	11.4500	125.5133	6167.9277
		61	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.5110	11.4500	67.8198	172.1430
		62	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.2380	11.4500	3.5782	172.1430
	FRAME 4.5	63	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.5000	10.2500	1902.4250	4333.3015
		64	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	10.2500	752.5246	3326.1653
		65	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.1360	10.2500	73.7425	5557.8024
		66	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4950	10.2500	67.5793	154.1018
		67	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1380	10.2500	2.0747	154.1018
	FRAME 5	68	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0540	424.1459	4.4870	8.8500	1903.1425	3753.6909
		69	FRAME (T PL. 200X8 ALA. 75X8)	0.0416	326.4426	2.3190	8.8500	757.0203	2889.0167
		70	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0693	544.2028	0.0720	8.8500	39.1826	4816.1950
		71	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	8.8500	67.2936	133.0537
		72	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	8.8500	1.5185	133.0537
	FRAME 5.5	73	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	7.4500	1896.9292	3149.5704
		74	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	7.4500	752.5246	2417.5543
		75	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	7.4500	39.0402	4039.5734
		76	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	7.4500	67.2936	112.0057
		77	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	7.4500	1.5185	112.0057
	FRAME 6	78	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	6.0500	1896.9292	2557.7048
		79	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	6.0500	752.5246	1963.2488
		80	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	6.0500	39.0402	3280.4590
		81	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	6.0500	67.2936	90.9576
		82	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	6.0500	1.5185	90.9576

	FRAME 6.5	83	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	4.6500	1896.9292	1965.8392
		84	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	4.6500	752.5246	1508.9433
		85	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	4.6500	39.0402	2521.3445
		86	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	4.6500	67.2936	69.9096
		87	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	4.6500	1.5185	69.9096
	FRAME 7	88	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	3.2500	1896.9292	1373.9736
		89	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	3.2500	752.5246	1054.6378
		90	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	3.2500	39.0402	1762.2300
		91	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	3.2500	67.2936	48.8615
		92	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	3.2500	1.5185	48.8615
	FRAME.5	93	PLATE. BULKHEAD 6.4 mm	0.4206	3301.4180	2.1940	2.2500	7243.3110	7428.1905
		94	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	2.2500	1896.9292	951.2125
		95	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	2.2500	752.5246	730.1338
		96	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	2.2500	39.0402	1220.0054
		97	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	2.2500	67.2936	33.8272
		98	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	2.2500	1.5185	33.8272
	FRAME 8	99	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	0.9500	1896.9292	401.6231
		100	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	0.9500	752.5246	308.2787
		101	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	0.9500	39.0402	515.1134
		102	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	0.9500	67.2936	14.2826
		103	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	0.9500	1.5185	14.2826
	FRAME 8.5	104	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	-0.3500	1896.9292	-147.9664
		105	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	-0.3500	752.5246	-113.5764
		106	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	-0.3500	39.0402	-189.7786
		107	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	-0.3500	67.2936	-5.2620
		108	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	-0.3500	1.5185	-5.2620
	FRAME 9	109	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	-1.6500	1896.9292	-697.5559
		110	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	-1.6500	752.5246	-535.4315
		111	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	-1.6500	39.0402	-894.6706

	112	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	-1.6500	67.2936	-24.8066
	113	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	-1.6500	1.5185	-24.8066
FRAME 9.5	114	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	-2.9500	1896.9292	-1247.1453
	115	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	-2.9500	752.5246	-957.2866
	116	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	-2.9500	39.0402	-1599.5626
	117	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	-2.9500	67.2936	-44.3512
	118	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	-2.9500	1.5185	-44.3512
FRAME 10	119	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	-4.0500	1896.9292	-1712.1825
	120	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	-4.0500	752.5246	-1314.2409
	121	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	-4.0500	39.0402	-2196.0097
	122	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	-4.0500	67.2936	-60.8890
	123	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	-4.0500	1.5185	-60.8890
FRAME 10.5	124	PLATE BULKHEAD 6.4 mm	0.4206	3301.4180	2.1940	-5.0500	7243.3110	-16672.1608
	125	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	4.4870	-5.0500	1896.9292	-2134.9437
	126	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	2.3190	-5.0500	752.5246	-1638.7448
	127	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0691	542.2246	0.0720	-5.0500	39.0402	-2738.2343
	128	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	-5.0500	67.2936	-75.9233
	129	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.1010	-5.0500	1.5185	-75.9233
FRAME 11	130	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0452	355.0869	4.7620	-6.2500	1690.9238	-2219.2931
	131	FRAME (T PL. 200X8 ALA. 75X8)	0.0491	385.0566	2.6110	-6.2500	1005.3829	-2406.6039
	132	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0519	407.3114	0.5000	-6.2500	203.6557	-2545.6961
	133	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.7560	-6.2500	71.5032	-93.9645
	134	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.5120	-6.2500	7.6976	-93.9645
FRAME 11.5	135	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0452	355.0869	4.7620	-7.6500	1690.9238	-2716.4148
	136	FRAME (T PL. 200X8 ALA. 75X8)	0.0491	385.0566	2.6110	-7.6500	1005.3829	-2945.6832
	137	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0519	407.3114	0.5000	-7.6500	203.6557	-3115.9321
	138	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.7560	-7.6500	71.5032	-115.0125
	139	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.5120	-7.6500	7.6976	-115.0125
FR	140	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0452	355.0869	4.7620	-9.0500	1690.9238	-3213.5364

		141	FRAME (T PL. 200X8 ALA. 75X8)	0.0491	385.0566	2.6110	-9.0500	1005.3829	-3484.7625
		142	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0519	407.3114	0.5000	-9.0500	203.6557	-3686.1680
		143	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.7560	-9.0500	71.5032	-136.0606
		144	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.5120	-9.0500	7.6976	-136.0606
	FRAME 12.5	145	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0452	355.0869	4.7620	-10.4500	1690.9238	-3710.6581
		146	FRAME (T PL. 200X8 ALA. 75X8)	0.0491	385.0566	2.6110	-10.4500	1005.3829	-4023.8418
		147	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0519	407.3114	0.5000	-10.4500	203.6557	-4256.4039
		148	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.7560	-10.4500	71.5032	-157.1086
		149	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.5120	-10.4500	7.6976	-157.1086
	FRAME 13	150	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0452	355.0869	4.7620	-11.8500	1690.9238	-4207.7798
		151	FRAME (T PL. 200X8 ALA. 75X8)	0.0491	385.0566	2.6110	-11.8500	1005.3829	-4562.9211
		152	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0519	407.3114	0.5000	-11.8500	203.6557	-4826.6399
		153	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.7560	-11.8500	71.5032	-178.1567
		154	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.5120	-11.8500	7.6976	-178.1567
	FRAME 13.5	155	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0433	339.6569	4.7620	-13.2500	1617.4463	-4500.4545
		156	FRAME (T PL. 200X8 ALA. 75X8)	0.0500	392.3166	2.6110	-13.2500	1024.3387	-5198.1953
		157	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0498	390.6945	0.5000	-13.2500	195.3473	-5176.7021
		158	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.7560	-13.2500	71.5032	-199.2047
		159	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.5120	-13.2500	7.6976	-199.2047
	FRAME 14	160	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0808	634.0131	6.7290	-14.2500	4266.2741	-9034.6867
		161	FRAME (T PL. 200X8 ALA. 75X8)	0.0857	673.0034	4.3340	-14.2500	2916.7968	-9590.2988
		162	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0341	267.6505	0.5160	-14.2500	138.1076	-3814.0191
		163	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	6.8290	-14.2500	102.6694	-214.2391
		164	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.7000	-14.2500	10.5240	-214.2391
	FRAME 14.5	165	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0808	634.0131	6.6290	-15.2500	4202.8728	-9668.6998
		166	FRAME (T PL. 200X8 ALA. 75X8)	0.0857	673.0034	4.2340	-15.2500	2849.4965	-10263.3022
		167	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0341	267.6505	0.5710	-15.2500	152.8284	-4081.6695
		168	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	6.8290	-15.2500	102.6694	-229.2734
		169	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.7000	-15.2500	10.5240	-229.2734

	FRAME 15	170	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0808	634.0131	6.8290	-16.6500	4329.6755	-10556.3181
		171	FRAME (T PL. 200X8 ALA. 75X8)	0.0857	673.0034	4.3340	-16.6500	2916.7968	-11205.5070
		172	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0341	267.6505	0.6980	-16.6500	186.8200	-4456.3802
		173	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	6.8290	-16.6500	102.6694	-250.3214
		174	FRAME-FLOOR PLATE BRACKET (9.5)	0.0019	15.0343	0.7000	-16.6500	10.5240	-250.3214
	FRAME 15.5	175	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0756	593.6578	6.7540	-18.0500	4009.5649	-10715.5237
		176	FRAME (T PL. 200X8 ALA. 75X8)	0.0821	644.6954	4.6020	-18.0500	2966.8881	-11636.7516
		177	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		178	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	-18.0500	67.2936	-271.3695
		179	FRAME-FLOOR PLATE BRACKET (9.5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	FRAME M16	180	GRIDDLE 6.4 mm	0.0761	597.4164	3.7400	-19.4500	2234.3373	-11619.7490
		181	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0509	399.7942	6.0930	-19.4500	2435.9462	-7775.9976
		182	FRAME (T PL. 200X8 ALA. 75X8)	0.0413	324.5039	4.4790	-19.4500	1453.4531	-6311.6014
		183	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		184	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	7.0350	-19.4500	105.7664	-292.4175
		185	FRAME-FLOOR PLATE BRACKET (9.5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	FRAME 16.5	186	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0539	422.7611	6.0350	-20.2000	2551.3634	-8539.7747
		187	FRAME (T PL. 200X8 ALA. 75X8)	0.0720	565.5872	5.7430	-20.2000	3248.1671	-11424.8607
		188	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		189	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	7.0350	-20.2000	105.7664	-303.6933
		190	FRAME-FLOOR PLATE BRACKET (9.5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	FRAME 17	191	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0470	368.8750	6.0350	-20.9500	2226.1603	-7727.9303
		192	FRAME (T PL. 200X8 ALA. 75X8)	0.0588	461.7514	6.0350	-20.9500	2786.6700	-9673.6928
		193	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		194	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	6.0340	-20.9500	90.7171	-314.9690
		195	FRAME-FLOOR PLATE BRACKET (9.5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	FRAME	196	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0246	192.7954	7.7490	-21.7000	1493.9713	-4183.6596
		197	FRAME (T PL. 200X8 ALA. 75X8)	0.0366	287.6303	7.0830	-21.7000	2037.2853	-6241.5771

		198	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		199	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	-21.7000	67.2936	-326.2447
		200	FRAME-FLOOR PLATE BRACKET (9.5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	FRAME 18	201	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0179	140.1357	4.4870	-22.4500	628.7888	-3146.0462
		202	FRAME (T PL. 200X8 ALA. 75X8)	0.0265	208.3638	2.3190	-22.4500	483.1957	-4677.7674
		203	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		204	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	-22.4500	67.2936	-337.5205
		205	FRAME-FLOOR PLATE BRACKET (9.5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	FRAME 18.5	206	BEAMS REINF (T PL.8x200 ALA.8X75')	0.0097	75.7651	7.8650	-23.2000	595.8922	-1757.7494
		207	FRAME (T PL. 200X8 ALA. 75X8)	0.0075	58.7525	8.1640	-23.2000	479.6557	-1363.0589
		208	FLOOR PLATE (T PL.6.35x350 ALA.8x75)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
		209	FRAME-BEAM BRACKET (9.5')	0.0019	15.0343	4.4760	-23.2000	67.2936	-348.7962
		210	FRAME-FLOOR PLATE BRACKET (9.5)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LONGITUDINAL ELEMENTS		211	ESL. DECK (T PL.6.4x250 ALA. 8x100)	1.6498	12951.2754	4.0790	1.5460	52828.2524	20022.6718
		212	FIN KEEL	1.6045	12595.1994	0.7200	0.8000	9068.5436	10076.1595
		213	TANKS SIDE BULKHEAD	1.4860	11665.4454	4.4560	3.7690	51981.2247	43967.0637
		214	SIDE BULKHEAD REINF.	0.1457	1143.3996	4.4560	3.7650	5094.9886	4304.8995
		215	BOW BULKHEAD. LONG.	1.3497	10595.2392	4.9650	-18.5600	52605.3626	-196647.6396
		216	BOW BULKHEAD REINF	0.1373	1078.1190	4.9650	-18.5600	5352.8608	-20009.8886
TOTAL HULL					284100.2968			769103.2389	415073.7173

4.8.2. SUPERESTRUCTURE

	ITEM	DESCRIPTION	VOLUMEN	WEIGHT	KG	LCG	Mto(KG) (KG* WEIGHT)	Mto(lcg) LCG* WEIGHT
			m^3	(kg)	m	m	ton-m	ton-m
LINING PLATES	1	FRONTAL BULKHEAD	0.1629	1278.7650	7.4230	-11.4650	9492.2726	-14661.0407
	2	REINF. BULKHEAD FRONT.	0.0670	526.1070	7.4230	-10.4560	3905.2923	-5500.9748
	3	SIDE BULKHEAD	0.0520	408.3570	7.4230	-12.2450	3031.2340	-5000.3315
	4	SIDE BULKHEAD REINF	0.0702	551.0700	7.4230	-11.5460	4090.5926	-6362.6542

	5	BACK BULKHEAD	0.3369	2644.6650	7.4230	-11.4650	19631.3483	-30321.0842
	6	REINF BULKHEAD BACK	0.0702	551.0700	7.4230	-10.4560	4090.5926	-5761.9879
	7	CABIN ROOF	0.4937	3875.3880	8.4650	-12.2450	32805.1594	-47454.1261
	8	REINF. CABIN ROOF	0.1890	1483.6500	8.3450	-11.5460	12381.0593	-17130.2229
BINNACLE	9	STERN BULKHEAD	0.0741	581.6850	5.8700	-11.4650	3414.4910	-6669.0185
	10	REINF. STERN BULKHEAD	0.0313	245.8620	5.8700	-10.4560	1443.2099	-2570.7331
	11	SIDE BULKHEAD	0.5407	4244.1810	5.8700	-12.2450	24913.3425	-51969.9963
	12	REINF. SIDE BULKHEAD	0.1037	813.8880	5.8700	-11.5460	4777.5226	-9397.1508
	13	DECK BINNACLE	0.1037	813.8880	7.7700	-11.4650	6323.9098	-9331.2259
	14	REINF.CUB. BINNACLE	0.0115	90.4320	7.7100	-10.4560	697.2307	-945.5570
BRIDGE	15	BRIDGE DECK	0.1843	1446.9120	11.8200	-12.2450	17102.4998	-17717.4374
	16	SIDE FRAMEWORKS	0.2035	1597.6320	10.3200	-11.5460	16487.5622	-18446.2591
	17	BOW FRAMEWORKS	0.1190	934.4640	10.3200	-11.4650	9643.6685	-10713.6298
	18	STERN FRAMEWORKS	0.1190	934.4640	10.3200	-10.4560	9643.6685	-9770.7556
	19	BREACK DECK	0.1882	1477.0560	9.0400	-12.2450	13352.5862	-18086.5507
	20	BREACK REINF.	0.0672	527.5200	9.0000	-11.5460	4747.6800	-6090.7459
	TOTAL SUPERESTRUCTURE			25027.0560			201974.9227	-293901.4825

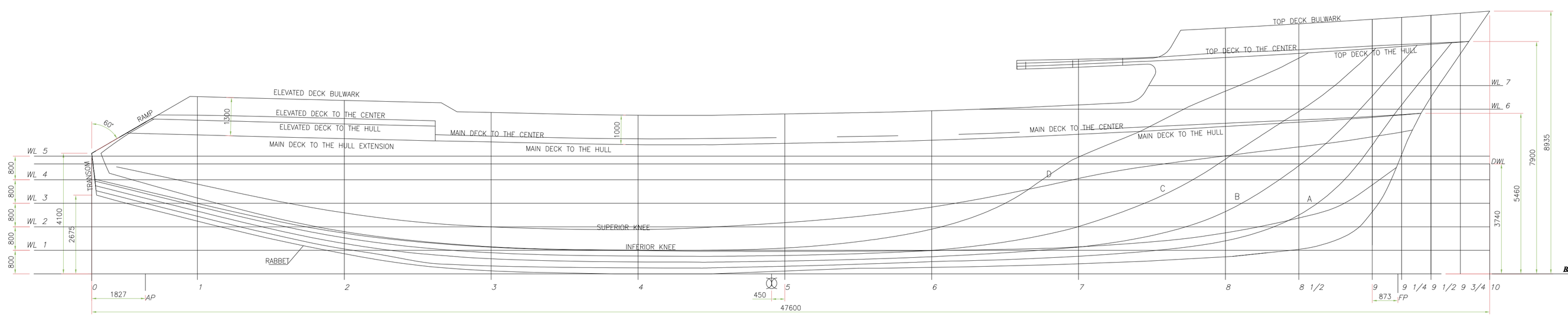
4.8.3. EQUIPMENT AND TANKS

ÍTEM	DESCRIPCIÓN	QUANTITY	PESO	NET WEIGHT	KG	XG	Mto(KG) (KG* WEIGHT	Mto(lcg) LCG* WEIGHT
			(kg)	(kg)	m	m	ton-m	ton-m
1	HYDROCARBON SEPARATORDE 0.5 M3/HR	1	280	280	1.045	9.234	292.6	2585.52
2	POSITIVE DISPLACEMENT PUMP OF 5M3/HR A 20 M.C.A	1	180	180	2.234	9.234	402.12	1662.12
3	CAT GENERATOR3056-99KW-1800RPM	1	595	595	2.034	12.435	1210.23	7398.825
4	HYDRAULIC FORCE FOR WINCHS	1	500	500	6.887	3.622	3443.5	1811
5	BOW WINCH	1	789	789	8.701	-0.931	6865.089	-734.559

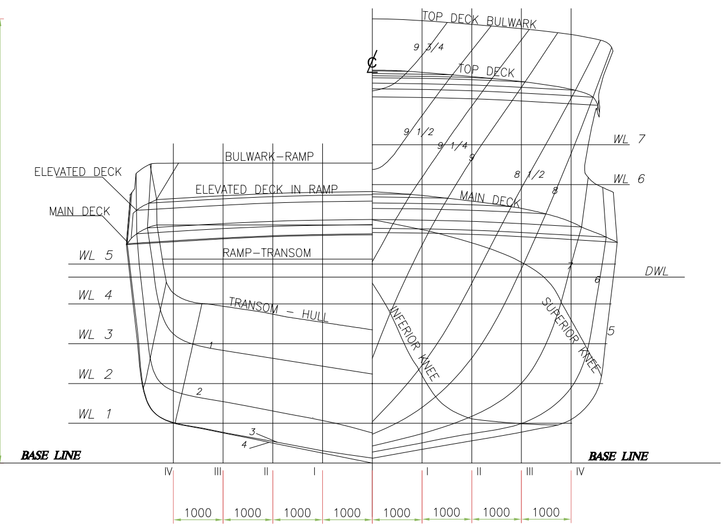
6	STERN WINCH	1	800	800	6.456	4.82	5164.8	3856
7	ANCHOR + CHAIN	1	400	400	5.086	-17.56	2034.4	-7024
8	CAT 3512C 1340HP @ 1600RPM MAIN MOTOR	1	7484	7484	1.679	12.93	12565.636	96768.12
9	CENTRIFUGAL PUMP DRAG OF 800M3 / HR TO 90 M.C.A	2	400	800	1.86	0.54	1488	432
10	SEA OUTLET FOR EXTERIOR FIRE FIGHTING	1	90	90	0.049	1.448	4.41	130.32
11	SEA TANK FOR BALLAST SYSTEM, CHAIN AND COOLING OF MAIN MACHINE	1	180	180	0.055	0.63	9.9	113.4
12	LIGHTING TRANSFORMERS	2	60	120	2.443	-1.345	293.16	-161.4
13	ECO SOUNDING	2	5	10	1	-12	10	-120
14	TAKING SEA FOR SANITARY	1	2	2	0.5	4.345	1	8.69
15	CENTRIFUGAL PUMP SUBMERSIBLE FOR GRAY WATERS	1	100	100	4.345	4	434.5	400
16	E / AUTOMOBILE PUMP OF 36 M3 / HR TO 60 M.C.A CONT. FIRE AND SERV. GENERAL	1	70	70	1.105	-1.56	77.35	-109.2
17	E/BOMBA AUTOCEBANTE DE 36M3/HR A 30 M.C.A PARA ACHIQUE Y LASTRE	1	80	80	1.105	-6	88.4	-480
18	MANIFOLD OF LASTRE	1	160	160	0.65822	-6.345	105.3152	-1015.2
19	CONSOLE	1	450	450	1.964	-6.3456	883.8	-2855.52
20	EMERGENCY ELECTRICITY GROUP 27 KW	1	580	580	1.09	-0.345	632.2	-200.1
21	MANIFOLD OF ACHIQUE	1	105	105	1.09	-0.345	114.45	-36.225
22	PETROLEUM MANIFOLD FOR TRAVASE	1	115	115	1.18	0.0435	135.7	5.0025
23	OIL PURIFIER OF Q = 1150L / H, 220 / 380V	1	160	160	1.6	2.435	256	389.6
24	PETROLEUM TRAVEL PUMP	1	25	25	2.1	5.45	52.5	136.25
25	SALT WATER HYDRAULIC	1	18.5	18.5	4	2.234	74	41.329
26	SWEATER WATER HYDRAULIC	1	17	17	4	6.345	68	107.865
27	E / 20 M3 / HR SELF-HEATING PUMP AT 25 M.C.A FOR FRESHWATER TRAVEL	1	65	65	1.82	7.235	118.3	470.275
28	WAGNER LB HYDRAULIC UNIT OF GOVERNANCE 1.6-35	1	250	250	2.41	7.353	602.5	1838.25
29	PROPELLING PROPELLER 101 '' 3 WINGS P / D = 0.65	1	1245	1245	0.97	19.457	1207.65	24223.965
30	PROPULSION SHAFT 7 ''	1	1048	1048	1.14	17.362	1194.72	18195.376
31	REDUCTION BOX TWIN DISC MG5506 RATIO: 6: 1	1	2200	2200	1.567	12.564	3447.4	27640.8
32	BARON AXIS9''	1	934	934	3.657	19.457	3415.638	18172.838

33	PAL OF GOVERNMENT	1	4120	4120	1.074	19.987	4424.88	82346.44
34	SWEATER WATER PRESSURIZATION PUMP	2	10	20	2.343	9.61	46.86	192.2
35	BLACK WATER TREATMENT PLANT	2	20	40	2.85	6.232	114	249.28
36	DRAIN PUMP, GRAY WATER DISCHARGE SYSTEM Q = 3 M3 / HR, 6 M.C.A	1	80	80	1.94	4.279	155.2	342.32
37	HYDRAULIC GOVERNMENT PUMP	1	180	180	1.02	11.128	183.6	2003.04
38	MAIN MOTOR MUFFLERS	1	65	65	3.5	-0.833	227.5	-54.145
39	SILENCER OF THE ELECTROGENES	1	38	38	3.54	9.653	134.52	366.814
40	KEEL COOLER COOLING SYSTEM	1	31221	31221	0.22	9.546	6868.62	298035.666
41	LEATHER TANK IN BABOR	1	120	120	0.69	8.345	82.8	1001.4
42	DAILY PETROLEUM TANK IN STARBOARD	1	75	75	2.5	10.83	187.5	812.25
43	DIARE PETROLEUM TANK IN PORT	1	60	60	2.5	10.83	150	649.8
44	LUBRICANT OIL TANK IN PORT	1	45	45	2.3	4.345	103.5	195.525
45	LUBRICANT OIL TANK IN STARBOARD	1	100	100	0.48	6.345	48	634.5
46	HYDRAULIC OIL TANK IN STARBOARD	1	45	45	2.3	8.26	103.5	371.7
47	ENGINE FLOODING TANK AT THE CENTER	1	130	130	1.14	-1.068	148.2	-138.84
48	FRESH WATER TANK 1	1	15779	15779	2.23	-4.345	35187.17	-68559.755
49	AXIAL FAN OF 2000 M3 / HR	1	200	200	5.774	4.563	1154.8	912.6
50	HEAT EXCHANGER	1	100	100	1.515	4.346	151.5	434.6
51	FISHING MACHINERY	1	40000	40000	4.5	7.234	180000	289360
TOTAL SYSTEM AND EQUIPMENT				112270.5			276165.4182	802806.7365

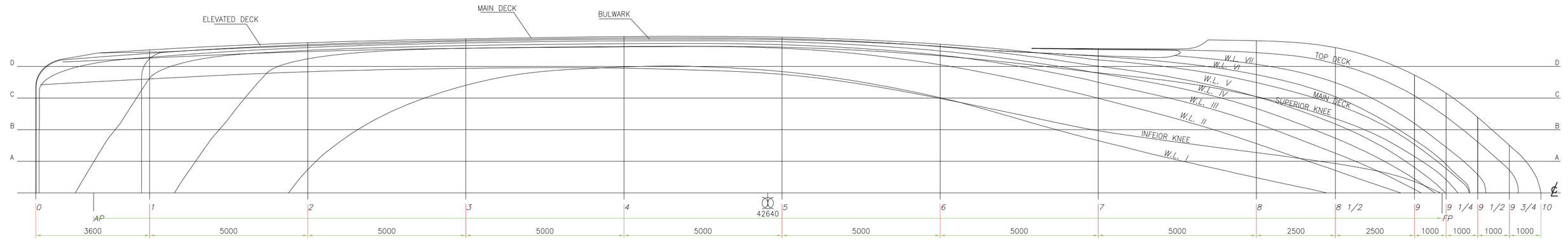
5. ANNEXES



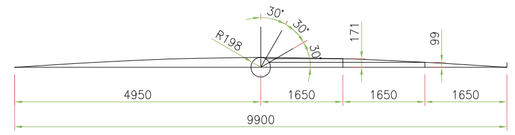
LONGITUDINAL ELEVATION



CROSS SECTION



TOP VIEW



ROUND OF BEAM

MAIN CHARACTERISTICS

OVERALL LENGTH.....47.60 m
LENGHT BETWEEN PERPENDICULARS.....42.64 m
MOLDED BREADTH.....9.90 m
MOLDED DEPTH.....4.40 m

HEIGHT FROM BASE LINE

ST.	RABBET	INFERIOR KNEE	SUPERIOR KNEE	BILGE RADIUS	ELEVATED DECK TO THE HULL	MAIN DECK TO THE HULL	ELEVATED DECK TO THE CENTER	MAIN DECK TO THE CENTER	ELEVATED BULWARK	MAIN DECK BULWARK	SECONDARY DECK TO THE HULL	SECONDARY DECK TO THE CENTER	SECONDARY DECK BULWARK	ST.
0	6788	-	-	-	-	-	-	-	-	-	-	-	-	0
1	1791	2395	3051	836	5224	-	5394	-	6024	-	-	-	-	1
2	683	1384	2075	751	5097	-	5281	-	5897	-	-	-	-	2
3	101	907	1597	749	-	4487	-	4683	-	5487	-	-	-	3
4	10	792	1508	811	-	4392	-	4590	-	5392	-	-	-	4
5	97	766	1741	1266	-	4437	-	4636	-	5440	-	-	-	5
6	220	792	2271	1954	-	4543	-	4719	-	5544	-	-	-	6
7	229	919	3242	3017	-	4744	-	4896	-	5745	7128	7298	7227	7
8	580	1395	4013	7226	-	5011	-	5121	-	-	7356	7526	8360	8
8 1/2	832	1900	4318	29055	-	5159	-	5231	-	-	7495	7616	8499	8 1/2
9	2107	3022	4660	20345	-	5324	-	5349	-	-	7663	7748	8653	9
9 1/4	4048	-	4820	-	-	5403	-	5413	-	-	7735	7798	8720	9 1/4
9 1/2	6017	-	-	-	-	-	-	-	-	-	7807	7843	8789	9 1/2
9 3/4	7481	-	-	-	-	-	-	-	-	-	7879	7887	8860	9 3/4
10	8945	-	-	-	-	-	-	-	-	-	-	-	8935	10

HALF BREADTH FROM CENTER LINE

ST.	INFERIOR KNEE	SUPERIOR KNEE	ELEVATED DECK TO THE HULL	MAIN DECK TO THE HULL	ELEVATED BULWARK	MAIN DECK BULWARK	SECONDARY DECK TO THE HULL	SECONDARY DECK BULWARK	ST.
0	-	-	-	-	4223	-	-	-	0
1	3606	4266	4441	-	4246	-	-	-	1
2	3832	4470	4739	-	4656	-	-	-	2
3	3941	4574	-	4925	-	4833	-	-	3
4	3945	4619	-	4945	-	4860	-	-	4
5	3750	4607	-	4924	-	4846	-	-	5
6	2989	4335	-	4703	-	4634	-	-	6
7	1965	3799	-	4208	-	4341	4550	4564	7
8	1276	3047	-	-	-	-	4438	4812	8
8 1/2	847	1548	-	-	-	-	4086	4594	8 1/2
9	360	1150	-	-	-	-	3072	3728	9
9 1/4	-	419	-	-	-	-	2398	3154	9 1/4
9 1/2	-	-	-	-	-	-	1610	2390	9 1/2
9 3/4	-	-	-	-	-	-	719	1508	9 3/4
10	-	-	-	-	-	-	-	-	10

NATIONAL UNIVERSITY OF ENGINEERING

450 M3 PURSE SEINE FISHING VESSEL

SHAPE LINES

REVIEWED: OSCAR BERNABE

DATE: 08/09/2016

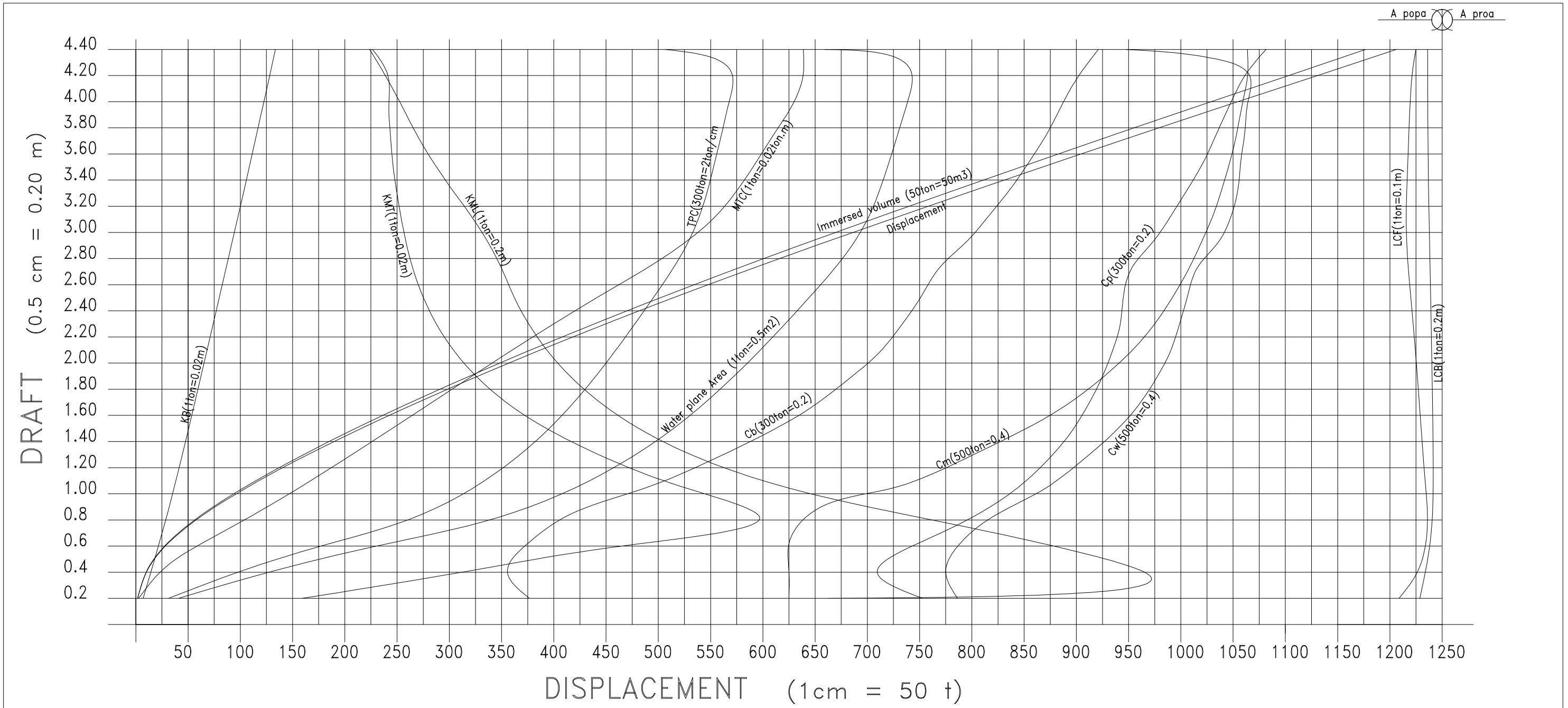
PLAN N° 1

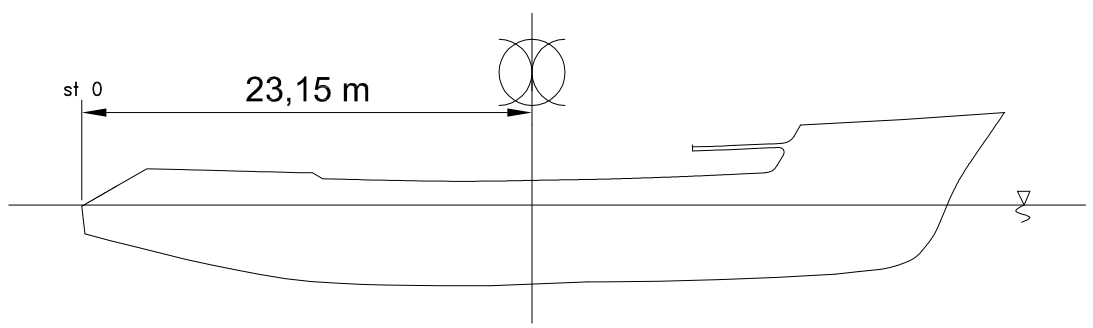
REV.:

SCALE: 1:100

PROJECT:

SHEET: OF:





MAIN CHARACTERISTICS

OVERALL LENGTH.....47.60 m
LENGTH BETWEEN PERPENDICULARS.....42.64 m
MOLDED BREADTH.....9.90 m
MOLDED DEPTH.....4.40 m

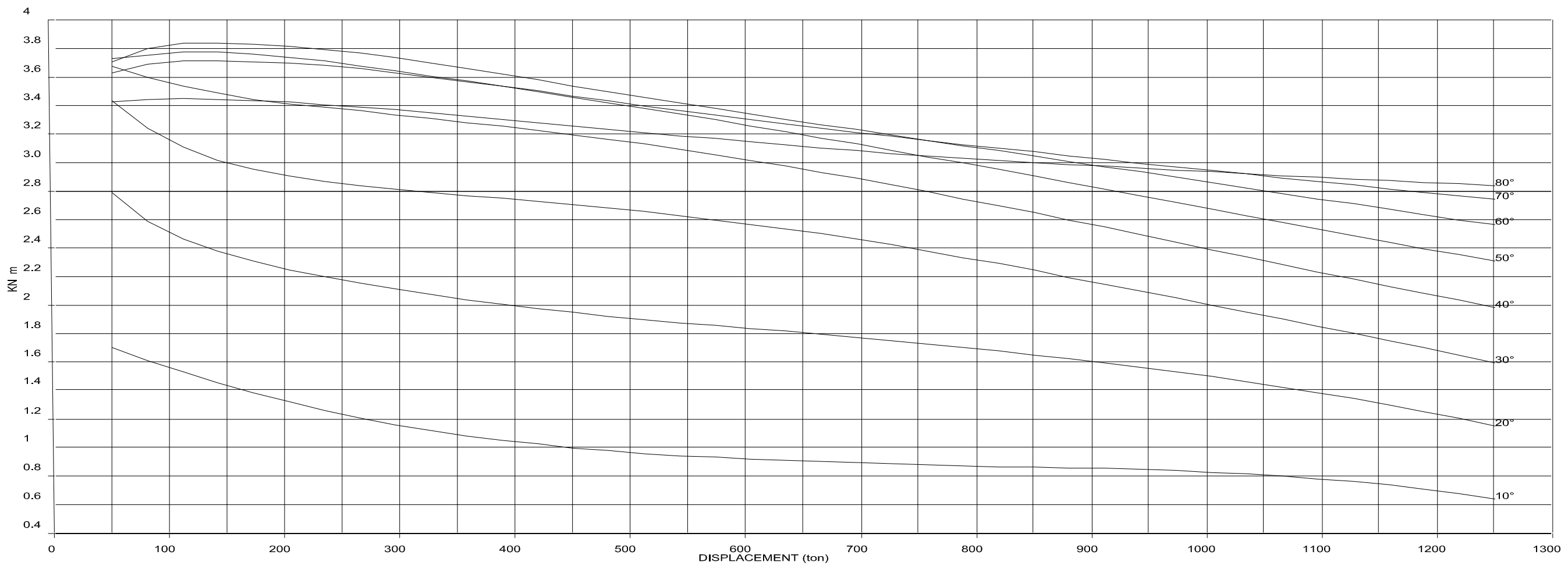
NOTES:

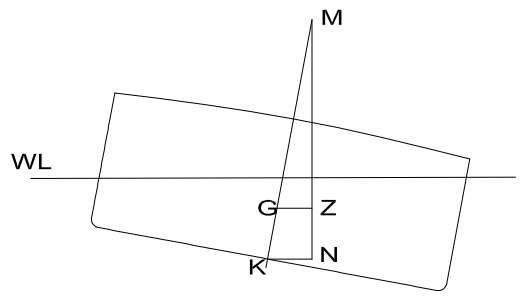
- Heel : 0°
- Trim : 0°
- Sea water : 1025 t/m ^{3}
- Drafts at base line.
- LCB and LCF values from midship.

NATIONAL UNIVERSITY OF ENGINEERING

450 M3 PURSE SEINE FISHING VESSEL
HYDROSTATIC CURVES

REVIEWED: OSCAR BERNABE			
DATE: 08/09/2016	PLAN N°: 1	REV.:	
SCALE: 1:1	PROJECT:	SHEET: OF:	





50 ton = 1 cm

0.2 m = 0.5 cm

KG ASSUMED = 0 m

MAIN CHARACTERISTICS

OVERALL LENGTH.....47.60 m

LENGTH BETWEEN PERPENDICULARS.....42.64 m

MOLDED BREADTH.....9.90 m

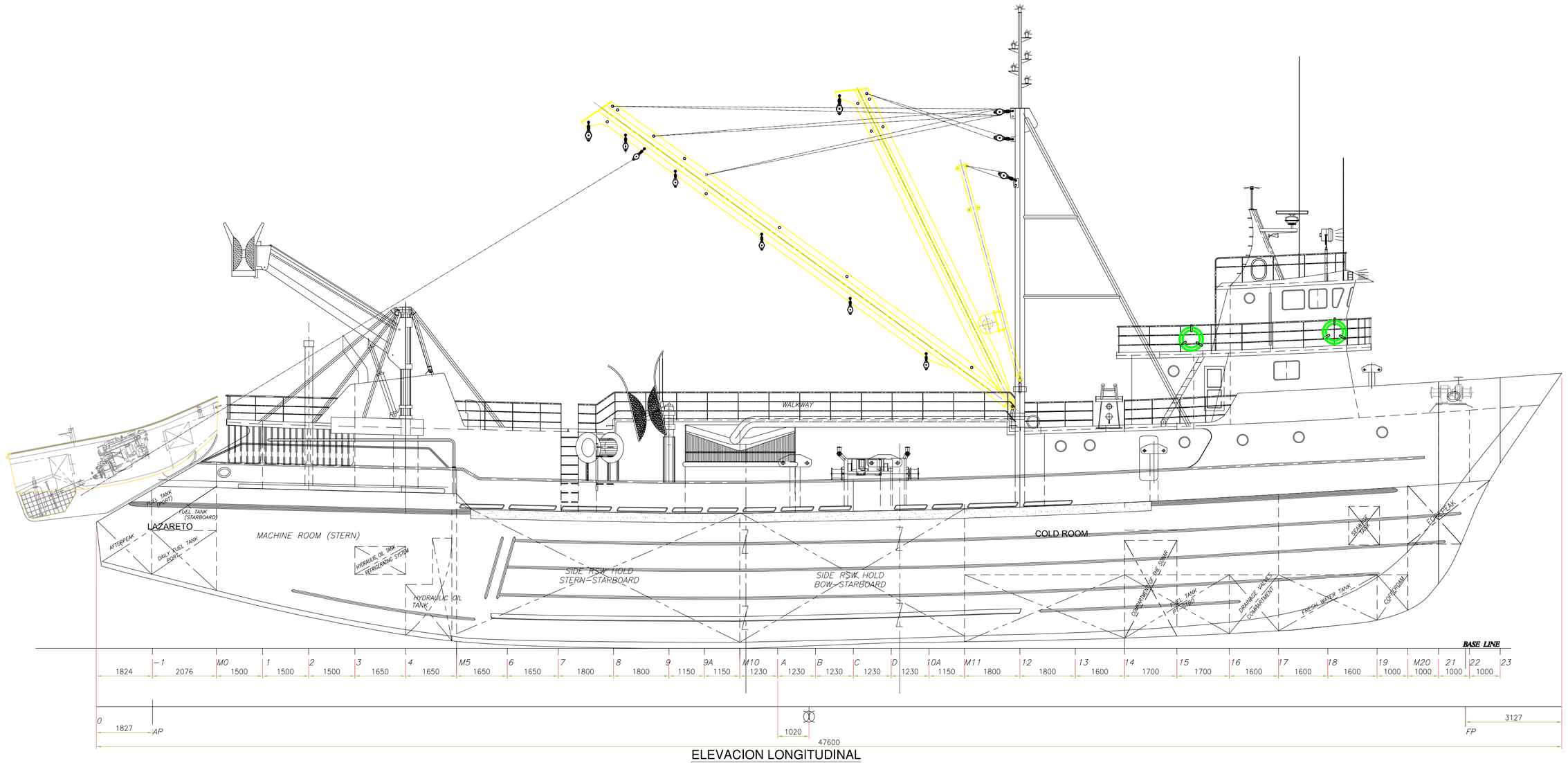
MOLDED DEPTH.....4.40 m

NATIONAL UNIVERSITY OF ENGINEERING

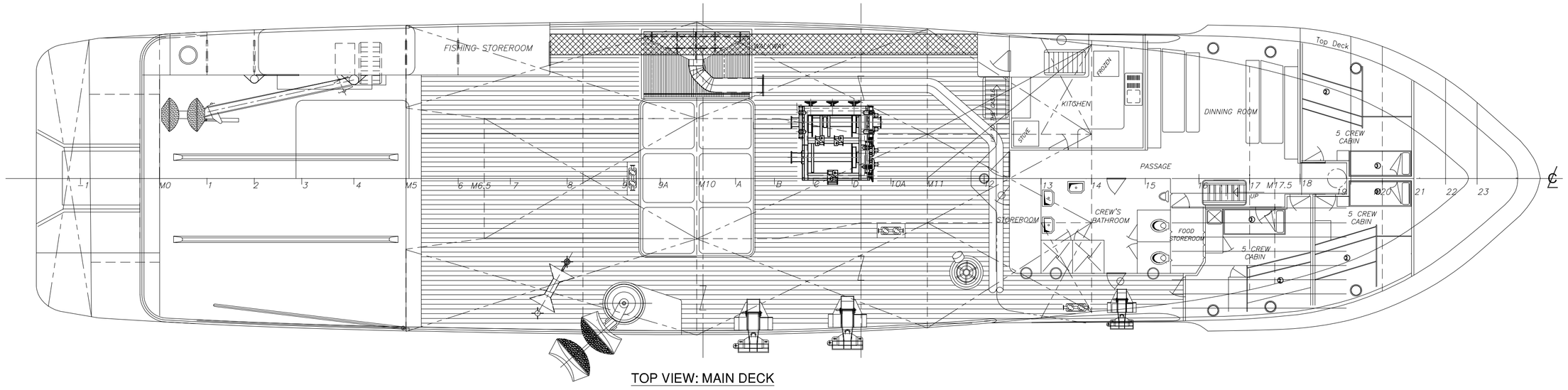
450 M3 PURSE SEINE FISHING VESSEL

CROSS CURVES

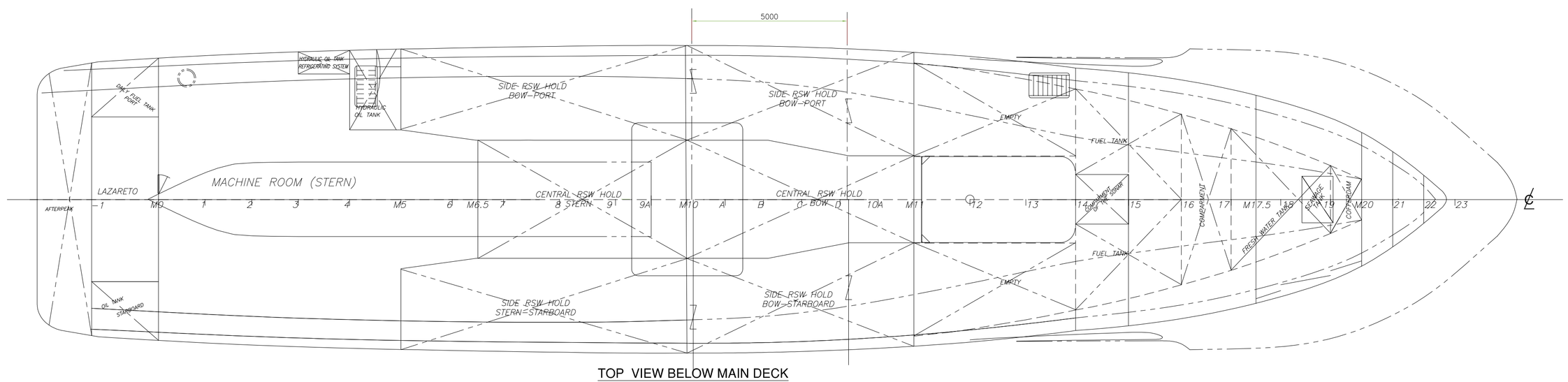
REVIEWED: OSCAR BERNABE			
DATE: 08/09/2016	PLAN N°: 1	REV.:	
SCALE: 1:1	PROJECT:	SHEET:	OF:



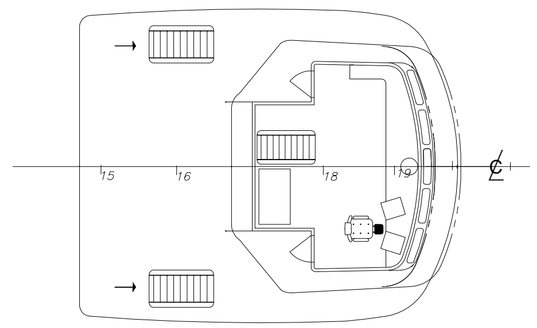
ELEVACION LONGITUDINAL



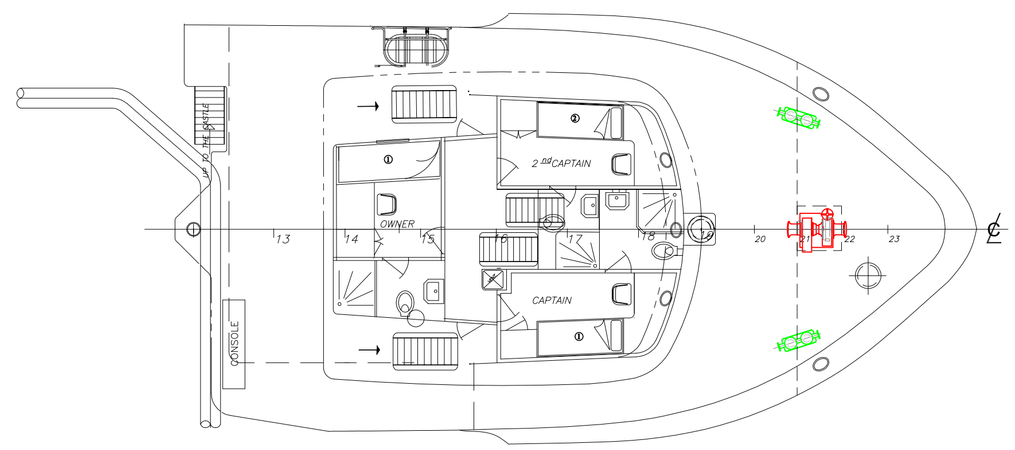
TOP VIEW: MAIN DECK



TOP VIEW BELOW MAIN DECK



BRIDGE

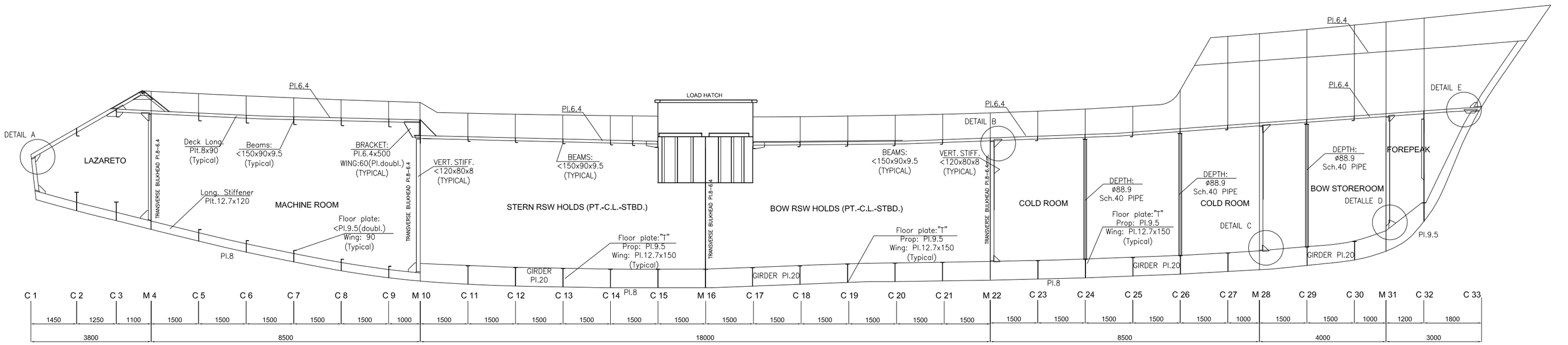


FORECASTLE DECK

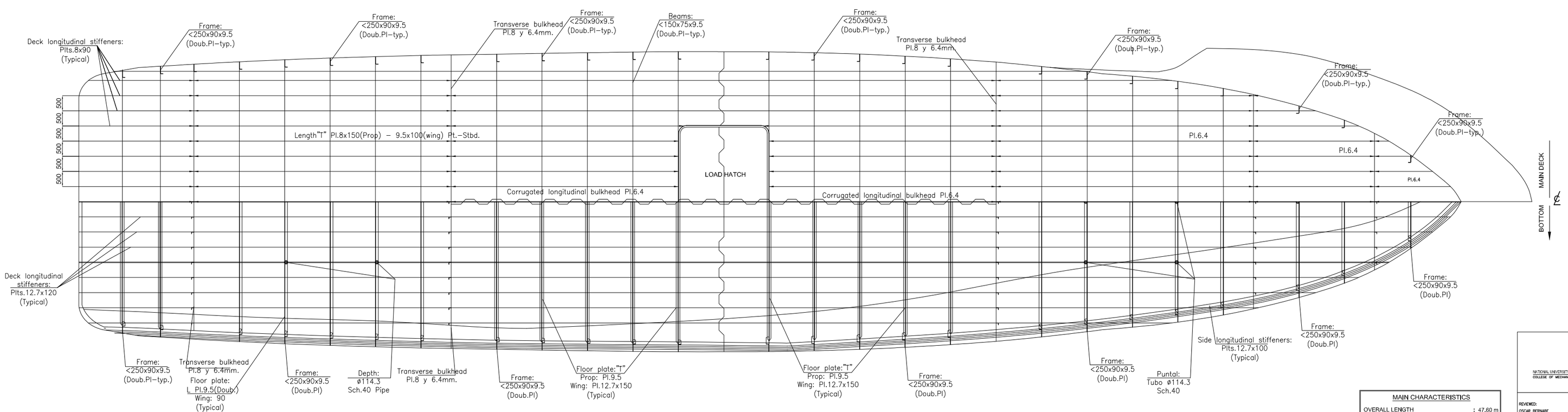
MAIN CHARACTERISTICS

OVERALL LENGTH.....47.60m.
MOLDED BREADTH..... 9.90 m.
MOLDED DEPTH.....4.40 m.
VELOCITY.....13 knt.
AUTONOMY.....10 Days
CREW.....18 and Captain
HOLD'S CAPACITY.....450 m3.

NATIONAL UNIVERSITY OF ENGINEERING			
	450 M3 PURSE SEINE FISHING VESSEL GENERAL DISPOSITION		
REVIEWED: OSCAR BERNABE			
DATE: 08/09/2016	PLAN N°: 1	REV.:	
SCALE: 1:100	PROJECT:	SHEET: OF:	



LONGITUDINAL VIEW FROM CENTER LINE



MAIN DECK TOP VIEW (STARBOARD) AND BOTTOM (PORT)

MAIN CHARACTERISTICS

OVERALL LENGTH	:	47,60 m
LENGHT BETWEEN PERPENDICULARS	:	42,64 m
MOLDED BREADTH		9,90 m
MOLDED DEPTH	:	4,40 m

NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF MECHANICAL ENGINEERING

REVIEWED:
OSCAR BERNABE

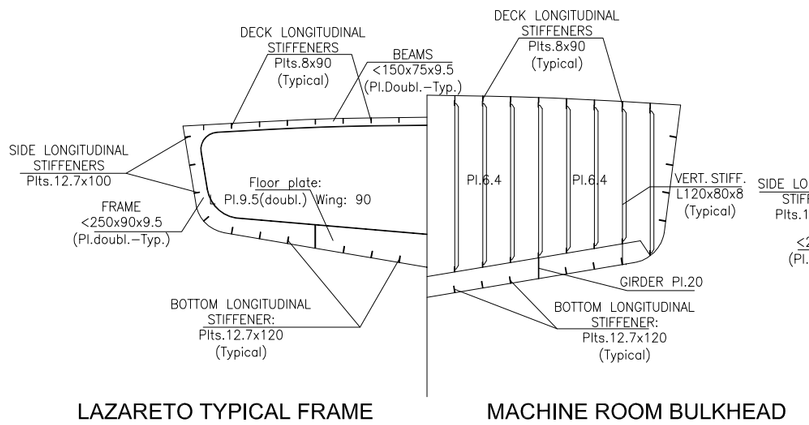
NAVAL_PROJECTS_II

PURSE_SEINE_FISHING_VESSEL

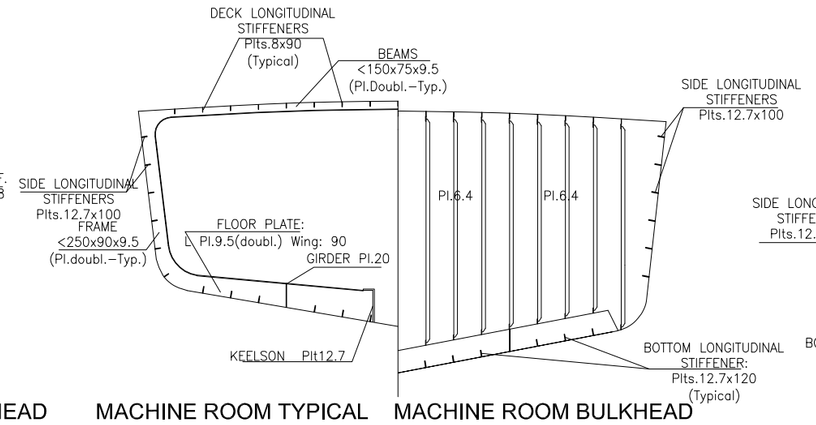
GENERAL STRUCTURE

PLAN N°

DATE:	SCALE:	UNITS:	PROJECT N°:
22 - 09 - 16	1:75	MM	01

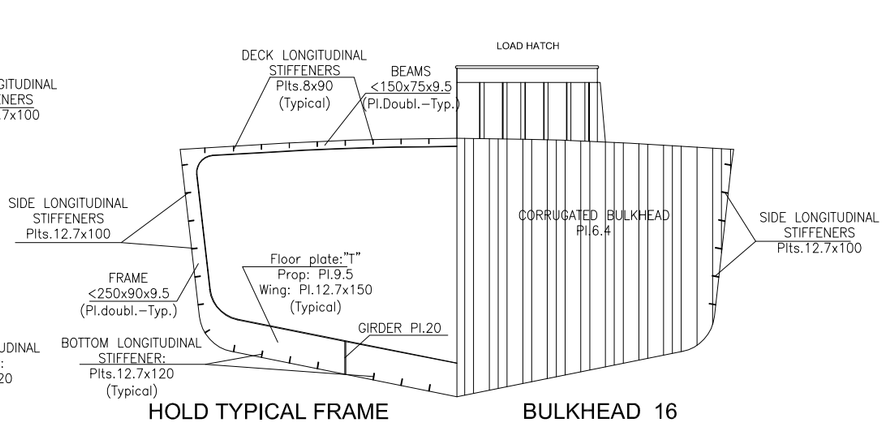


LAZARETO TYPICAL FRAME
FRAME 2
LOOKING AFT



MACHINE ROOM BULKHEAD
BULKHEAD 4
LOOKING AFT

MACHINE ROOM TYPICAL
FRAME
FRAME 6
LOOKING AFT



MACHINE ROOM BULKHEAD
BULKHEAD 10
LOOKING AFT

HOLD TYPICAL FRAME
FRAME 15
LOOKING AFT

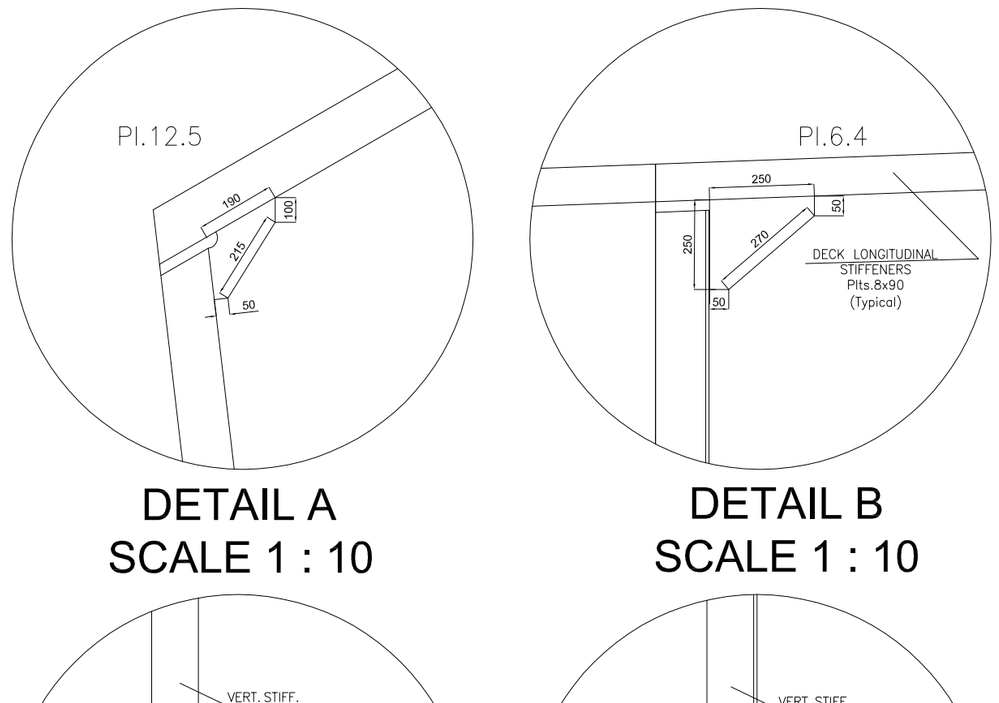
BULKHEAD 16
LOOKING AFT

COLD ROOM TYPICAL FRAME
FRAME 20
LOOKING AFT

COLDROOM BULKHEAD
BULKHEAD 22
LOOKING FORWARD

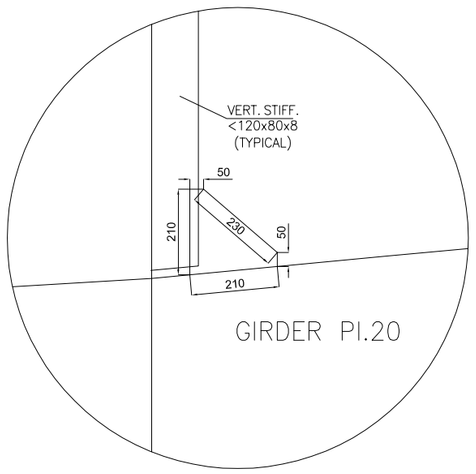
COLD ROOM TYPICAL FRAME
FRAME 26
LOOKING AFT

FOREPEAK BULKHEAD
BULKHEAD 31
LOOKING FORWARD

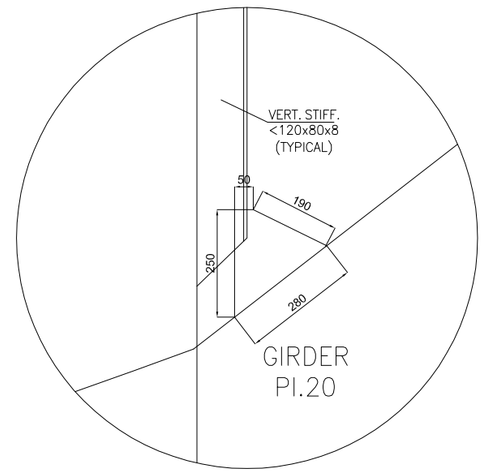


DETAIL A
SCALE 1 : 10

DETAIL B
SCALE 1 : 10



DETAIL C
SCALE 1 : 10



DETAIL D
SCALE 1 : 10

DETAIL E
SCALE 1 : 10

MAIN CHARACTERISTICS		
OVERALL LENGTH	:	47,60 m
LENGHT BETWEEN PERPENDICULARS	:	42,64 m
MOLDED BREADTH		8,90 m
MOLDED DEPTH	:	4,40 m

NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF MECHANICAL ENGINEERING

REVIEWED:
OSCAR BERNABE

NAVAL_PROJECTS_II

PURSE_SEINE_FISHING_VESSEL

FRAME AND BULKHEAD

PLAN N°

DATE:	SCALE:	UNITS:	PROJECT N°:
22 – 09 – 16	1:75	MM	01

NATIONAL UNIVERSITY OF ENGINEERING

450 M3 PURSE SEINE FISHING VESSEL

GOVERNMENT SYSTEM

REMEMBER: OSCAR BERNABE

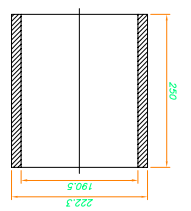
DATE: 27/10/2016 | PLAN: | 3-1 | REV: | SCALE: 1:25 | PROJECT: | SHEET: | OF:

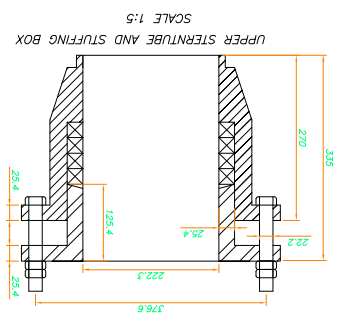
MAIN CHARACTERISTICS

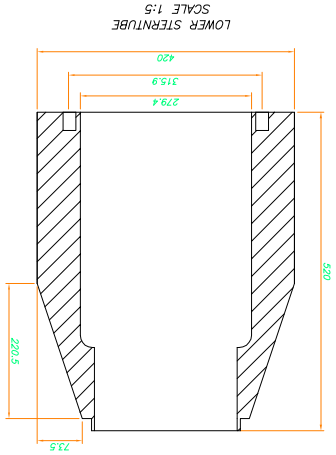
OVERALL LENGTH	47.60 m
LENGTH BETWEEN PERPENDICULARS	42.64 m
MOLDED BREADTH	9.90 m
MOLDED DEPTH	4.40 m

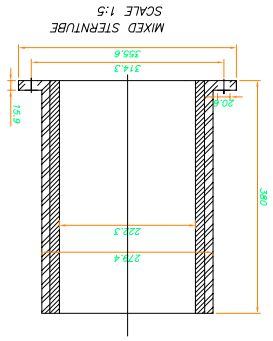
MATERIAL LISTING

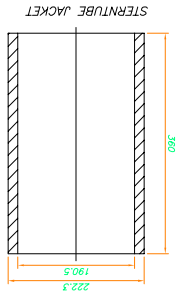
Pos.	AMT.	DESCRIPTION	MATERIAL	OBS.
01	01	GOVERNMENT BLADE 2.50m x 1.50 m	ASTM-A131	
02	01	44.5" BLADE SHAFT	MANGANESE BRONZE	
03	01	BLADE FLANGE 400 mm * 500 mm— 6 BOLTS	SAE 1020	
04	06	7/8 " BOLTS	GRADE 8	
05	01	#7 1/2 " HOLE SHAFT	SAE 1020	
06	01	HOLE SHAFT BOTTOM JACKET (ext #222.3mm int #190.5 mm)	ASTM-B30-1A / BRONZE	
07	01	MIXED FLANGE (BRASS AND RUBBER) 8 3/4 " Leng.380 mm	BRASS AND RUBBER	
08	01	LOWER STERNTUBE	SAE 1020	WELTED
09	01	10" SCH 80 PIPE	SAE 1020	
10	01	UPPER STERNTUBE	SAE 1020	WELTED
11	01	HOLE SHAFT TOP JACKET	ASTM-B30-1A / BRONZE	
12	01	1" STUFFING BOX 4 vuelltas	VEGETABLE FIBRE	
13	01	STUFFING BOX	SAE 1020	
14	01	ASPARAGUS	BRONZE	FOR THRUST SHAFT
15	01	BEARING	SAE 1020	WELTED
16	01	JACKET ext. #136.5 mm int.111.1 length. 90mm	ASTM-B30-1A / MG.TEO BRONZE	
17	01	EXT. SHAFT #111.1mm/int.88.7 mm x length. 85.7mm	ASTM-B30-1A / MG.TEO BRONZE	
18	01	#76.2 mm JACKET	MG.TEO BRONZE ASTM-1045	
19	01	KEY 25.4x90x25.4 mm	Cuivre ASTM-B30-1A / Nickel Steel/Melted Bronze / CARBON STEEL	
20	01	WASHER TYPE L LA2 2.5-35 GOVERNMENT UNIT	ASTM-B30-1A / Melted Bronze	
21	01	CLAMP	SAE 1020	For propeller nut

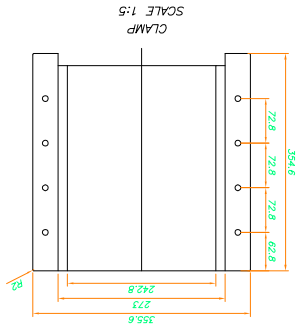


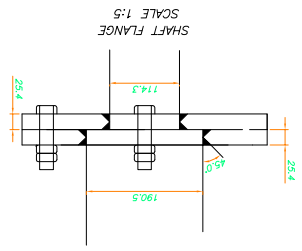


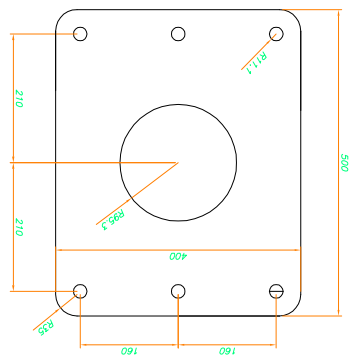


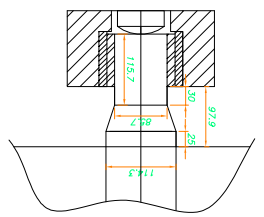


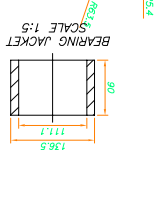


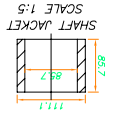


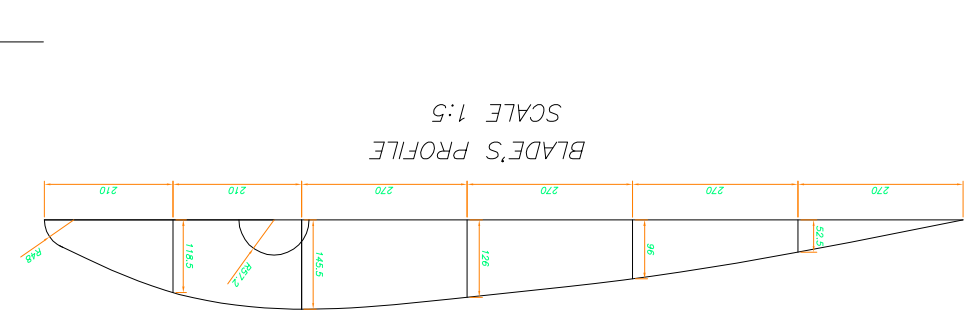


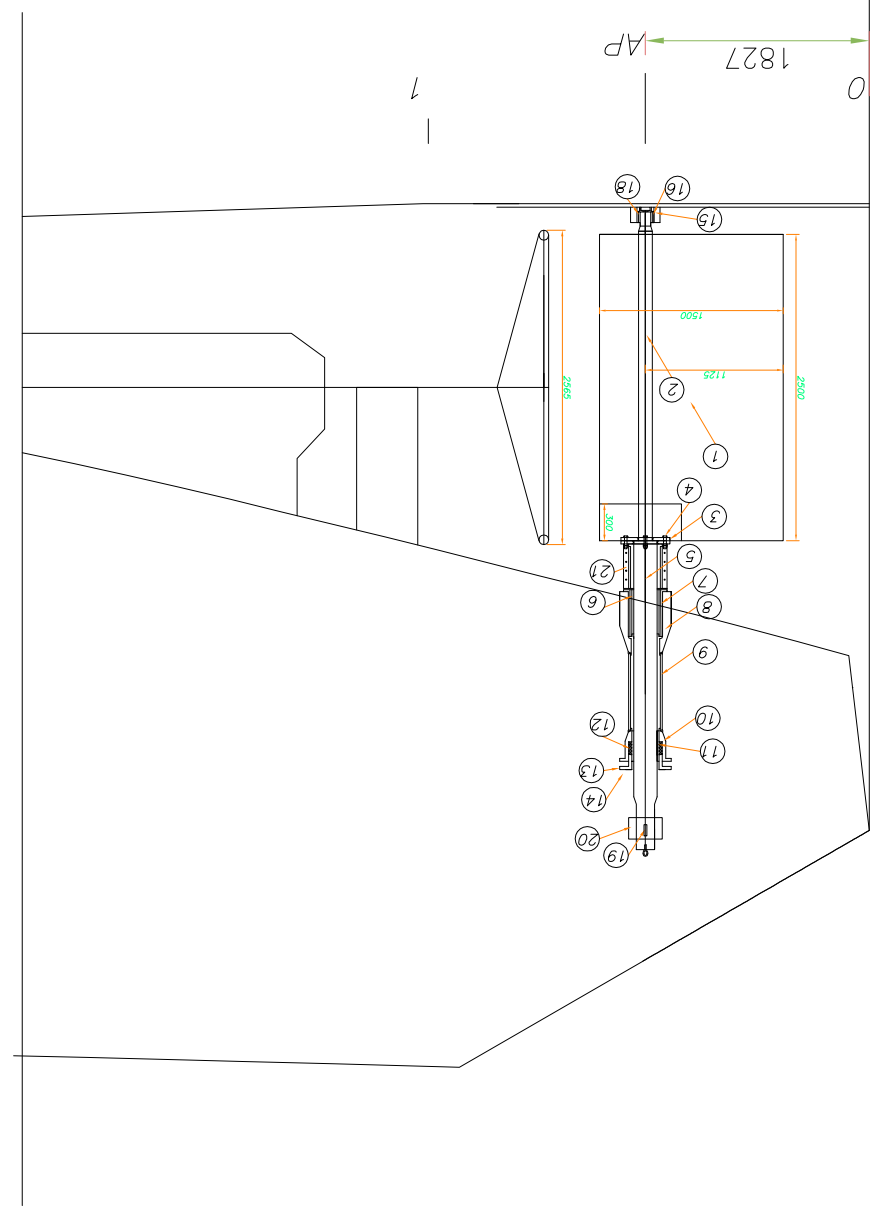


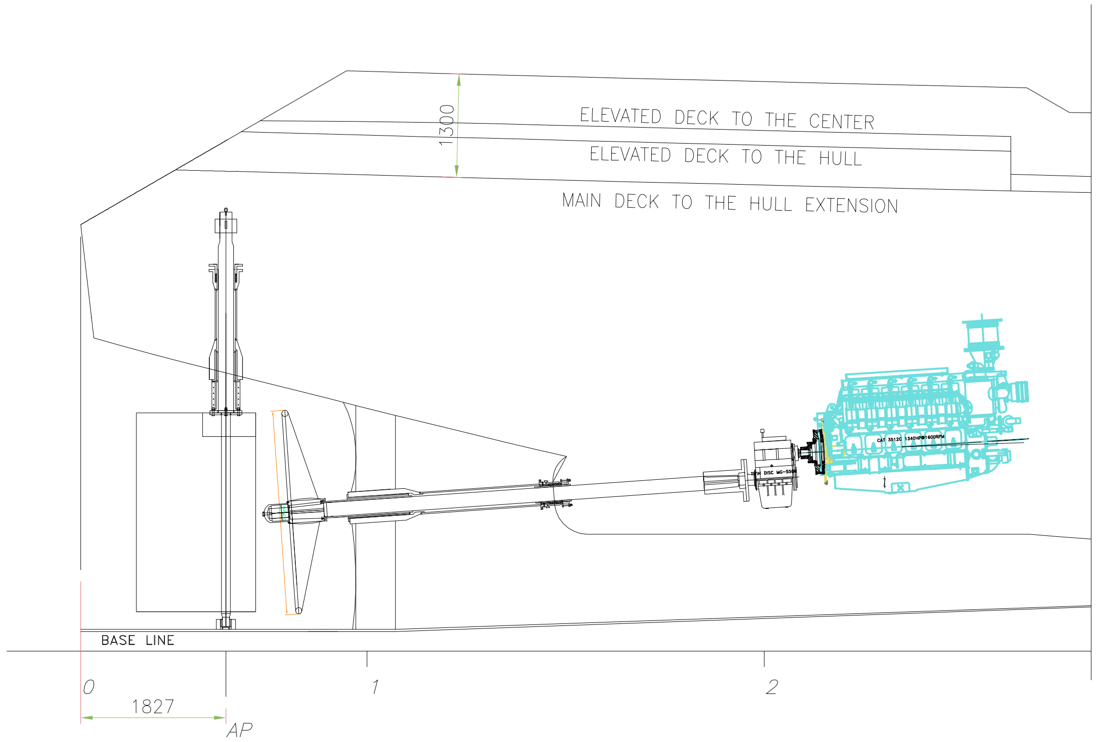


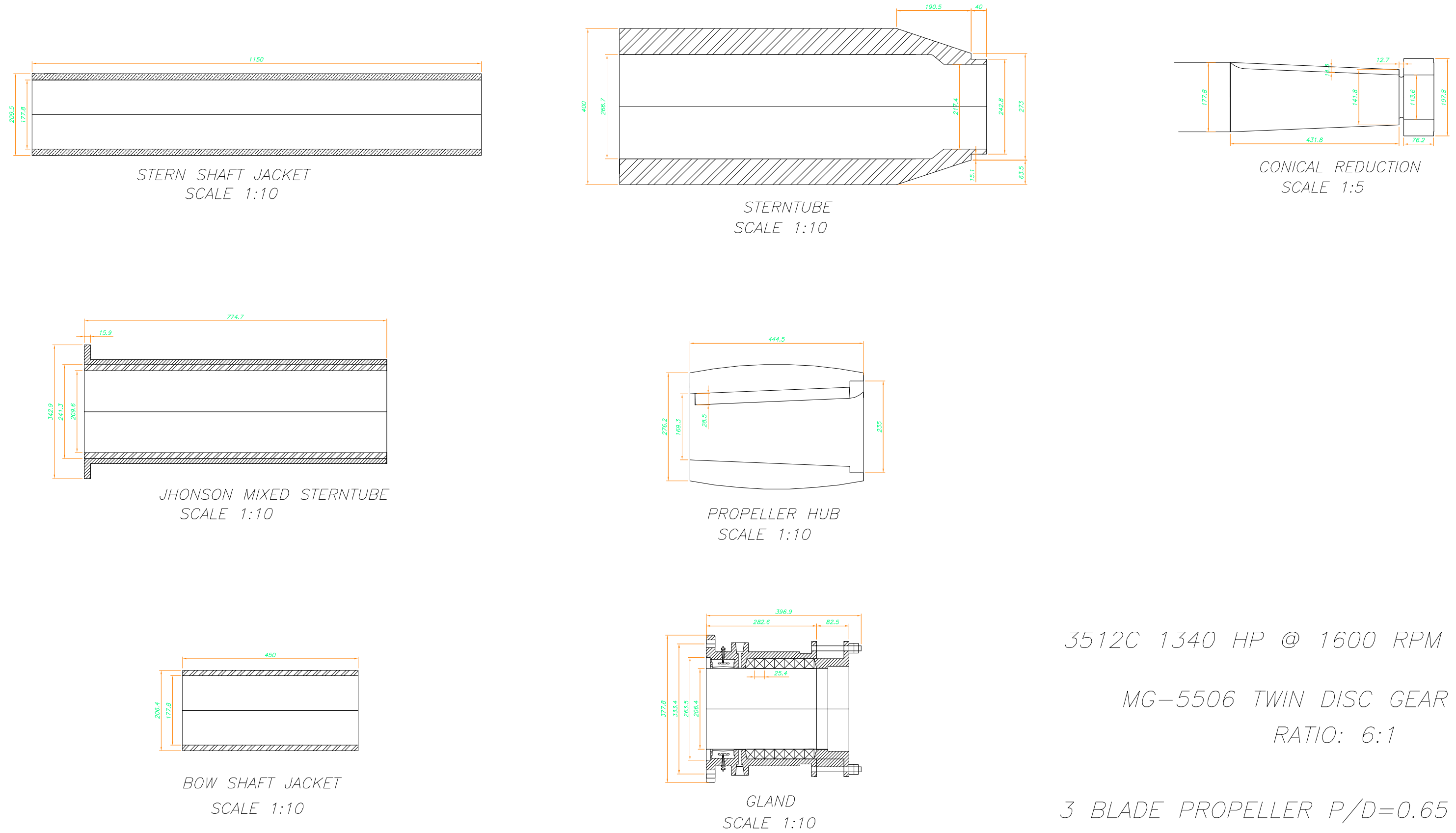












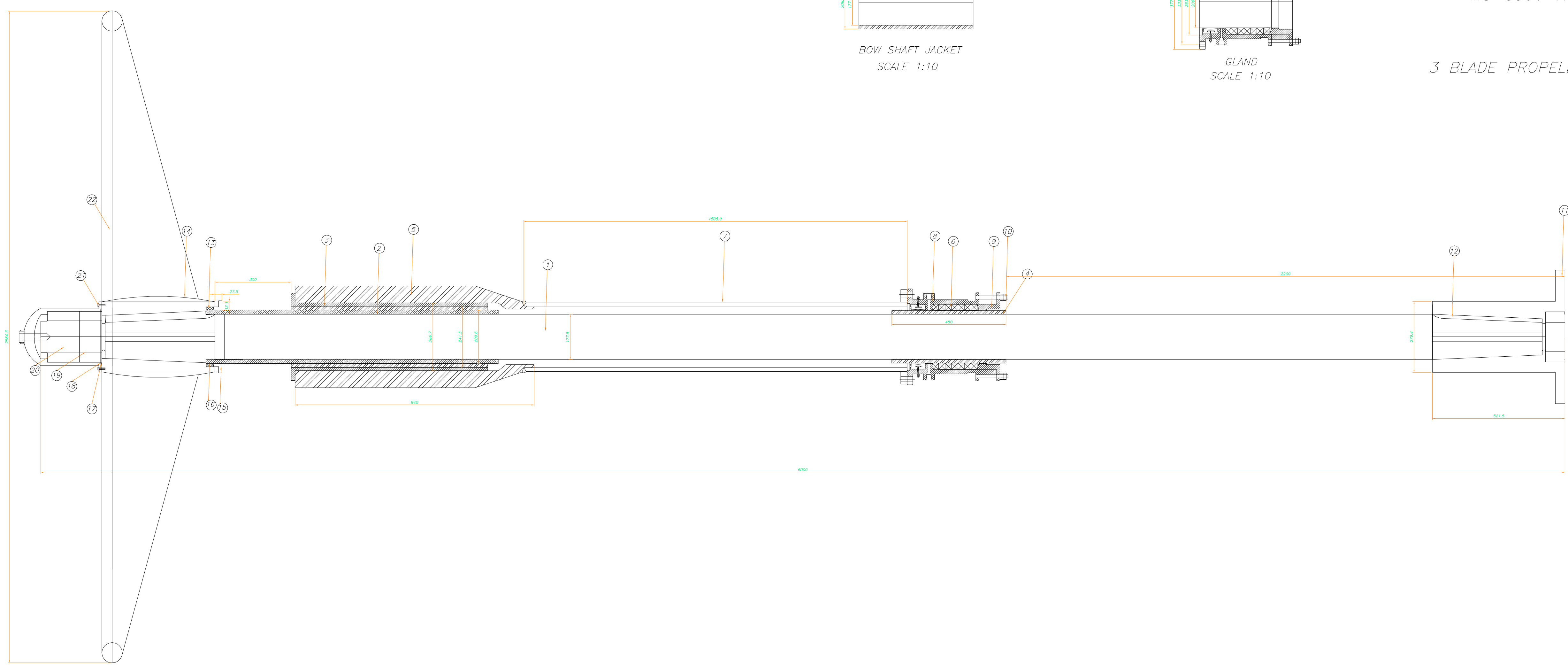
3512C 1340 HP @ 1600 RPM ENGINE

MG-5506 TWIN DISC GEAR BOX
RATIO: 6:1

3 BLADE PROPELLER P/D=0.65 n=0.615

MAIN CHARACTERISTICS

OVERALL LENGTH.................................47.60 m
LENGTH BETWEEN PERPENDICULARS..........................42.64 m
MOLDED BREADTH.............................9.90 m
MOLDED DEPTH..........................4.40 m



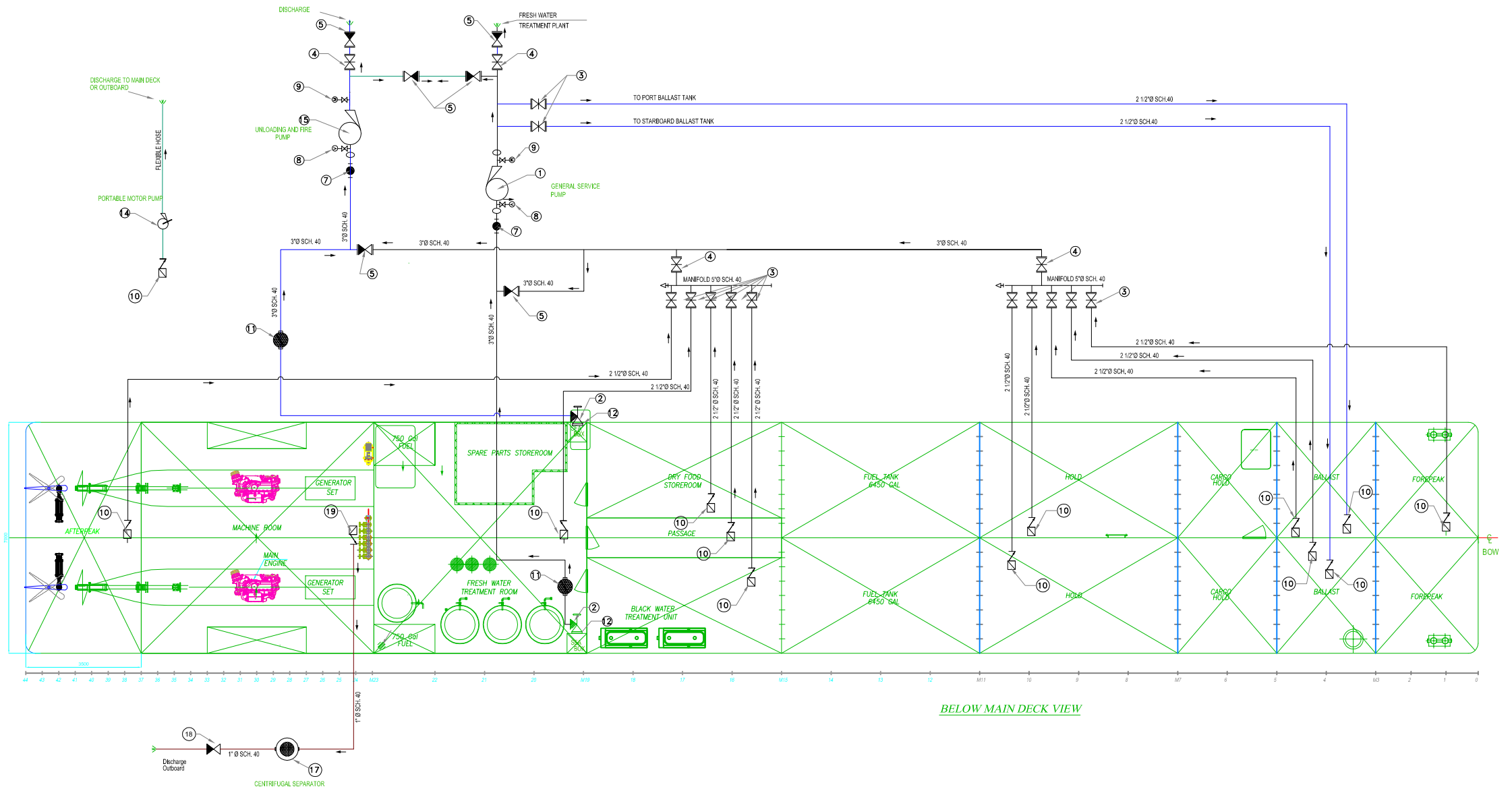
Pos.	AMT.	DESCRIPTION	MATERIAL	OBS.
22	01	2564.3 mm PROPELLER 3 BLADES	Steel SAE 1020	
21	01	CONUS NUT	Steel SAE 1020	For propeller nut.
20	01	PROPELLER NUT	Steel SAE 1020	
19	01	SPLITTED BULKHEAD FEEDTHROUGH	Naval Steel/Melted Bronze	
11	01	ϕ152.4 (6") SHAFT COUPLING	ASTM-A27	
10	01	3/4" ASPARAGUS	Grade 8	
9	01	JHONSON STERN GLAND		
08	01	JHONSON STUFFING BOX		
07	01	8" TUBE	SAE 1020	
06	01	1" STUFFING BOX	VEGETABLE FIBRE	
05	01	STERNTUBE	SAE 1020	MELTED
04	01	TAIL SHAFT JACKET	MANGANESE BRONZE	
03	01	FLANGED MIXED STERNTUBE	BRASS AND RUBBER	
02	01	TAIL SHAFT JACKET	SAE 1035	
01	01	7" TAIL SHAFT	SAE 1045	

MATERIAL LISTING

NATIONAL UNIVERSITY OF ENGINEERING

450 M3 PURSE SEINE FISHING VESSEL
PROPULSION SYSTEM

REVIEWED: OSCAR BERNABE			
DATE: 27/10/2016	PLAN: 3-1	REV.:	
SCALE: 1:50	PROJECT:	SHEET: OF:	



BELOW MAIN DECK VIEW

LEGEND

BUTTERFLY VALVE	STRAIGHT GLOBE VALVE
GATE VALVE	CHECK VALVE OF FOOT
STOP CHECK VALVE	FILTER
CHECK VALVE	MANOMETER
GLOBE VALVE	VACUOMETER
BALL VALVE	REDUCTION
STOP CHECK ANGLE VALVE	

MAIN CHARACTERISTICS

LENGTH OVERALL	47.60 m
MOLDED BREADTH	9.90 m
MOLDED DEPTH	4.40 m

UNLOADING, BILGE, BALLAST AND FIRE SYSTEMS MATERIALS

ITEM	DESCRIPTION	AMT.	MATERIAL	OBS.
1	100 GPM SELF-PRIMING PUMP, 52', 3" Ø x 3" Ø	1	-	-
2	ANGLE VALVE STOP CHECK 3" Ø PN. 16C/FLANGE	2	NODULAR CAST IRON	-
3	COMPACT VALVE 2 1/2" Ø FLANGE 150 PSI	12	CAST IRON / BRONZE	-
4	COMPACT VALVE 3" Ø PN FLANGE 150 PSI	4	CAST IRON / BRONZE	-
5	STRAIGHT VALVE STOP CHECK 3" Ø PN. 10C/FLANGE	6	NODULAR CAST IRON	-
6	STRAIGHT GLOBE VALVE 2" Ø PN. 10C/FLANGE AND COUPLING	2	BRONZE	-
7	FILTER OF 3" Ø (SLUDGE BOX) FLANGE	2	GALV. STEEL/IN. BRONZE	-
8	VACUOMETER W/GLYCERIN OF 2 1/2"	2	BRONZE	-1 to 1 BAR
9	MANOMETER W/GLYCERIN OF 2 1/2"	2	BRONZE	0 to 8 BAR
10	CHECK VALVE OF FOOT OF 2 1/2" Ø PN. 10	13	BRONZE	-
11	BASKET TYPE SUCTION FILTER	2	STEEL ASTM A-36	STD. SS. 6.01
12	3"Ø BULKHEAD FEEDTHROUGH FLANGE, PN.10	2	STEEL ASTM A-36	STD.41
13	3"Ø CONCENTRIC REDUCTION, SCH. 40	2	STEEL	-
14	PORTABLE MOTOR PUMP	1	-	-
15	70 GPM PUMP, 115', 3" Ø x 3" Ø	1	-	-
16	5" Ø x 2000 SCH 80 PIPE	6 m	STEEL	ASTM A53-B
17	OIL-WATER CENTRIFUGAL SEPARATOR	1	-	-
18	STRAIGHT VALVE STOP CHECK 1" Ø PN. 10C/FLANGE	1	NODULAR CAST IRON	-
19	CHECK VALVE OF FOOT OF 1" Ø PN. 10	1	NODULAR CAST IRON	-

NATIONAL UNIVERSITY OF ENGINEERRING

450 M3 PURSE SEINE FISHING VESSEL

UNLOADING, BILGE, BALLAST AND FIRE SYSTEM

REVIEWED:	SCALE:	REV.:	PLAN N°
OSCAR BERNABE SANCHEZ	1:75		
	DATE: 17- 11 - 2016		