DECK LOADING ANALYSIS

FOR

12M CREW BOAT FIBERGLASS

Rev. 0

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REVISION SHEET

Rev.	Status / Reason	Page(s)	Date
0	Issued for Approval	1-27	18-12-19

TABULATION OF REVISED PAGES

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	0	1	2	3	4	5	6	7			0	1	2	3	4	5	6	7	
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1. INTRODUCTION

The structural analysis for “Deck structure”, fitted on “12M Crew Boat - Fiberglass” using Ansys Workbench 19.2, which the calculation is useful to determine the ability of main deck structure to accommodate loading with specification 200 Kg /m^2.

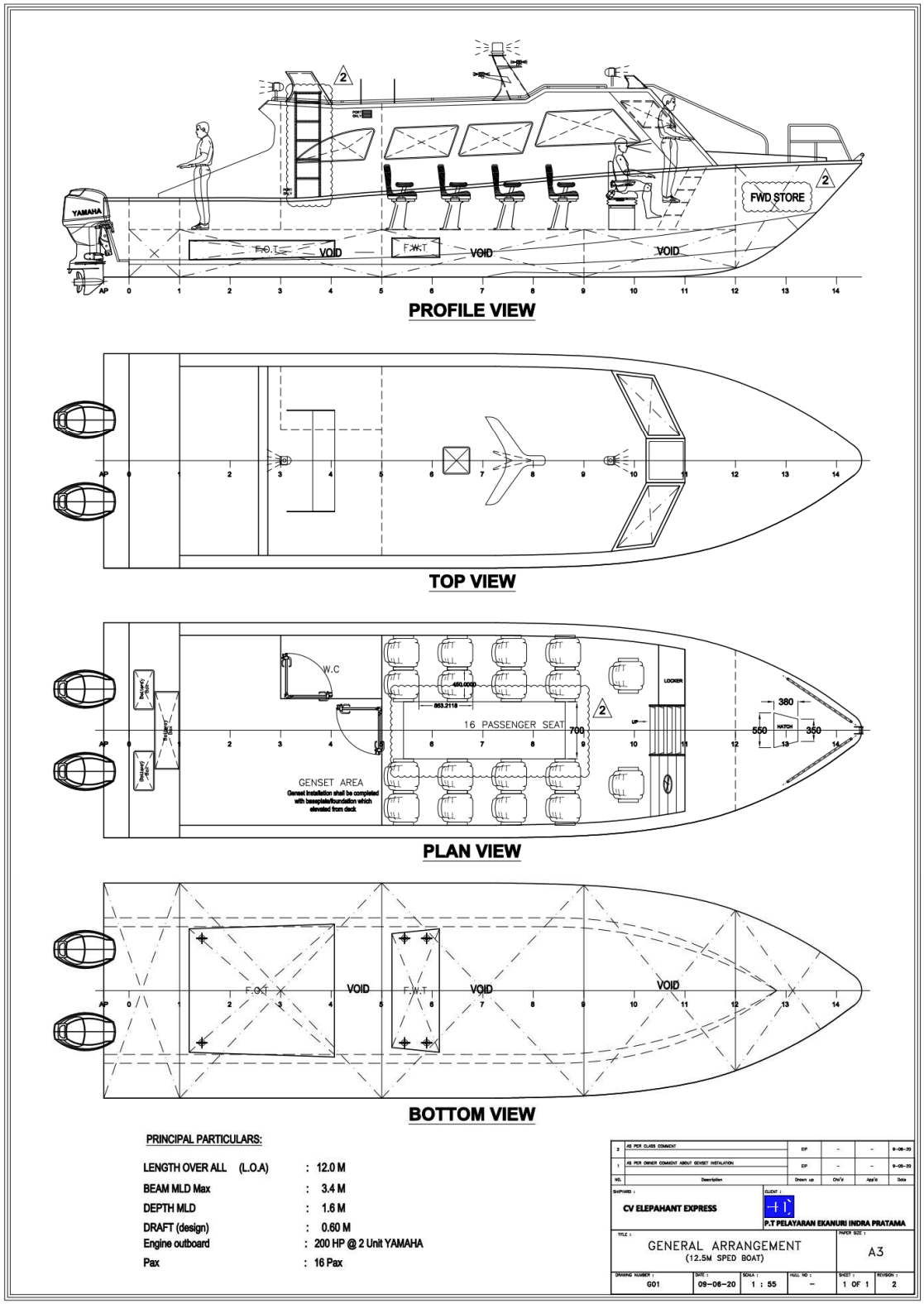
As for the main deck structure’s software modeling is refer to drawing are :

a. General Arrangement
b. Midship Section
c. Construction Profile
d. Construction Plan

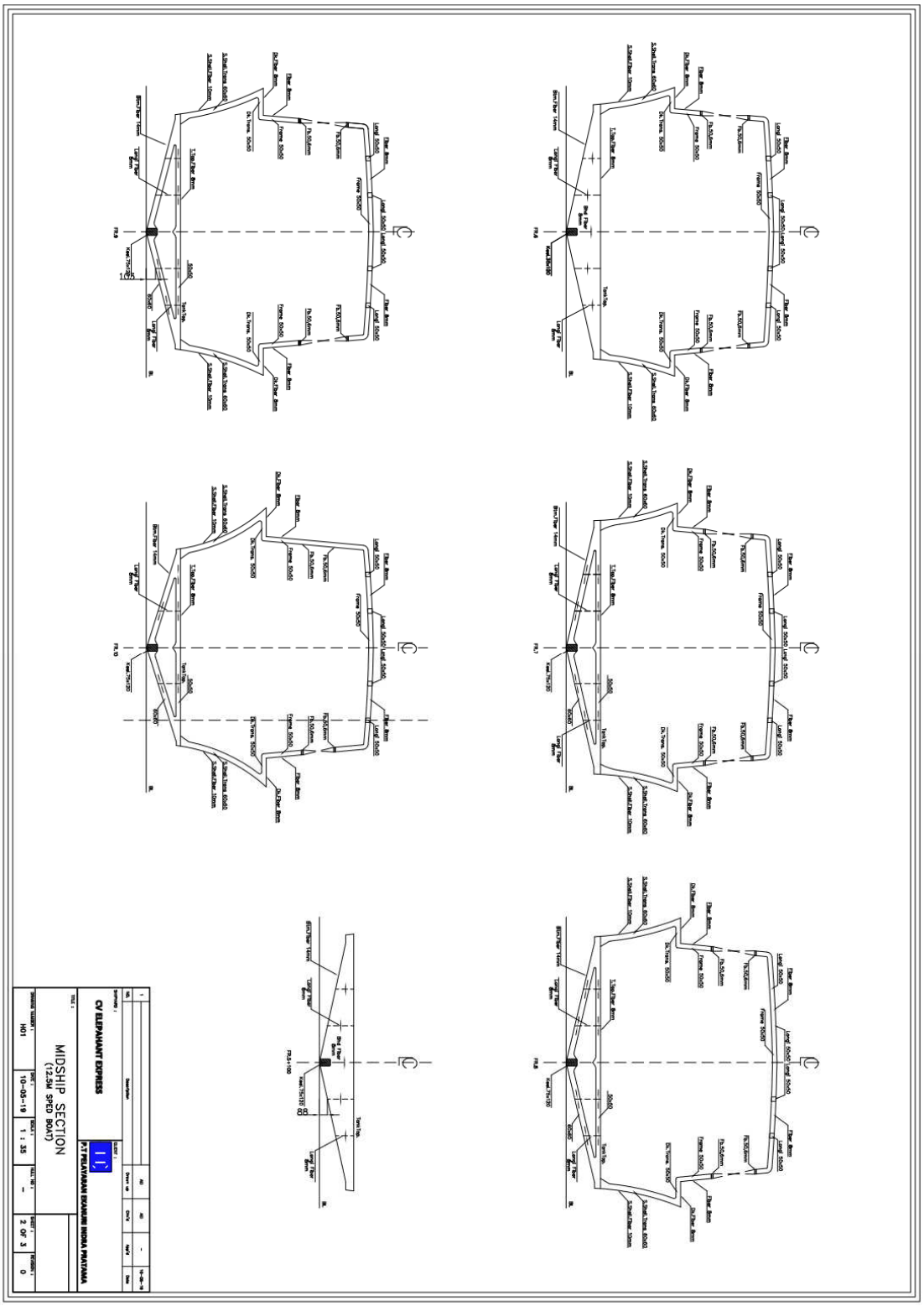
All drawing details see at Appendix 1

Ship Particular are :

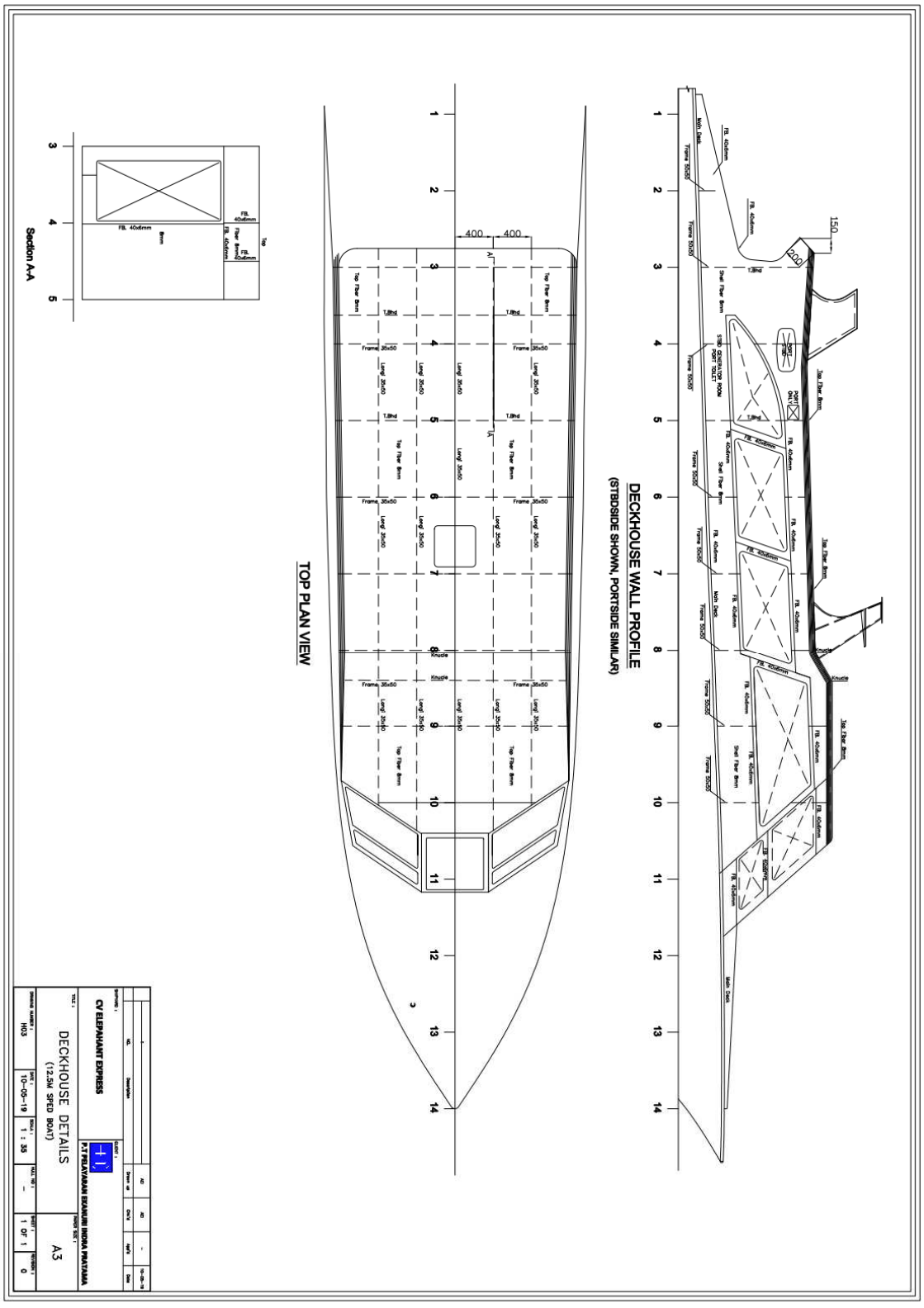
Ship Type	:	Fiberglass Crew Boat	
Length Over All	:	12.00	m
Breadth Moulded	:	3.40	m
Depth Moulded (Main Deck)	:	1.60	m
Draft Moulded	:	0.50	m



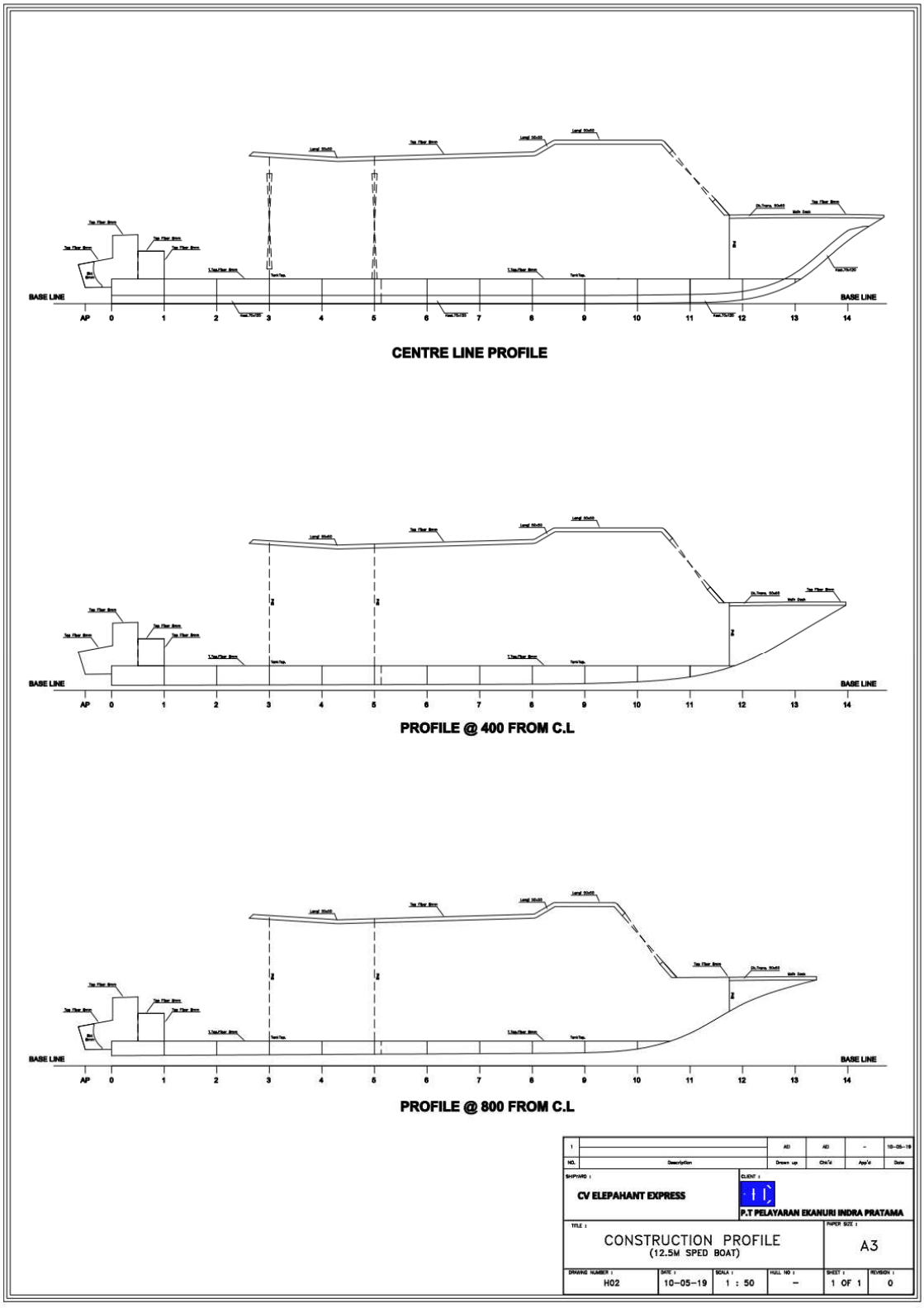
Drawing 1: General Arrangement (See Appendix 1)



Drawing 2: Midship Section



Drawing 3 : Construction Plan



Drawing 4 : Construction Profile

2. MODEL ANALYSIS

2.1 Structural Idealization

The considerations of deck structural detail are as follows:

- For minimum yield stress material follow BKI Rule Volume V – Rules For Fiberglass Reinforced Plastic Ships 2016 Edition, Section 1 chapter C Part 4.4.1.

4. Scantlings

4.1 The scantling required in these Rules are specified for **FRP** ships moulded with fibre glass reinforcements composed of chopped mats and roving cloths and moulded with **FRP** having the strength specified in the following 1 to 4, but excluding gelcoats :

1.	Tensile strength	: 98	N/mm^2
2.	Modulus of tensile elasticity	: $6,86 \times 10^3$	N/mm^2
3.	Bending strength	: 150	N/mm^2
4.	Modulus of bending elasticity	: $6,86 \times 10^3$	N/mm^2

- Structure using material Fiberglass Reinforcemnt (FRP) with Tensile Strength 98 N/mm^2).
  - Bottom Thicknes = 14 mm
  - Side Shell Thickness = 10 mm
  - Deck Thickness = 8 mm
  - Web Keel = Square bar 120x75
  - Longitudinal Web = 8 mm
  - Web Girder = U profil 60x60x6mm
- For calculation using minimum Yield strength value 85 N/mm^2.
- The specific gravity is 9.81 m/s^2 for modeling of this load capacity, which is applied for truck loading.
- Modeling applies only for plate, stiffeners and web structure without welding, using Finite Element Method and mild steel properties.

2.2 System Coordinate

For modeling use, the system ordinates are:

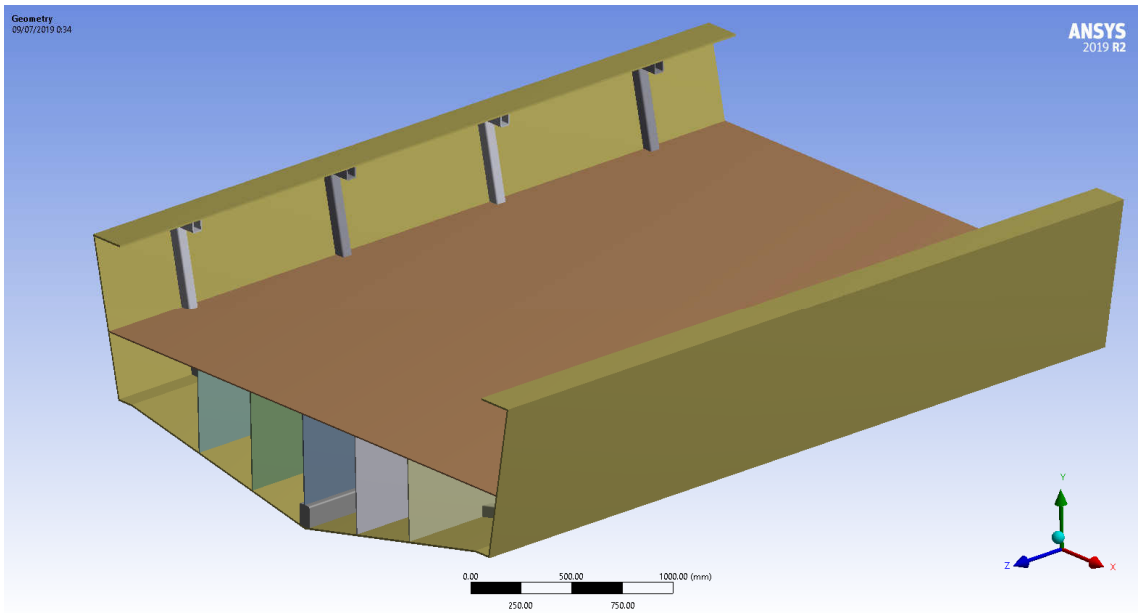
X axis	=	Length (positive toward bow of structure)
Y axis	=	Vertical (positive toward portside of structure)
Z axis	=	Breadth (positive upwards of structure)

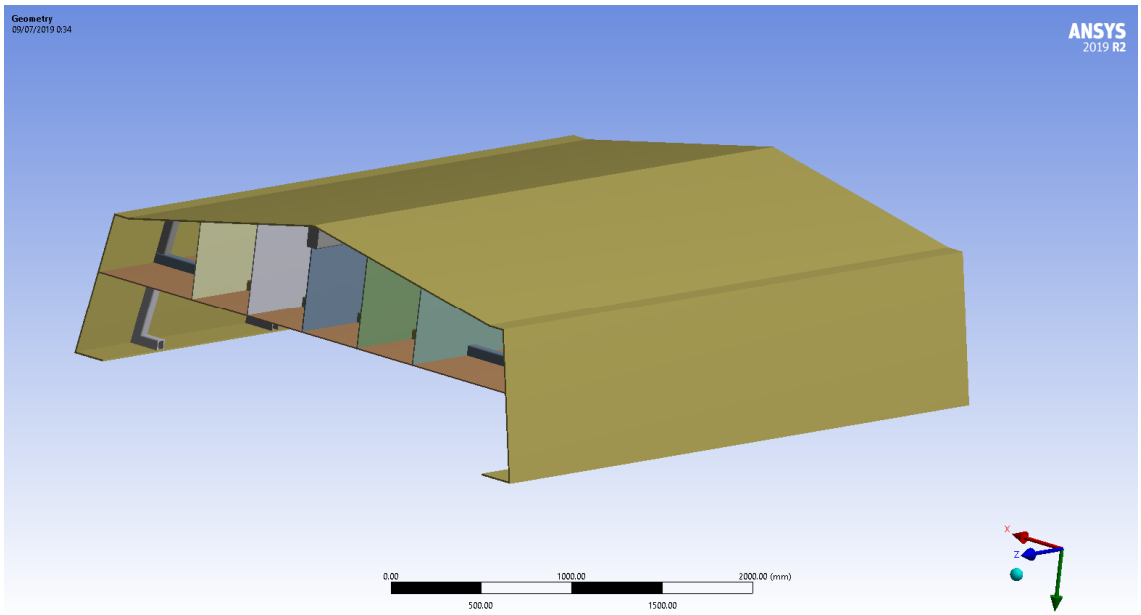
For unit use, the metric systems are:

Length	=	mm
Mass	=	Ton
Force	=	Newton

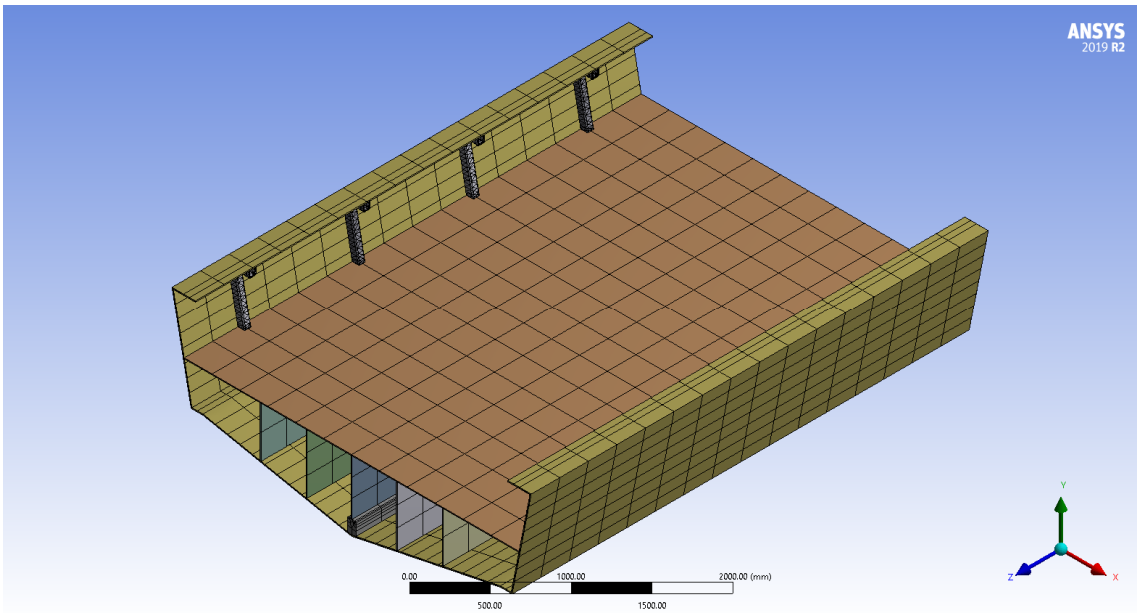
2.3 Modeling

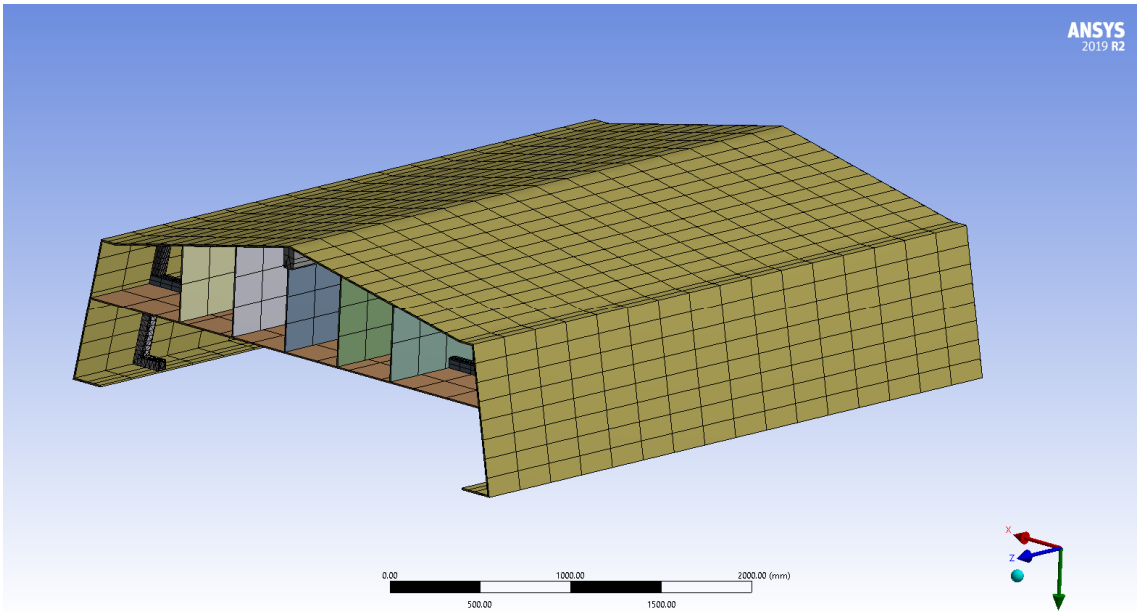
For Modeling using software Ansys Workbench with solid modeling.



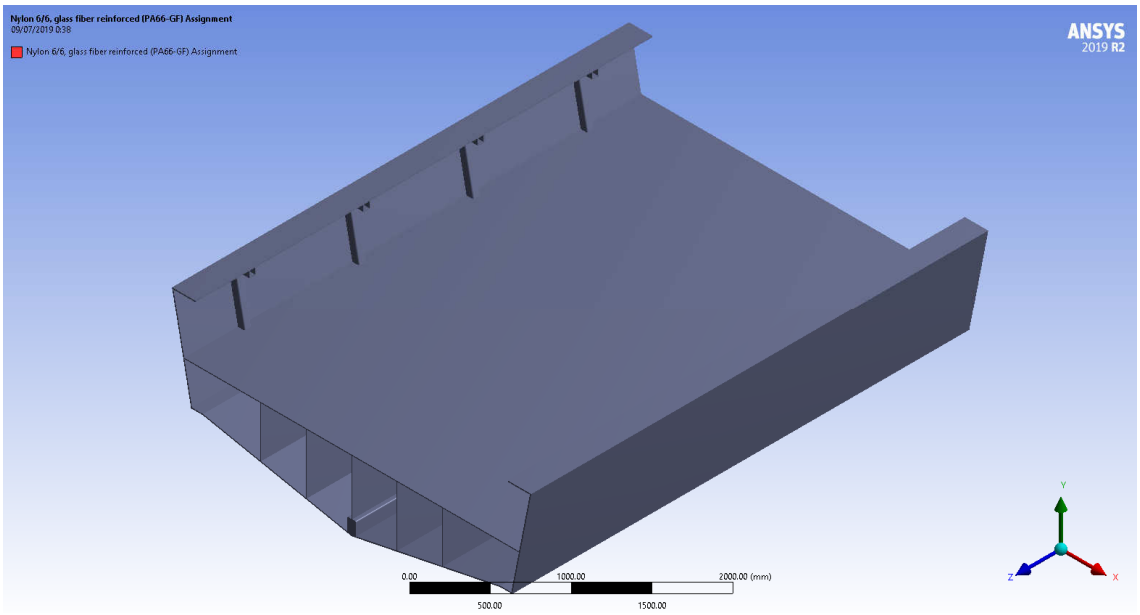


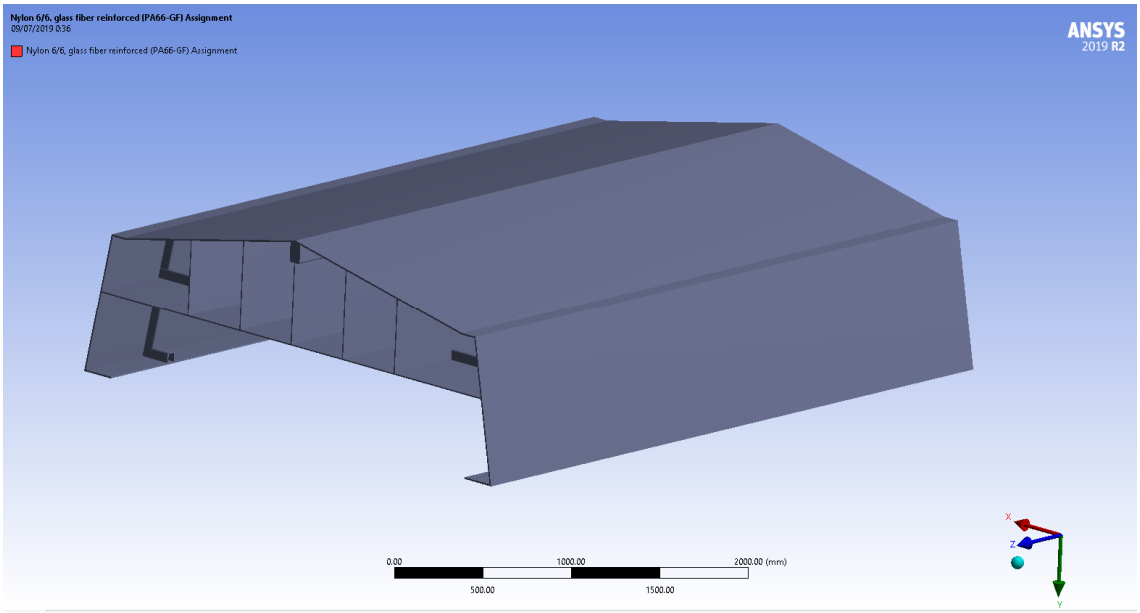
Drawing 5 : Modeling using Ansys Workbench 19.2 - Geometry





Drawing 6: Modeling using Ansys Workbench 19.2 – Meshing





Drawing 7 : Modeling using using Ansys Workbench 19.2 – Material Aluminium Alloy

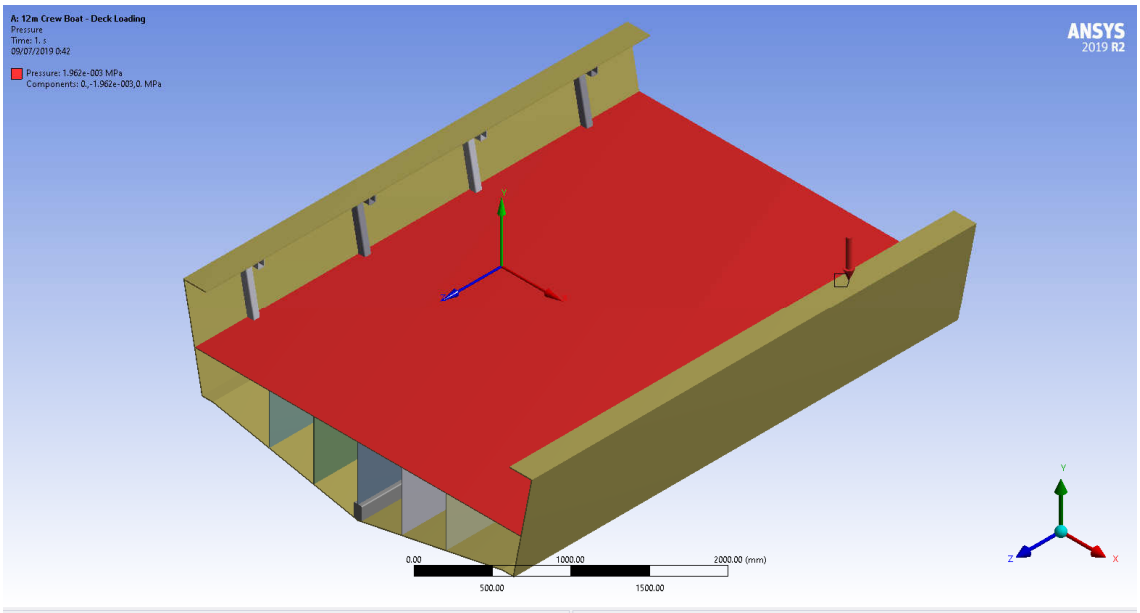
2.4 Loading Condition

Follow requirement from owner deck load of the vessel are 200 Kg/m2, with specification gravity are 9.81 m/s^2.

Total load pressure are

= 200 x 9.81

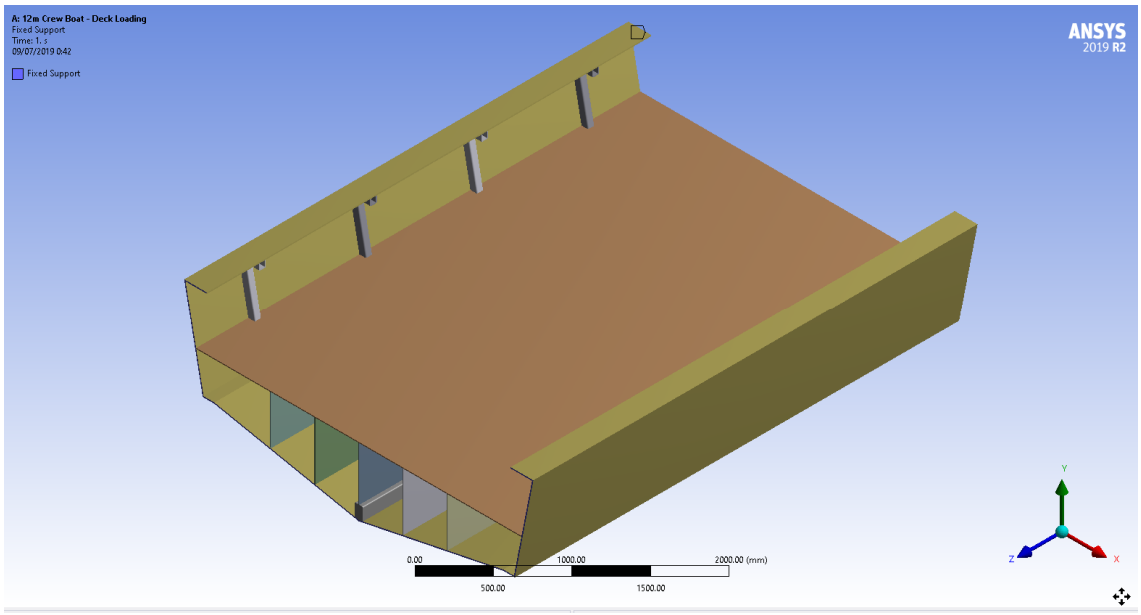
= 1962 N/m^2 ----------> 0.001962 Mpa

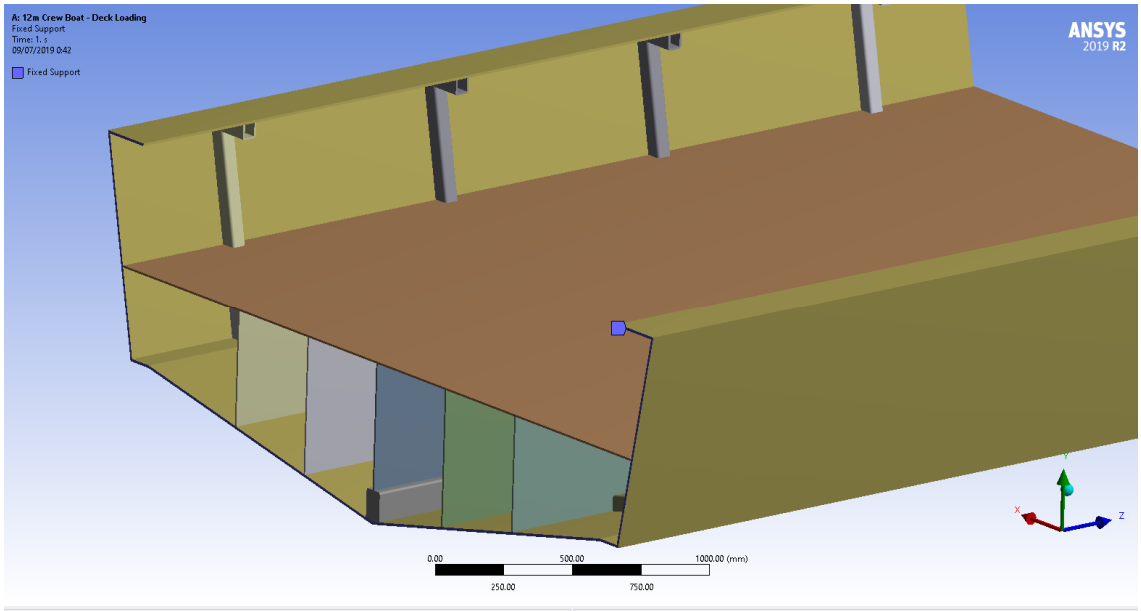


Drawing 8 : Loading with deck load 200 Kg/m^2 = 1962 N/m^2 = 1.962e-003 MPa

2.5 Boundary Condition

It's using a fixed boundary at bottom plate structure (see at Appendix for Boundary Condition Drawing).





Drawing 9: Boundary condition with fixed type boundary

3 ACCEPTABLE CRITERIA

Von Misses stress which obtained from Finite Element Method Analysis is directly used for assessing the adequacy of structures against failure of yielding.

For Plated Structures; member might designed according to Von Misses equivalent stress criteria, where the equivalent stress δ_{eqv} is not exceeding F_y / F.S.

As for Safety Factor (F.S.) = 1.0 for Static Loading, therefore:

$\delta_e \leq Fy /1.00$

$\delta_e \leq 98/1.00$ ----> where F_y for Fiberglass using = 98 N/mm^2

$\delta_e \leq 98.0$ N/mm^2

Note : δ_e = Von Misses Stress

F_y = Material Yield Stress

Stress contour legend is uniformly customized with levels contour, so that high stress area (if any) can be easily identified.

4 ANALYSIS RESULT

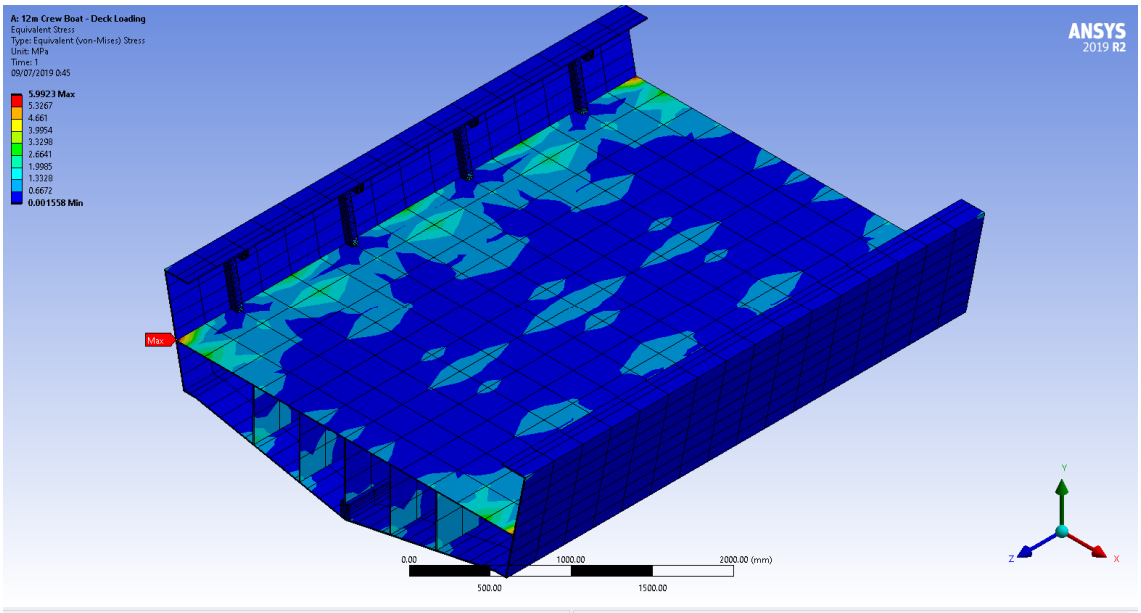
The analysis results for barge structures are describe in Appendix and summarize in table below.

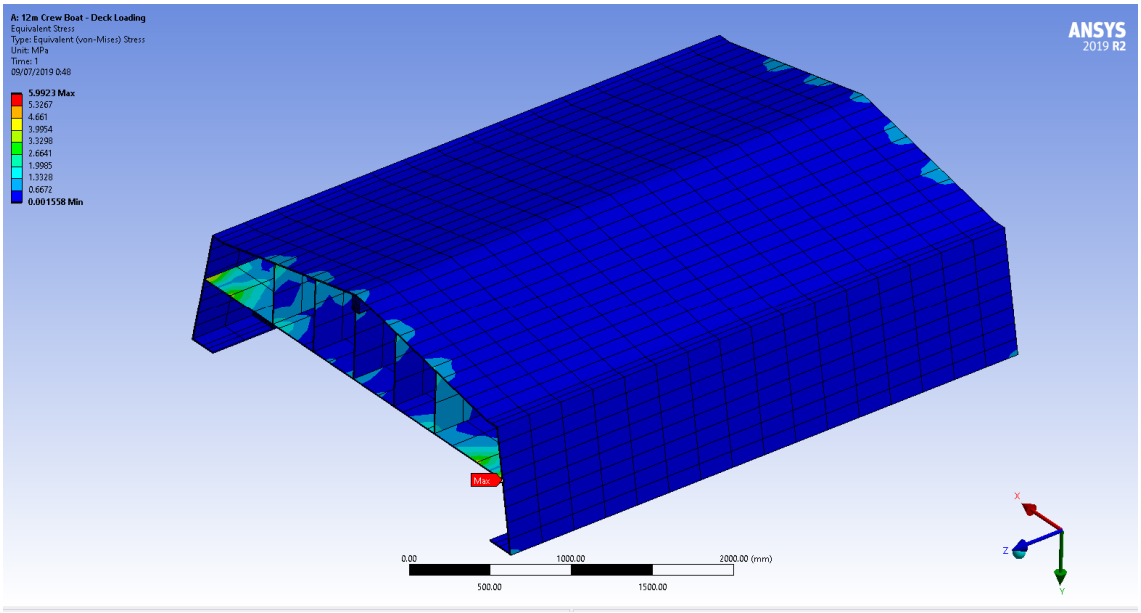
4.1 RESUME

Table 1: Summary of Plate Von Misses

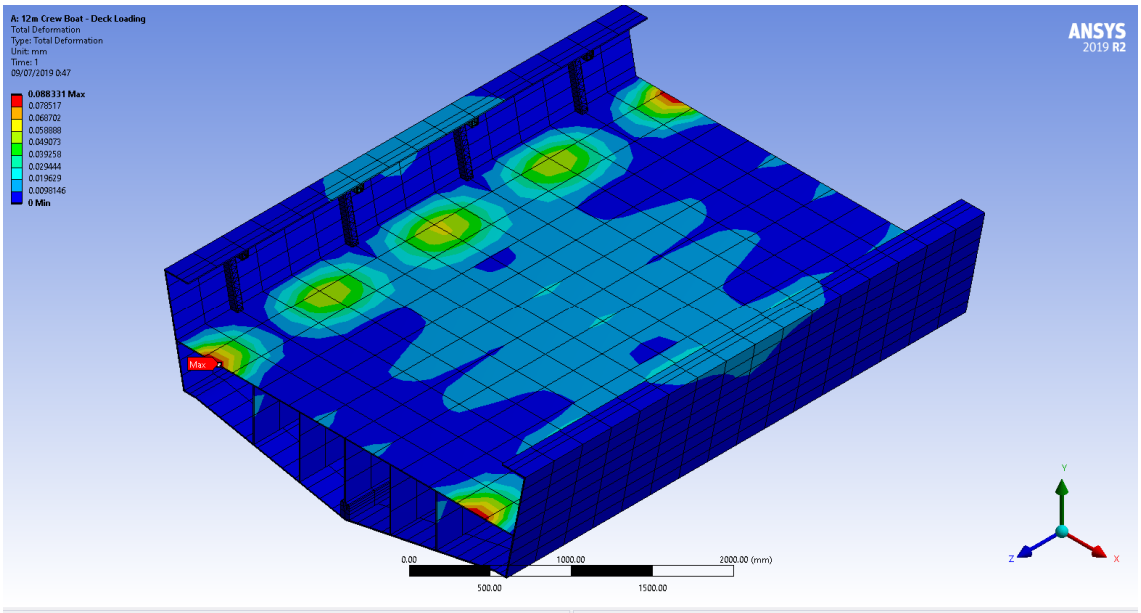
Area	Load Applied (in Kg/m2)	Stress (N/mm2)	Acceptable Criteria	Result	Safety Factor
Deck Load	200	5.992	98.00	Pass	16.35

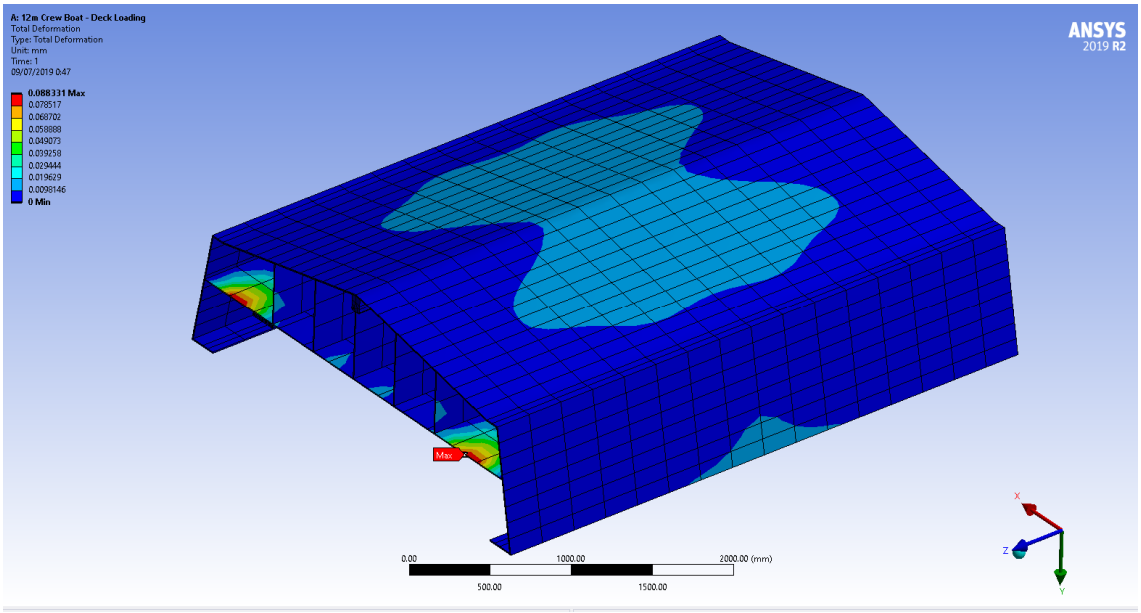
4.2 VON MISSES RESULT





4.3 DEFORMATION RESULT

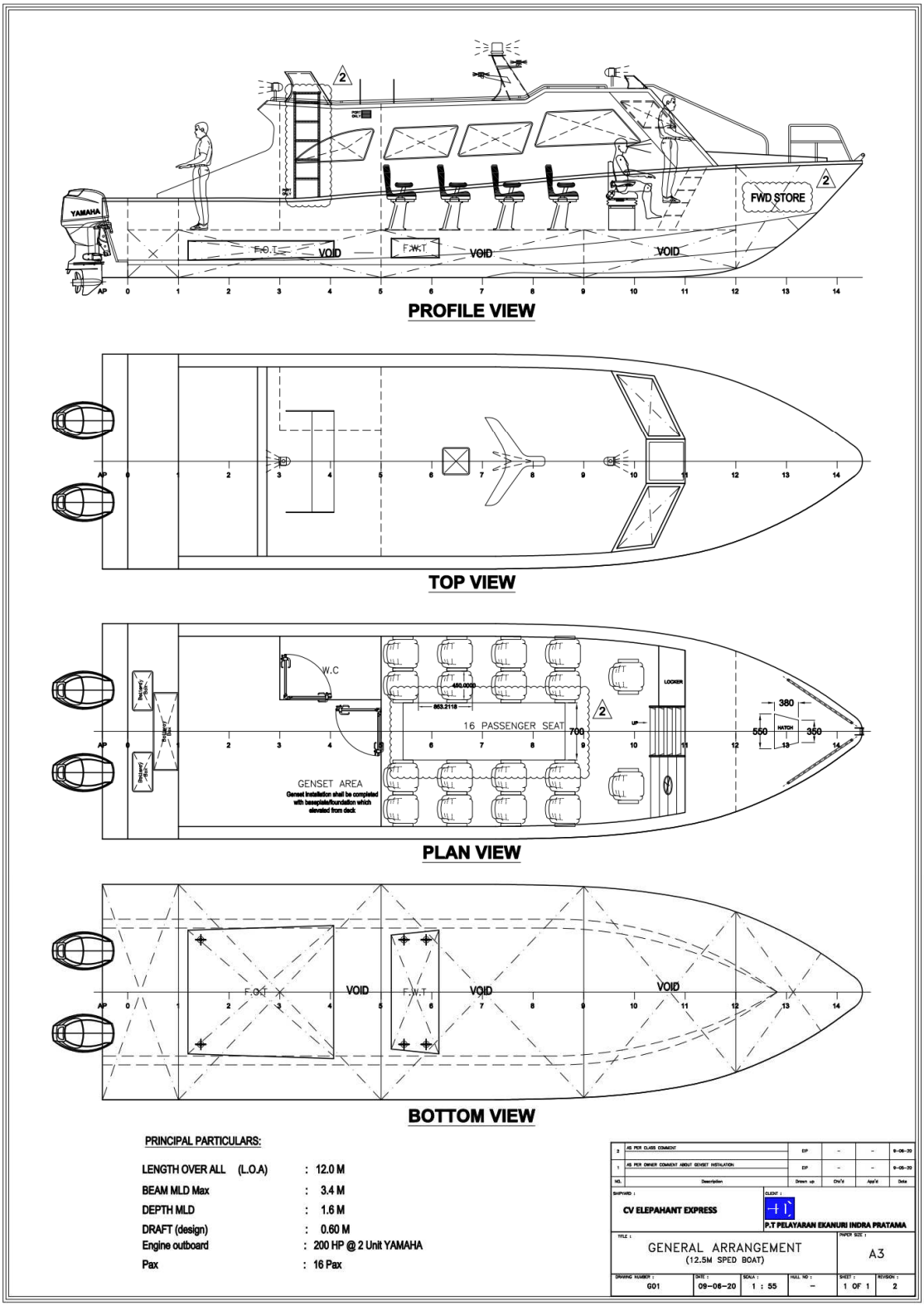




5 CONCLUSION

According to the analysis result, it can be concluded that strength of Main Deck structure at 12M Fiberglass Crew Boat **adequate** for the intended loading with deck load 200 Kg/m^2, with safety load factor are 16.35.

APPENDIX 1 - DRAWING



PRINCIPAL PARTICULARS:

LENGTH OVER ALL (L.O.A)	:	12.0 M
BEAM MLD Max	:	3.4 M
DEPTH MLD	:	1.6 M
DRAFT (design)	:	0.60 M
Engine outboard	:	200 HP @ 2 Unit YAMAHA
Pax	:	16 Pax

2	AS PER CLASS COMMENT	EIP	–	–	9-06-20
1	AS PER OWNER COMMENT ABOUT GENSET INSTALATION	EIP	–	–	9-05-20
NO.	Description	Drawn up	Chk'd	App'd	Date

SHIPYARD : CV ELEPAHANT EXPRESS

CLIENT : P.T PELAYARAN EKANURI INDRA PRATAMA

TITLE : GENERAL ARRANGEMENT (12.5M SPED BOAT)

PAPER SIZE : A3

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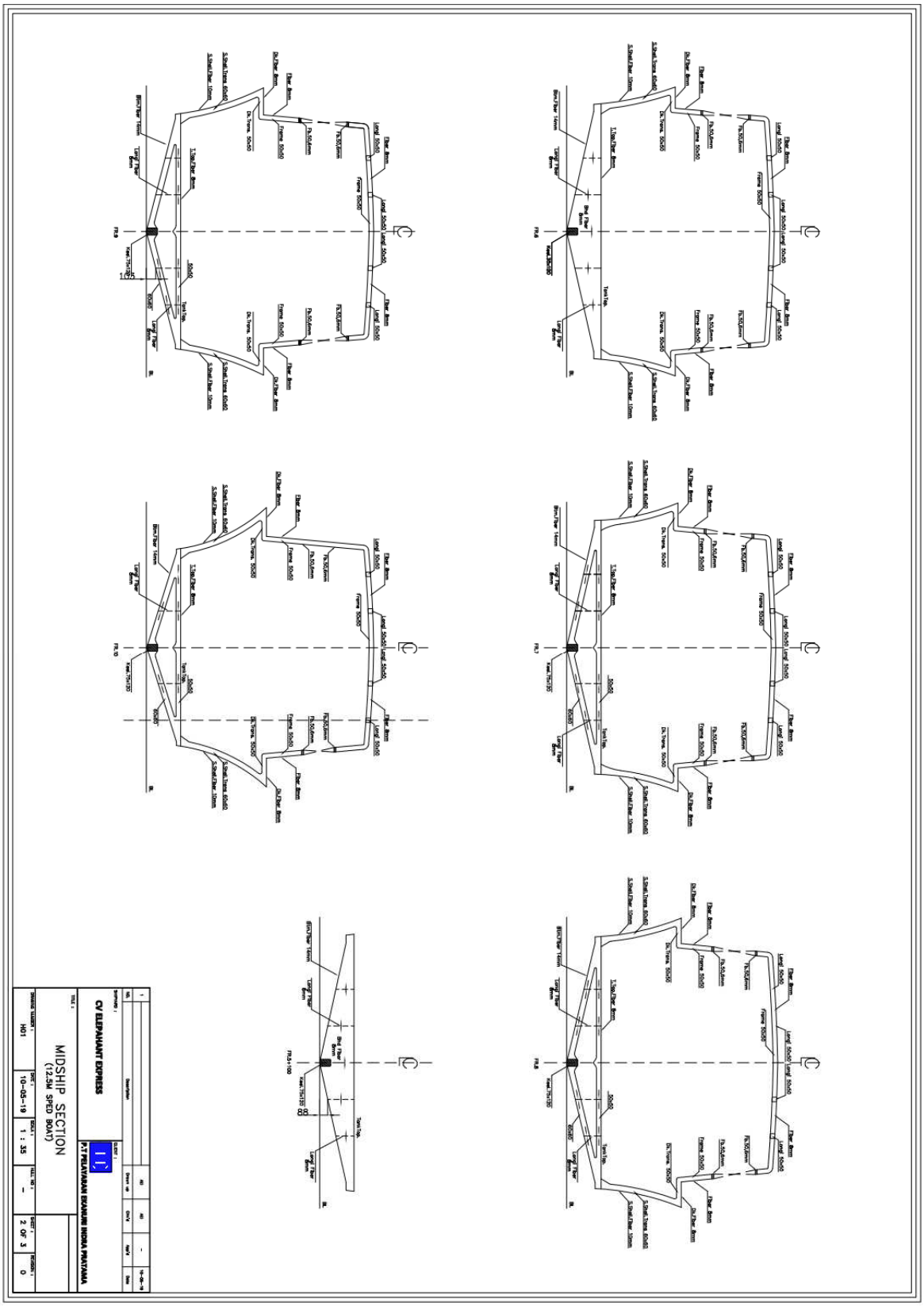
CV ELEPHANAT EXPRESS
PT PELAYARAN ESANARI INDRA PRATAMA
MIDSHIP SECTION
(12.5M SPED BOAT)
1 : 35
10-05-19
H01
2 OF 3
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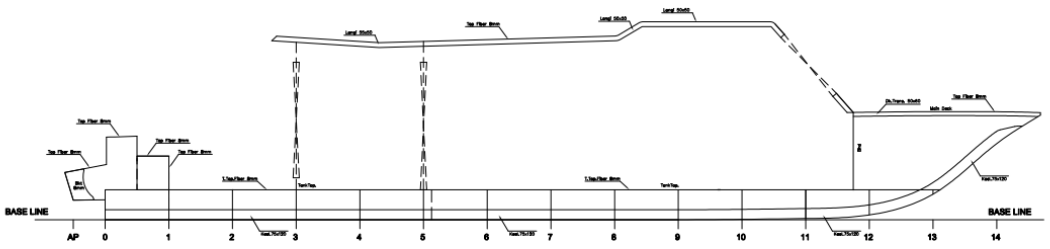
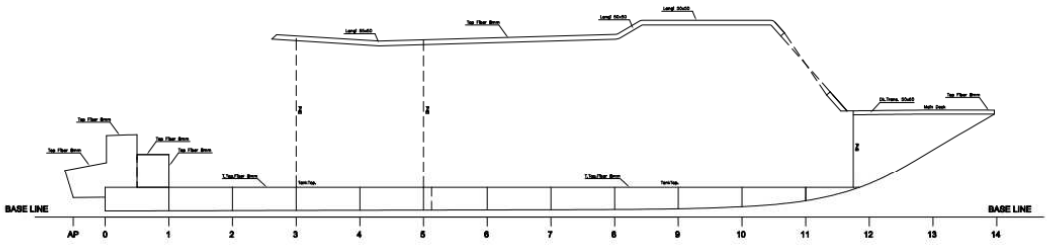
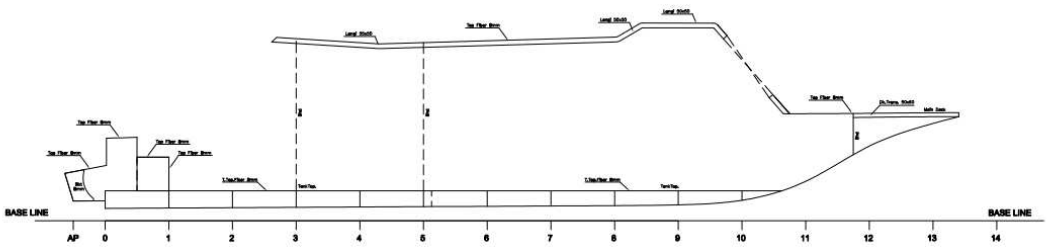


CENTRE LINE PROFILE



PROFILE @ 400 FROM C.L



PROFILE @ 800 FROM C.L

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SHIPYARD : **CV ELEPAHANT EXPRESS**

CLIENT : **P.T PELAYARAN EKANURI INDRA PRATAMA**

TITLE : CONSTRUCTION PROFILE (12.5M SPED BOAT)

PAPER SIZE : A3

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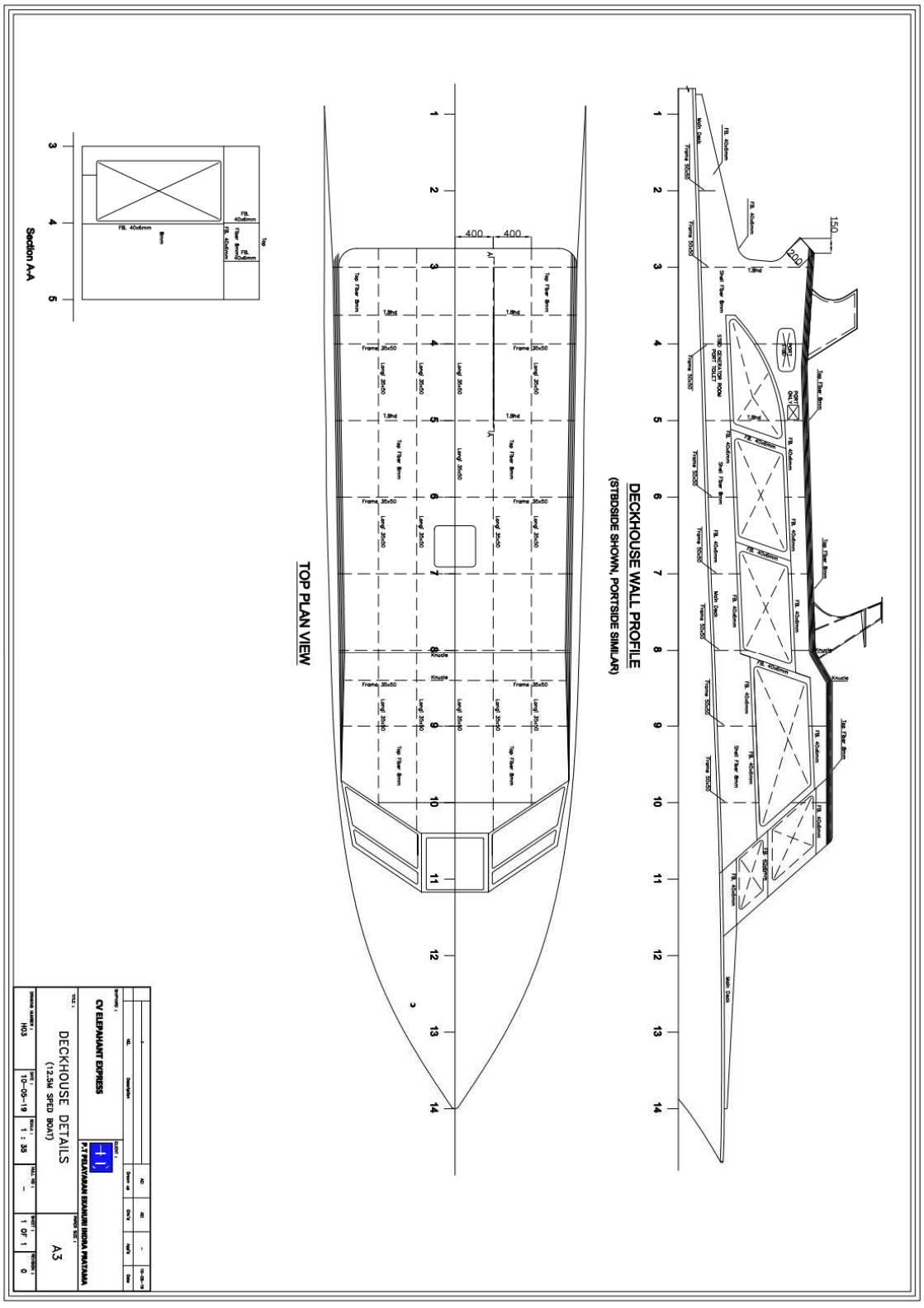
DECKHOUSE WALL PROFILE
(STBDSIDE SHOWN, PORTSIDE SIMILAR)
TOP PLAN VIEW
Section A-A
CV ELEPHANT EXPRESS
PT PELAYARAN BISMARI INDRA PRATAMA
DECKHOUSE DETAILS
(12.5M SPED BOAT)
A3
H03
10-06-19
1 : 35
1 OF 1
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