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REVISIONS

CLIENT
VEEJAY MARINE AND ENGINEERING SERVICES PTE LTD.

BUILDER

HULL NO

CLASS BV

PROJECT ANDROMEDA V

DESIGN BY

OFFSHORE & MARINE ENGINEERING LTD

(Your Ultimate Companion for the Road Ahead)

DRAWING TITLE

DIRECT STRENGTH CALCULATION OF PANAMA CHOCK

DRAWN MYA	**SCALE** 01	**DRAWING NO:** OMEL-SIS-258-D1-01-R0		**REV**
CHECKED MGK	**SIZE** A4	**PAGE-** 01 of 15	**DATE** 21-07-2022	0

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DIRECT STRENGTH CALCULATION REPORT

Contents

Introduction.:

Model info

The structure was modelled from 11900 Offset of Centerline portside to the end of the poop deck in transverse direction. In long direction frame -6 to frame 0 was considered and in vertical direction 14339 Above baseline to 16419 Above baseline was taken so that, the boundary conditions could be assigned far away from the area of interest, not affecting the stress results.

Corrosion Allowance:

Corrosion allowance for under deck stiffener for chock was considered 2 mm.

For hull structure, the total corrosion addition, t_c was considered 2.5 mm for plates with a gross thickness greater 10 mm and t_c, 2 mm for plates with a gross thickness less than or equal to 10 mm.

Based on NR467, Part B, Ch 4, Sec 2, net scantling approach was used on scantlings which provide strength characteristics required to sustain loads. For primary supporting members analyzed through a three-dimensional model, the net thickness of plating which constitutes primary supporting members was obtained by deducting 0,5 t_c from the gross thickness. The following table displays the hull structure's thicknesses used in the analysis, alongside their actual thickness.

Item	Actual Thickness (mm)	Model Thickness
Poop Deck	10	9
Sides shell at upper poop deck area	15	13.75
Sides shell below	9.5	8.5
Transom Plate	9	8
Frame (350X8+100X8)	8	8
Girder Web (600X10)	10	10
Girder Flange (150X15)	15	15
Brackets	10	10
Chock Stiffener (350 X25)	25	23
Chock Stiffener (350 X22)	22	20

Software:

Ansys static structural 18.1.

Mesh:

Average element size: 45 mm

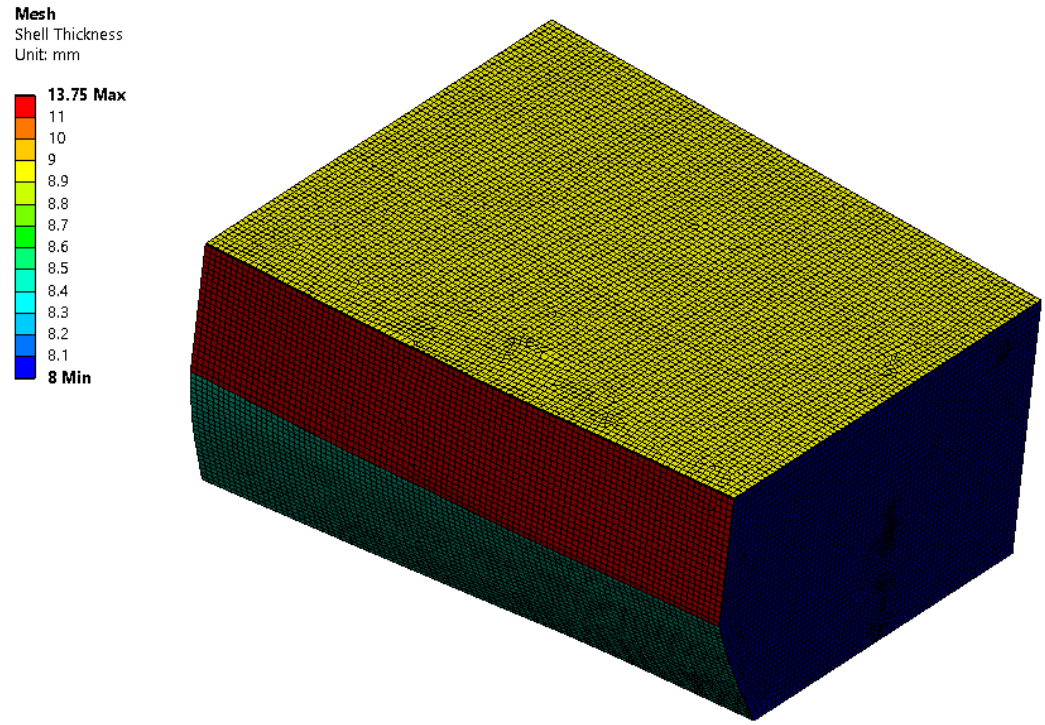
Elements: 20888

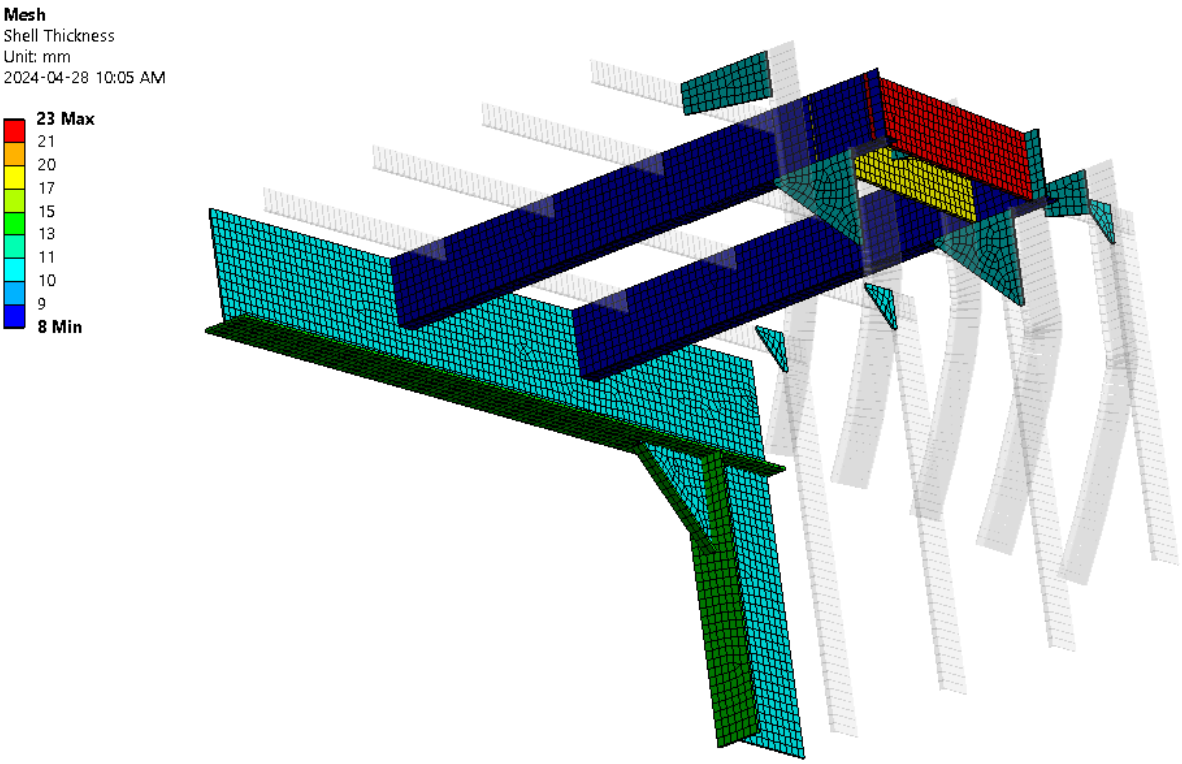
Nodes: 21772

Element Types: Shell element, Beam element.

Thickness plot:

The hull structure's thicknesses are displayed in the following images:

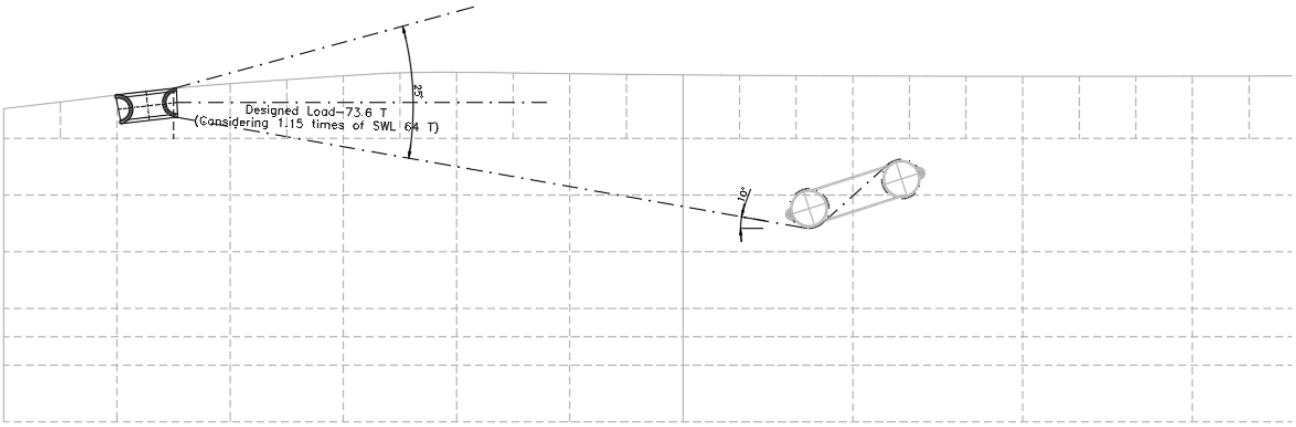




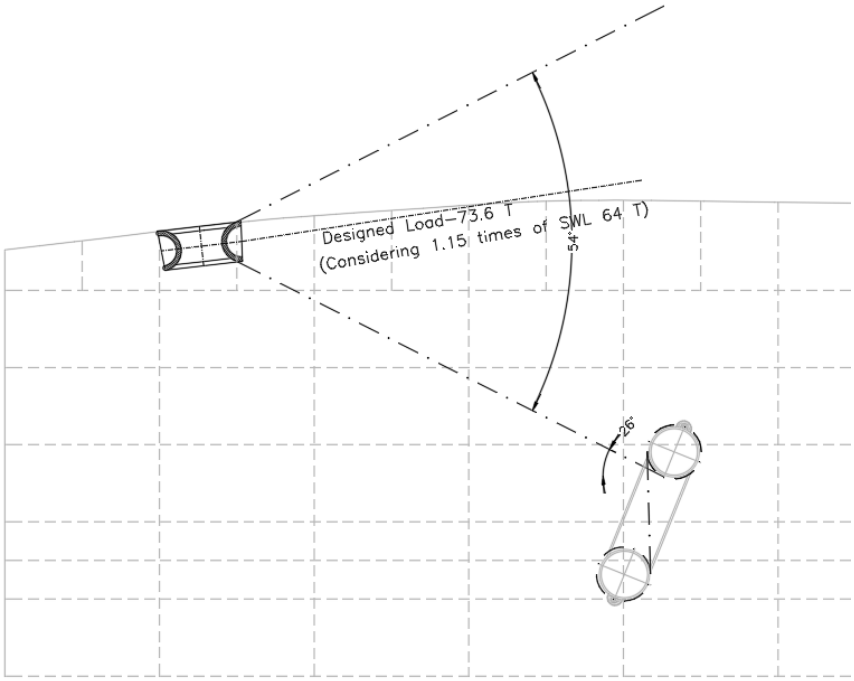
Applied Load:

Let's look at the load direction and magnitude for each load case first.

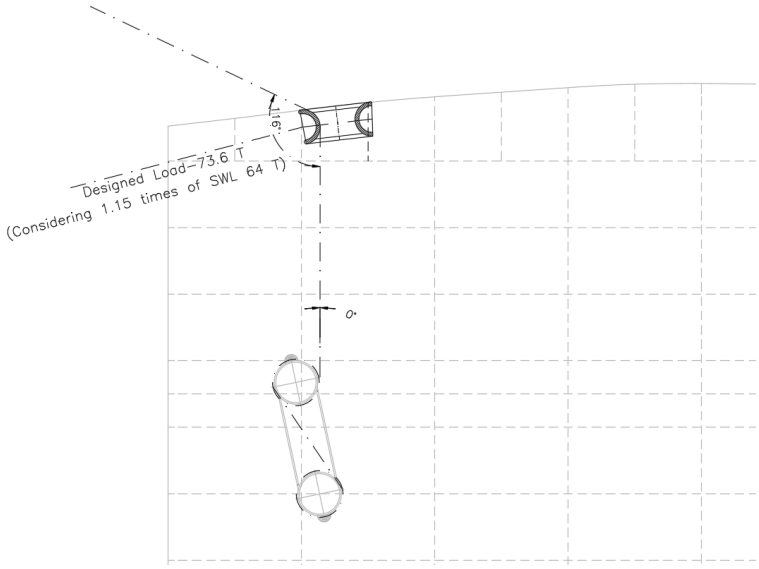
Case-1: Load Applied at 25^0 angels.



Case-2: Load Applied at 54^0 angels.



Case-3: Load Applied at 116^0 angels.



Rules

As per, NR467 Part B, Ch 9, Sec 4, 4.2.5d, for mooring operations, the design load to be considered shall be 1.15 times the greater of the MBL of the mooring line and the SWL of the shipboard fitting.
In this case, the MBL is 57T (559kN) and the SWL is 64T, thus 1.15 x 64T (73.6 T or 721769.44 N) was considered.

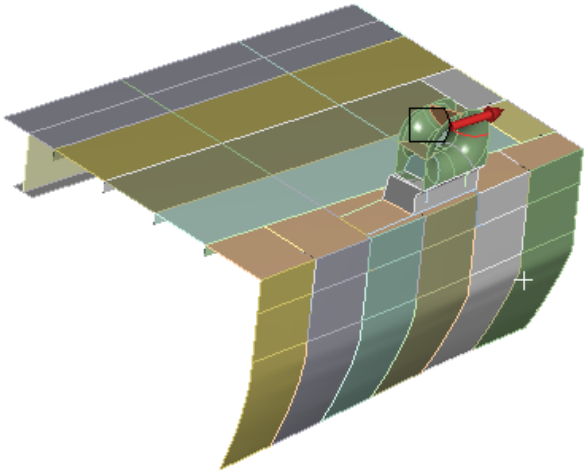


Fig: Applied force at Aft direction

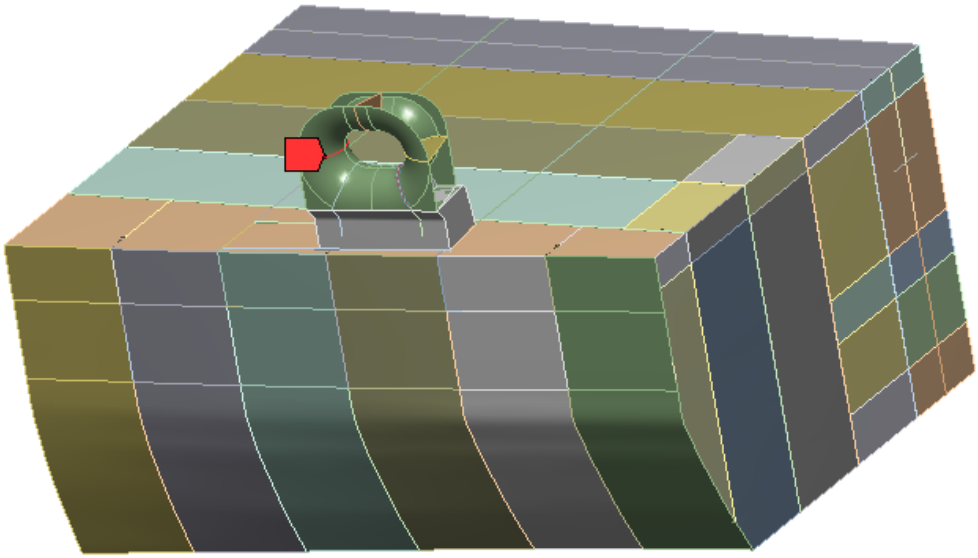
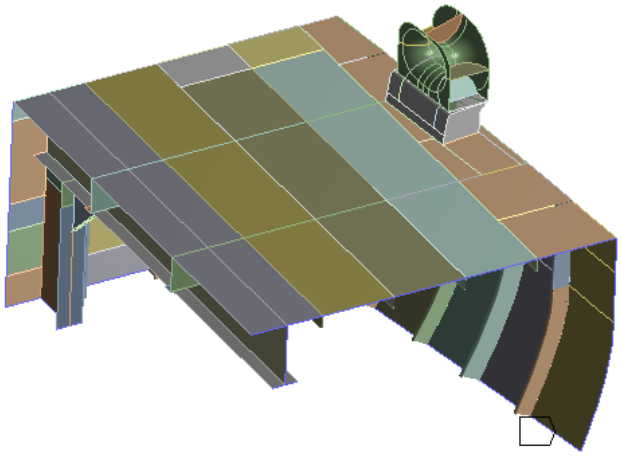


Fig: Applied force at Fwd direction

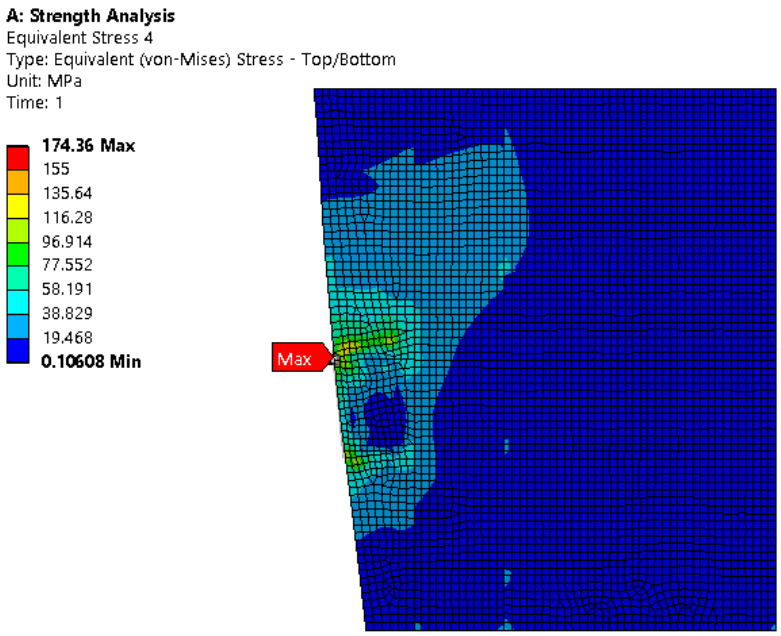
Boundary condition:



The outer and lower edge of transom and side shell, and transverse free edge of deck were kept. Fixed.

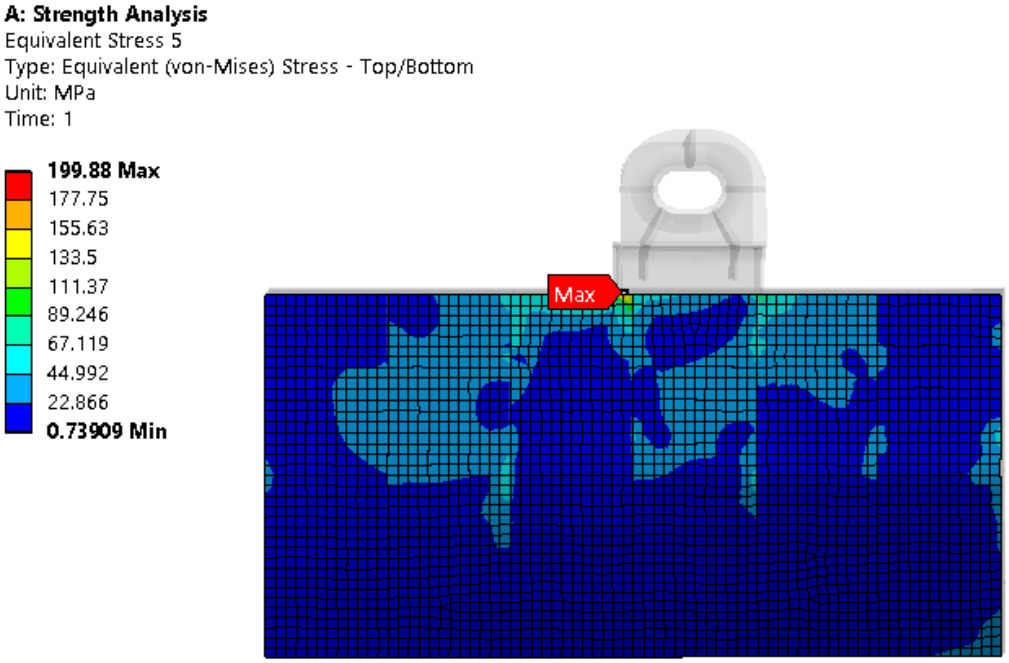
Result: Force Applied at AFT direction

Stress on deck



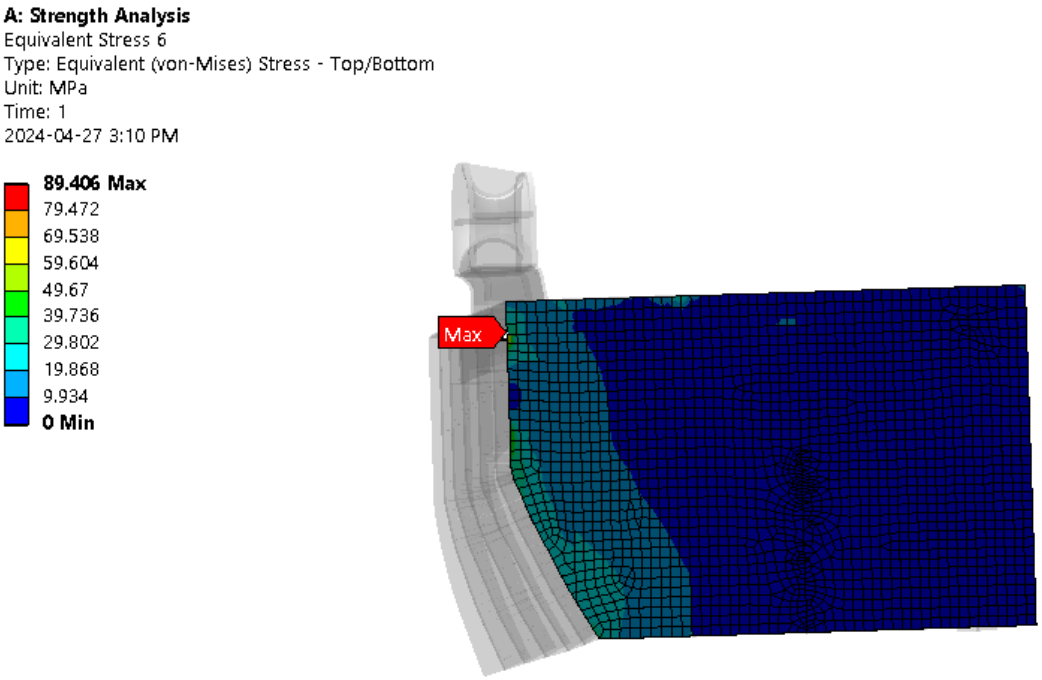
Maximum stress on deck plate was found 174.36 MPa.

Stress on Side shell



Maximum stress on deck plate was found 199.88 MPa.

Stress on transom

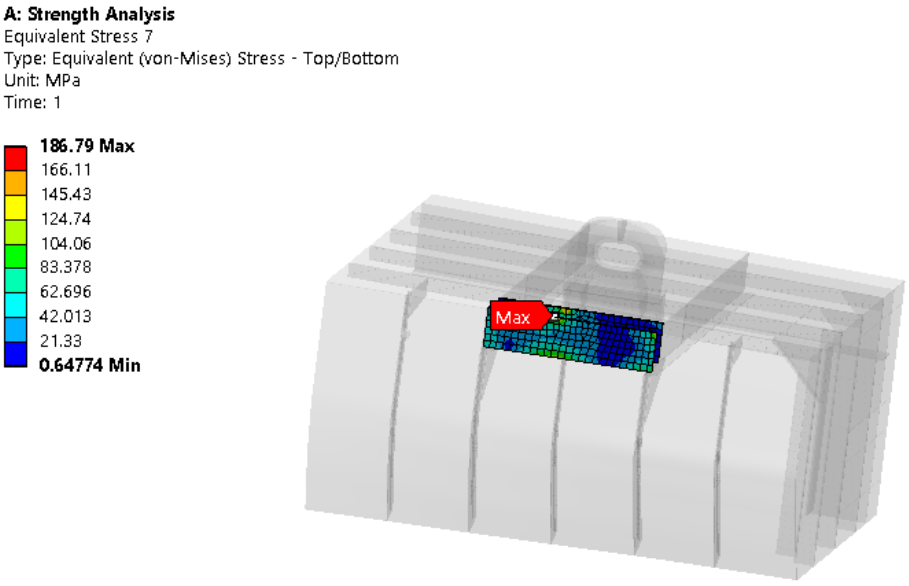


Maximum stress on Transom plate was found 89.406 MPa.

Stress on under deck structures

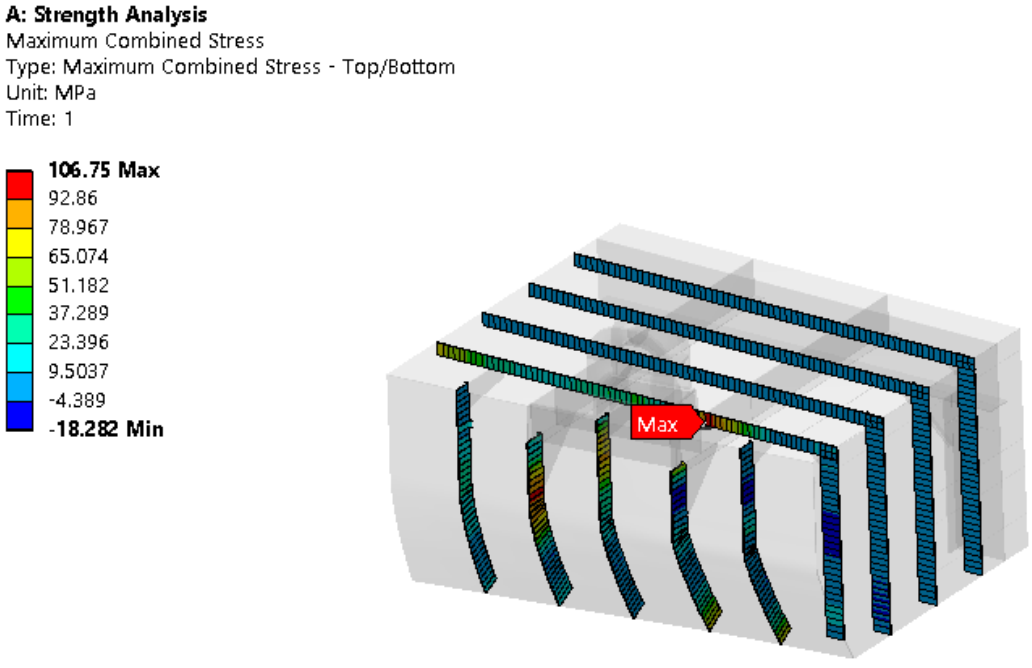
Maximum stress on deck supporting structure was found 185.51 MPa.

Stress on Panama Chock supporting structures



Maximum stress on Panama Chock supporting structure was found 186.79 MPa.

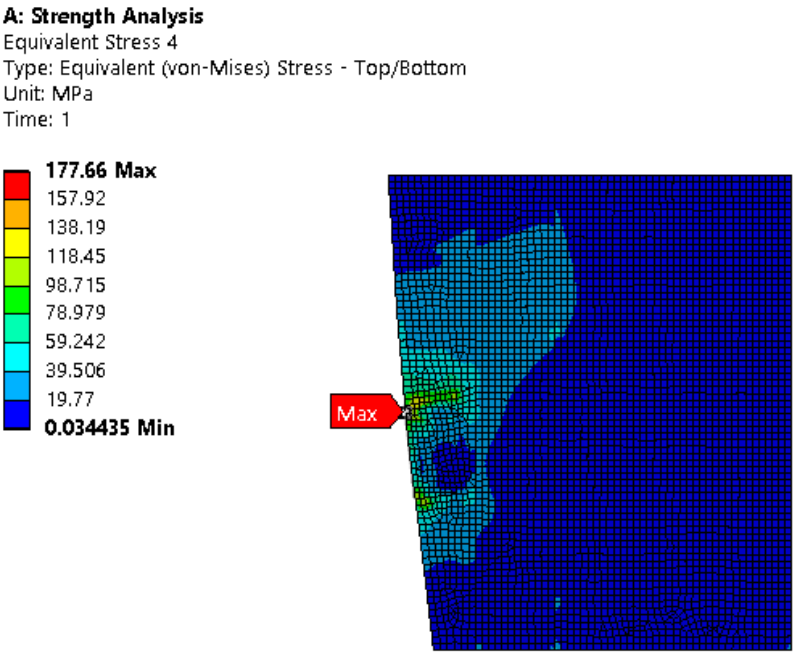
Beam Stress



Maximum stress on Beam structure was found 106.75 MPa

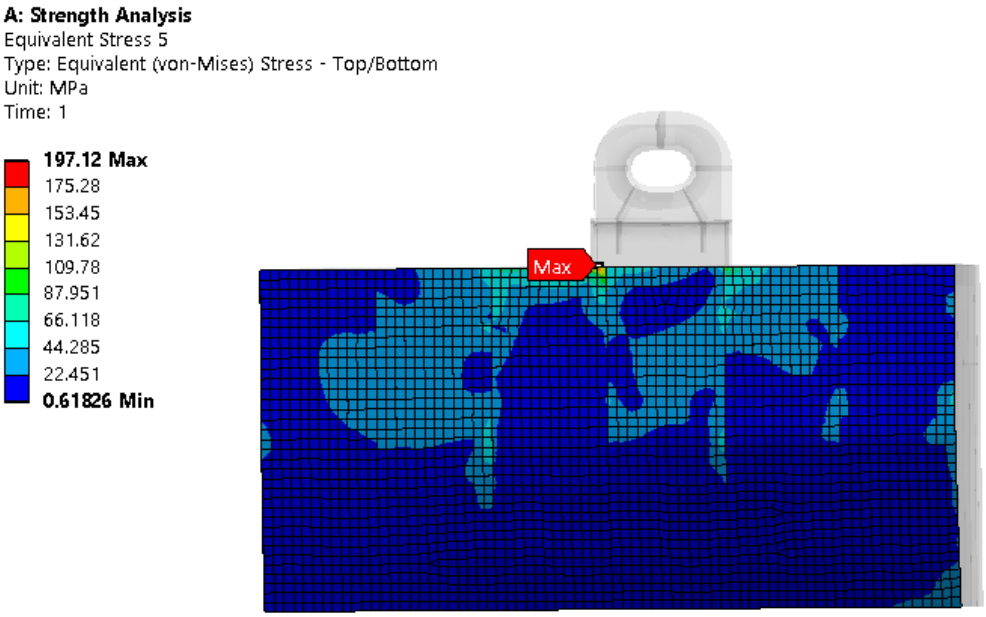
Result: Force Applied at FWD direction

Stress on deck



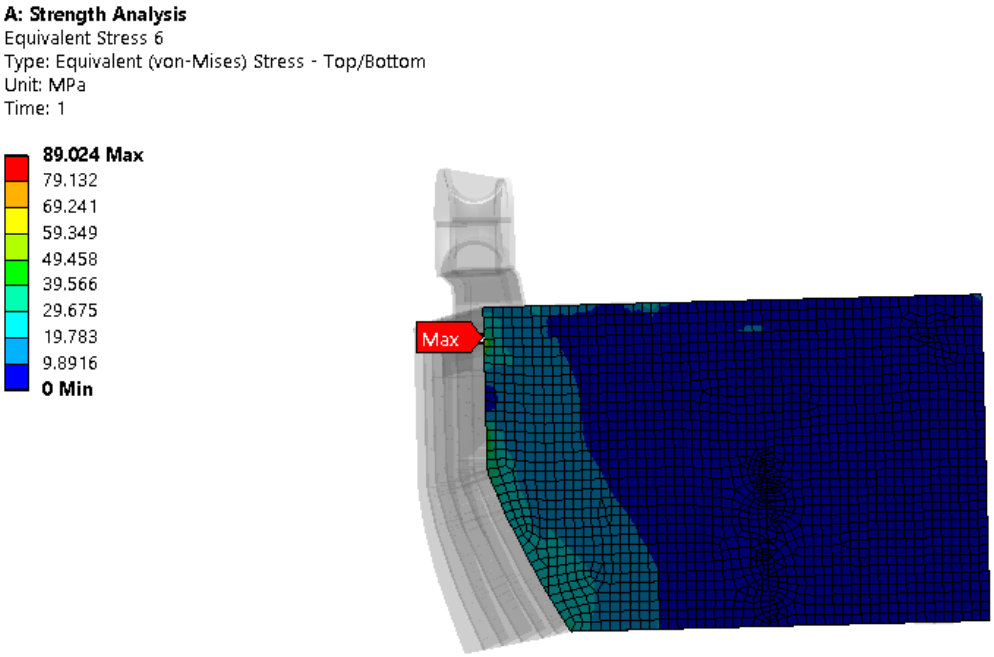
Maximum stress on deck plate was found 177.66 MPa.

Stress on Side shell



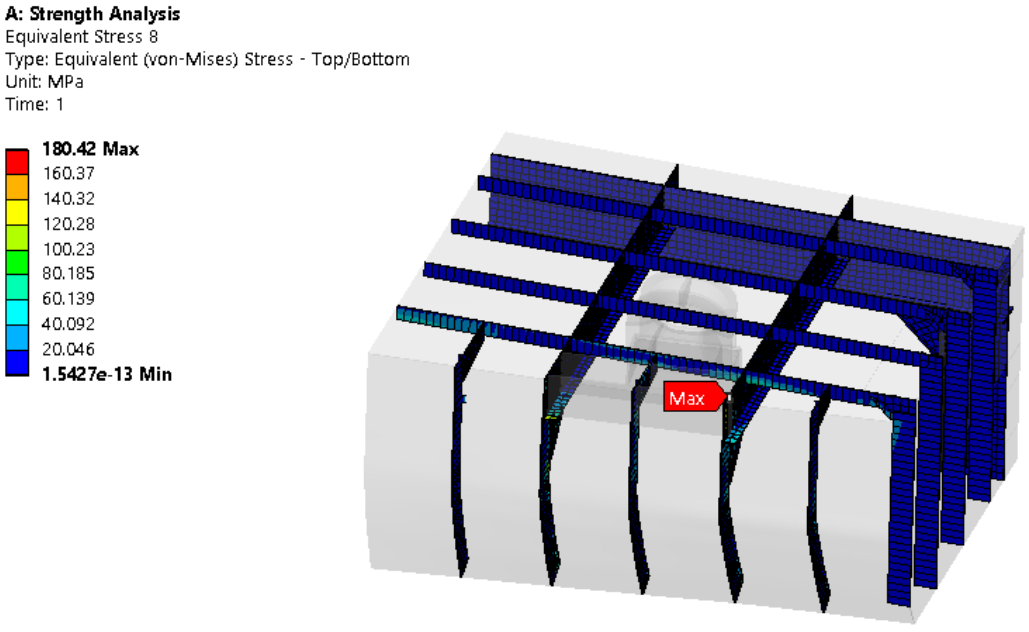
Maximum stress on deck plate was found 197.12 Pa.

Stress on transom



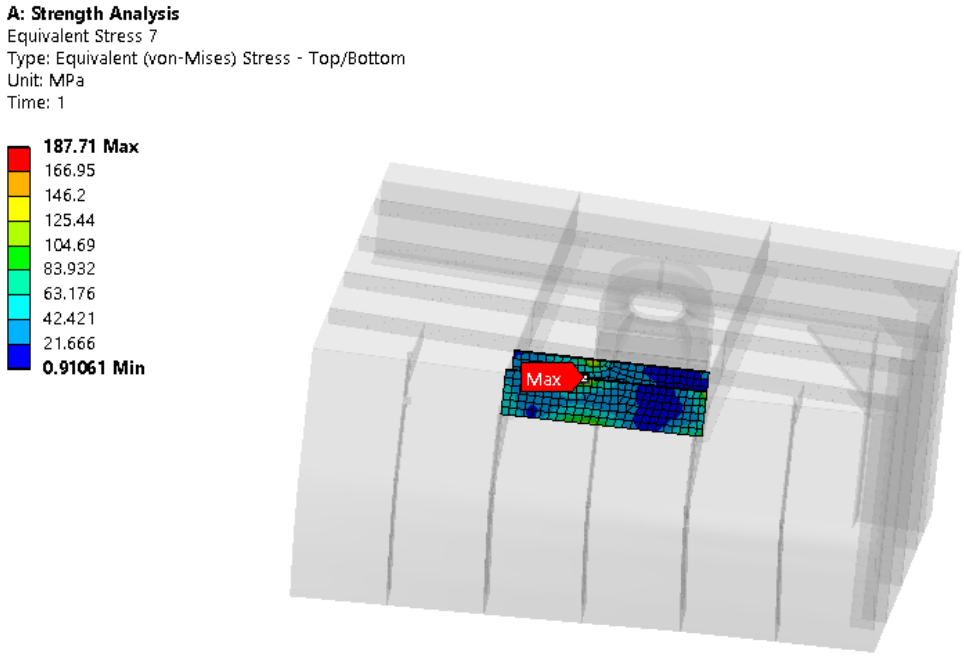
Maximum stress on Transom plate was found 90.072 MPa.

Stress on under deck structures



Maximum stress on deck supporting structure was found 180.42 MPa.

Stress on Panama Chock supporting structures



Maximum stress on Panama Chock supporting structure was found 187.71 MPa.

Beam Stress

Maximum stress on Beam structure was found 109.47 MPa.

Result Summary:

SN	ITEM	LOAD DIRECTION AFT	LOAD DIRECTION FWD
		EQ. STRESS (MPa)	EQ. STRESS (MPa)
1	Deck Plate	174.36	177.66
2	Side Shell	199.88	197.12
3	Transom Plate	89.406	90.072
4	Under Deck Structures	185.51	180.42
5	Chock Stiffeners	186.79	187.71
6	Beams	106.75	109.47

Strength criteria:

1. Allowable stresses (NR 467 Rules for the Classification of Steel Ships Pt B, Ch 9, Sec 4.2.6):
For strength assessment with finite element analysis:
Equivalent stress: 100% of minimum yield stress ReH

Conclusion:

The equivalent stresses in each scenario were less than 100% of minimum yield stress ReH which is 235MPa. In conclusion, the structure has demonstrated sufficient strength against the designed load.