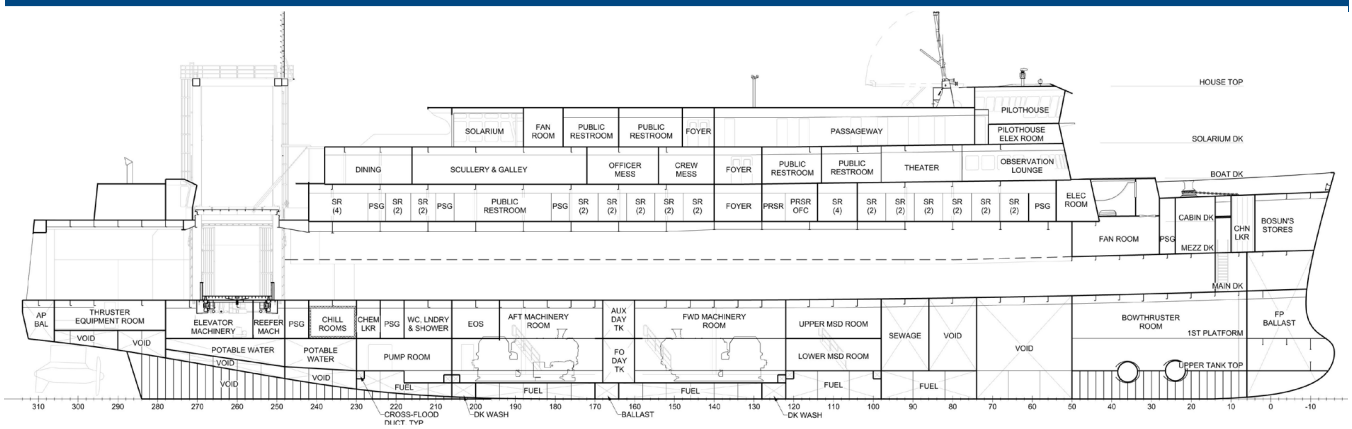
Implementation of New Propulsion System for the Replacement of the Tustumena Vessel Serving Rural Southwest Alaska

APPENDIX B: TECHNICAL VOLUME



SHEET LIST

SHT	TITLE
1	OUTBOARD PROFILE
2	INBOARD PROFILE
3	TOPSIDE ARRANGEMENT
4	SOLARIUM DECK & BOAT DECK
5	CABIN DECK & MEZZANINE DECK
6	MAIN DECK & 1ST PLATFORM
7	HOLD LEVEL & DOUBLE BOTTOM TANK TOP

GENERAL PARTICULARS

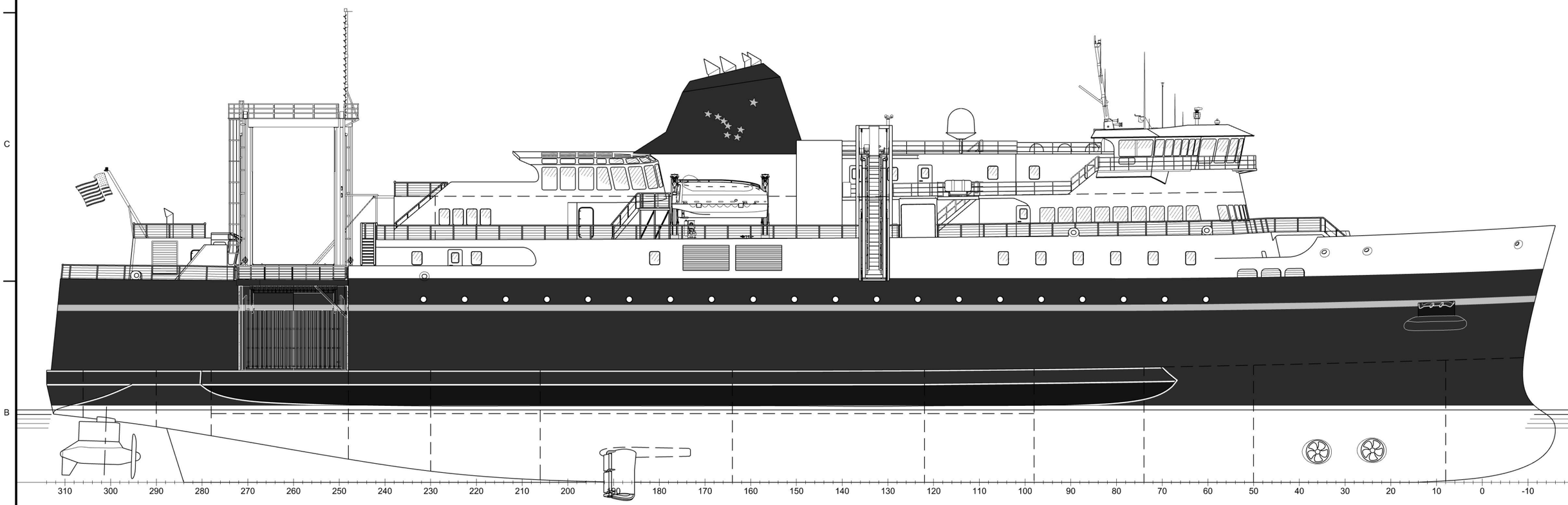
LOA	330'
LWL	325'-4"
DEPTH	24'-6"
BOA	74'-0"
DESIGN DRAFT	15'-10"
(@ END OF SERVICE LIFE)	16'-6"
AIR DRAFT	90'
VANS & CARS	14 & 23
CARS ONLY	55
VEHICLE LANE LENGTH	1220'
PASSENGERS	250

VEHICLE ELEVATOR

LENGTH X WIDTH	52' X 17'
SAFE WORKING LOAD	80,000 LB
SAFE WORKING LOAD (W/ PASSENGERS)	64,000 LB
MAX. NUMBER OF CARS	4
MAX. NUMBER OF PASSENGERS	25

ACCOMODATIONS

PASSENGER (4 PERSON SR W/ WC INC ADA)	9
PASSENGER (2 PERSON SR W/ WC INC ADA)	31
PASSENGER (2 PERSON ROOMETTE)	14
PASSENGER (4 PERSON ADA W/ WC)	1
PASSENGER (2 PERSON ADA W/ WC)	2
TOTAL PASSENGER BERTHS	126



ELEVATION 1-4A
OUTBOARD PROFILE

GENERAL NOTES	REFERENCES

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPD

PRELIMINARY

ALASKA MARINE HIGHWAY SYSTEM
KETCHIKAN, ALASKA

TUSTUMENA REPLACEMENT VESSEL (PROJECT 70062)
GENERAL ARRANGEMENT
OUTBOARD PROFILE

Glosten More than DESIGN.
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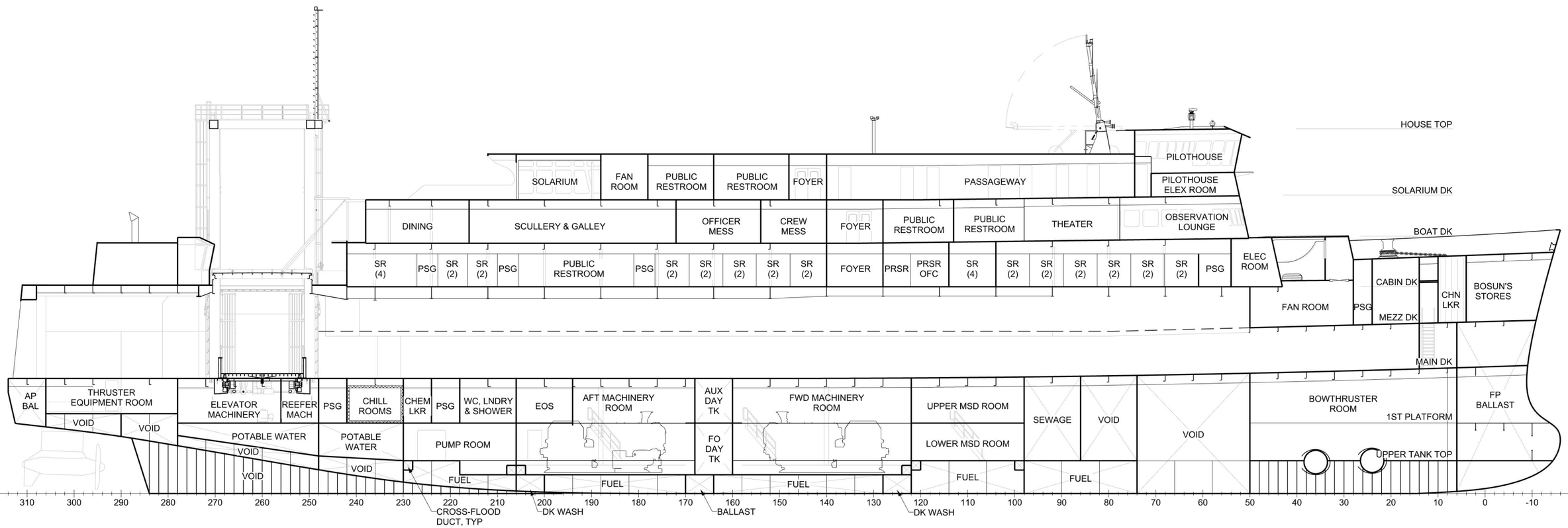
Drawn	Checked	Approved	Date
IHM	IWM	GW	10/12/2021

Scale	Drawing Number	Sheet	of	Revision
3/64" = 1'-0"	13105.10-070-001	1	7	P1



ELEVATION 2-4A
INBOARD PROFILE

PRELIMINARY

ALASKA MARINE HIGHWAY SYSTEM
KETCHIKAN, ALASKA

TUSTUMENA REPLACEMENT VESSEL (PROJECT 70062)
GENERAL ARRANGEMENT
INBOARD PROFILE

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IHM	IWM	GW	10/12/2021

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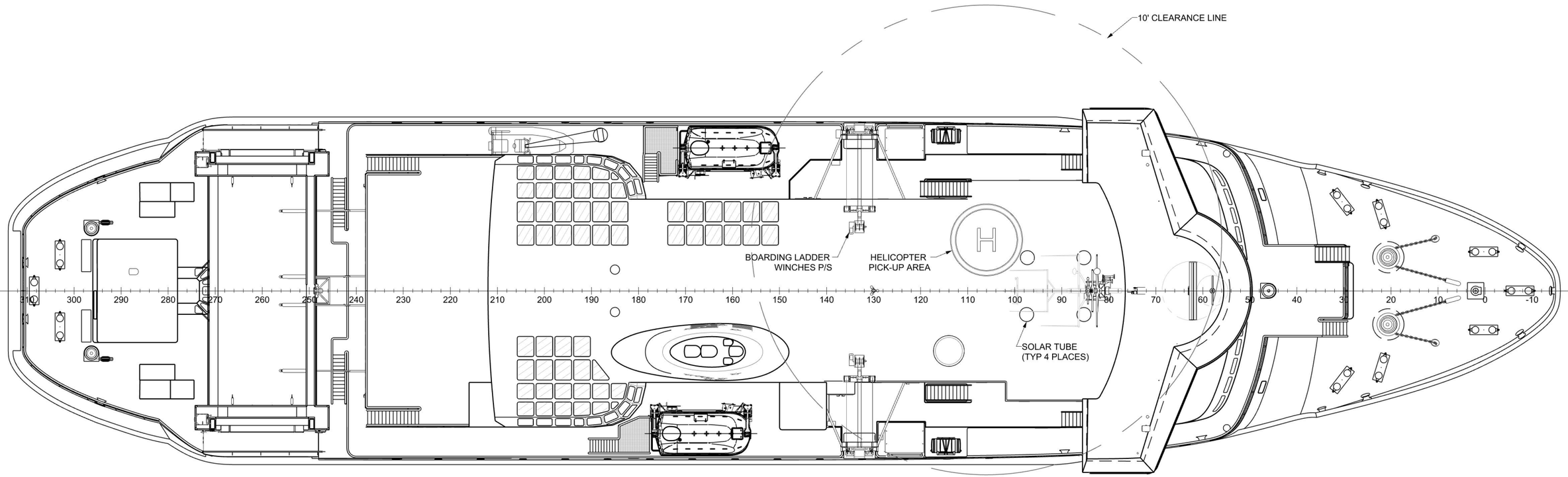

PLAN 3-4A
TOPSIDE ARRANGEMENT

PRELIMINARY

ALASKA MARINE HIGHWAY SYSTEM
KETCHIKAN, ALASKA

TUSTUMENA REPLACEMENT VESSEL (PROJECT 70062)
GENERAL ARRANGEMENT
TOPSIDE ARRANGEMENT

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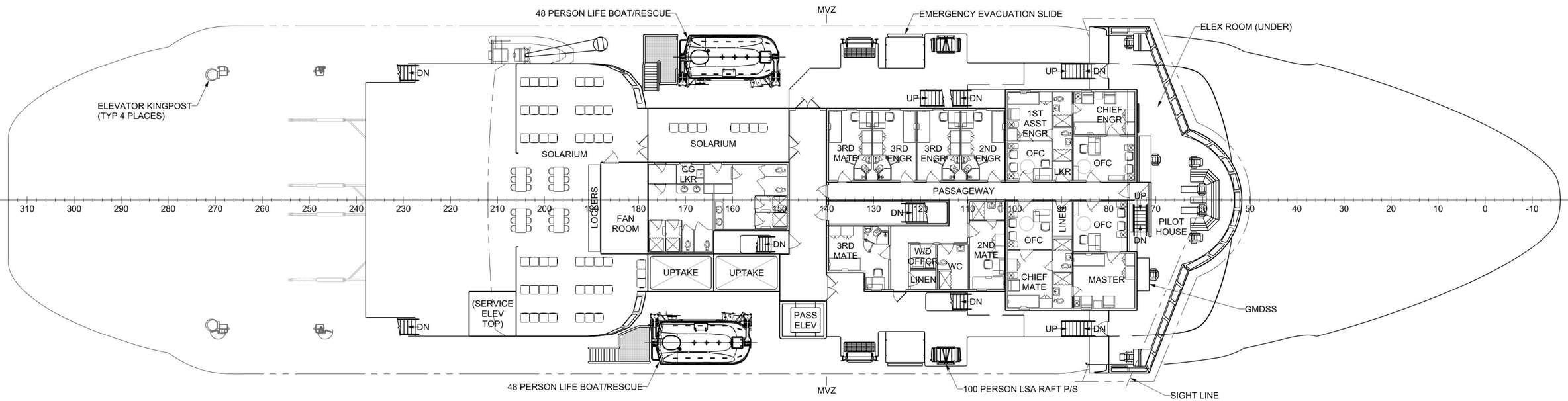
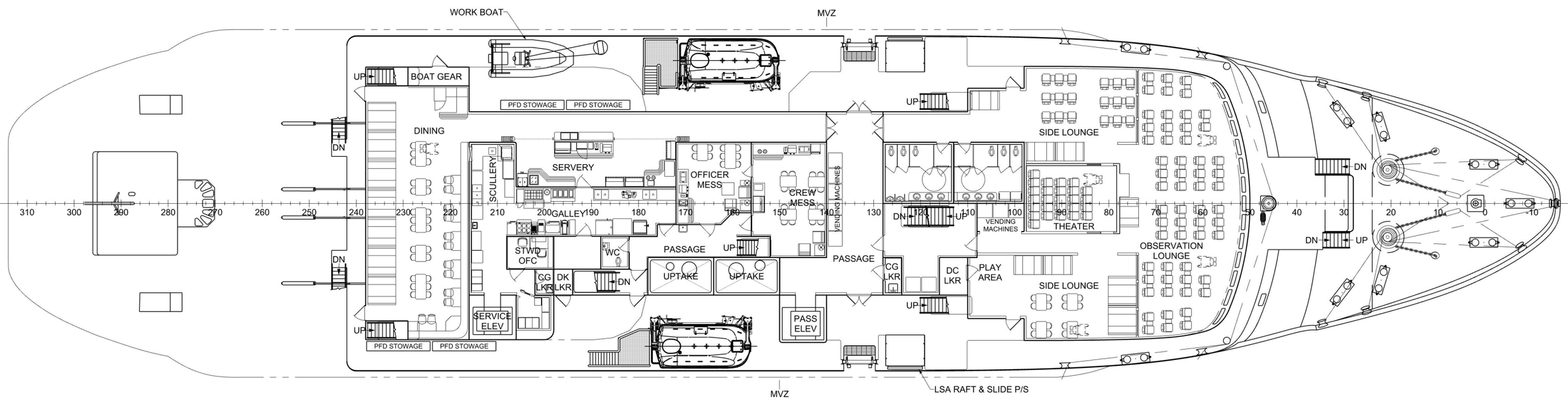


PLAN 4-4C
SOLARIUM DECK



PLAN 4-4A
BOAT DECK

PRELIMINARY

ALASKA MARINE HIGHWAY SYSTEM
KETCHIKAN, ALASKA

TUSTUMENA REPLACEMENT VESSEL (PROJECT 70062)
GENERAL ARRANGEMENT
SOLARIUM DECK & BOAT DECK

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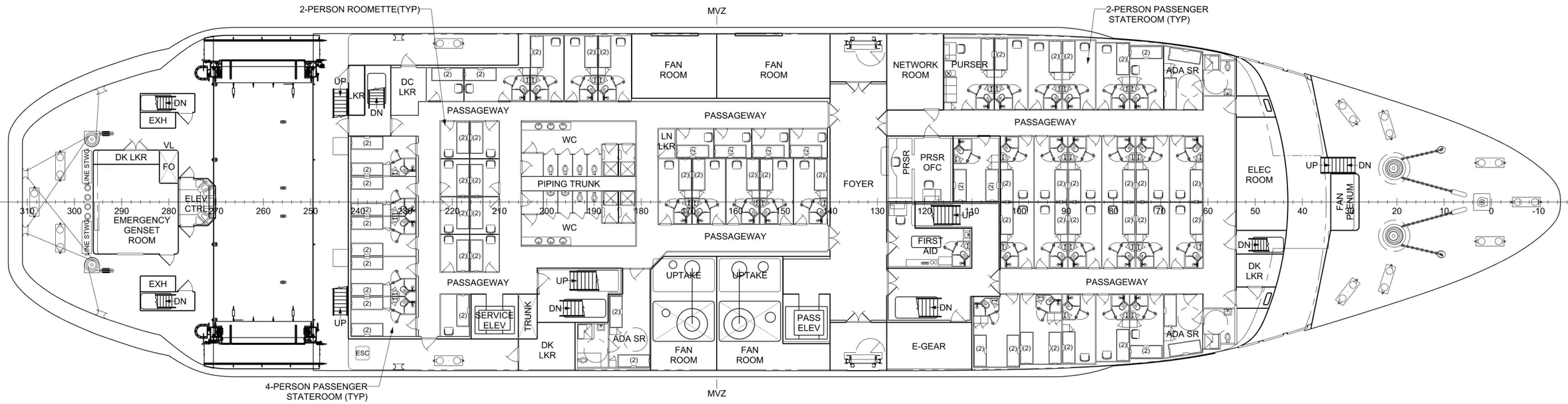
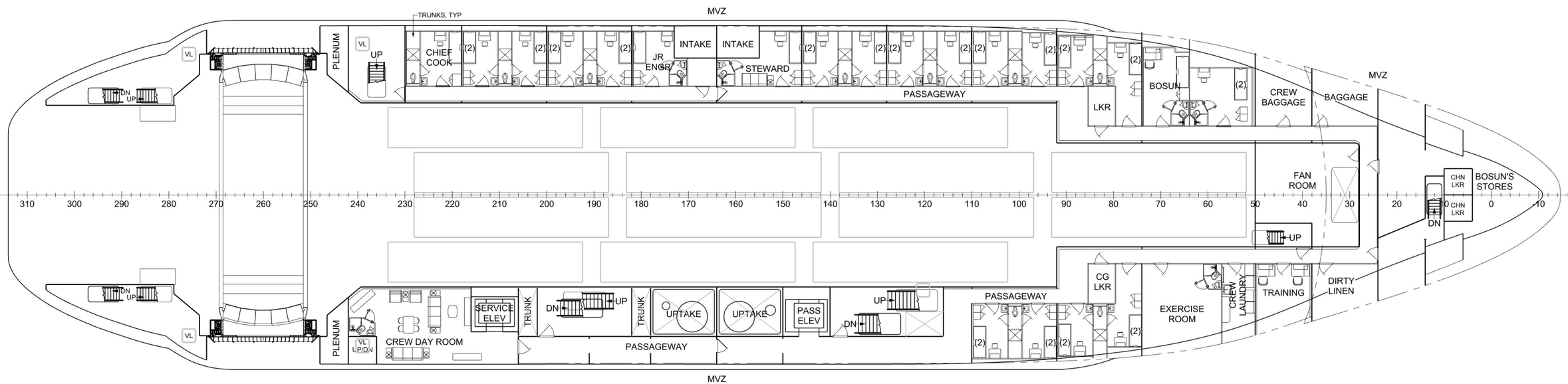


PLAN 5-4C
CABIN DECK



PLAN 5-4A
MEZZANINE DECK

PRELIMINARY

ALASKA MARINE HIGHWAY SYSTEM
KETCHIKAN, ALASKA

TUSTUMENA REPLACEMENT VESSEL (PROJECT 70062)
GENERAL ARRANGEMENT
CABIN DECK & MEZZANINE DECK

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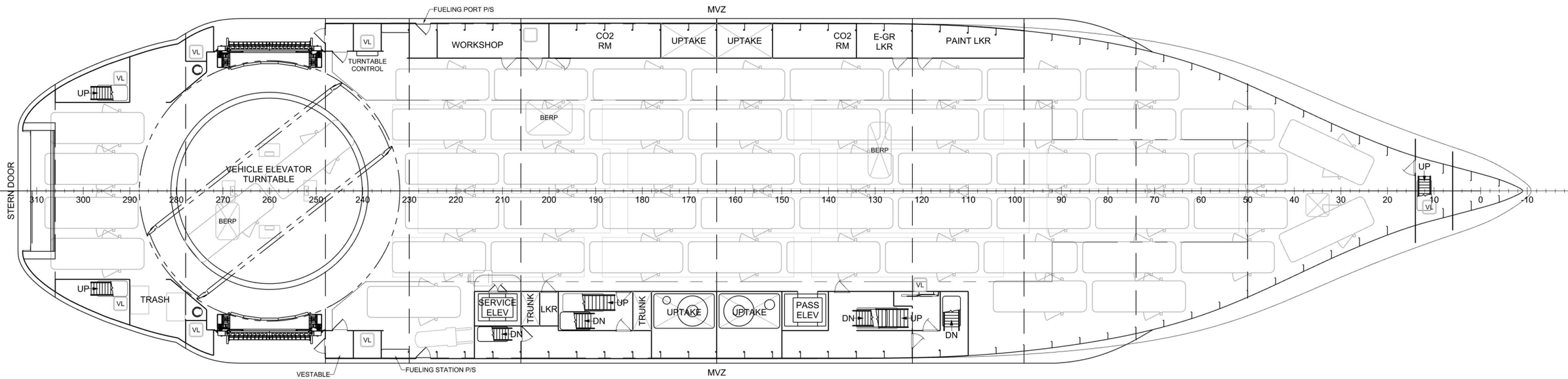
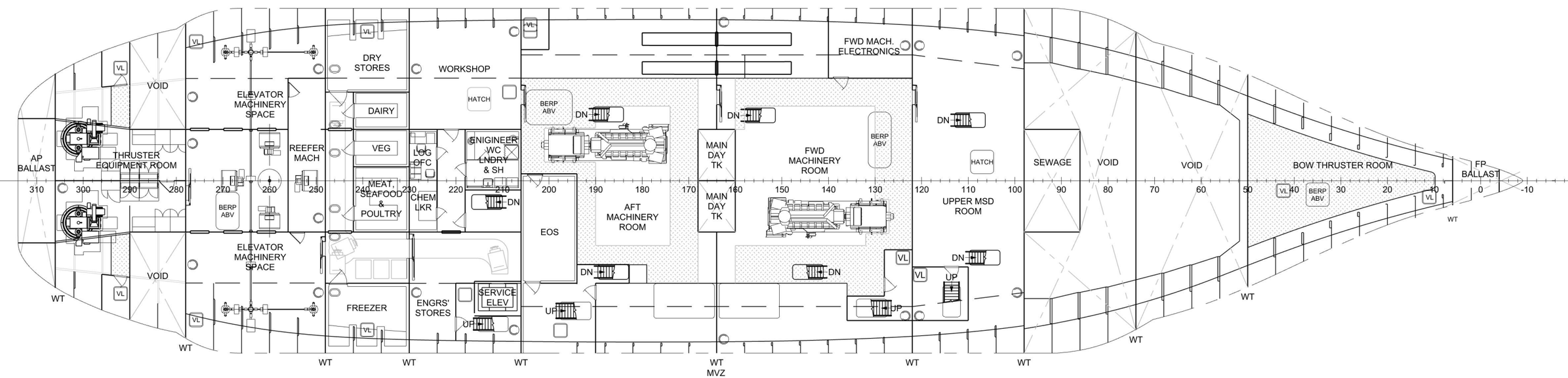


PLAN 6-4C
MAIN DECK



PLAN 6-4A
1ST PLATFORM

PRELIMINARY

ALASKA MARINE HIGHWAY SYSTEM
KETCHIKAN, ALASKA

TUSTUMENA REPLACEMENT VESSEL (PROJECT 70062)
GENERAL ARRANGEMENT
MAIN DECK & 1ST PLATFORM

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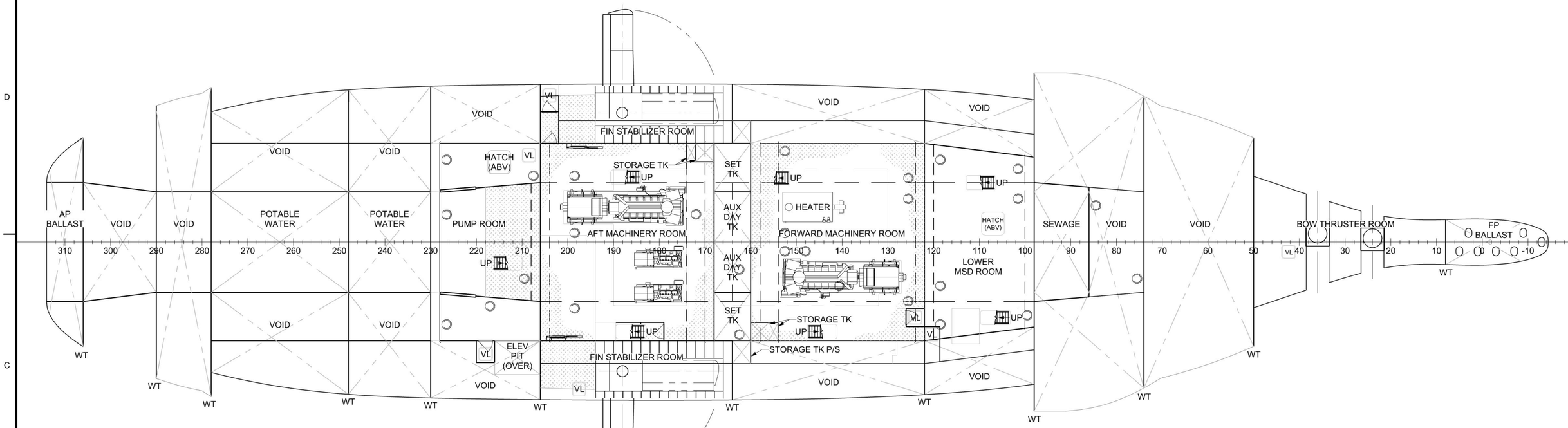
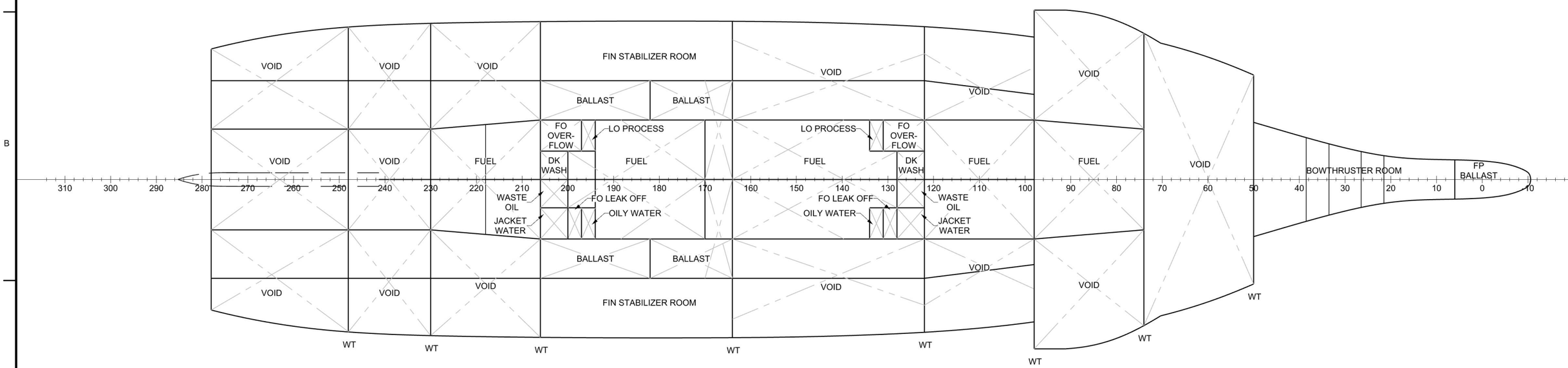


PLAN 7-4C
HOLD LEVEL



PLAN 7-4A
DOUBLE BOTTOM TANK TOP

PRELIMINARY

ALASKA MARINE HIGHWAY SYSTEM
KETCHIKAN, ALASKA

TUSTUMENA REPLACEMENT VESSEL (PROJECT 70062)
GENERAL ARRANGEMENT
HOLD LEVEL & DOUBLE BOTTOM TANK TOP

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Scale	Drawing Number	Sheet of	Revision
3/64" = 1'-0"	13105.10-070-001	7 7	P1

Tustumena Replacement Vessel

Design Study Report

Prepared for
Alaska Marine Highway System
Ketchikan, Alaska

File No. 13105.05
21 November 2014
Rev. A

Tustumena Replacement Vessel

Design Study Report

Prepared for
Alaska Marine Highway System
Ketchikan, Alaska

File No. 13105.05
21 November 2014
Rev. A

PREPARED: Digitally Signed 21-Nov-2014

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Project Engineer

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Appendix J Power Generation Report
Appendix K Seakeeping Analysis
Appendix L Public Participation Reponses
Appendix M Americans with Disabilities Act Report
Appendix N Regulatory Compliance Report
Appendix O Environmental Analysis Report
Appendix P Nicolson Cost Calculations
Appendix Q Vessel Technical Description Document
Appendix R AMHS Comment Tracking Log
Appendix S Public-Workspace Matrix
Appendix T Preliminary Value Engineering Study Report
Appendix U DSR Comment Tracking
Appendix V Hull Optimization Report

Revision History

Section	Rev	Description	Date	Approved
All	P0	95% Draft	8/29/2014	DWL
All	–	Final Submittal	10/22/2014	DWL
All	A	Incorporated AMHS and AKDOT comments	11/21/2014	DWL

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Executive Summary

The *M/V Tustumena* entered service in 1964 and is near the end of its design service life. Together with the *M/V Kennicott*, these two ferries are the only ferries capable of serving the Alaska Marine Highway routes between Homer, Kodiak, and the Aleutian Chain. Alaska Marine Highway System (AMHS) has begun a design project to replace the existing *Tustumena* with a new ferry, hereafter referred to as the *Tustumena Replacement Vessel*.

These ferries are set apart by not only their unique service route, but also their onboard systems; no other vessel in the world shares the unique vehicle handling systems of these two ferries. The *Tustumena Replacement Vessel* will require a vehicle handling system with similar capabilities. This handling system is the key driver of the new vessel design.

This report presents the findings from the preliminary design cycle and builds on the previous work developed during the March 2014 Recon Study. A complete preliminary design for the replacement vessel has been developed addressing the key design and regulatory requirements identified during the Recon Study. The appendices to this report contain drawings and renderings of the *Tustumena Replacement Vessel* preliminary design.

The purpose of this report is to provide feedback on the validity of the results developed during the Recon Study and report on the progress of the vessel design. As part of that effort, this report builds on key vessel design drivers, regulatory requirements and cost drivers of the new vessel design identified during the March 2014 Recon Study.

The *Tustumena Replacement Vessel* design is driven by several competing design and regulatory requirements:

- Handle vehicles, heavy construction equipment, and trailers (vans) through the vessel side at docks which do not have dedicated ferry ramps or other standard loading facilities.
- Interface with the standard AMHS docks in Prince William Sound and Southeast Alaska.
- Serve southwest Alaska routes and docks with design challenges due to the draft limits while maneuvering at low tide and small dock sizes.
- Sail in unprotected north Pacific waters and meet current American Bureau of Shipping and United States Coast Guard regulations for oceans certification.
- Meet Americans with Disabilities Act requirements.
- Meet new Environmental Protection Agency air emission and water emission standards.

An initial design for a *Tustumena Replacement Vessel* is presented in this report and reflects an ongoing and collaborative effort with AMHS vessel engineering and the AMHS Steering Committee. This design seeks to balance the design requirements with operator and real world experience.

This preliminary design principle dimensions and capabilities are presented in Table 1. Comparisons to the data presented with the concept design during the Recon Study are

included. The vessel size has increased by 5 feet in length, 2 feet in beam and 1.5 feet in depth, while the passenger and vehicle capacity remain the same. This increase in size allows for a longer vehicle elevator to decrease the "double shuffle" requirements during loading/unloading operations, speeding up vessel loading/unloading times.

Table 1 Recon Study and preliminary design principal characteristics

Dimension/Capability	Preliminary Design Characteristics (Current)	Recon Study Characteristics (Superseded)
Length Over All (LOA)	330'	325'
Length Water Line (LWL)	314'-0"	309'-6"
Depth	24'-6"	23'
Breadth Over All (BOA)	70'	68'
BOA (Over Guards)	72'	70'
Design Draft	15'-10"	14'-10"
Draft at End of Service Life	16'-6"	15'-6"
Air Draft	77'	81'
Vans & Cars	12 & 27	12 & 27
Cars Only	52	52
Vehicle Lane Length	1135'	1135'
Passengers	250	250

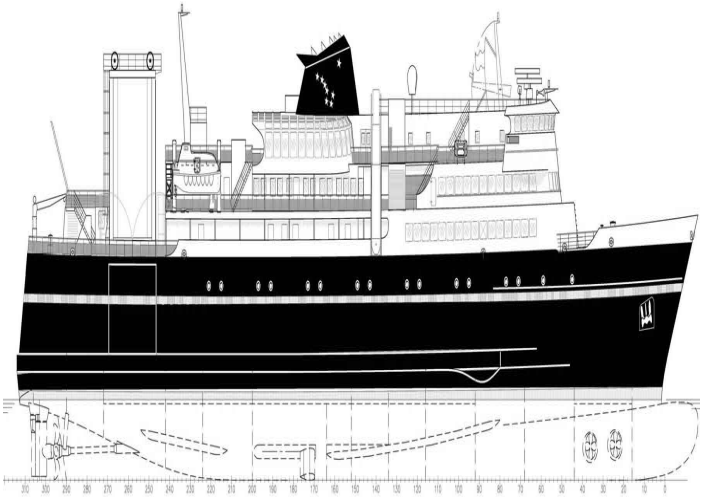
A Value Engineering (VE) Study was completed between the 95% draft Design Study Report and this final Design Study Report. The VE Study identified 27 items to be considered during the PS&E phase of the project. Of those 27 recommendations, AMHS has approved 19 of the recommendations for incorporation into the vessel design during PS&E. Design areas where the VE Study recommendations differ from the present design are identified in this report.

Cost estimates place the project budget for the new vessel at up to $237 million in 2014 dollars. However, it should be noted that until the design is sufficiently mature and the procurement methodology finalized these numbers are preliminary.

2020-2023 Alaska Statewide Transportation Improvement Program
2020-2023 Amendment 3; Approved November 23, 2021

Need ID: 30189
Title: AMHS Tustumena Replacement Vessel
Region: Marine Highways
Place Name: Statewide

Project Description: Construct a replacement ferry to service Southcentral and Southwest Alaska coastal communities.



Phase	Fund	FFY20	FFY21	FFY22	FFY23	After2023
Design	EMRK	7,500,000	0	0	0	
Design	OSF	1,875,000	0	0	0	
	Totals:	9,375,000	0	0	0	238,144,450

Program:	National Highway System	**Sponsor:**	
Primary Work:	Ferry Boats	**PEB Score:**	
2013 Election District:	99 Statewide	**Criteria:**	
Borough/Census Area:	Various Boroughs	**Functional Class:**	PRINCIPAL ARTERIAL - OTHER
Municipal Planning Org. (MPO):	non-MPO		

10.15.2021

TUSTUMENA REPLACEMENT VESSEL DESIGN REFRESH.

Glosten

DESIGN

TUSTUMENA REPLACEMENT VESSEL DESIGN CHANGES.

- Stability meets all new stability regulations. USCG/IMO/SOLAS.
- Beam increased by 3' for stability compliance.
- LOA did not increase, but LWL was increased to compensate for increased beam and hull lines changed accordingly.

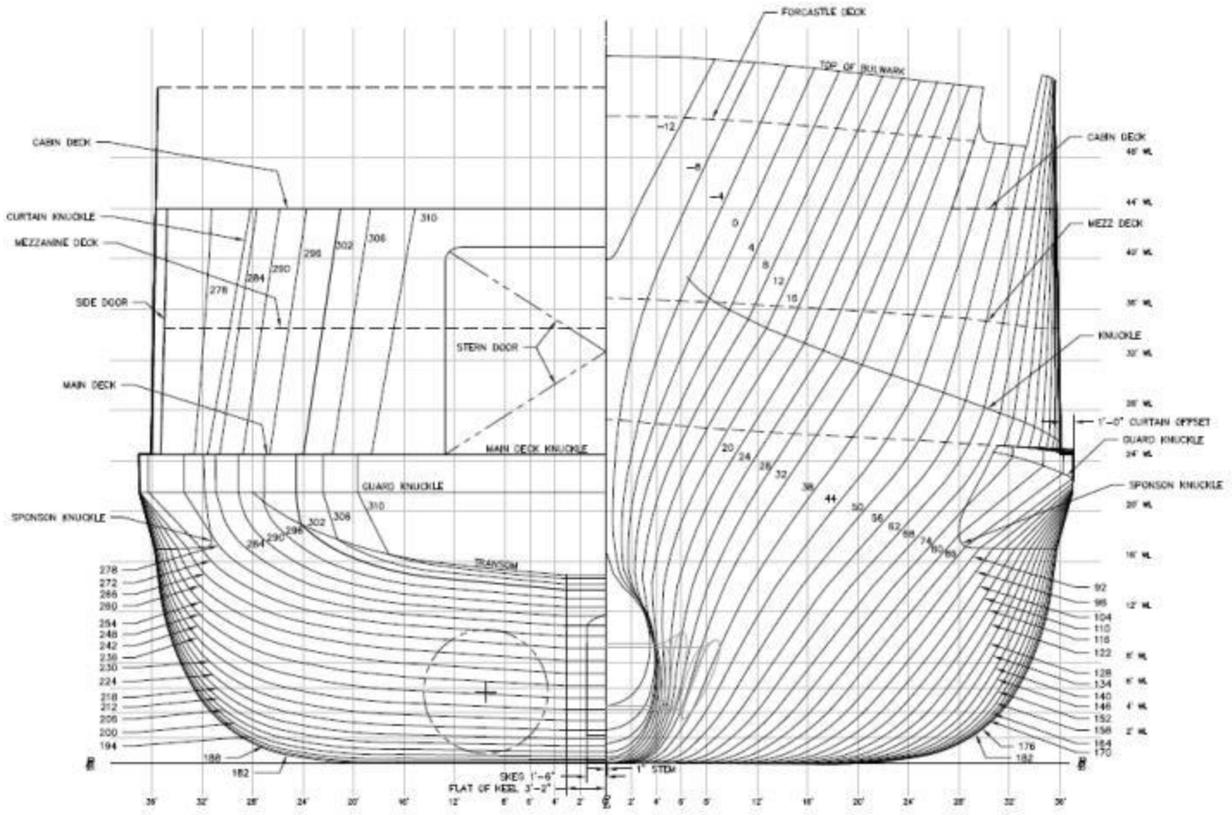
DESIGN

TUSTUMENA REPLACEMENT VESSEL DESIGN CHANGES.

- Drafts and freeboards are unchanged. Able to moor in all planned ports of call.
- SOLAS “Ready” – Design meets all SOLAS regulations at present.

Tustumena Replacement Vessel Design Changes.

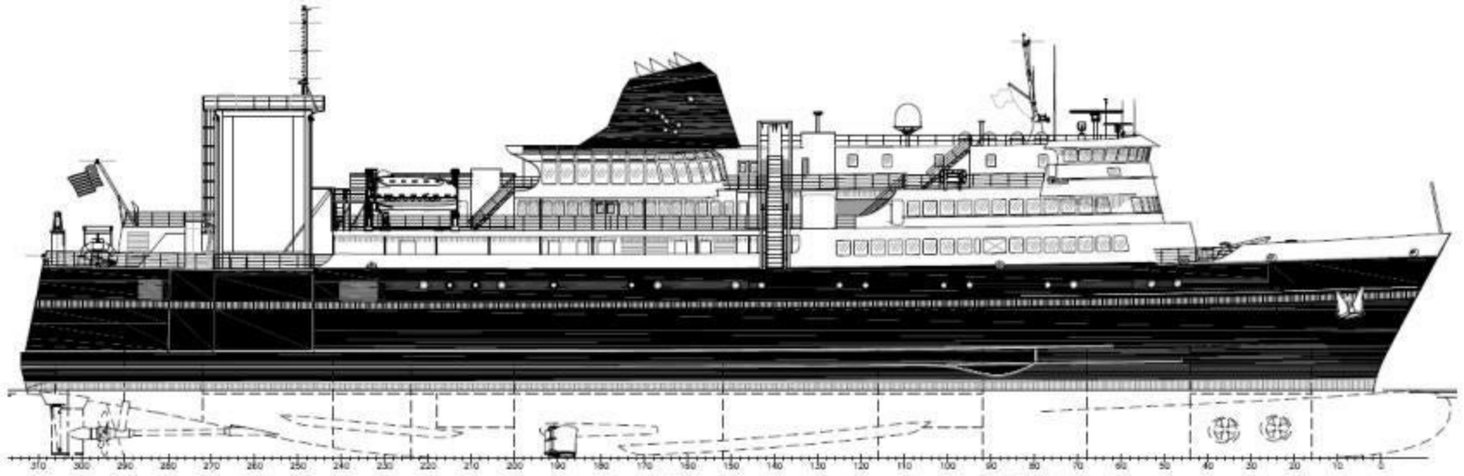
General Particulars	Previous TRV Design	Current TRV Design	Change
Length Overall (LOA)	330'-0"	330'-0"	No Change
Waterline Length (LWL)	311'-0"	325'-4"	14'-4"
Beam	71'-0"	74'-0"	3'-0"
Draft	15'-10"	15'-10"	No Change
Air Draft	90'-0"	90'-0"	No Change
Full Displacement (16'-6" Draft)	5,550 LT	5,680 LT	130 LT
Service Speed (knots)	15.0 kts	15.0 kts	No Change
Propulsion Power (BHP)	7,000 BHP	7,000 BHP	No Change
Passengers	250	250	No Change
Total Passenger Berths	104	126	22
Vehicle Lane Feet	1180'	1220'	40'
Vehicles	54	55	1
Vans	12	14	2
Vans & Vehicles	12 & 27	14 & 23	+2, -4



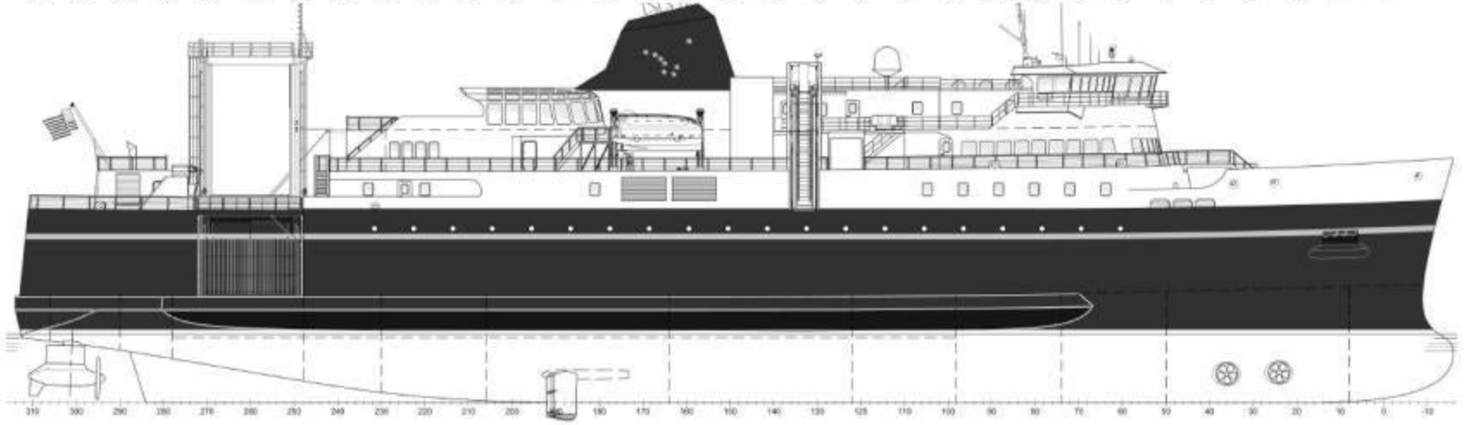
SECTION 2-5A
BODY PLAN
1/8"=1'-0"

Tustumena Replacement Vessel Design Changes.

- Raised foc'sle to improve dryness of the foredeck and pilothouse.
- Modified Pilot House to improve visibility from control stations and better comply with regulations. Raised Pilot House 4 ft to allow electronics to be installed in space below.
- Waterline length increased to reduce powering requirements.



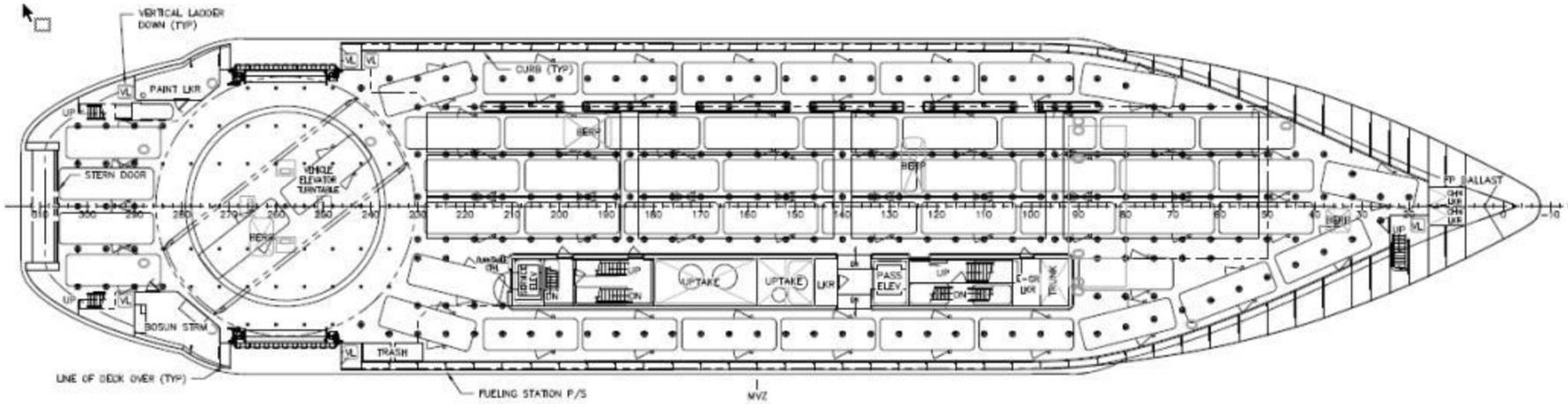
Old profile



New profile

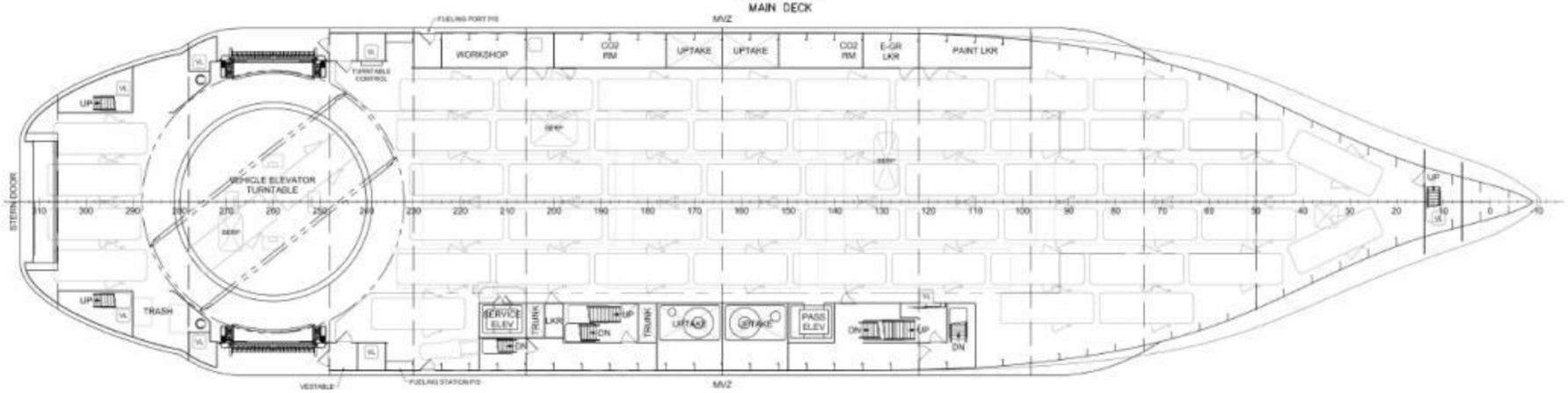
MAIN DECK PLANS.

- Reconfigured Main Deck and vehicle space for the increased beam.
- Van capacity increased from 12 to 14.
- Vehicle capacity increased from 54 to 55.
- Changed casings to outboard of vehicle stowage area similar to ACFs.



PLAN 4–4A
MAIN DECK

Old plan

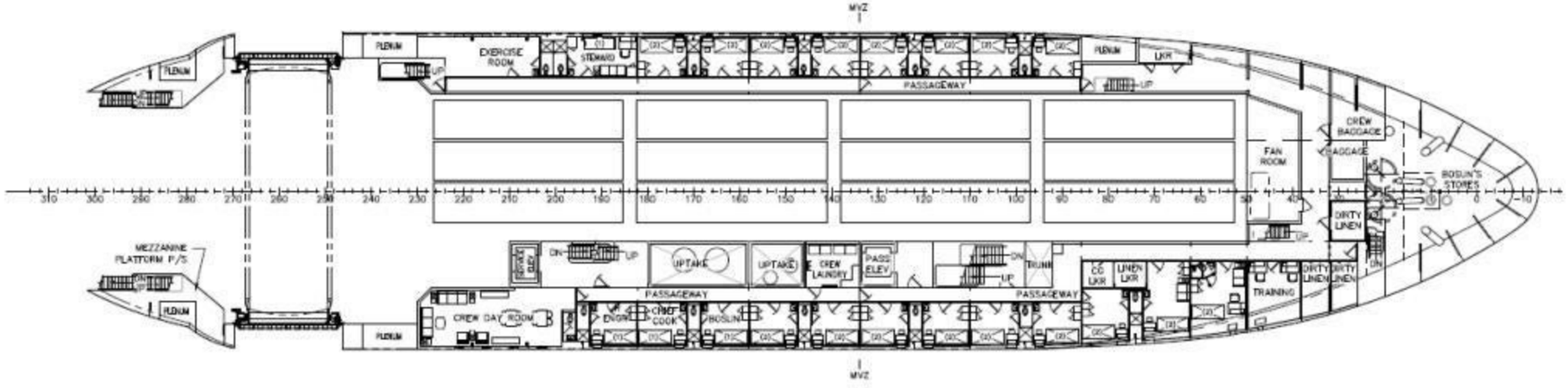


PLAN 6-4C
MAIN DECK

New plan

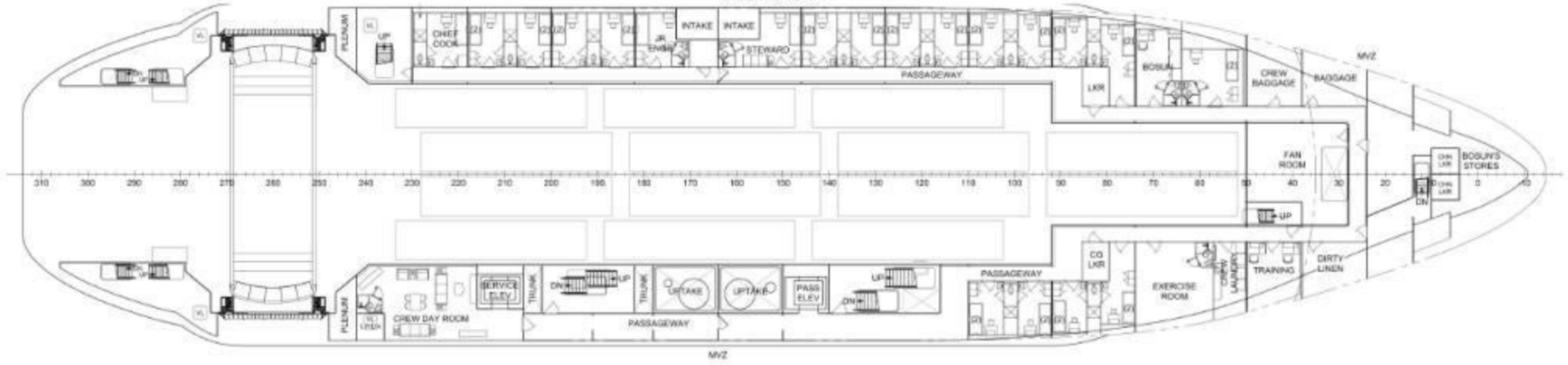
MEZZANINE DECK PLANS.

- Reconfigured Mezzanine Deck and vehicle space for the increased beam.
  - Van capacity increased from 12 to 14.
  - Changed casings to outboard of vehicle stowage area similar to ACFs.



Old plan

PLAN 4–4C
MEZZANINE DECK



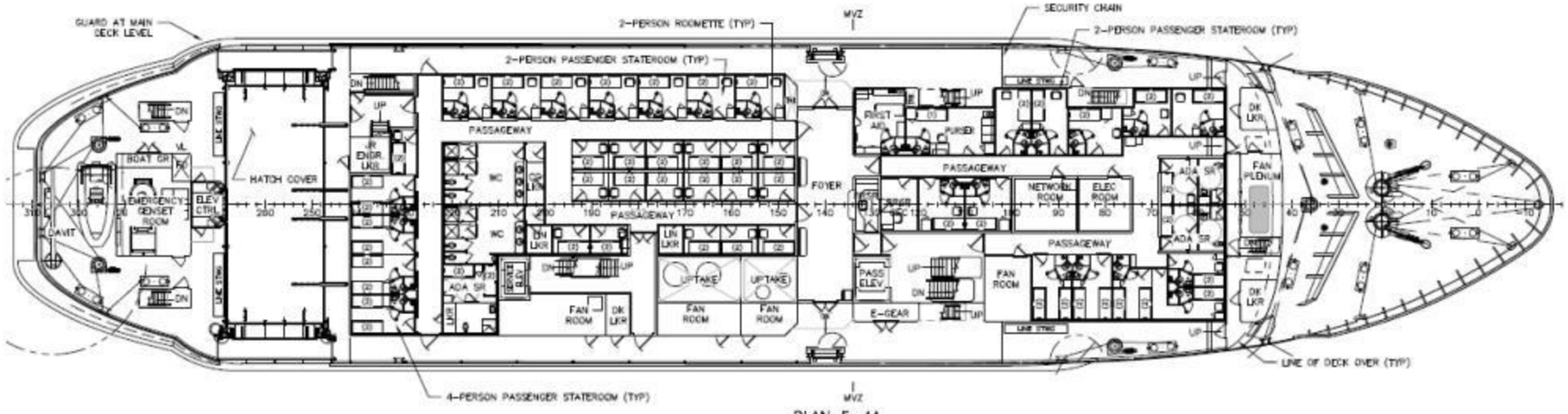
New plan

PLAN 5-4A
MEZZANINE DECK

NEW CABIN DECK PLAN.

- Reconfigured Cabin Deck for the increased beam and outboard machinery casing changes.
- Overall number of passenger berths increased from 104 to 126 berths.

PASSENGER (4 PERSON SR W/ WC INC ADA)	9
PASSENGER (2 PERSON SR W/ WC INC ADA)	31
PASSENGER (2 PERSON ROOMETTE)	14
PASSENGER (4 PERSON ADA W/ WC)	1
PASSENGER (2 PERSON ADA W/ WC)	2
TOTAL PASSENGER BERTHS	126



PLAN 5-4A
CABIN DECK

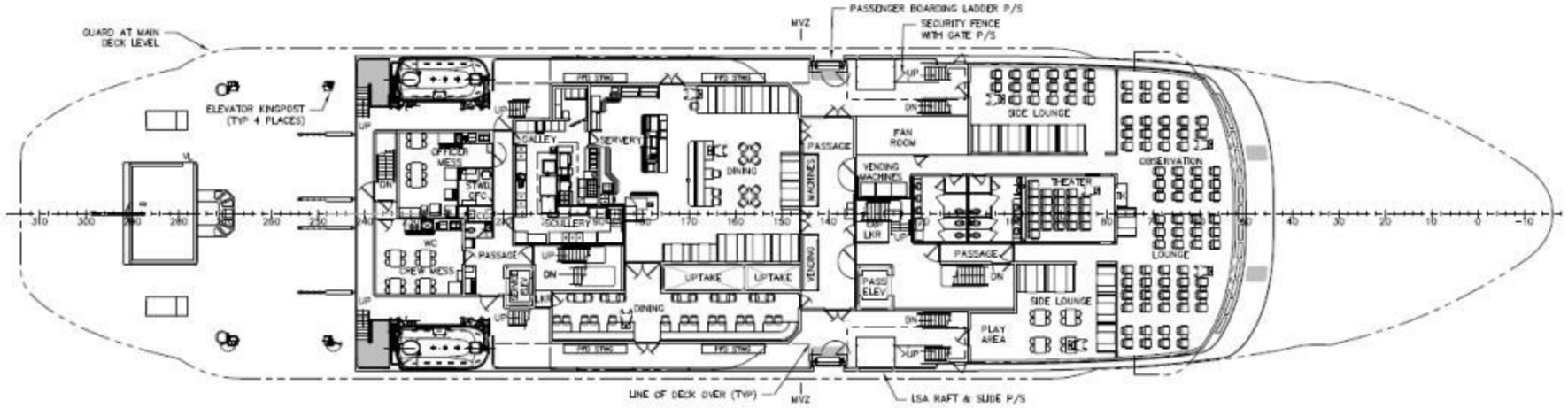
Old plan

PLAN 5-4C
CABIN DECK

New plan

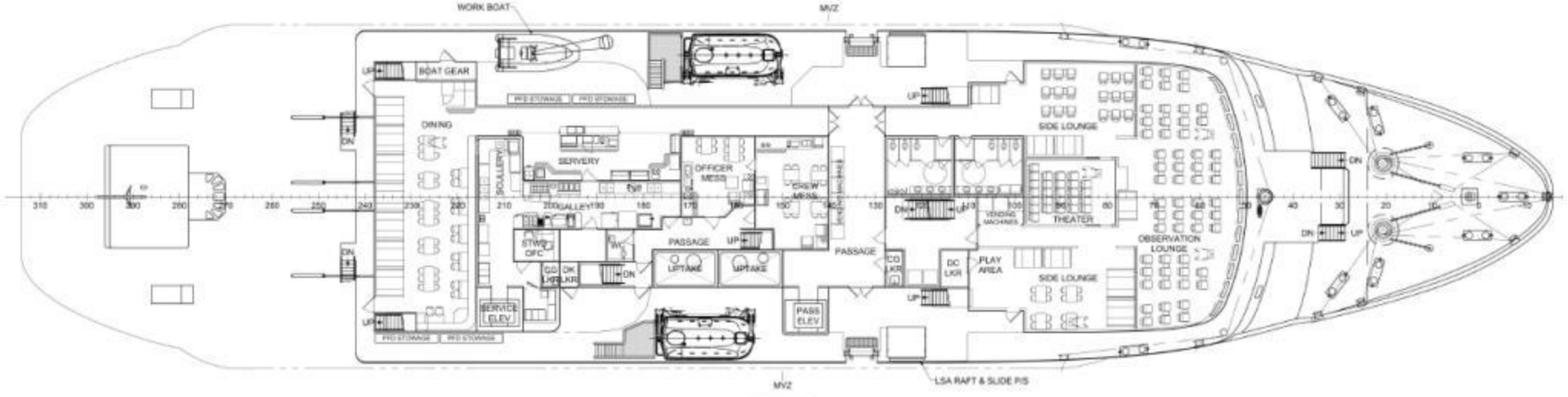
NEW BOAT DECK PLAN.

- Reconfigured Boat Deck for the increased beam and machinery casing changes.
  - Added outside walkway forward of observation lounge.
  - Moved passenger dining aft and crew dining forward of galley. Similar to other AMHS Ferries.
  - Relocated work boat forward. May be replaced by rescue boat if desired.



PLAN 5-4C
BOAT DECK

Old plan

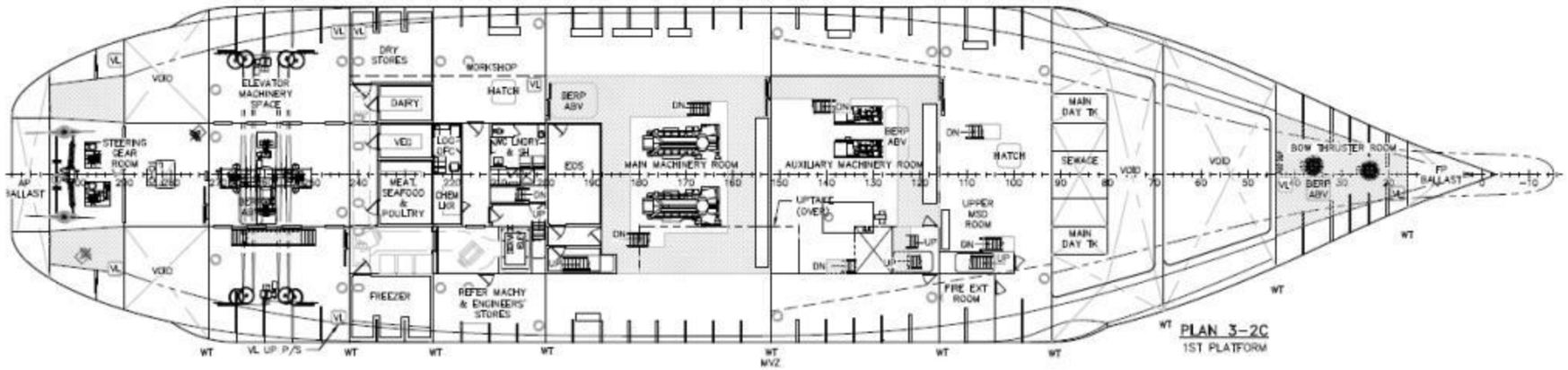


PLAN 4-4A
BOAT DECK

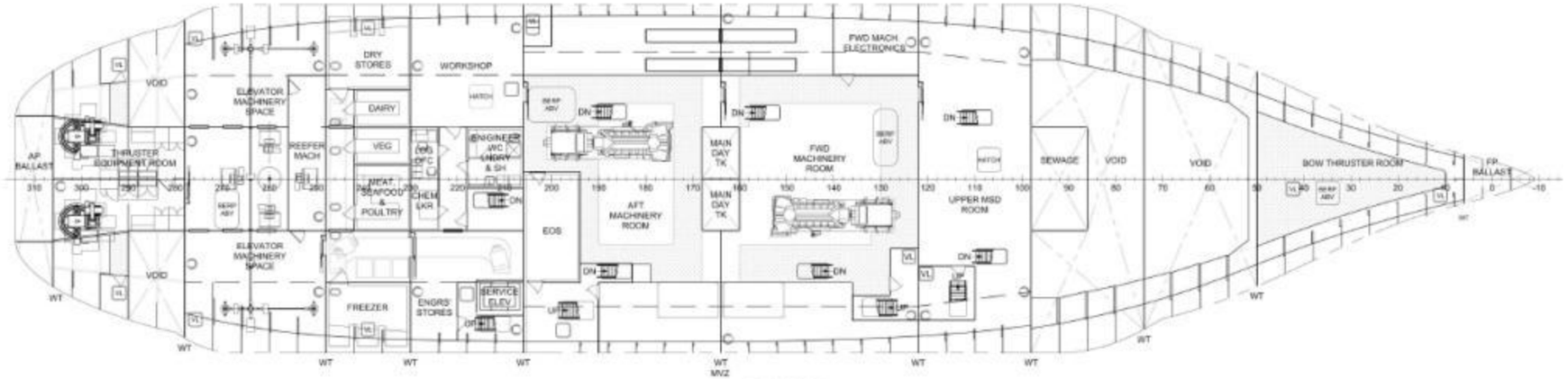
New plan

NEW 1ST PLATFORM PLAN.

- Changed VETS to ball screw design to comply with ASME elevator code.
- "SOLAS Ready" impacts:
  - Redundant engine rooms for compliance with Safe Return to Port (SRtP).
  - Changed to podded propulsion for SRtP compliance.
  - Changed to diesel electric propulsion to comply with Energy Efficiency Design Index (EEDi) and support the podded propulsion.



Old plan



New plan

Glosten