

Attachment A
FVF Chenega Condition Report



PHOTO Courtesy of Alaska Marine Highway System

2018 - 2019 FLEET CONDITION SURVEY

FVF CHENEGA

PREPARED FOR
ALASKA MARINE HIGHWAY SYSTEM

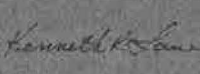
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Revision History

Section	Rev	Description	Date	Approved
All	-	Initial release	29 April 2019	DWL

References

1. *Engineers Operating Manual*, Alaska Marine Highway System, Rev. A, June 2016.
2. *High Speed Craft Operating Manual*, Alaska Marine Highway System, Rev. A, 30 June 2016.
3. *FVF System Upgrades 2014: Work Item Specifications*, Glosten, Rev.-, 15 August 2014.
4. *General Arrangement 71.75m Catamaran Ferry*, Derecktor Shipyards, Drawing No. NG432-650-01-1, 15 December 2003.
5. *AMHS FVF Engine Replacement Consulting: MV Chenega Impact Inspection Report*, Glosten, 13028.04, Rev. -, 7 April 2015.

Section 1 Executive Summary

1.1 Background

This report on the FVF *Chenega* is a deliverable under the AMHS Term Agreement — PSA 02553011B, NTP No. 6 AMHS FVF Survey and Valuation. The purpose of the project is to:

- Summarize the current vessel condition from a photo survey.
- Reflect construction or significant refurbishments performed during and after the 2014 Shipyard Period.

This report is based in part on an actual ship survey of the *Fairweather* (sister vessel to the *Chenega*), a recent photo survey of the *Chenega* by AMHS personnel and in part on studies and discussions with AMHS personnel. While every effort has been made to verify the information used in developing this report, it has not been possible in every instance, and there are potentially some factual errors. For example, there may be items reported as original equipment which have been replaced at some time during the vessel's history. The opinions of personnel that submitted comments on the draft report may differ from those of other crew members assigned to the vessel.

Table 1 describes the adjectives used throughout the report to indicate the condition of equipment or systems. It is provided as a guideline to accurately depict the condition description.

Table 1 Evaluation criteria

Rating	Description
Excellent	Item is in like new condition.
Good	Item is not significantly damaged, but repair/replacement would improve functionality of the system/component.
Fair	Item is damaged. Improvements should be considered as soon as possible.
Poor	Item is damaged. Improvements should be considered immediately.
Obsolete	Item is no longer supported by manufacturer or vendors. Replacement parts are scarcely available or are not available.

1.2 Ferry Description

The FVF *Chenega* was built to serve the communities of Prince William Sound with Cordova as home port. The *Chenega* is considered a day boat and has no overnight accommodations for passengers. Since the repowering and latest shipyard period (2016), the vessel has not operated for a complete season and is regarded in an almost new condition.

Table 2 summarizes key vessel particulars of the *Chenega*.

Table 2 FVF *Fairweather* particulars

Year Built	2005
Year Repowered	2014
Length	235'-5"
Draft	8'-5½"
Beam	59'-1"
Speed	35 knots
Power	19,310 HP
Passenger Capacity	250 passengers
Vehicle Capacity	620 lane feet
USCG Official Number	1166054
USCG Classification	SOLAS/HSC Code Category B
DNV Classification	+1A1 HSLC R3 Passenger Car Ferry A E0
Call Sign	WDC 3997

1.3 Vessel Condition

The FVF *Chenega* is in near excellent condition overall. The structure of the vessel is in very good condition, with well-maintained coatings, minimal damage incidents, and sufficient maintenance and repair over the vessel's 14-year age.

The passenger spaces are in excellent condition overall. Very few items were found in fair condition, and no items were found in poor condition.

Crew spaces are in good condition with few exceptions.

No problems were reported with the electrical and mechanical systems, or with the communication systems. In particular, no problems were reported with the new propulsion engines and steering system, and the generators are in excellent condition.

The heating, air conditioning, and ventilation system was not observed but is assumed to be in generally good condition.

Section 2 Regulatory Compliance Determination

2.1 United States Coast Guard (USCG)

The vessel meets the requirements for USCG Inspection per Safety of Life at Sea/High Speed Craft Code (SOLAS/HSC Code) Category B as an equivalent to 46 CFR Subchapter H for domestic voyages.

There were no outstanding USCG 835's at the time of this report.

2.2 Safety of Life at Sea (SOLAS)

The vessel meets SOLAS/HSC Code Category B for international voyages.

2.3 Det Norske Veritas (DNV)

The vessel was designed and built in accordance with the DET NORSKE VERITAS (DNV) Rules for High Speed Light Craft with the following notation:

- +1A1 HSLC R3 Passenger Car Ferry A E0
 - +1A1 HSLC Passenger designates that this vessel is a craft of light weight displacement and is a high-speed craft in compliance with the High Speed Craft Code as well as the DNV High Speed Light Craft Parts 1-5.
 - The R3 is a Coastal service restriction limiting the range of the vessel to 20 nm in the winter, 50nm in the summer and 100nm in tropical conditions from safe anchorage.
 - Car Ferry A designates that the craft is arranged for carriage of vehicles in enclosed spaces with fuel in their tanks for their own propulsion, into and from which such vehicles can be driven and to which passengers have access, including spaces intended for the carriage of cargo vehicles.
 - EO designates that the craft has periodically unattended machinery spaces.

2.4 Other Regulations

The vessel is Americans with Disabilities Act (ADA) compliant and has a passenger elevator and other dedicated public access areas such as the food court, passenger lounges, and restrooms.

Section 3 Structural Condition Reports

3.1 Hull Plating and Appendages

All hull compartments are clean, and structure are reported in sound condition throughout. The double bottom spaces have no reported damage. There has been no reported fatigue cracking in areas of the jet foundations or transom and brackets.

The underwater hull coating system is made up of the following major components:

- Intergard 264 (two coats)
- Intersleek 731 (tie coat)
- Intersleek 979 (one coat)

Underwater coatings were renewed during the fall/winter 2015/2016.

3.2 Tanks and Voids

In response to damage suffered by the *Chenega's* sister vessel *Fairweather* during its first year of operation, the forepeak of the *Chenega* was redesigned to include stanchion connections of bottom structure to deck structure, webframe enhancements, and shell stiffener straightening. No damage is reported in this area on the *Chenega*.

The *Chenega* suffered a collision during the 2014 repower at Foss Shipyard in Seattle, Washington (Reference 5). A tugboat drifted into the port side of the *Chenega*, resulting in permanent deflection at Frames 12 and 13 in the vicinity of the Port Engine Room. This damage has since been repaired.

3.3 Vehicle Space

The vehicle deck bulkheads and overhead are entirely covered by insulation (Figure 1). There is no evidence of corrosion or cracking.



Figure 1 Vehicle deck view looking forward towards side door; insulation visible at sides and overhead

3.4 Superstructure (Vehicle Deck and Above)

Topside and deckhouse exterior coatings are almost exclusively vinyl and are in good condition.

3.5 Summary

Overall the structure of the vessel appears in very good condition, especially considering the 14-year age. The coatings have been well maintained. Reported damage incidents have been minimal and repaired in accordance with regulatory requirements and oversight in every instance.

Section 4 Fire and Life Safety Equipment Reports

4.1 Sprinkler Systems

4.1.1 Automatic Sprinkler System and Piping

The sprinkler system servicing the passenger space on this vessel is a dry type system broken into two zones separated by the smoke tight doors located between Frames 26 and 27. The heads are fusible element type so that in the case of a fire, only the heads in the area of the fire will open and extinguish it. The fusible link opens when the temperature exceeds 155 °F.

Seawater is supplied to the system by a self-priming centrifugal pump with a flowrate of 1074 US gpm at a pressure of 60psi. This pump is located in Compartment 2.

For each zone there is a control valve that must be opened to allow water to flow to the zone. The control valves for the Passenger Deck sprinkler system are located in the Crew Day Room. Remote control of the control valves and the sprinkler pump is capable from the Operating Compartment through the IMACS system and also from the aft bulkhead of Air Handler Room #3. Manually opening the valve in the Crew Day Room provides local manual override of the control valves.

The sprinkler pump is provided with power from either switchboard via an automatic bus transfer switch. In the case the sprinkler pump fails to operate, the deluge pump can provide backup through a crossover in the wet deck.

In the case of a fire on the Passenger Deck, the sprinkler pump would be started from the Operating Compartment through the IMACS system. Once the pump is running, the control valve for the area with the fire is opened flowing water to the zone. If the control valve fails to open, a crew member would manually open the control valve in the Crew Day Room. Operation of the sprinkler system can also be carried out from the aft bulkhead of Air Handler Room #3 by starting the pump and opening the necessary control valve.

If neither of the remote pump starts works, either the deluge pump could be started to flow water to the sprinkler system, or the sprinkler pump could be started locally in Compartment 2.

The accommodation spaces sprinkler piping is 90:10 CuNi and is in excellent condition.

4.1.2 Manual Deluge Sprinkler System and Piping

The deluge system on this vessel is a dry type system broken into three zones on the Vehicle Deck. The heads on the Vehicle Deck are open heads so that all the heads in the entire zone will spray water if the control valve to that zone is opened.

Seawater is supplied to the system by a self-priming centrifugal pump with a flowrate of 1074 US gpm at a pressure of 60psi. This pump is located in Compartment 1. This pump is sized to provide enough water to the two largest adjacent zones on the Vehicle Deck.

Each of the three zones has a control valve. The control valves are located in the landing of the stairwell on the Vehicle Deck starboard side amidships. Remote control of the deluge pump and the control valves is from the wheelhouse through the IMACS system. The second location of control of the valves and the deluge pump is the stairwell landing itself. If necessary, the control valves can be manually opened by a crew member.

The deluge pump is provided with electrical power from either switchboard via an automatic bus transfer switch. In the case where the deluge pump fails to start, the sprinkler pump can be used

as a backup to the deluge system. Both the sprinkler and deluge pump are the same size, and each is sized to flow water to two adjacent zones on the Vehicle Deck. The deluge pump can be started locally in Compartment 1 as well.

The deluge piping is 90:10 CuNi and is in excellent condition.

4.2 Firemain System and Piping

The firemain system consists of two centrifugal pumps, one in each engine room. In addition to feeding the fire main, the system also provides water to the sprinkler/deluge system via a manual valve located in Compartment 3, forward overhead, as an emergency backup.

The cross connect to the sprinkler/deluge is an emergency backup. The firemain is 90:10 CuNi and is in excellent condition.

4.3 Fire Doors and Fire Screen Doors

Fire doors are found at various locations throughout the vessel. Fire doors are steel with A60 protection, providing 60 minutes of protection against fire without failing.

Fire doors were not tested but are assumed to be in excellent condition.

4.4 Fire Boundaries and Structural Insulation

When constructed in 2005, the vessel was fully compliant with all current regulatory and classification society fire boundary requirements. Structural fire protection insulation is typically mineral wool. The structural fire protection insulation in the accommodation spaces is generally protected by joiner linings and is in excellent condition. The structural fire protection insulation in the vehicle space and machinery spaces is more exposed and has been damaged, repaired and/or patched in some places.

4.5 Fire Suppression Systems and Piping

4.5.1 Engine Room Fixed Fire Suppression System

Fixed gas fire suppression is provided in both engine rooms. The agent used for this system is FM-200, which is a non-harmful active extinguishing agent. The FM-200 is stored in two 900-pound cylinders located at Frame 14 on the port side of the Vehicle Deck. The agent is stored as a liquid and vaporized upon release. The amount of agent available is sufficient to provide for two releases into either space, or one release into both spaces.

Fire suppression was not tested but is assumed in excellent condition.

4.6 Alarm Monitoring Systems

4.6.1 Centralized Fire Detection/Alarm System

Fire detection on the vessel is through an Ansul IQ-301 fire detection system. This Ansul IQ-301 is a fully addressable system that monitors the smoke and heat detectors as well as all of the manual pull stations located throughout the vessel. The fire detection system was not tested but is assumed in excellent condition.

4.6.2 Vehicle Space Alarm/Monitoring Systems

Smoke detectors are used throughout the vessel in the Pilothouse, Crew Day Room, Air Handler rooms, Passenger Deck, Vehicle Deck, forepeak, bow thruster rooms and Compartments 1, 2, 3, 4, 5, and 6, and both port and starboard aft peaks.

In the engine rooms, heat detectors rated for 190°F are fitted directly above the main propulsion engines, while smoke detectors are fitted as well. Manual fire pull stations are located at the exit from each space and are spaced not more than 66 feet (20 m) apart throughout the vessel.

Smoke detectors were not tested but are assumed to be in excellent condition.

Section 5 Lifesaving Equipment Reports

5.1 Rescue Boats and Davits

This vessel comes equipped with a rescue boat designed and built by Willard Marine, Inc. The Sea Force 490® SOLAS O/B Rescue Boat is a 16 ft Rigid Hull Inflatable Boat consisting of an inflatable tube attached mechanically attached to a rigid hull. It is powered by a USCG approved gasoline outboard engine. All walking surfaces on the vessel are covered with non-skid. The craft is equipped with a manually controlled self-righting system.

The davit is a fixed radius, single arm, slewing type by Welin Lambie. It rotates on a ball bearing type slew ring that is fixed between the post and the pedestal. Slewing is achieved by a geared drive, powered by an electric motor, backed up by a manual crankshaft. A new davit was procured at the crew's request but has not been installed. The davit is available from AMHS.

An electric winch is used to power hoist the boat. The winch will hoist a safe working load of 2,381 lbs (1080kg) at 59 ft/min (18m/min). A main brake is automatically applied to hold the load when hoisting stops. Lowering is by gravity and is controlled by lifting the main brake lever.

The rescue boat is currently secured on the Vehicle Deck, and the davit is installed on the House Top. Both are in good condition (Figure 2).

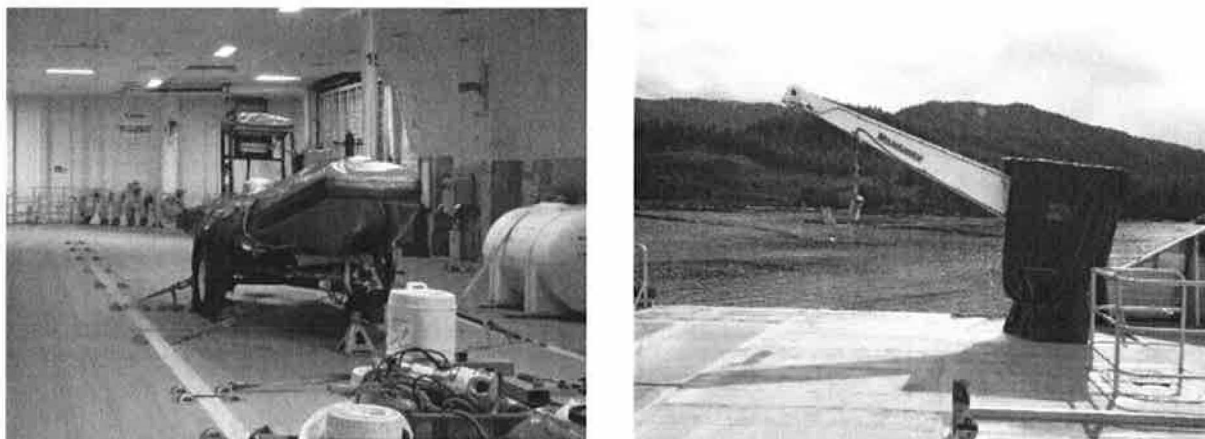


Figure 2 Rescue boat secured on Vehicle Deck; davit installed on House Top

5.2 Life Rafts and Evacuation Slides

The vessel is equipped with the following Marine Evacuation System (MES) equipment:

- *Two 100-person self-righting life raft units.* The Life Raft units are located on the House Top, aft of amidships. Each life raft is comprised of two superimposed buoyancy tubes divided along the center into left and right chambers. Four integral arch and thwart tubes support the life raft canopy. Personnel can deploy and position the life rafts from a rescue boat at another slide/life raft unit or boarding point prior to inflation.
- *Two evacuation slide / 100-person self-righting life raft units* (Figure 3). The Slide / Life Raft units are located amidships on the Passenger Deck, port and starboard. The 45.9 ft (14m) slides within these units are twin track evacuation slides designed for transferring people from the vessel to the life rafts. Trained crew can deploy the slides either locally

at the muster stations, or by use of remote control from either the Bridge or Operating Station (Figure 4).



Figure 3 (Left) Slide/Life Raft unit in Starboard MES; (Right) Life Raft unit on House Top, Port

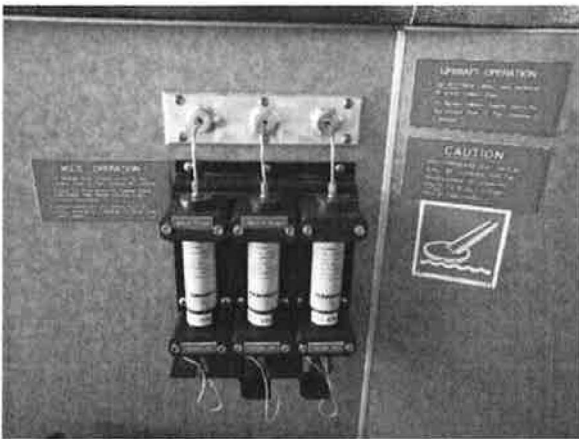


Figure 4 Remote deploying of MES, in Pilothouse

The MES equipment is manufactured and serviced by Liferaft Systems Australia. The equipment is in excellent condition.

Section 6 Spaces Report

The spaces onboard the FVF *Chenega* were photographed and assessed for this report, although many locations were protected with floor and furnishing coverings. The intent of this report is to capture major aesthetic or damaged items in the passenger and crew areas.

The condition of each item in the list below was evaluated for each space.

- Overhead
- Lighting
- Deck covering
- Furniture
- Windows and doors
- Bulkheads
- Plumbing and HVAC fixtures

Table 3 describes the evaluation criteria.

Table 3 Evaluation Criteria

Rating	Description
Excellent	Item is in like new condition.
Good	Item is not significantly damaged, but repair/replacement would improve functionality of the system/component.
Fair	Item is damaged. Improvements should be considered as soon as possible.
Poor	Item is damaged. Improvements should be considered immediately.
Obsolete	Item is no longer supported by manufacturer or vendors. Replacement parts are scarcely available or are not available.

Passenger and crew spaces are described for each deck. Three spaces were not available for inspection, but are assumed in good condition:

- Passenger Service Office
- First Aid Room
- Children’s Play Area

Generally, only areas rated as “Good” or worse will be identified in the individual sections.

6.1 Bridge Deck

6.1.1 Pilothouse

The Pilothouse is generally in excellent condition (Figure 5).



Figure 5 Pilothouse on Bridge Deck

6.1.2 Crew Day Room

The Crew Day Room is in good condition. Appliances should be cleaned and polished as applicable. Stains, wear, and deformation are evident on the carpet; it should be cleaned or replaced (Figure 6).



Figure 6 Crew Day Room on Bridge Deck

6.1.3 Ship's Office

The Ship's Office is in good condition.

6.1.4 Bridge Electrical Room

The Bridge Electrical Room is in excellent condition (Figure 7).

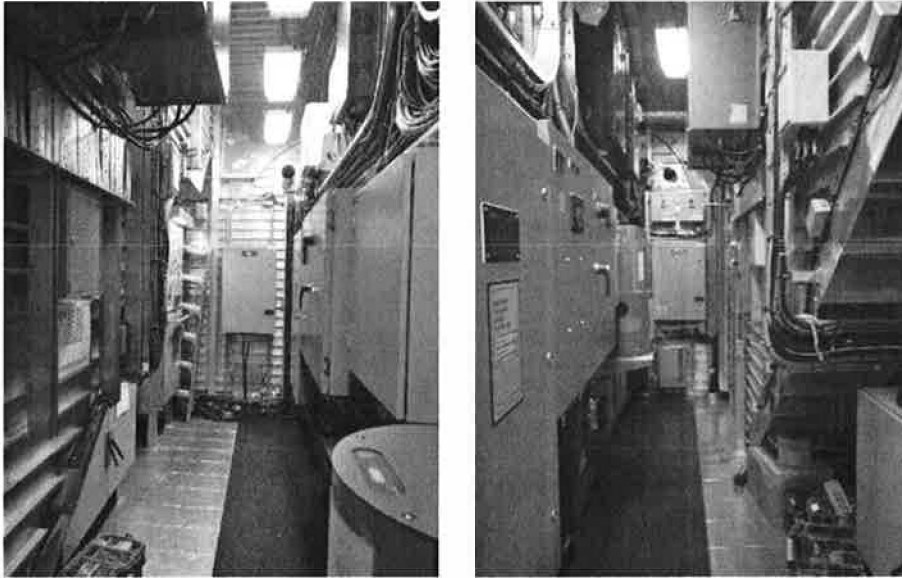


Figure 7 Bridge Electrical Room on Bridge Deck

6.1.5 House Top

The House Top is in good condition. Small regions of repair are evident in some areas (Figure 8).

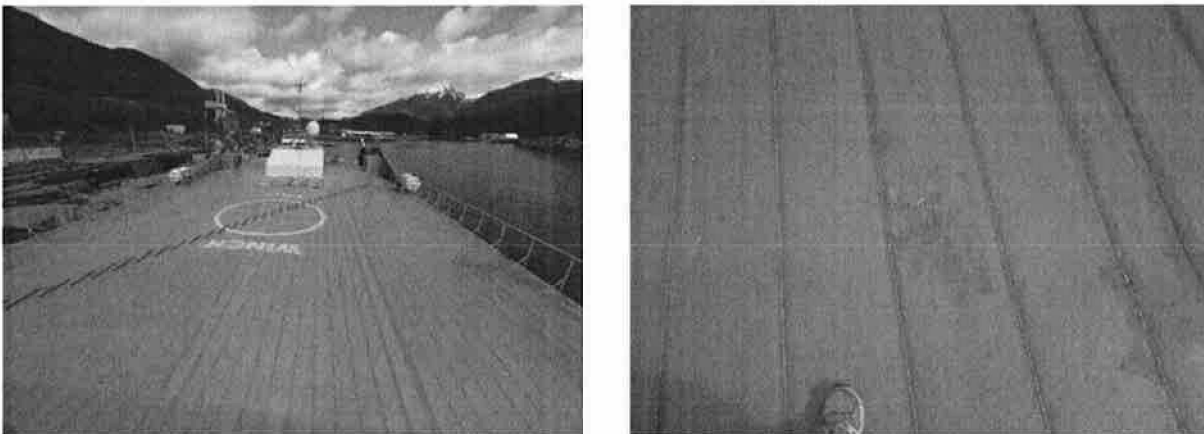


Figure 8 House Top (left) with repair evident (right) on Bridge Deck

6.2 Passenger Deck

6.2.1 Forward Observation Lounge

The Forward Observation Lounge is in excellent condition. In 2014, the carpeting and faux wood flooring were recommended to be replaced. Both deck covering types were replaced and are now in excellent condition. The armrest pads and seat cushions were also recommended for replacement in 2014. The replacement seats are in excellent condition (Figure 9).



Figure 9 Replacement seats (left), replacement faux wood flooring (middle), and replacement carpet (right) in Forward Observation Lounge

Lifejacket Locker

The lifejacket locker is in excellent condition (Figure 10).



Figure 10 Lifejacket locker on Passenger Deck

6.2.2 Crew Locker Room

The Crew Locker Room is in excellent condition (Figure 11).



Figure 11 Crew Locker on Passenger Deck

6.2.3 Quiet Work Area

The Quiet Work Area is in excellent condition (Figure 12). During the survey on the *Fairweather*, the crew noted that this space receives minimal use due to lack of outlets for purposes such as charging phones and plugging in laptops. It is recommended to add more outlets to this space.



Figure 12 Quiet Work Area on Passenger Deck

6.2.4 Amidships and Aft Passenger Heads

The Passenger Heads (Amidships and Aft) are in good condition (Figure 13). Deck coverings and overhead are in excellent condition.

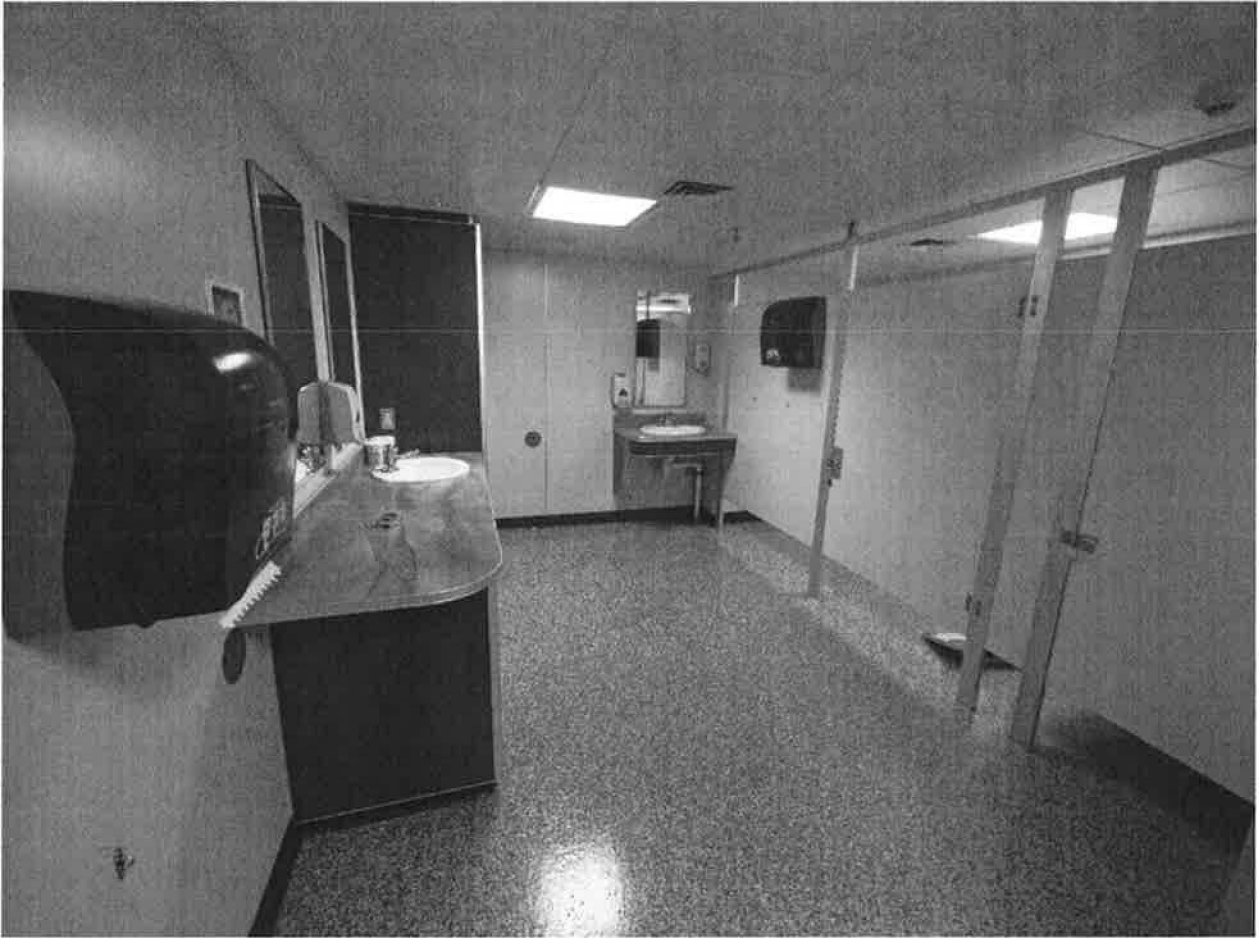


Figure 13 Passenger Head on Passenger Deck

Some appliances are discolored and should be replaced (Figure 14).



Figure 14 Appliance discoloration in Passenger Head on Passenger Deck

6.2.5 Storage/Preparation Area

The Storage/Preparation Area is in good condition. The deck covering is stained and worn in some areas and should be replaced (Figure 15).

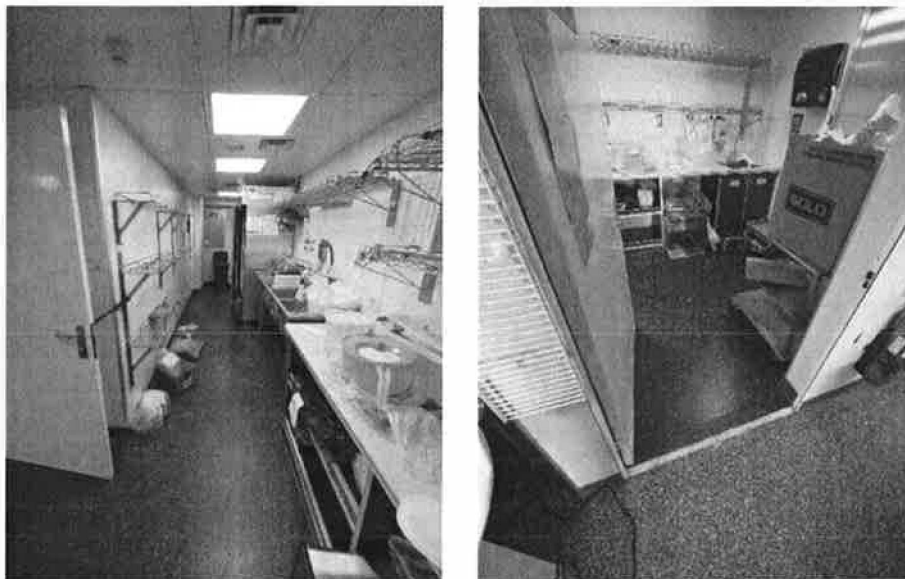


Figure 15 Worn deck covering evident in Storage/Preparation Area (left) and Storage/Preparation Area threshold (right) on Passenger Deck

6.2.6 Food Court

The Food Court is in good condition. The deck covering is discolored in some areas and should be cleaned or replaced. Increased lighting would improve visibility in the space (Figure 16).

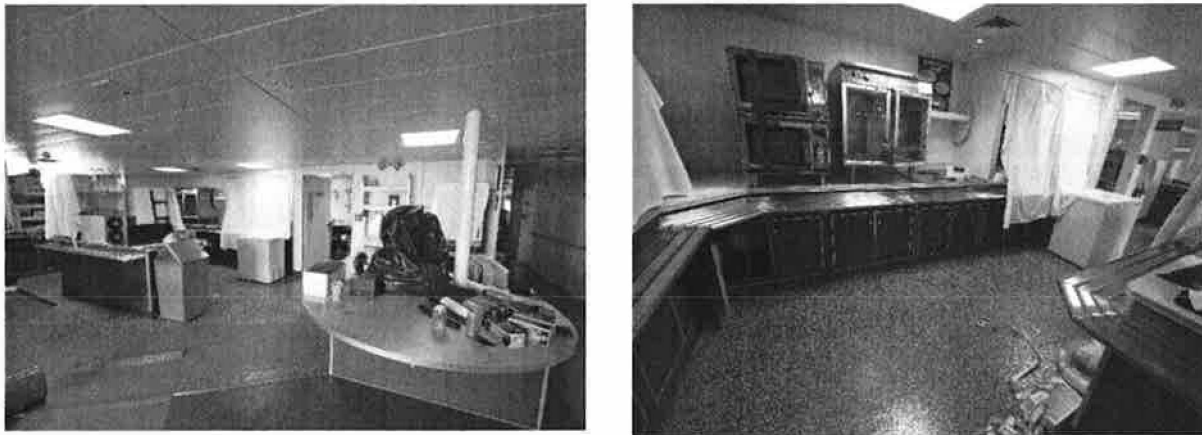


Figure 16 Worn deck covering (left) and low lighting levels (right) in Food Court

6.2.7 Snack Bar and Seating

The Snack Bar and seating are in good condition. The deck covering shows minor stains with seams evident; it should be cleaned. The bucket seating is worn and would benefit from replacement (Figure 17).

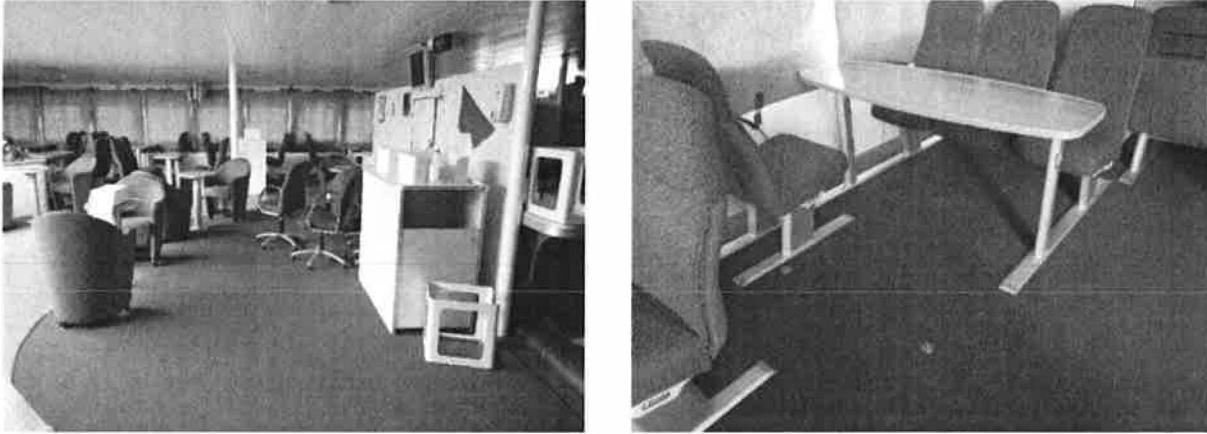


Figure 17 Bucket seating (left) and gaps in bulkhead lining (right) in Snack Bar/Seating on Passenger Deck

6.2.8 Solarium

The Solarium is in fair condition. Dark stains are evident on the deck covering, which should be replaced (Figure 18).

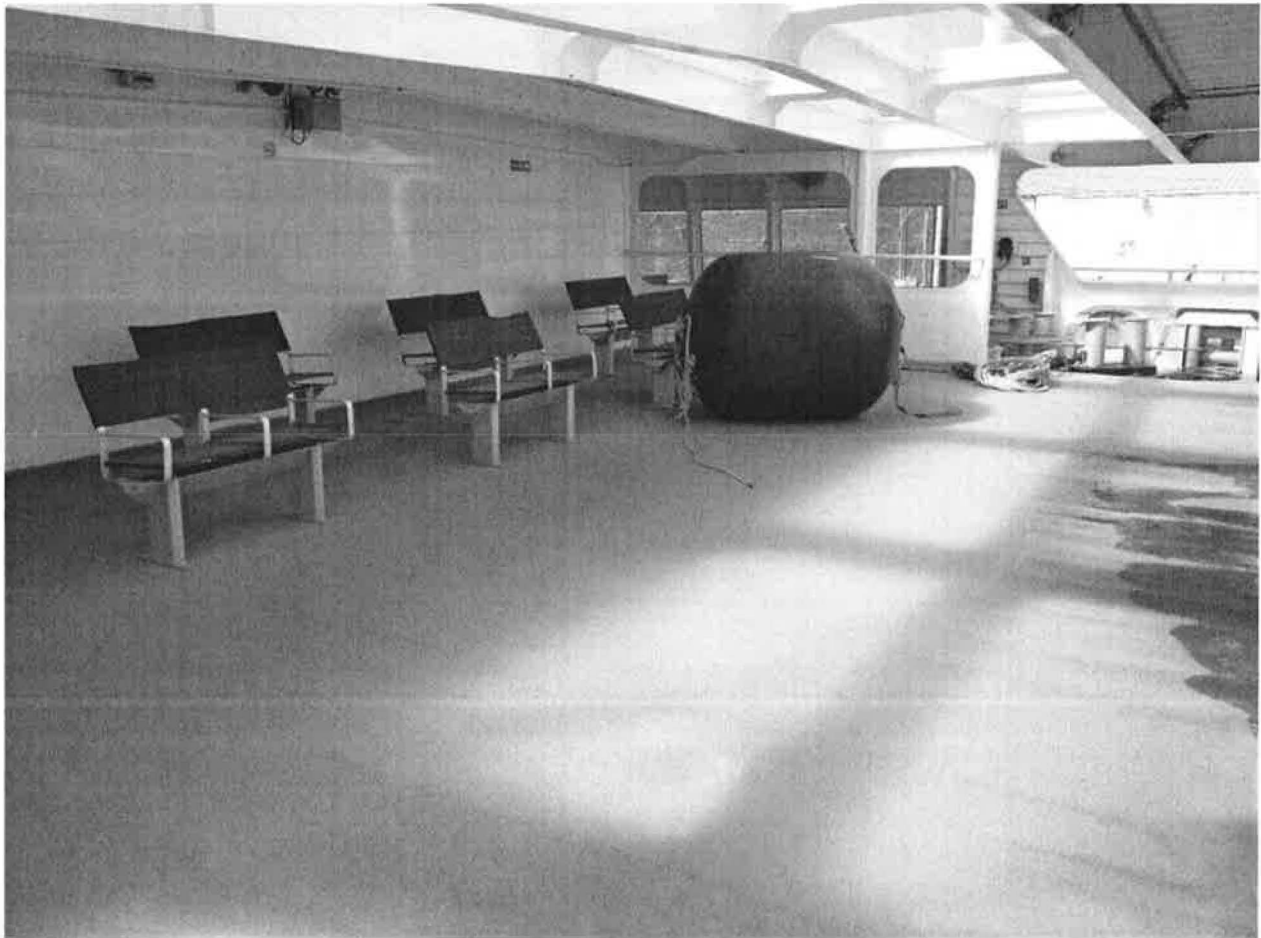


Figure 18 Solarium

Mooring equipment is in excellent condition and shows no wear (Figure 19).

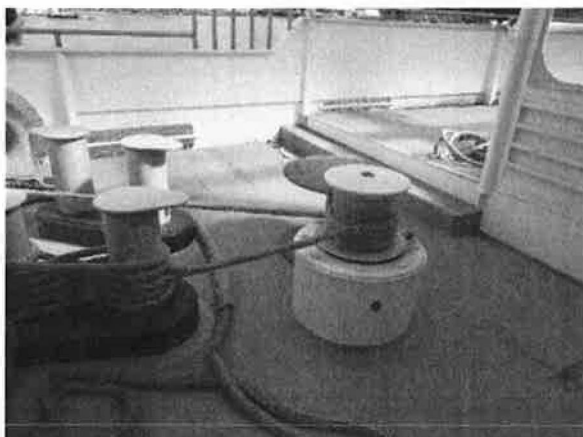


Figure 19 Mooring equipment in Solarium

Despite the minimal use of the vessel, the furniture shows wear. The space would benefit from replacing the furniture with heartier, more robust furniture suited to the ferry route climates (Figure 20).



Figure 20 Furniture in Solarium

6.3 Vehicle Deck

The Vehicle Deck is in excellent condition. The bulkheads, lighting, overhead, and structural fire protection appear to be in good condition. Figure 21 shows well maintained bulkheads and lane lines.

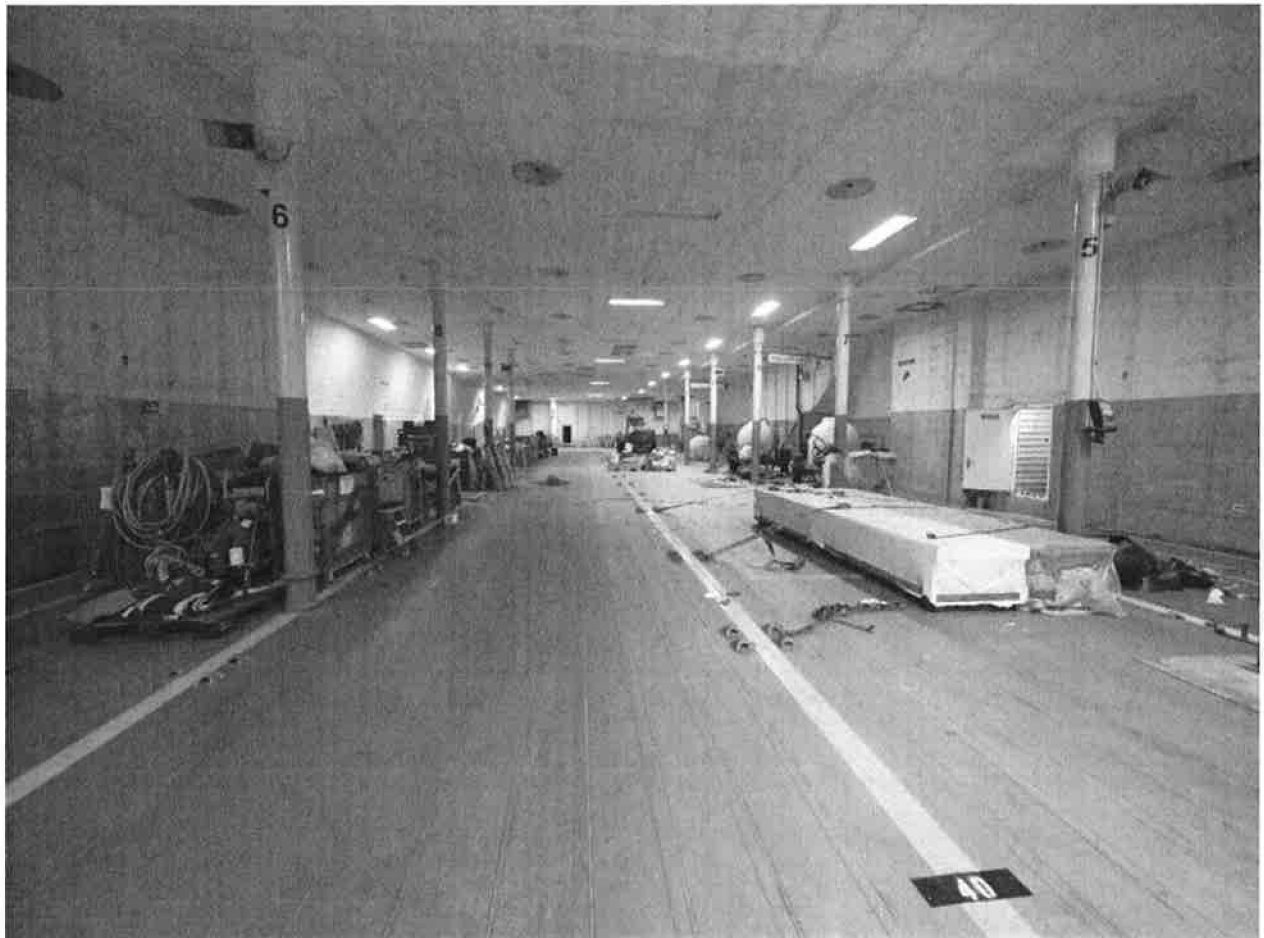


Figure 21 Vehicle Deck, looking forward

6.4 Crew-Only Spaces

Crew -Only spaces include:

- Hulls
- Thruster Room
- Engine Room
- Forepeak
- Compartments

These spaces were not all photographed, but are assumed to be in excellent condition, commensurate with the condition of the Engine Rooms. Similar to the Engine Room (Figure 22), lighting in these spaces is assumed to be very good, and spaces are assumed clean.

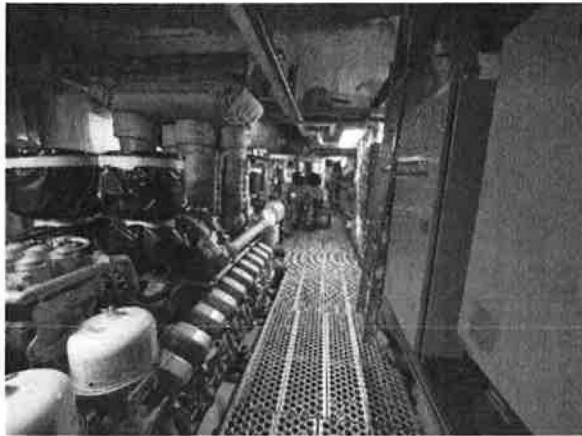


Figure 22 Port Engine Room (left) and Starboard Engine Room (right)

Section 7 Electrical Equipment Condition Report

7.1 Overview

Electrical equipment is summarized in this section. No problems have been reported with any electrical equipment on the *Chenega*; all electrical equipment is assumed in good to excellent condition.

7.2 Ship Service Power Generation

Electrical power is provided by four 185kW Northern Lights M6125T generators (specifications in Table 4).

Table 4 Diesel generator specifications

Manufacturer	Northern Lights
Model	M6125T
Quantity	4
Number of Cylinders	6
Generator	Marathon Electric
Power Produced	185kW each
Supply Voltage	480V / 3 phase / 60hz

Generators 1 and 3 are located in the starboard Engine Room, and feed the switchboard located in the starboard Switchboard Room on the Vehicle Deck. Generators 2 and 4 are located in the port Engine Room, and feed the switchboard located in the port Switchboard Room on the vehicle deck (Figure 23).



Figure 23 Generator 4 in Port Engine Room

The generators are 3 phase, 480 volts, with the Y-configuration. Each generator set includes the voltage regulator, a load sharing module, a synchronizer, and governor. Table 5 lists generator operating hours as of March 2019.

Table 5 Generator operating hours at time of report

Generator Number	Operating Hours
1	15,974 hrs
2	15,530 hrs
3	15,848 hrs
4	15,011 hrs

The 480 VAC switchboards, via step down transformers, feed the 208Y/120 3 phase circuits. The 24 VDC is fed from 120 VAC single phase circuit battery chargers. The 24 VDC feeds the 12 VDC circuit via a DC converter.

The generators are in excellent condition.

7.3 Ship Service Electrical Power Distribution

AC power is distributed throughout the vessel by two 480VAC switchboards located in the port and starboard Switchboard Rooms. The port switchboard houses Generator 2 and 4 control panels and 300 amp generator circuit breakers, 480VAC distribution, and a panel section for monitoring and controlling Generators 1 and 3. The starboard switchboard houses Generator 1 and 3 control panels and 300 amp generator circuit breakers, 480VAC distribution, a panel section for monitoring and controlling Generators 2 and 4, and a section for 208VAC distribution.

Two 85kva transformers are fitted to supply power to the 208V section of the starboard switchboard and 208V distribution panel in the electric room. Ground detection lamps are located in both switchboards and 208V distribution panels.

208V and 120V power is distributed throughout the vessel through power and lighting panels located in accordance with the electric one-line diagram.

7.4 Emergency Electrical Power Generation

Since two complete generator sets are located in each hull, any generator can act as the emergency generator. Normally, when three generators are operating, the stand-by generator will be the emergency generator. All generators are sized for the required emergency load. In the case where there is an emergency or failure in one or more diesel generators, the electrical load management system controls backup and diverting power.

UPS's and DC battery banks provide emergency power to communications and monitoring systems.

7.5 Emergency Electrical Power Distribution

Vital emergency pumps, including fire, sprinkler, deluge, and bilge controllers are fitted with two independent power feeders from each switchboard. Both feeds are fitted with motor operated circuit breakers. A loss of voltage in the supplying feeder will automatically cause transfer to the standby feeder via automatic operation of the circuit-breakers. Direct current (DC) power for vital control and navigation circuits is supplied by several battery banks and power supplies.

Two battery banks, one operating and one standby located on the Bridge Deck, supply power to the bridge consoles for navigation, communication and propulsion control.

Uninterrupted power supplies are fitted for the following services:

- Fire detection system
- Hull monitoring system
- Ship's computer and network (independent of any other network system)
- IMAC System in each engine room

7.6 Communication Systems

The vessel is equipped with a Hose-McCann Telephone Company Intelligent Digital Controlhead, a modern programmable microprocessor-controlled master station providing users with centralized access to telephone, public address, loudhailer, and talkback systems.

Docking Intercom System

The docking intercom system consists of stations at the Vehicle Deck doors, mooring stations, MES, Fast Rescue Boat davit and operating compartment.

Public Address (PA) System / General Alarm (GA) System

The Public Address / General Alarm (PA/GA) System is a Hose McCann Intelligent Digital Controlhead. This programmable microprocessor-controlled master station provides centralized access to telephone, public address, loudhailer, and talkback systems. Control of alarm signals as well as other functions is also possible.

The only PA/GA System talkback zone is between the IMAC control head and the elevator. The system is turned on and off at the control head. There is a call button inside the elevator.

Sound-Powered Telephone and EOT

The vessel is equipped with a United Marine Sound Powered Telephone system and with a PMC-United Marine Automatic Dial Telephone System.

Vessel Tracking Monitors

The vessel is equipped with an NC/Mitsubishi Video Information System with monitors located around the passenger spaces (Figure 24). The system displays safety messages and other information and allows the passengers to track the position of the vessel.



Figure 24 Video information system monitor in Snack Bar/Seating on Passenger Deck

CCTV Cameras

The CCTV system consists of 28 remote cameras located throughout the vessel and four 18” monitors located on the Bridge. The cameras are located throughout the machinery spaces, vehicle space and exterior of the vessel. No cameras on installed in the passenger spaces.

Satellite Communications

This vessel is fitted with a remote tank level indicator (TLI) system that allows tank levels to be monitored at various locations throughout the vessel. The remote TLI system is controlled through the IMAC system. Through the remote TLI system, tank levels for port and starboard fuel tanks, the sewage tank, and the potable water tank are displayed at each of the two fill/discharge stations located on the starboard side of the vehicle deck, one at Frame 38 and one at Frame 1.

The vessel is fitted a Weir-Jones ADIS Model 8240 Draft & Trim Monitoring system. This system works by measuring the freeboard at 6 locations around the perimeter of the vessel. The system is also capable of measuring the significant wave height of seas through which the vessel is sailing.

Section 8 Machinery and Equipment Condition Reports

8.1 Overview

Machinery and equipment are summarized in this section. No problems have been reported with machinery and equipment on the *Chenega*; all is assumed in good to excellent condition.

8.2 Main Propulsion

8.2.1 General

The Fairweather is powered by four KaMeWa 90SII water jet units via four high speed diesel engines and reduction gears. There are two waterjets, main engines, and reduction gears in each hull.

8.2.2 Main Engines

This ferry is powered by four MTU 20V 4000 M73L high-speed diesel engines. Each engine has 20 cylinders arranged in the V configuration (Figure 25).

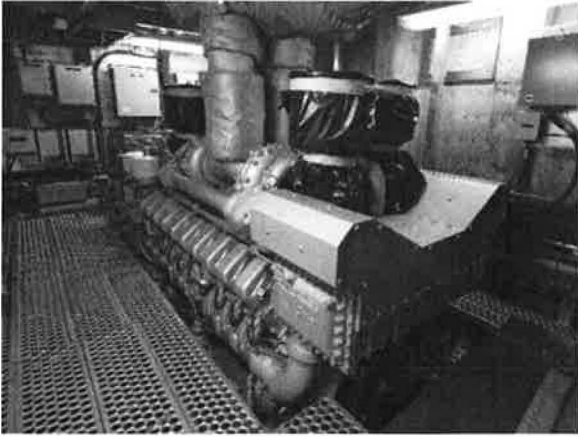


Figure 25 Engine in Port Engine Room

This engine is a basic liquid-cooled, four-stroke diesel engine with direct fuel injection, sequential exhaust gas turbocharging, and charge air cooling. The maximum continuous rating of each engine is 4830 hp at 2050 rpm. Table 6 estimates operating hours for each engine based on a 19 September 2015 report and estimate subsequent voyage duration. Hour estimates are rounded to the nearest hundred.

Table 6 Estimated engine operating hours at time of report

Engine Number	Estimated Operating Hours
1	1,100 hrs
2	1,000 hrs
3	1,000 hrs
4	1,000 hrs

8.2.3 Reduction Gears

The gearboxes fitted on this vessel are Reintjes marine reduction gearboxes with a hydraulically operated clutch for waterjet propulsion. The reduction ratio of the gearbox is 2.828 to 1. Each gearbox is fitted with two Rexroth AV10SO variable displacement hydraulic pumps (see section 8.1.4). The Number 1 & 2 gearboxes have two take-offs, each with an individual pump and Number 3 & 4 gearboxes are fitted with one tandem or dual pump take-off.

8.2.4 Waterjets and Shafting

The waterjets are KaMeWa 90SII units with six-blade impeller. A flanged Cooper Bearing, supplied by Centa, supports the impeller shaft at bulkhead 3. Where the impeller shaft exits the waterjet inlet duct, there is a KaMeWa supplied mechanical water seal.

Each waterjet's output is 3,600kW providing a net thrust of 380kN at cruise speed (36.5 knots) and a maximum of 420 kN. Maneuvering time from 30 degrees port to 30 degrees starboard is 7 seconds. The time to go from full ahead to full reverse is 7 seconds as well.

Each water jet consists of a hydraulic (biodegradable oil) power pack and a lube oil (mineral oil) pack. The hydraulic power pack consists of two PTO pumps driven by the reduction gear and one electric pump. One PTO pump operates the two steering cylinders on the bucket for each water jet and one PTO pump operates the reversing cylinder on the bucket for each waterjet. The electric pump circulates the system oil through a filter and can act as a backup to one of the PTO pumps in an emergency. The PTO pumps are Rexroth AV10SO variable displacement pumps. The lube oil pack consists of one electric pump. The pump circulates oil through the water jet bearing. Each lube oil pack has a circulation pump filter pack. The filter packs separate water and filter the lube oil.

8.3 Bow Thruster

The vessel is fitted with two bow thrusters, one in each hull located in Thruster Rooms 1 & 2. The bow thrusters are used to aid in maneuvering the vessel during mooring procedures. The bow thrusters are electrically driven by 100 hp motors, with a set of counter-rotating 20" Kaplan style propellers (specifications in Table 7). The maximum thrust generated by each bow thruster is 2716 pounds force.

Table 7 Bow Thruster specifications

Manufacturer	Quantum Marine (Wesmar)
Model	V2-20
Quantity	2
Motor Power	100 HP
Power Supply	480V/60hz/3 phase through Variable Frequency Drive Propeller Material: NiBrAl
Tunnel Material	½" Aluminum
Shafting Material	Stainless Steel

8.4 Heating Plant

Conditioned air is supplied to the passenger deck, crew spaces and Operating Compartment by three air handler units. Each air handler unit consists of an outside electric pre heater, water coil for air cooling or air heating, supply fan and return air fan.

8.5 Steering Systems

The steering system for the waterjets is hydraulic. The system piping is stainless steel tubing and is in excellent condition. No problems were reported with the system (Figure 26).



Figure 26 Waterjet steering system in Pilothouse on Bridge Deck

8.6 Sewage Collection and Treatment Systems

The sewage system is a USCG Type 3 (holding) system. All gray and black water drains are gravity feed into the sewage holding tank. The sewage holding tank is located in Compartment 3 and has a capacity of 3,600 gallons. On a daily basis, after route has been completed, the holding tank is emptied using the installed centrifugal macerating pump, to a shore-based disposal location.

8.7 Seawater Piping Systems

8.7.1 Deck Drains and Scuppers

The vessel is fitted with aluminum deck drains, scuppers and piping.

8.7.2 Bilge and Ballast System

The vessel is fitted with submersible AC- driven bilge pumps. There is one pump in each Compartment, with the exception of the Forepeak. The Forepeak is fitted with hand pumps. Also, each engine room is provided with emergency bilge suction from the fire main pump.

Bilge piping is 90:10 CuNi and is in excellent condition.

Each space that a bilge pump serves includes a high level alarm monitored through the IMAC system.

8.7.3 Flushing System

The sanitary flushing system uses seawater supplied by the flushing pumps located in Compartment 1.

8.7.4 Seachests

The vessel is fitted with ten seachests: four in each main engine room, one in Compartment 1, and one in Compartment 2. Each Engine Room seachest provides cooling water to one main engine/reduction gear/shaft seal and one generator, with the aft seachest in each engine room also supplying water to the fire pumps. The Compartment 1 seachest serves the deluge pump, flushing pumps, and forward door hydraulic power pack. The Compartment 2 seachest serves the sprinkler pump and the A/C chiller unit's salt water pump.

8.7.5 Seawater Cooling System

Each main engine and diesel generator are provided with a sea water cooling pump. The discharge side of the main engine sea water cooling pump branches into two lines, one supplying water to the main engine heat exchanger and the other supplying sea water to the reduction gears, water jet shaft seal, and the water jet hydraulic oil power pack, prior to discharging overboard. The generator sea water pump circulates water to the generator heat exchanger and then discharges overboard.

8.8 Freshwater Piping Systems

8.8.1 Freshwater Cooling Systems

Dedicated freshwater cooling systems are provided on each of the four main engines and four generators on the vessel. Systems are supplied via engine attached pumps.

8.8.2 Potable Water System

The potable water system on the *Chenega* consists of a 1000-gallon potable water tank and two centrifugal pumps to circulate potable water to consumers throughout the vessel.

8.9 Fuel and Lube Oil Systems

8.9.1 Fuel Oil System

The fuel system consists of two independent tanks, located in Double Bottom 3 & 4, and two fuel service tanks located in Compartments 5 and 6. The capacity of each tank is 6,900 US gallons. There are two FO Service Pumps in each hull. The FO Service Pump takes suction from the storage tank via a strainer and pumps fuel through the NFV filter to the service tank with a capacity of 265 US gallons. Excess fuel in the service tank returns to the fuel storage tank via overflow piping.

Each engine has an electro-pneumatic controlled supply valve from the service tank. The fuel passes through a 10-micron pre-filter then connects to the main engine fuel inlet. The two generators in each hull are supplied by a single electro pneumatic controlled supply valve from the service tank.

8.9.2 Lube Oil Systems

The lube oil system consists of two lube oil storage tanks, located in Compartments 5 & 6 with a capacity of 175 US gallons each. These tanks store oil which can be pumped through an air driven diaphragm pump into the main engine replenishment tanks. Each engine has a replenishment tank located adjacent to the engine with a capacity of 45 US gallons. In addition, oil from the storage tank can be used in the main engines & generators to replace used oil during

engine oil changes. The lube oil storage tank fill is located on the Vehicle Deck port and starboard.

8.9.3 Waste Oil Systems

Each engine room and jet room is capable of being serviced by the waste oil/oily bilge system. The waste oil/oily bilge system consists of an air driven diaphragm pump that serves to clean up oily bilge water in the bottom of the engine room and jet room through suction hoses fitted in each space. In addition, the waste oil/oily bilge pump serves to discharge waste oil from the main engines, generators, reduction gears, and water jet hydraulic and lube oil systems.

The discharge of the waste oil/oily bilge pump is to a portable tank cart through fittings on the Vehicle Deck both port and starboard side where it is taken ashore for disposal.

8.10 Compressed Air Systems

The compressed air system consists of two compressor/receiver units, one in Compartment 3 and one in Compartment 4.

The compressors operate between 460 psi and 580 psi. Each compressor unit has a pressure reducing valve set at 120 psi for ship service air. Cross connect pipes, with two cutout valves (one in each Compartment 3 and Compartment 4) is available if needed.

Receiver capacity is 132 gallons at 580 psi (specifications in Table 8). Compressor operation is controlled and monitored through the IMAC system.

Table 8 Compressed Air Receiver specifications

Manufacturer	Sperre
Model	HL2/90 with 132-gallon high pressure receiver
Quantity	2

8.11 Heating, Ventilation, and Air Conditioning Systems

The vessel is equipped with a central air conditioning system for all passenger and crew spaces. This system is centrally monitored and controlled. The Vehicle Deck of this vessel is provided with ventilation to eliminate exhaust fumes, while engine rooms and auxiliary machinery spaces are provided with heating and ventilation to ensure safe and comfortable conditions.

8.11.1 Vehicle Space Ventilation

Four single speed, explosion proof exhaust fans have been installed. Supply air is provided via the open vehicle space doors. The system is not operated while the vessel is underway.

8.11.2 Engine Room Ventilation

Both Engine Rooms (Port and Starboard) are provided with two two-speed supply fans. These fans and their fire dampers are controlled by IMACS. Excess air from each engine room is naturally exhausted via louvres installed on the exhaust pipe trunks at the Bridge Deck level. Again, trunks are protected with fire dampers.

Within the Engine Rooms, electric blast heaters are provided to maintain temperature above freezing to protect the equipment and piping.

8.11.3 Accommodation Space Ventilation

Three Air Handling Units (AHU) serve the passenger and crew areas:

- **AHU # 1** provides air to the Operating Compartment and crew areas at the Bridge Deck level.
- **AHU # 2** serves fwd part of the vessel (Observation Deck) together with all spaces located within the fwd part of the vessel (electrical spaces, washrooms, etc.).
- **AHU #3** serves aft part of the vessel (Food Court) together with offices, first aid area and food court. This unit also provides air to stairwells and elevator shaft leading to the car deck.

A single pipe system provides cold or hot water to AHU's in order to condition the air. A control system based on outside temperature decides whether to use boiler, chiller, or neither. All units are additionally provided with electric preheaters to eliminate ice formation in the extreme cold weather. To reduce the demand for power, economizer cycle is used on all units. Rate of recirculation will change from full to zero depending on inside and outside conditions. Minimum fresh air supply is ensured by exhaust fans.

8.12 Refrigeration Systems

The food court equipment is fitted with appliances with self-contained refrigeration systems.

8.13 Ride Control System

The Maritime Dynamics, Inc. (MDI) ride control system (RCS) consists of two interceptors, a hydraulic power system, and the ride control system electronics. The system is operated at the system display and control unit and the manual control panel located in the pilothouse

Each interceptor is a movable structure mounted at the transom of each hull. Hydraulic actuators installed on the transom raise and lower the interceptors on command.

The RCS will automatically stow the interceptors when the ahead thrust is reduced to below 30% or when the ship's speed falls below 8 knots. Should the automatic stowing function fail to raise the interceptors to the fully up position, an Emergency Interceptor Stow Switch can be used.

8.14 Elevator Systems

8.14.1 Passenger Elevator

The passenger elevator is a Macgregor MC3000. It is located near midships on the starboard side of the vessel. The elevator serves the Vehicle Deck and the Passenger Deck (Figure 27).



Figure 27 Passenger elevator on Passenger Deck

The elevator system was not tested on this survey but is assumed to be in good condition and functioning normally.

Section 9 Deck Machinery Condition Reports

9.1 Overview

Deck machinery equipment is summarized in this section. No problems have been reported with the deck machinery equipment on the *Chenega*; all equipment is assumed to be in good to excellent condition.

9.2 Anchor Windlass and Chain

The anchor windlass and chain are in good condition and function normally (Figure 28).

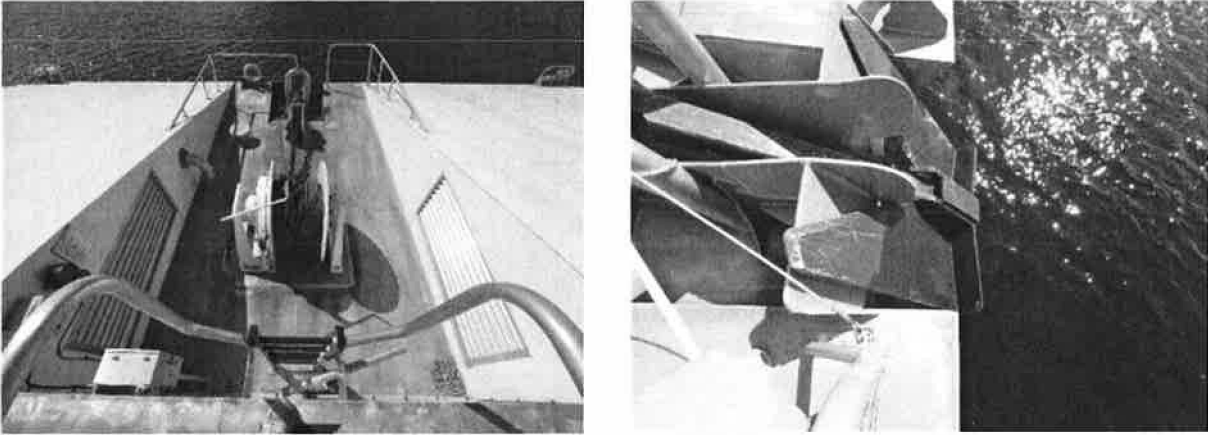


Figure 28 Anchor windlass and chain (left) and anchor close-up (right) from Forward Mooring Deck

9.3 Mooring Capstans and Fairleads

Mooring capstans and fairleads in the Solarium and on the Forward Mooring Deck (Figure 29) are in good condition and function normally.

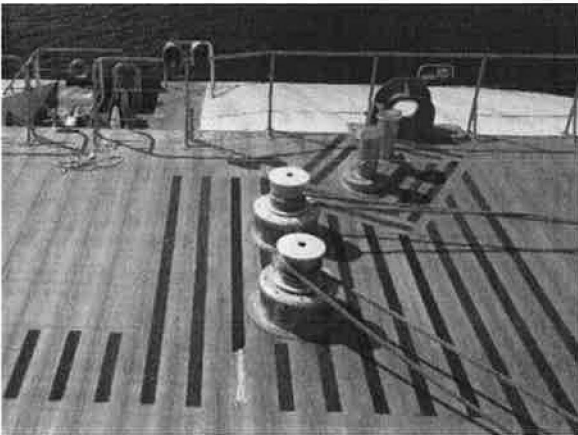


Figure 29 Mooring capstans and fairlead on Forward Mooring Deck

9.4 Vehicle Loading Doors and Stern Ramp

The vehicle deck cargo doors are both in excellent condition with no visual or reported damage. The stern and side door systems were not tested but are assumed to function as intended (Figure 30).

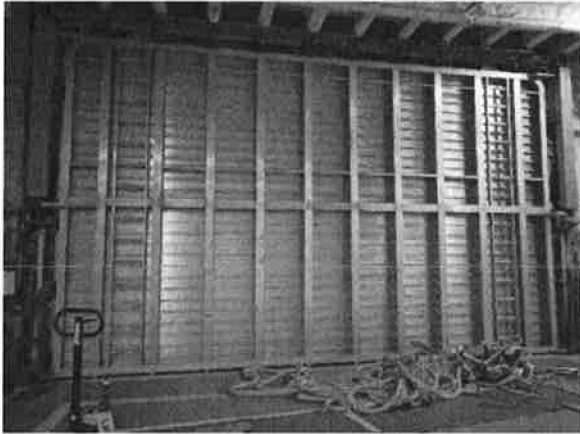


Figure 30 Vehicle Deck stern door (left) and side door (right)

Section 10 Navigation Equipment Condition Report

10.1 Overview

Navigation equipment is summarized in this section. No problems have been reported with any navigation equipment on the *Chenega*; all equipment is assumed in good to excellent condition.

10.2 Night Vision System

The vessel is equipped with a Night Navigator™ 8450/8520 System (Figure 31). This bridge-mounted system provides a clear image intensified view of the water in the immediate path of the vessel at night. The image is displayed on a monitor.

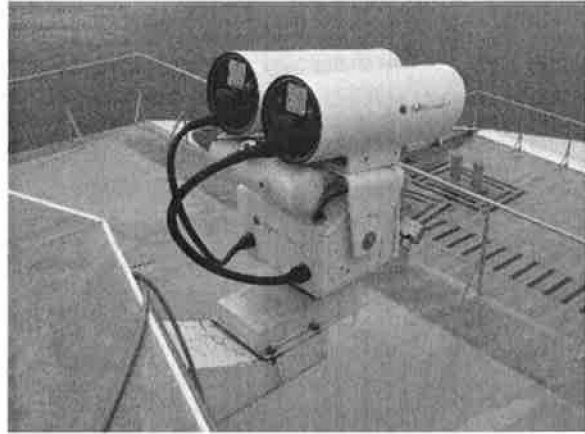
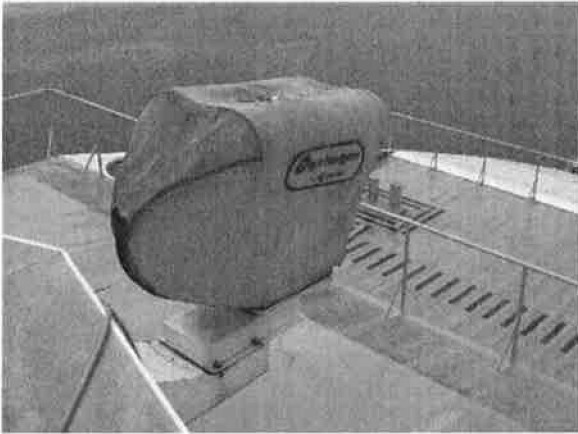


Figure 31 Night vision system mounted on top of Bridge

10.3 Gyro Compass

The vessel is equipped with an Anschütz Gyro Compass System. This compass is equipped with automatic speed and latitude error correction.

The ship's magnetic compass is installed in the Operating Compartment on the starboard chart table.

10.4 Voyage Data Recorder (VDR)

The vessel is equipped with a Rutter VDR 100G3/G3S Recorder (Figure 32).



Figure 32 Voyage Data Recorder on House Top

10.5 Display

The vessel is equipped with a Nauticonning-Raytheon Marine Conning Display. The system reads in and adapts navigation and sensor data, performs sensor monitoring and selecting, manages alarms, and displays data.

10.6 Radar

The vessel is equipped with an NSC Chartradar, ARPA equipped 25kW X-band with 40rpm antenna and two 29" monitors.

10.7 Electronic Charting System (ECDIS)

The vessel is equipped with a Raytheon NSC ECDIS (Figure 33).



Figure 33 ECDIS and controls in Pilothouse

10.8 NAVTEX

The vessel is equipped with a NAVTEX Receiver for the broadcast and automatic receipt of Maritime Safety Information (MSI).

10.9 Autopilot System

The vessel is equipped with the NP2015/2025 Autopilot System. Standard operating features include heading control, track control, rate-of-turn control, and remote operation.

10.10 Weather System

The vessel is equipped with Weather Facsimile Model JAX-9.

10.11 Clocks

The vessel is equipped with one master and five slave clocks manufactured by Franklin. The master is located at the chart table in the Pilothouse. Circuit Breaker L11-5 in the Passenger Service Office supplies power.

10.12 Speed Log

The vessel is equipped with the Walker 7070 Speed Log. This system provides true ship's speed, wind speed, and direction by combining ship speed through water with wind speed and direction along gyro heading data.

10.13 Global Positioning System

The vessel is equipped with a JRC JLR-7800 Global Positioning System (Figure 34).

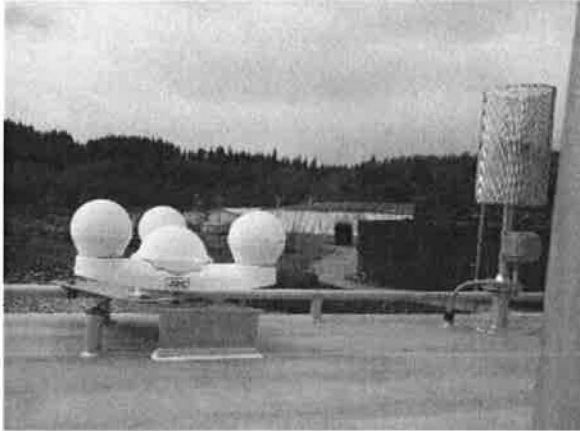


Figure 34 GPS transmitter on top of Pilothouse

10.14 Echo Sounder

The vessel is equipped with a Raytheon GDS 101 (Graphic Depth Sounder). The system provides inputs for speedlog, compass, navigation receiver, and outputs for repeaters, VDR, printer, alarm panel, and computer system. It features a backlit LC-display and high-resolution dot-matrix screen.

10.15 Searchlights and Navigation Lights

The vessel is equipped with Carlisle & Finch MXE 5111 Searchlight Model XE 9666-ARFV. There are two 1000w Xenon Searchlights located on top of the Pilothouse facing forward (Figure 35). The searchlights are controlled on the bridge at a single station with joystick.

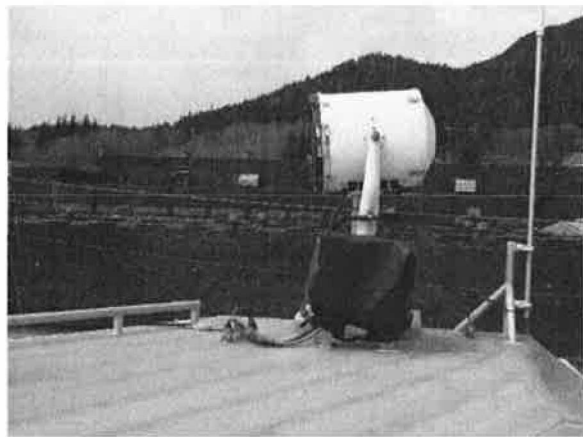


Figure 35 Port (left) and starboard (right) Searchlights on Pilothouse