

Alaska Region Research Vessel (ARRV) Changes to the Contract Specifications for Optional Lengthening

Prepared for
University of Alaska, Fairbanks
and the
National Science Foundation

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Optional Lengthening

SUMMARY

This document describes required changes to the Alaska Region Research Vessel (ARRV) Contract Specifications, Rev. D, to support the optional lengthening of the vessel to incorporate an anti-roll tank. The lengthening incorporates an anti-roll system and attendant machinery, as well as rearrangement of tanks and spaces aft of Frame 67. This document is intended to supplement the Contract Specifications. Where this document is silent on requirements pertaining to the lengthened vessel, the Contract Specifications shall apply.

The 12-foot lengthening is accomplished by adding 12 feet of parallel mid-body, main deck and below, aft of Frame 60. The main machinery space remains the same length, with the aft bulkhead at Frame 67. Spaces aft of Frame 67 and forward of Frame 96 have a revised configuration.

A U-shaped anti-roll tank is located between the 1st platform and inner bottom, from Frames 67 to 78, inboard of the wing bulkheads. Space for the anti-roll tank equipment is provided by a new anti-roll tank equipment space (3-67-0) between the 1st and 2nd platforms, from Frame 67 to Frame 73, and from centerline to 13 feet port of centerline.

SECTION 000
GENERAL REQUIREMENTS FOR DESIGN AND CONSTRUCTION

INTRODUCTION

The optional lengthening to incorporate an anti-roll tank, if exercised, will require the Contractor to fully integrate the changes described in this document into the design verification process and resultant vessel specification and plan package. All systems in way of the lengthened portion of the hull will require additional piping, cabling, insulation, hangers and outfit associated with the increased length and volume of the hull. These areas include, but are not limited to, the items delineated in this document.

IMPACTED SPECIFICATION SECTIONS:

REFERENCES

Replace Ref. 000.2 with the following:

000.2 Glosten Drawing No. 07096-070-01A General Arrangement

032.3 Contract Drawings

The drawings in the table below replace the corresponding drawings in Table 000-1:

Table 000-1. Contract Drawings

Dwg No.	Title	No. Sheets	Rev.
070-01A	General Arrangement (partial)	4	—
070-01AC	General Arrangement (complete)	8	—
070-02A	Lines Plan	2	—
100-02A	Structural 01 Level & Below	15	—
200-01A	Machinery Arrangement	3	—
320-01A	Electrical Power System One-Line Diagram	3	—
511-01A	HVAC Diagram – Supply	2	—
511-02A	HVAC Diagram – Exhaust	3	—
529-01A	Bilge and Ballast System Diagram	4	—
537-01A	Waste Heat Recovery System/Deck Heating Diagram	4	—
541-01A	Fuel Oil Service, Fill, Transfer and Purification System Diagram	4	—
630-01A	Fire Zone Diagram and Boundaries	2	—

070.2 Principal Characteristics

Replace Table 000-2, Principal Characteristics, and Table 000-3, Maximum Capacities, with the following tables.

Table 000-2. Principal Characteristics

Length Overall	254'-0"
Length on Design Waterline	231'-0"
Beam	52'-0"
Depth, Baseline to Main Deck	28'-0"
Total Installed Power, Continuous	5,750 HP
Design Speed, Calm Water	14 knots
Crew Complement, Maximum	20
Science Complement, Maximum	26
Design Draft (above baseline)	18'-9"
Displacement at Design Draft	3,668 LT
Lightship Weight (estimated)	2,699 LT
Upper Ice Waterline (above baseline)	19'-0"
Lower Ice Waterline (above baseline)	17'-0"

Table 000-3. Maximum Capacities

Diesel Fuel, at 95%	169,600 gal.
Fresh Water, at 100%	13,190 gal.

070.4 Lines of Hull Form

In line 313, replace "Contract Drawing No. 070-02" with "Contract Drawing No. 070-02A."

SECTION 086 Technical Publications

086.3 Purchase Orders

At the end of the list of required purchase orders, insert "Anti-roll tank system" after line 842.

SECTION 088 Training

At the end of the list of systems/equipment requiring hands-on training by factory certified representatives, after line 944, add:

- "Anti-roll system (4 hours)."

SECTION 092 Tests

092.2 Shop Inspections and Factory Acceptance Tests – Stage 1

At the end of the list of equipment requiring shop tests, after line 1042, add:

- “Anti-roll system.”

092.3 Construction Inspections and Tests – Stage 2

At the end of the list inspections and tests, after line 1083, add:

- “Static testing of anti-roll system in accordance with the manufacturer’s requirements.”

092.5 Dock Trials – Stage 4

At the end of the list of Auxiliary Systems Tests, after line 1193, add:

- “Anti-roll system.”

092.6 Builder’s Sea Trials – Stage 5

At the end of the list of builder’s sea trials, after line 1278, insert:

- “Anti-Roll System Test: This test shall be performed to verify the functionality and calibration of the system. The test shall be performed in accordance with the Manufacturers Sea Trial Requirements and those stated below.

During sea trials, the vessel shall be steered beam on to the prevailing seas at slow speed (0 – 5 kts) with sufficient way to maintain a steady heading with minimal use of the azimuthing units (preferably only one), since they themselves can exert rolling forces. The stabilizer shall be turned off and the tank valves closed, thus ‘locking’ the system. The vessel is to proceed until at least 100 cycles of rolling have taken place. A record of the resultant rolling motion shall be taken and plotted. This may be an output from the stabilizer control unit itself or by other means. The procedure shall be repeated for another 100 cycles of rolling with the stabilizer in operation, and once more a record of the motion shall be taken and plotted. The records shall then be analyzed by taking readings of out-to-out roll angles and registering their occurrences in a table similar to the one illustrated below.

CHART OF UNSTABILIZED RESULTS																
Chart X axis reference	Range of angle	Occurrences												Totals	Accum Totals	Occurrence %
1	0 to 2															
2	2 to 4															
3	4 to 6															
4	6 to 8															
5	8 to 10															
6	10 to 12															
7	12 to 14															
8	14 to 16															
9	16 to 18															
10	18 to 20															
11	20 to 22															
12	22 to 24															
13	24 to 26															
14	26 to 28															
15	28 to 30															
TOTAL ENTRIES																

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Chart X axis reference	Range of angle	Occurrences												Totals	Accum Totals	Occurrence %
1	0 to 2															
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6	10 to 12															
7	12 to 14															
8	14 to 16															
9	16 to 18															
10	18 to 20															
11	20 to 22															
12	22 to 24															
13	24 to 26															
14	26 to 28															
15	28 to 30															
TOTAL ENTRIES																

092.7 Acceptance Trials – Stage 6

At the end of the list of acceptance trials, after line 1383, insert:

- **“Anti-Roll System Test:** This test shall be performed to verify the functionality and calibration of the system. The test shall be performed in accordance with the manufacturer’s sea trial requirements and those stated below.

During sea trials the vessel shall be steered beam on to the prevailing seas at slow speed (0 – 5 kts) with sufficient way to maintain a steady heading with minimal use of the azimuthing units (preferably only one), since they themselves can exert rolling forces. The stabilizer shall be turned off and the tank valves closed, thus ‘locking’ the system. The vessel is to proceed until at least 100 cycles of rolling have taken place. A record of the resultant rolling

motion shall be taken and plotted. This may be an output from the stabilizer control unit itself or by other means. The procedure shall be repeated for another 100 cycles of rolling with the stabilizer in operation, and once more a record of the motion shall be taken and plotted. The records shall then be analyzed by taking readings of out-to-out roll angles and registering their occurrences in a table similar to the one illustrated below.

CHART OF UNSTABILIZED RESULTS																
Chart X axis reference	Range of angle	Occurrences												Totals	Accum Totals	Occurrence %
1	0 to 2															
2	2 to 4															
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12	22 to 24															
13	24 to 26															
14	26 to 28															
15	28 to 30															
TOTAL ENTRIES																

CHART OF STABILIZED RESULTS																
Chart X axis reference	Range of angle	Occurrences												Totals	Accum Totals	Occurrence %
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2	2 to 4															
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8	14 to 16															
9	16 to 18															
10	18 to 20															
11	20 to 22															
12	22 to 24															
13	24 to 26															
14	26 to 28															
15	28 to 30															
TOTAL ENTRIES																

”

092.9.7 Reports of Dock and Sea Trials

At the end of the list of acceptance trials, after line 1730, insert:

- “Trials report for anti-roll system performance.”

SECTION 100 GENERAL REQUIREMENTS FOR HULL AND DECKHOUSE STRUCTURE

INTRODUCTION

The additional structure for the Lengthening Option is described in Ref. 100.4. All requirements contained in the Contract Specifications Section 100 apply to the additional or modified optional structure.

In addition to the added parallel mid-body, new structure is required to accomplish the revised tank arrangement aft of Frame 67, including the addition of the anti-roll wing tanks and cross over duct.

The added length requires that a sheave tower be built to lead wire from the relocated position of the traction winch to the aft deck (see Ref. 100.2 and 100.4).

IMPACTED SPECIFICATION SECTIONS:

REFERENCES

Replace Refs. 100.2, 100.3, and 100.4 with the references below:

100.2	Glosten Drawing No. 07096-070-01A	General Arrangement
100.3	Glosten Drawing No. 07096-070-02A	Lines Plan
100.4	Glosten Drawing No. 07096-100-02A	Structure 01 Level & Below

SECTION 160 SPECIAL STRUCTURES

After line 325, add:

“The Contractor shall fabricate and install a sheave tower, as shown in Refs. 100.2 and 100.4.

A steel doghouse shall be fabricated and installed to facilitate access to the bosun’s stores/workshop. It shall be located on the main deck, immediately forward of the starboard crane (see Reference 100.4).”

**SECTION 300
ELECTRICAL PLANT**

INTRODUCTION

The optional lengthening will increase the square footage of, and thus the number of lighting fixtures in, the following spaces:

Space Name & New Square Footage	Approximate No. of New Fixtures
Science Hold (2-67-0) to ~1080 ft ² .	+2 Pauluhn FPS232 fixtures, or equal
Bosun's Workshop/Stores (2-87-0) to ~864 ft ² .	+3 Pauluhn FPS232 fixture, or equal
Aft Winch Room (2-82-0) to ~1008 ft ² .	+5 Pauluhn FPS232 fixtures, or equal

The Contractor shall verify the lighting calculations, and update the lighting system design accordingly.

A new space, Anti-Roll Tank Equipment Room (3-67-0), will be added to contain the tank piping valves air compressor and controls. Approximately two new fluorescent lighting fixtures will be required for this space. Circuit 20, 208Y/120V Clean Power Machinery Space Lighting Panel (Ref. 300.3, Sheet 11) is available for these lights.

The optional lengthening adds a new anti-roll tank and associated equipment. The following circuits have been added to Ref. 300.3:

- “Anti-Roll Tank Valve Air Compressor – 480V Machinery Space Power Panel No. 2, Circuit 9 (Sheet 7).
- Anti-Roll Tank Valve Control – 208Y/120V Workshop Power Panel, Circuit 7 (Sheet 8).”

The optional lengthening adds new seawater ballast tanks. Two new ballast tank cross-over motor-operated valves will be required. The Contractor shall add circuits to 120V MOV Power Panel No. 3 and/or No. 4 (Ref. 300.3, Sheet 17), as required.

The optional lengthening will change tank compartment numbers aft of Frame 67. The Contractor shall verify new numbers on Ref. 300.1 for use on Ref. 300.3.

IMPACTED SPECIFICATION SECTIONS:

REFERENCES

Replace Refs. 300.1 – 300.3 with the references below.

300.1	Glosten Drawing No. 07096-070-01A	General Arrangement
300.2	Glosten Drawing No. 07096-200-01A	Machinery Arrangement
300.3	Glosten Drawing No. 07096-320-01A	Electrical Power System One-Line Diagram

SECTION 330 LIGHTING SYSTEM

332.2 Floodlights

Add the following sentence at the end of the paragraph at line 1644:

“Additional floodlights shall be provided and installed, as required, to illuminate the aft working deck areas to an average illuminance level of 5-10 fc.”

SECTION 400 COMMAND AND SURVEILLANCE

INTRODUCTION

Changes to the Contract Specifications in this section address the additional requirements of the anti-roll tank and the revised ballast tank arrangement.

IMPACTED SPECIFICATION SECTIONS:

REFERENCES

Replace Refs. 400.1 and 400.2, with the references below.

- 400.1 Glostén Drawing No. 07096-070-01A General Arrangement
 400.2 Glostén Drawing No. 07096-200-01A Machinery Arrangement

SECTION 430 INTERIOR COMMUNICATIONS

SECTION 431 Centralized Machinery Control and Monitoring System

Add the following entry to Table 400-1, Integrated Monitoring, Alarm and Control System (IMACS) Points List.

Table 400-1 Integrated Monitoring, Alarm and Control System (IMACS) Points List

ID NO.	Description (F5)	Remarks (F8)	Authority			Function			IMACS Station (F2)					
			Technical	Regulatory	Preference	Display	Alarm	Control	ECR	Bridge	Bridge Wings	Staterooms	Public Spaces	Science Control Room
527.001	Anti-Roll Tank Summary Function Alarm	Status	-	-	X	X	X	-	D	-	-	-	-	-

SECTION 432 Interior Communications Telephone Systems

432.3 Sound Powered Telephone System

432.3.1 Engineering System (Circuit 2JV)

Add the following station at the end of the list of sound powered telephone stations, after line 1072:

- “Anti-Roll Tank Equipment Space.”

SECTION 436 Interior Communications, Alarms, Safety and Warning Systems

436.4 Tank Level Monitoring System

In the table of remote tank level indicating systems at line 1271, change the quantity of seawater ballast tanks from 10 to 12.

436.5 Bilge High Level Alarms

In the list of required high level bilge alarms, delete the list beginning at line 1295 and ending at line 1308 and replace with the following:

- “Forepeak Void (4-[-1]-0)
- Chain Locker (2-1-1)
- Chain Locker (2-1-2)
- Void (4-7-0)
- Bow Thruster Room (3-12-0)
- MSD Room (3-21-01)
- Lift Trunk (4-30-0)
- Void (4-30-1)
- Void (4-30-2)
- Auxiliary Machinery Room (3-30-01)
- Main Machinery Room (3-40-0)
- F.O. Transfer Equipment Enclosure (3-40-1)
- Anti-Roll Tank Equipment Space (3-67-0)
- Forward Transducer Room (4-30-01)
- Aft Transducer Well (4-67-0)
- Thruster Room (3-96-0)
- Void (3-111-0)
- Line Locker (3-111-1)
- Line Locker (3-111-2)”

**SECTION 500
MACHINERY – GENERAL**

Insert the following in the Table of Contents after line 81:

“SECTION 527 Anti-Roll Tank 500-65”

INTRODUCTION

Changes to the Contract Specifications in this section address the additional requirements of the anti-roll tank. A new section, Section 527, is added describing the anti-roll tank requirements. Additional requirements for anti-roll tank ancillary systems, i.e., Overflows, Vents, and Soundings; Bilge and Ballast System; Compressed Air System are described.

This section also addresses the revised ballast tank and fuel tank arrangements.

IMPACTED SPECIFICATION SECTIONS:

REFERENCES

Replace the following references:

Replace 500.1 with:

500.1 Glosten Drawing No. 07096-070-01A General Arrangement

Replace 500.3 with:

500.3 Glosten Drawing No. 07096-200-01A Machinery Arrangement

Replace 500.5 with:

500.5 Glosten Drawing No. 07096-511-01A HVAC Diagram -- Supply

Replace 500.6 with:

500.6 Glosten Drawing No. 07096-511-02A HVAC Diagram -- Exhaust

Replace 500.13 with:

500.13 Glosten Drawing No. 07096-529-01A Bilge & Ballast System Diagram

Replace 500.16 with:

500.16 Glosten Drawing No. 07096-537-01A Waste Heat Recovery System / Deck Heating Diagram

Replace 500.17 with:

500.17 Glosten Drawing No. 07096-541-01A Fuel Oil Service, Fill, Transfer & Purification System Diagram

Replace 500.21 with:

500.21 Glosten Drawing No. 07096-570-01A Fuel Oil Tank Vents & Overflows

Replace 500.24 with:

500.24 Glosten Drawing No. 07096-630-01A Fire Zone Diagram & Boundaries

Add the following reference:

500.60 Glosten Drawing No. 07096-100-02A Structure 01 Level and Below

SECTION 505 General Requirements for Hull and Machinery Piping Systems

505.3 Installation

In Table 500-2, delete the following tank vents:

Reference Number	Details	Pipe Diameter.	Estimated Length	Amb T	Maint T
				°F	°F
500.20	3-79-1 Fo Tk Vent	2.5	5	-25	35
500.20	3-79-3 Fo Tk Vent	2.5	5	-25	35
500.20	3-79-2 Fo Tk Vent	2.5	5	-25	35
500.20	3-79-4 Fo Tk Vent	2.5	5	-25	35
500.20	3-30-2 Fo Tk Vent	2.5	5	-25	35
500.20	3-37-4 Fo Tk Vent	2.5	5	-25	35
500.20	3-35-1 Fo Tk Vent	6	5	-25	35
500.20	3-37-3 Fo Tk Vent	2.5	5	-25	35
500.20	Aft Overflow Tk Vent	2.5	5	-25	35
None	All Ballast Tk Vents (13)	5	5	-25	35

In Table 500-2, insert the following new tank vents:

Reference Number	Details	Pipe Diameter	Estimated Length	Amb T	Maint T
				°F	°F
500.20	3-76-0 FO Tk Vent	2.5	5	-25	35
500.20	3-78-1 FO Tk Vent	2.5	5	-25	35
500.20	3-78-2 FO Tk Vent	2.5	5	-25	35
500.20	3-87-0 FO Tk Vent	2.5	5	-25	35
500.20	3-87-1 FO Tk Vent	2.5	5	-25	35
500.20	3-87-2 FO Tk Vent	2.5	5	-25	35
500.20	3-78-4 Aft Overflow Tk Vent	2.5	5	-25	35
None	All Ballast Tk Vents (12)	5	5	-25	35

After line 2275, insert the following section describing the anti-roll tank system:

“SECTION 527 Anti-Roll Tank

The lengthened vessel described in this specification shall be equipped with an automatic stabilizer (anti-roll) tank. The tank geometry is shown in Ref. 500.1. The system described here and shown in Ref. 500.1 is based on a Rolls-Royce Interling system. Alternative systems meeting the “or equal” requirements of the Contract will be considered if the Contractor takes responsibility for any required re-engineering. The system design shall be reviewed and verified by the system supplier, the Contractor, and by UAF during Design Verification.

The tank stabilizer shall be of the passive controlled (active) type. It shall be of ‘U’ shape transverse cross-section, with port and starboard side tanks joined at the bottom by a cross duct of cross-section as shown in Reference 500.60. The tops of the tanks shall be joined by a duct or series of ducts into which valves are fitted which control the air flow from side to side. The action of these valves shall be controlled by a unit based on gyros (or similar means) and other sensors accompanied by software, in order to optimize the performance of the stabilizer in a variety of sea states, ship headings and ship operating stability characteristics. In order to prevent corrosion the stabilizer, the tank fluid shall be fresh water. However, the tank shall also be arranged for the optional use of seawater provided through the seawater system as shown on Reference 500.13. The tank internals shall be coated in accordance with the requirements for ballast tanks as given in Section 630 of this specification.

The tank shall have two operational ranges; a purely passive operation at short periods, and an actively controlled range at periods longer than the natural period of the tank system. The dimensions of the stabilizer tank have been defined so that the natural period of the tank has about the same value as the shortest roll period expected in the service of the vessel. When the ship rolls in the short period range, the stabilizer valves shall be continuously open and the tank water will oscillate within the tank with a 90-degree phase delay to the ship’s roll. As soon as the ship rolls with periods slightly longer than the natural period of the tanks due to reduced GM values or due to the effect of the waves, the motion of the tank water shall be immediately adapted to the changed roll motion by the automatic controls. The stabilizer valve shall close periodically on the upwards moving ship’s side, block the tank water for a time defined by the automatic control, and thus cause an artificial extension of the period of oscillation of the water to the same value as the actual roll period of the vessel.

The design of the air cross ducts shall be such as to minimize or prevent the accumulation of tank water in the cross ducts by avoiding low spots in the ducting where water may tend to collect. Alternatively, the system shall be designed to collect the water and automatically drain. Similarly, the tanks shall be fitted with sensors to close the valves in order to prevent water slamming on the tank tops, thereby minimizing the generation of noise and water ingress to the air ducts.

The following equipment list is as specified for the Rolls-Royce Interling system and will not necessarily reflect the equipment specified by an 'or equal' supplier. The automatic controls shall, at a minimum, consist of:

- Roll sensing unit in which the signals for roll angle and roll angle velocity are permanently defined.
- Electronic control logic.
- Water level sensors.
- Pneumatically operated valves.

As a minimum, the manufacturer shall supply the following equipment:

- 1 control unit and control panel
- 8 stabilizer valves
- 2 vent valves
- 1 remote control panel
- Sheet steel cabinet (for pneumatic valve blocks and other pneumatic components)
- 2 pneumatic valve blocks (for stabilizer valves)
- 1 automatic drain filter
- 1 pneumatic check valve
- 1 pressure switch
- 1 air accumulator
- 1 pressure reduction unit with safety valve
- 8 rubber compensators
- 2 high-level sensors
- 1 flow sensor
- 1 pneumatic control module
- 1 set of vendor recommended spares
- 3 sets of installation instructions
- 3 operating manuals

The remote control panel shall be installed in the wheelhouse per the manufacturer's instructions. In case of failure of elements of the system rendering it inoperative, the system shall automatically shut down and close all air valves thus 'locking' the tank. The crew shall have the ability to bypass the controls and, if deemed safe, to open the valves, allowing the unit to operate in purely passive mode. In the event of roll augmentation taking place, such as in a long following sea, the crew shall likewise have the ability to close the valves.

The stabilizer valves, rubber compensators, pneumatic valve blocks, ventilation valves, compressed air system (air compressor (see Section 551.3), air accumulator (see Section 551.2), automatic drain filter, pneumatic check valve, pressure switch, pressure reduction unit), and the control panel shall all be installed in the Anti-Roll Tank Equipment Space (3-67-0) per the manufacturer's instructions (see Refs. 500.2 and 500.3). The level sensors shall be installed in the tank per the manufacturer's instructions. The main control unit shall incorporate a data logging system whereby the performance of the stabilizer can be recorded in service, thus allowing fine tuning of the control functions through actual operational experience.

The sheet steel cabinet housing the pneumatic valve blocks and other pneumatic components (Module I) shall be resiliently mounted to reduce the transmission of airborne and underwater radiated noise. The stabilizer valves shall be resiliently mounted to the air cross duct by rubber compensators to reduce the transmission of radiated noise (see Section 790.5).

The stabilizer valves shall be pneumatically actuated. The air shall be normally supplied by a dedicated rotary screw compressor (see Section 551.3) and dedicated air receiver. A cross connection to the ship's compressed air system shall be provided for use in the event of a failure of the dedicated compressor (see Section 551.5).

The wing tanks shall be fitted with air pipes to atmosphere to facilitate filling and emptying of the anti-roll tank. The air pipes shall be fitted with lockable valves, which will be kept closed during stabilizer operations. The tank shall be fitted with a depth gage as part of the vessel's tank sounding system, so that it can be accurately filled and checked during operation.

The supplier of the anti-roll tank system shall inspect the equipment installation to ensure that it has been installed properly. The supplier shall also have personnel available during the initial commissioning and tuning of the system prior to sea trials. The supplier shall have engineers present during sea trials and to provide fine tuning and training of the ship's crew on the operation of the system. In the event of unsuitable sea conditions prevailing at the time of the sea trials, the vendor shall allow for at least one visit during delivery or when in service to make the necessary adjustments.

An equivalent system shall not only meet the space and performance requirements, but shall also be designed to minimize the transmission of airborne and structureborne noise from valves, equipment and fluid movement in the tanks and ducts as described below.

The valves and their mode of operation shall be designed such that noise is minimized. Particular attention shall be paid to prevention of direct metal to metal contact and reverberation in metal panels and valve lids. (see Section 790.5)

Ductwork or piping shall be isolated at their suspension points by use of flexible duct or pipe couplings and noise and vibration attenuating resilient mounts. Valve chambers or individual valves (such as butterfly types) shall be fitted with flexible

couplings to their adjacent piping, and shall be supported on noise and vibration attenuating resilient mounts. (see Section 790.5)

The size and configuration of the ductwork shall be so arranged that, at the air speeds prevailing, no airborne tones are generated which could be transmitted either structurally or airborne through the vessel.

The roll motions of the vessel shall be minimized in the following conditions:

CONDITION	DRAFT (ft)	DISP. (LT)	GM fluid¹ (ft)
Full Load	18.59	3702	3.3
50% Consumables	18.49	3636	3.8
Light Load	18.46	3599	4.2

LBP	ft	228
B	ft	52
Anti-roll Tank Volume*	cu-ft	3950

*Based on a tank geometry as shown in Ref. 500.1.”

SECTION 529 Bilge and Ballast Piping System

Add the following sentence at the end of the paragraph, at line 2306:

“The ballast system shall include a line for filling and draining the Anti-Roll Tank (3-67-01).”

Delete the list of ballast tanks requiring cross connect valves, beginning at line 2315 and ending at line 2317, and replace with the following list:

- “4-21-1 to 4-21-2
- 4-58-1 to 4-58-2
- 4-67-1 to 4-67-2
- 4-78-1 to 4-78-2
- 4-87-1 to 4-87-2”

536.3.3 Ballast Tank Heating System

Change the number of ballast tanks in the sentence at line 2712 from “ten (10)” to “twelve (12)”.

¹ Excludes the anti-roll tank free surface. Based on a tank geometry as shown in Ref. 500.1.

SECTION 540 FUEL & LUBE OIL SYSTEMS

541.2 Tanks

Replace the list of fuel tanks requiring cross connect valves, beginning at line 2759 and ending at 2761, with the following list:

- “3-30-1 to 3-30-2
- 3-78-1 to 3-78-2
- 3-87-1 to 3-87-2”

SECTION 550 COMPRESSED AIR & FIREFIGHTING SYSTEMS

551.3 Air Compressors

Insert the following paragraphs after line 3097:

“A Gardener Denver, EndurAir Rotary Screw compressor, Model ELA 5 (or equal) shall be installed in the Anti-Roll Tank Equipment Space (3-67-0). The compressor shall have a capacity of 18 cfm at 150 psig, and shall be mounted on an 80 gallon (or similar sized) receiver. A compatible Hankinson (or equal) air dryer shall also be mounted with the compressor on the air receiver. The compressor motor shall be minimum 5HP and electrical power shall be supplied as 3-phase, 460V, at 60Hz. The compressor shall be air-cooled and shall be installed in a quiet enclosure with a maximum noise level of 69dBA. The compressor shall be resiliently mounted to reduce the transmission of underwater radiated noise and airborne noise (see Section 790.5).

An equivalent compressor shall be a rotary screw compressor with a capacity of at least 16.5 cfm at 150 psig. Also included in the scope shall be an air receiver of approximately 80 gallons and an air dryer. The compressor shall be air-cooled. Ideally, the compressor and the air dryer shall be mounted on top of the receiver within a sound enclosure. The maximum noise level shall not exceed 69dBA. The equipment shall fit within the available space in the Anti Roll Tank Equipment Room (3-67-0) without requiring modifications to the space.”

551.5 Ship Service Air System

Insert the following paragraph after line 3122:

“A cross connect pipe from the ship service air system to the anti-roll tank air receiver attached to the rotary screw compressor (see Section 551.3) shall be provided for redundancy in the case of a failure of the anti-roll tank compressor (see Section 551.3). The cross connect shall have all required pressure reducing equipment and filters as required by the anti-roll tank equipment manufacturer”

SECTION 600 OUTFIT AND FURNISHINGS

INTRODUCTION

The optional lengthening will result in increases to some deck areas, surfaces, and spaces requiring additional outfit:

- Section 611.2.1: Additional exterior bolt-down fittings, main deck area is increased by 624 ft².
- Section 611.2.2: Additional interior bolt-down fittings in Science Hold (2-67-0), deck area is increased by 292 ft².
- Section 611.3: Additional unistrut in:
 - Science Hold (2-67-0), space is lengthened by 6 ft, widened by 2 ft.
 - Bosun's Workshop/Stores (2-87-0), space is combined and increased by 245 ft².
- Section 632: Additional anodes in Salt Water Ballast tanks. The ballast tanks in the lengthened option have approximately 8,000 ft² more surface area.
- Section 631: Additional hull coatings will be required for the lengthened hull.
- Section 633: Increase in cathodic protection. The wetted surface area of the lengthened hull is increased by 1,000 ft².
- Section 635.3: Additional thermal insulation will be required for the lengthened hull.

IMPACTED SPECIFICATION SECTIONS:

REFERENCES

Replace Refs. 600.1, 600.6, and 600.7, with the following.

600.1	Glosten Drawing No. 07096-070-01A	General Arrangement
600.6	Glosten Drawing No. 07096-630-01A	Fire Zone Diagram & Boundaries
600.7	Glosten Drawing No. 07096-511-02A	HVAC Diagram – Return and Exhaust

665.4 Bosun's Storeroom and Deck Gear Locker

Change first sentence, line 2503 to line 2504, to read "The bosun's workshop area (2-87-0) shall be outfitted with a steel workbench with vise, line stowage racks and shelving for other miscellaneous deck gear."

SECTION 670 STOWAGE

Change shelving location, line 2528, from "(2-67-2) Bosun's Workshop" to "(2-87-0) Bosun's Workshop/Stores".

**SECTION 700
SCIENCE SUPPORT EQUIPMENT AND OUTFITTING**

INTRODUCTION

The addition of the anti-roll tank requires the system equipment to be resiliently mounted in order to meet noise requirements.

IMPACTED SPECIFICATION SECTIONS:

REFERENCES

Replace Refs. 700.1, 700.2, 700.4, 700.5, and 700.6 with the following:

700.1	Glosten Drawing No. 07096-070-01A	General Arrangement
700.2	Glosten Drawing No. 07096-070-02A	Lines Plan
700.4	Glosten Drawing No. 07096-100-02A	Structure 01 Level & Below
700.5	Glosten Drawing No. 07096-511-01A	HVAC Diagram – Supply
700.6	Glosten Drawing No. 07096-511-02A	HVAC Diagram – Exhaust

790.5 Vibration Isolation

In Table 700-9, add the following items:

Equipment	Vibration Isolation	Noise Critical
Anti-roll tank valve block cabinet	X	X
Anti-roll tank stabilizer valves	X	X
Anti-roll tank compressor	X	X