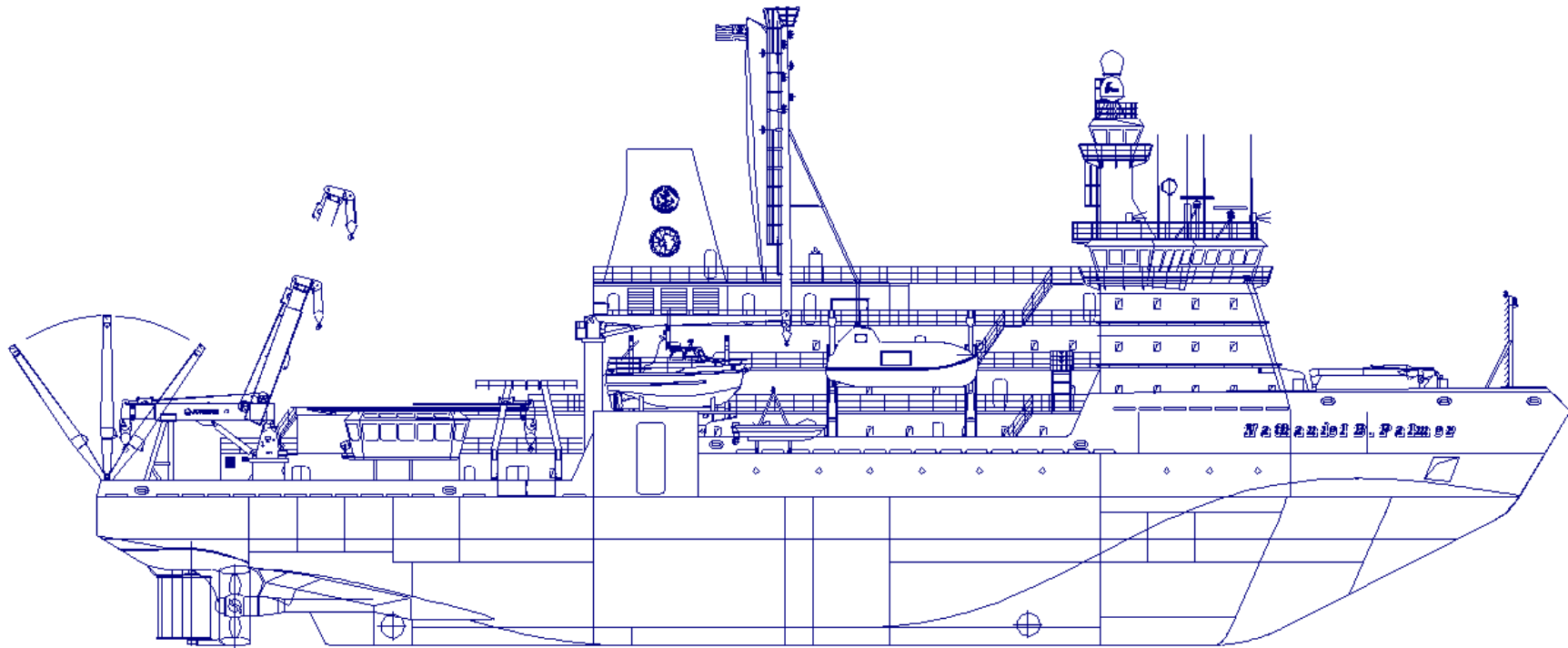

Nathaniel B. Palmer

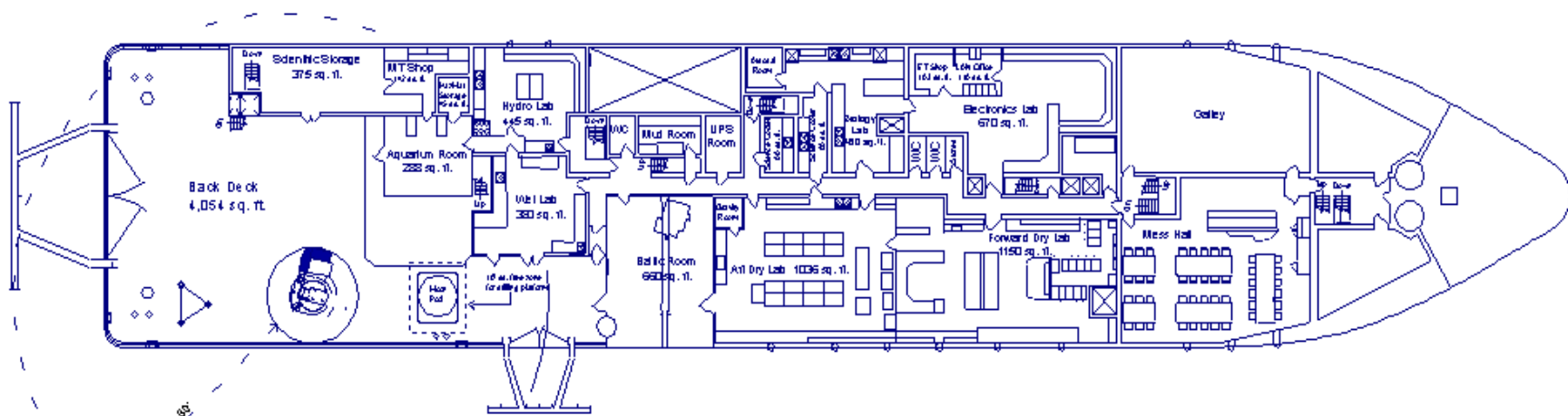
Research Vessel / Icebreaker



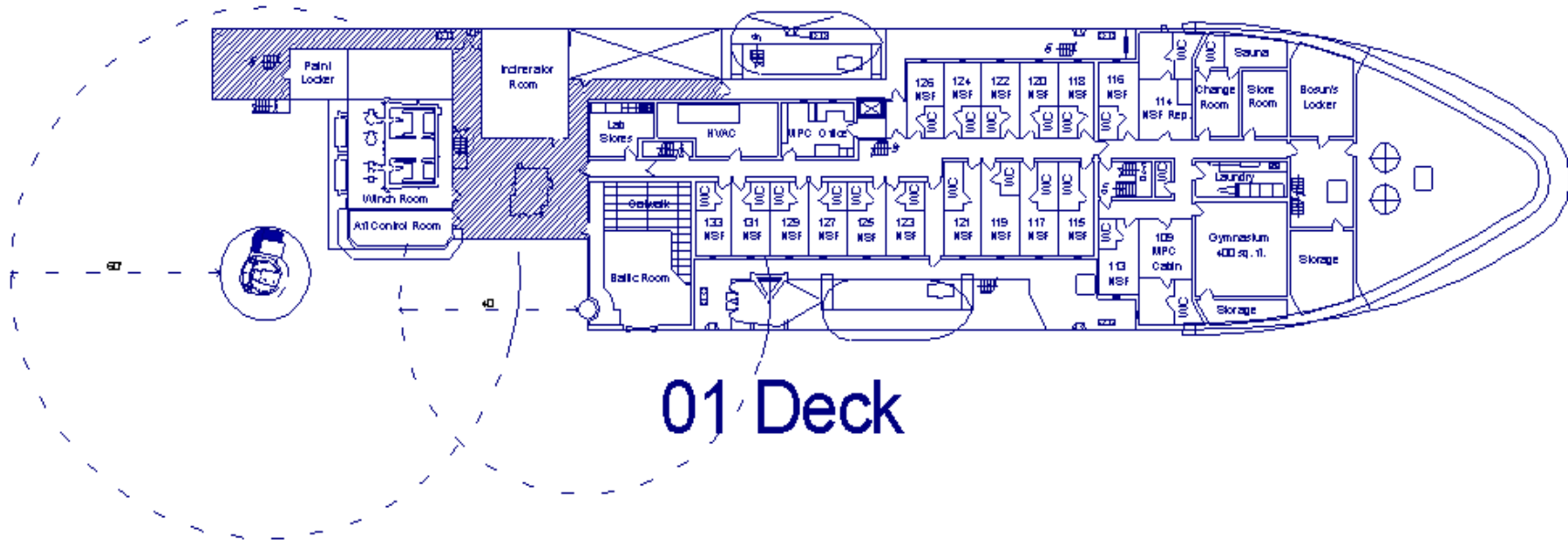
Operated for the
National Science Foundation Office of Polar Programs
by



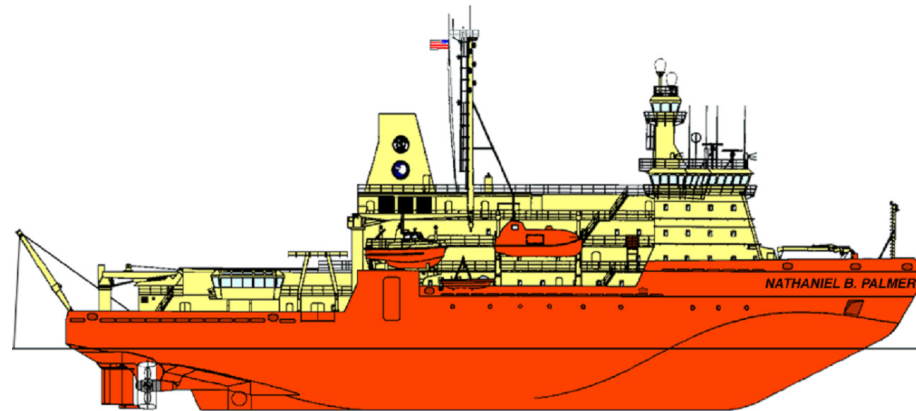
Under a charter with
Offshore Service Vessels LLC



Main Deck



01 Deck



The RVIB *Nathaniel B. Palmer* is operated by Leidos ASC on a long-term charter from Offshore Service Vessels LLC, Galliano, Louisiana. ASC staffs the vessel with a charter representative to coordinate cruise planning and scheduling and with technical staff to support science operations. Offshore Service Vessels LLC provides the vessel master (captain), ice pilot, and crew.



The vessel was named after merchant marine and ship builder, Nathaniel B. Palmer (8 August 1799 - 21 June 1877). The son of a Connecticut ship builder, Palmer had a prosperous and adventurous life as a sealer and whaler, a sea captain, and a ship designer and builder. He was a pioneer in the clipper era and some historians credit Palmer with the discovery of Antarctica, although others challenge this view.

The *Palmer*, completed in 1992, is 308 feet long and is ice-classed ABS-A2, capable of breaking three feet of level ice at three knots. The *Palmer* can accommodate 39 scientists and staff in one and two-person staterooms. Each stateroom has a television and computer network connection. The ship has a galley and a common dining area, conference room/library, lounge with audio and visual systems, a sauna, and an exercise room.

RVIB *Nathaniel B. Palmer*

Principal Features and Technical Information

General		
Vessel Owner	Offshore Service Vessels LLC	
Builder	North American Shipbuilding, U.S.A.	
Year Commissioned	1992	
Chartered to	Leidos ASC	
Classification	ABS A1, AMS, E, ACC, Ice Class A2	
Flag	U.S.A.	
Principal Dimensions		
Length Overall	308.50 ft	94.0 m
Length on Waterline	279.85 ft	85.3 m
Breadth Moulded	60 ft	18.3 m
Draft, Design	22.5 ft	6.8 m
Depth	30.0 ft	9.1 m
Displacement	6,800 Long Tons (LT)	6,909 t
Light Ship Weight	4,800 LT	4,877 t
Main Propulsion Machinery		
Shafts		
Number of Shafts	2	
Total Shaft HorsePower (SHP)	12,700 SHP	9,500 kW
Transmission and shafting efficiency	0.96	
Shaftline Bearing Loss	2%	
Gearing Loss	2%	
Total Brake Horsepower (BHP)	13,200 BHP	9,900 kW
Main Engines		
Number of Engines	4	
Manufacturer Model	Caterpillar	3608
Prime Mover	Diesel	
Rating of Engine	3,300 BHP @ 900 rpm	
Transmission System	Reduction Gear	
Gear Box		
Manufacturer Model	Lohmann & Stoltefort	GVL 1250B
Gear Ratio	6.4 to 1	
Propellers		
Number of Propellers	2	
Propeller Diameter	13.12 ft	4 m
Number of Blades	4	
Material	NiAlBr	
Direction of Rotation	Inboard turning	
Hub Diameter	4.36 ft	1.33 m
Hub to Prop Diameter Ratio	0.33	
Manufacturer	Ullstein, Norway	
Nozzles		
Inside Diameter	13.28 ft	4.05 m
Outside Diameter	16.14 ft	4.92 m
Material	Stainless Steel	
Stern Tub Bearing		
Manufacturer	Thordon	
Generators		
Number	4	
Rating of each	1,400 BHP	1,050 kW
Total Auxiliary Power	5,600 BHP	4,200 kW
Manufacturer Model	Caterpillar	3512
Electric Power	AC=480/240/120V, 60Hz, DC=24V	
Thrusters		
Bow Thruster		
Number	1	
Type	Water Jet Azimuthing	Flush Mounted
Thrust	10.0 LT	
Rating	1,400 BHP	1,050 kW
Stern Thruster		
Type	Tunnel	
Thrust	6.0 LT	
Prime Mover	Electric Motor	

RVIB *Nathaniel B. Palmer*

Principal Features and Technical Information

Rudders			Exterior Lighting		
Number	2		Searchlights		
Type	Schiling High-Lift		Number	4 single	1 double
Evaporator/Fresh Water Maker			Rating	2.5 kW zenon with heater circuit	
Number	3		Manufacturer	Carlisle and Finch	
Manufacturer Type	Alfa Laval	JWP-26-C80	Tank Capacities		
Rating of each (daily)	15 LT		Fuel	425,000 gallons	
Heeling System			At 22.5 ft draft	1,550 LT	1,574 t
Number of Tanks	1 Pair		At 95% maximum capacity	1,740 LT	1,768 t
Number of Pumps	1		Fresh Water at 95%	215 LT	218 t
Total Heeling System Horsepower	1,400 BHP	1,050 kW	Ballast Water at 95%	1,000 LT	1,016 t
Manufacturer Model	Caterpillar	3512	Aviation Fuel at 95%	34 LT	
Induced Roll & Time Period	5° roll side to side in 2 minutes		Heeling Tanks (16 ft level)	227 LT	
Anti-roll tanks			Antiroll Tanks (4.5 ft level)	173 LT	
Number	2 pair		Endurance	15,000 NM @ 12 knots	
Dimensions	10 ft. (W) x 60 ft (L)		Accommodations		
Percent Roll Reduction, Sea State 6	40-50%		Crew Owner	22	5
Waste Disposal System			Scientists and Staff	39 (two spare berths)	
Incinerator	1		Total Accommodations	68	
Manufacturer	Golar 500		Special Features		
Holding Tanks	2-hour duration		Helicopter hangar and ability to carry two small helicopters and 7,200 gallons of fuel		
Emergency Diesel Generator			Low friction hull coating (Inerta 160)		
Number	1		No fuel oil in double bottom		
Rating	300 kW		One compartment damage stability standard		
Manufacturer	Caterpillar		Overboard discharge on port side only		
Glycol Heating System			Uninterruptible and conditioned power in main work area and computer lab		
Number	2		Two boilers to circulate water/antifreeze mixture under exterior deck on main level		
Rating of each	6,600,000 BTU/hr		Design Air Temperature	100° to -50° F	37.8° to 45.6° C
Manufacturer	Vapor Corporation		Design Water Temperature	85° to 28° F	29.4° to -2.2° C
			Drinking water made from seawater	12,000 gal/day maximum production	

RVIB *Nathaniel B. Palmer*

Principal Features and Technical Information

Other Features and Space Allocations		
Aloft Observation Station (deck height)	80 ft above water surface	
Pilot House (deck height)	54 ft above water surface	
Main Science Deck aft (deck height)	9 ft above water surface	
Pilot House (interior width)	74 ft	
Overhang at vessel side	12 ft	
Helicopter Hangar	40 ft x 32 ft	1,300 sq ft
Flight Deck	54 ft x 44 ft	2,500 sq ft
Boats		
Survey Boat "Cajun Cruncher"		
Length	28.8 ft	8.8 m
Breadth	10.75 ft	3.3 m
Depth	7.25 ft	2.2 m
Draft (keel)	4 ft	1.2 m
Displacement	11.3 LT	11.5 t
A-frame	800 lbs	
Winch	300 m 5/16" cable	
Personnel Capacity	4 scientists	2 crew
Diesel Manufacturer	GM	8V-71
Diesel Engine Horsepower	230	
Propeller Diameter	36", fixed pitch, in a nozzle	
Cooling System	Keel cooler	
Lifeboats with Davits		
Number	2 (1 port, 1 starboard)	
Capacity of each	76	
Features	Enclosed, powered (55 HP)	
Material	Fiberglass	
Manufacturer	Schat Watercraft	
Inflatable Rafts		
Number	1	
Capacity of each	20	
Manufacturer	Suitlik	
Rescue Boat with Davits		
Number	1	
Length	19.7 ft	
Features	100 HP outboard, 25 knots	
Manufacturer	J&V, Grimstad, Norway	
Miscellaneous Vessel Facts		
Over 3,000 10x40-ft steel plates & 810,000 linear feet of welding were used on the ship		
The steel plate in the bow is 1 9/16" thick and is twice the strength of regular steel		
The steel on the hull is made with a low-temperature alloy rated to -60° C		
75,000 ft (14 miles) of pipe were used to outfit the ship		
There are 2,700,000 feet, (511 miles) of wire inside the vessel		
Total electrical generating capacity is 4.63 million watts (nearly 4,000 hair dryers)		
The vessel is capable of carrying twenty, 20 ft cargo containers		
Over-the-Side Handling Equipment		
Cranes		
Bow Crane	5,000 lbs	30 ft reach
Main Crane, forward	20,000 lbs	40 ft reach
Telescoping Main Crane	50,000 lbs	60 ft reach
Manufacturer of all crane	Appleton Marine	
A-frames		
A-frame on Fantail (20 tons)	18 ft horizontal reach	30 ft vertical reach
A-frame on Starboard Side (20 tons)	13 ft horizontal reach	17 ft vertical reach
Telescoping Boom for Baltic Room	6 ton capacity, 13 ft reach from side of vessel	
Winches		
Markey DUSH-9-11 Deep Sea Trawl Winch, double drum	9/16-inch mechanical wire (to starboard)	
	680-inch hybrid fiber-optic/coaxial electro-mechanical (EM) cable (to port)	
Markey DUSH-5-5 Waterfall Hydrographic Winch, double drum	Lower drum carries 10,000 m of 5/16-inch mechanical wire	
	Upper drum carries 10,000 m of .322-inch conductor EM cable	
Markey DUSH 5 Oceanographic winch in Baltic Room	10,000 m of .322-inch 3-conductor EM cable	

RVIB *Nathaniel B. Palmer*

Principal Features and Technical Information

Water Column Sampling Equipment			Underway Seawater System																																				
Blake Trawl	5 ft		<p>The seawater system supplies underway seawater to the Aquarium Room, Wet Lab, Hydro Lab, Helo Deck, Helo Hangar, and Baltic Room. Green strand piping, a non-metallic, chemically resistant material has been used throughout the system to minimize algae and bacterial growth. It also maintains its structural integrity under low temperatures. Large diameter piping and a minimum of 90° turns help prevent frazil ice formation in the system.</p> <p>Seawater Intake</p> <table border="1"> <tr> <td>Main</td> <td>At Stern Thruster</td> <td>6 in. diameter</td> </tr> </table> <p>Surface Seawater Sampling Equipment</p> <table border="1"> <tr> <td>Fluorometer</td> <td>WET Labs</td> <td>ECO-FL</td> </tr> <tr> <td>Thermosalinograph</td> <td>Sea-Bird</td> <td>SBE-45</td> </tr> </table> <p>Surface Seawater Sampling Equipment (continued)</p> <table border="1"> <tr> <td>Transmissometer</td> <td>WET Labs</td> <td>C-Star</td> </tr> <tr> <td>Digital Remote Temperature Sensor</td> <td>Sea-Bird</td> <td>SBE-38</td> </tr> <tr> <td>pCO₂ Equilibration System</td> <td colspan="2">Lamont-Doherty Earth Observatory</td> </tr> </table> <p>Aquaria</p> <p>Two permanent fiberglass tanks, space for four additional Xactic tanks (4 x 4 x4 ft.)</p> <p>Deck Incubators</p> <table border="1"> <tr> <td>Number</td> <td>3</td> <td></td> </tr> <tr> <td>Material Type</td> <td>Plexiglas</td> <td>UV Transparent</td> </tr> </table> <p style="text-align: center;">Water Purification Systems</p> <table border="1"> <tr> <td>E-pure four-holder system</td> <td>Barnstead</td> <td>Type I water (ultrapure); 2 L per minute</td> </tr> <tr> <td>Diamond UV</td> <td>Barnstead</td> <td>TOC-free water</td> </tr> </table> <p style="text-align: center;">Bottom-Sampling Equipment</p> <p>Dredges</p> <table border="1"> <tr> <td>Small Chain Dredge, Rock Dredge</td> <td>Kahl Scientific</td> </tr> <tr> <td>Large Chain Dredge, Rock Dredge</td> <td>Kahl Scientific</td> </tr> </table> <p>Coring Equipment</p> <p>The vessel can be equipped with several different coring devices designed to take vertical samples of sediment from below the sea floor. Below are the coring systems currently available on the RVIB <i>Nathaniel B. Palmer</i>.</p>			Main	At Stern Thruster	6 in. diameter	Fluorometer	WET Labs	ECO-FL	Thermosalinograph	Sea-Bird	SBE-45	Transmissometer	WET Labs	C-Star	Digital Remote Temperature Sensor	Sea-Bird	SBE-38	pCO ₂ Equilibration System	Lamont-Doherty Earth Observatory		Number	3		Material Type	Plexiglas	UV Transparent	E-pure four-holder system	Barnstead	Type I water (ultrapure); 2 L per minute	Diamond UV	Barnstead	TOC-free water	Small Chain Dredge, Rock Dredge	Kahl Scientific	Large Chain Dredge, Rock Dredge	Kahl Scientific
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Small Chain Dredge, Rock Dredge	Kahl Scientific																																						
Large Chain Dredge, Rock Dredge	Kahl Scientific																																						
Otter Trawls (2)	18 ft	30 ft																																					
Isaac Kidd Midwater Trawl	1 m	3 frames																																					
Flat Trawl	35 ft																																						
MOCNESS (2)	1 m	10 m																																					
Tucker Trawl (opening/closing)	3 nets	1 m																																					
Conductivity Temperature Depth (CTD) Sensor																																							
<p>The Sea-Bird 911+ CTD system offers real-time operation via sea cable telemetry, includes a solid state memory module, and has a maximum depth of 6,800 m.</p> <p>The CTD is mounted on a 24-bottle General Oceanics rosette sampler. The Nathaniel B. Palmer bottle inventory includes 5, 12, and 30L bottles.</p>																																							
Altimeter	Valeport	VA-500																																					
Altimeter	Teledyne Benthos	PSA-916																																					
Conductivity	Sea-Bird	4-02/O																																					
Conductivity	Sea-Bird	4C, 6,800 m																																					
Conductivity	Sea-Bird	4M, 6,800 m																																					
CTD Fish	Sea-Bird	SBE 9+																																					
CTD Pressure Sensor	Paroscientific	410K-105																																					
Dissolved Oxygen	Sea-Bird	SBE 43																																					
CTD Pump	Sea-Bird	5T																																					
Fluorometer	WET Labs	ECO-FL																																					
PAR	Biospherical Instruments	QCP-2350-HP																																					
PAR	Biospherical Instruments	QSP-2300/2350																																					
PAR	Biospherical Instruments	QSP-200L4S																																					
Temperature	Sea-Bird	3-02/F																																					
Temperature	Sea-Bird	3plus, 6,800 m																																					
Transmissometer	WET Labs	C-Star																																					
Water-Sampling Bottle	Niskin	Bullister design																																					
XBT / XCTD	Sippican	MK-21																																					

RVIB *Nathaniel B. Palmer* Principal Features and Technical Information

Jumbo Piston Corer	Woods Hole Oceanographic Institute		3.5 kHz sub-bottom profiler	Knudsen	3260 Chirp, 10 kW
Standard Piston Corer	Woods Hole Oceanographic Institute		12 kHz bottom tracker		
Gravity Corer			EM 122 Multibeam System	Simrad	12 kHz full-ocean-depth swath mapping
Kasten Corer	State University of New York/Ocean Instruments		The EM 122 uses a fan of narrow acoustic beams to create a map of the sea floor. Preliminary maps can be produced and plotted almost immediately after a survey is finished.		
Mega Corer	Mark I				
Deep Sea Rock Dredge	Scripps Institute of Oceanography				
Grab Sampler	Smith-MacIntyre				
Seismic Instrumentation					
Seismic Data Logger	Geometrics	Geode 24 w/ Marine Multi-Geode OS			
Research Vessel Data Acquisition System (RVDAS)	Lamont Doherty Earth Observatory / Leidos	Linux-Based Data Acquisition System			
Magnetometer	Marine Magnetics	Seaspy			
Digital Benthic Camera, with Strobe	Ocean Imaging Systems	DSC 10000 Strobe Model: 3831			
Four-Gun Seismic Gun Controller	Real Time Systems	SCTL-2 (HotShot 2); HotShot 1 (qty: 2)			
Gravity Meter	Bell Aerospace	BGM-3			
Solid Single-Channel Seismic Streamer (2); Length: 100 m active section, 24 channels, 72 hydrophones, 300m lead-in tow cable	Geometrics	MicroEel			
Seismic Sound Sources					
Generator Injector (GI) Seismic Air Guns (6)	Seismic Systems Inc.	210 cu in. volume, configurable in both volume and mode via volume and port reducers			
Bolt Gun 1500 Long Life Airgun	Bolt Technology Corp.	Sizes in cu. in.: 1,000, 800, 500, 450, 400, 350, 300, 200, 145, 80			
GI Water Gun (1)	Seismic Systems, Inc.	15 cu in.			
Seismic Air Compressors	Borsig-LMF	1,200 scfm 2,000 psi			
Sonar Systems					
Acoustic Doppler Current Profiler (ADCP)	RD Industries	OS-75			
ADCP	RD Industries	OS-38			
Diving Equipment					
Dive Compressors (one (1) on board)	Bauer	Fills to 3,000 psi			
Dive Van (dive gear storage and setup)	20 x 8 x 8.5 ft.				
DAN (Divers Alert Network) Oxygen Kit					
Meteorological Sensor Suite					
Humidity/Temperature/DewPoint	Rotronic	HC2A-S3			
Barometer	Vaisala	PTB210B			
Anemometer	Gill	Wind Observer II (ultra-sonic)			
Precision Infrared Radiometer	Eppley	PIR			
Pyranometer	Eppley	PSP			
PAR Radiometer	Biospherical Instruments	QSR-2100			
PRR (mast)	Biospherical Instruments	PRR-800/810			
GUV (mast)	Biospherical Instruments	GUV-2511			
PUV (underwater)	Biospherical Instruments	PUV-2500			
Time & Navigation Systems					
Time & Frequency Receiver and Clock	Symmetricom	XLi			
GPS	Furuno				
GPS, with heading and attitude	Seatex	SeaPath 200			
GPS, with heading and attitude	Seatex	SeaPath 330			

RVIB *Nathaniel B. Palmer* Principal Features and Technical Information

Gyrocompass (2)	Teledyne (Meridian)	MK2 Standard
3 cm Radar (X-band)	Furuno	FAR 2822X
10 cm Radar (S-band)	Furuno	FAR 2837S
HF WEFAX	Furuno	DFAX
HF Radio Direction Finder (RDF)	Simrad	
VHF Radio Direction Finder	Taiyo	TDC338H2 MKI
Communications Equipment		
Inmarsat	Cobham	Sailor 100GX (Global Xpress)
Inmarsat	Cobham	Sailor 500 (Fleet Broad-band)
Iridium	Cobham	SC4000
VHF Radios		
Sailor	RT146	Bridge to Bridge
Sailor	RT2048	Main
Sailor	RM2042	Watch Receiver
HF SSB Radios		
Sailor	SP300	
Sailor	T2130	
<p>The RVIB <i>Nathaniel B. Palmer</i> is Global Maritime Distress Safety System (GMDSS) compliant. This means there is automatic and complete redundancy for each mode of communication for both ship to ship and ship to shore. These systems are provided and maintained by the vessel owner, Offshore Service Vessels LLC.</p>		
Computers and Networking		
Windows, Macintosh, and Linux operating systems available. There are six to eight computers available for general usage in the Electronics Lab (E-Lab), Aft Dry Lab and in the 03 Level Conference Room.		
Network	400 LAN drops throughout ship, including cabins	
E-mail	Transmitted via satellite every 30 minutes	
Individual email size restrictions	10 MB outgoing	10 MB incoming
Space Allocation		
Lab spaces feature recessed unistrut on 2' centers, floor and ceiling, running fore and aft		
Main Deck		
Electronics/Computer Lab	670 sq. ft	
Forward Dry Lab	1,150 sq. ft	
Aft Dry Lab	1,036 sq. ft	
Hydro Lab	445 sq. ft	
Wet Lab	416 sq. ft	
Bio Lab	460 sq. ft	
Science Coolers	2 @ 86 and 68 sq. ft	
Baltic Room / Staging Area	680 sq. ft	
Aquarium Room	298 sq. ft	
Marine Tech Workshop	142 sq. ft	
Scientific Storage	375 sq. ft	
Electronic Equipment Room	96 sq. ft	
Changing / Mud Room / Darkroom	100 sq. ft	
Lower Deck		
Scientific Storage	170 sq. ft	
Scientific Storage	four 20-foot containers	
Exterior Main Deck		
Deck tie down points are located on 2 ft centers on the main deck and helo deck		
Science Vans		
Radioisotope Vans	2 vans	20 x 8 x 8 ft.
Freezer Lab Vans	2 vans	20 x 8 x 8 ft.
Garage/Trace Metal Clean Van	1 van	20 x 8 x 8 ft.
Recreation / Leisure Spaces		
Library / Conference Room (03 Deck)	700 sq. ft	
TV Lounge (02 Deck)	510 sq. ft	
Gymnasium (01 Deck)	400 sq. ft	

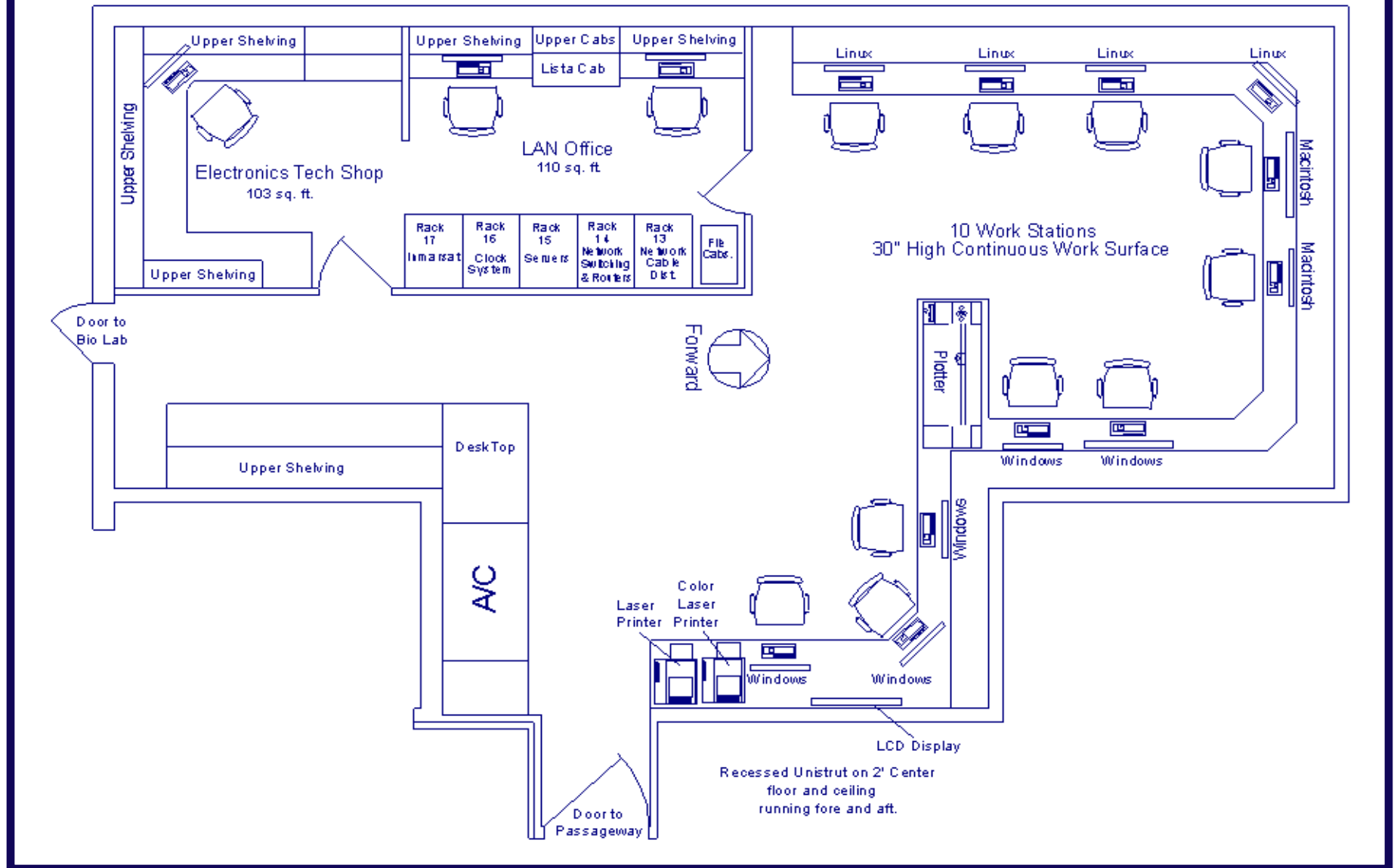
RVIB *Nathaniel B. Palmer*
Principal Features and Technical Information

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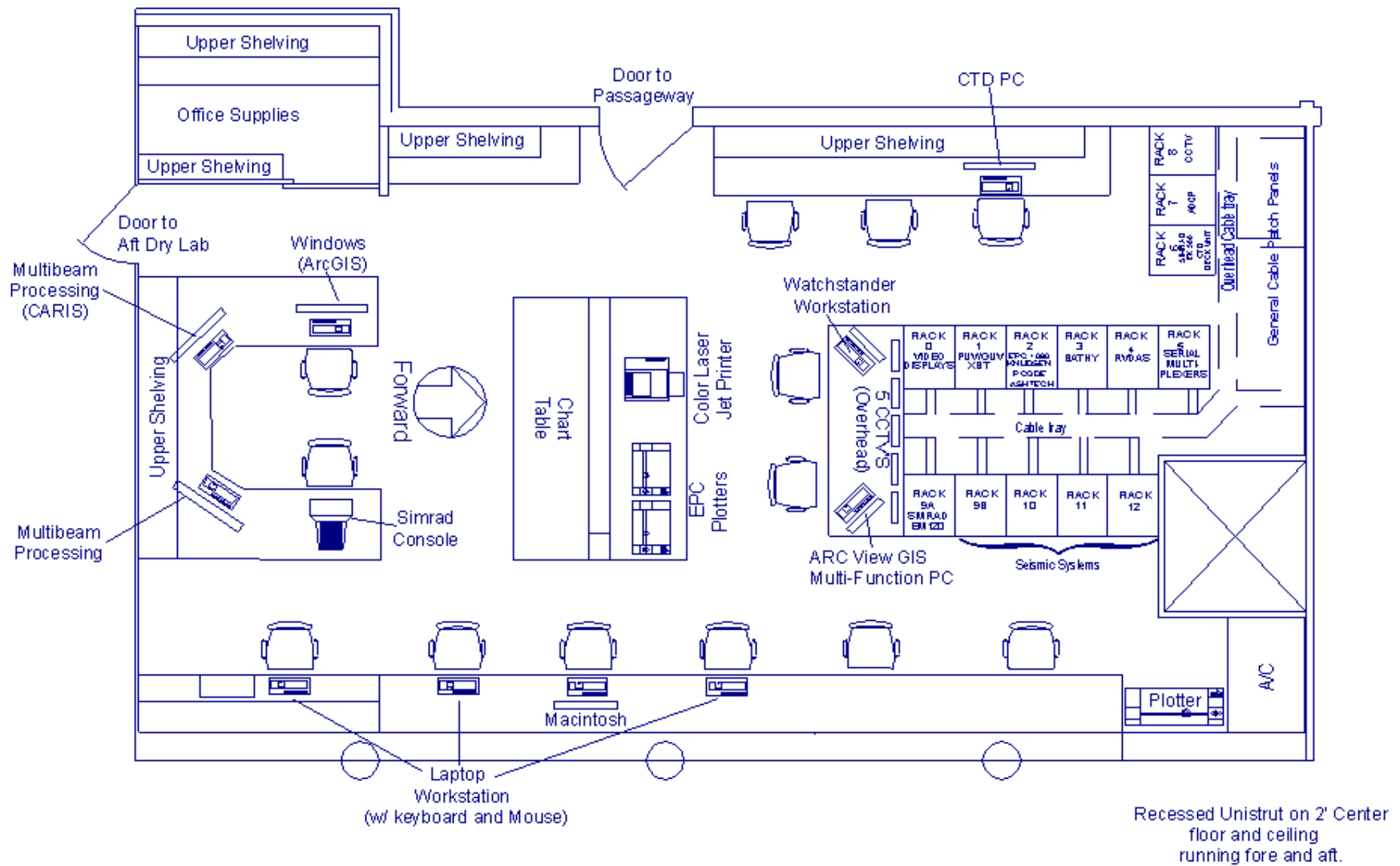
Electronics Lab

670 sq. ft.



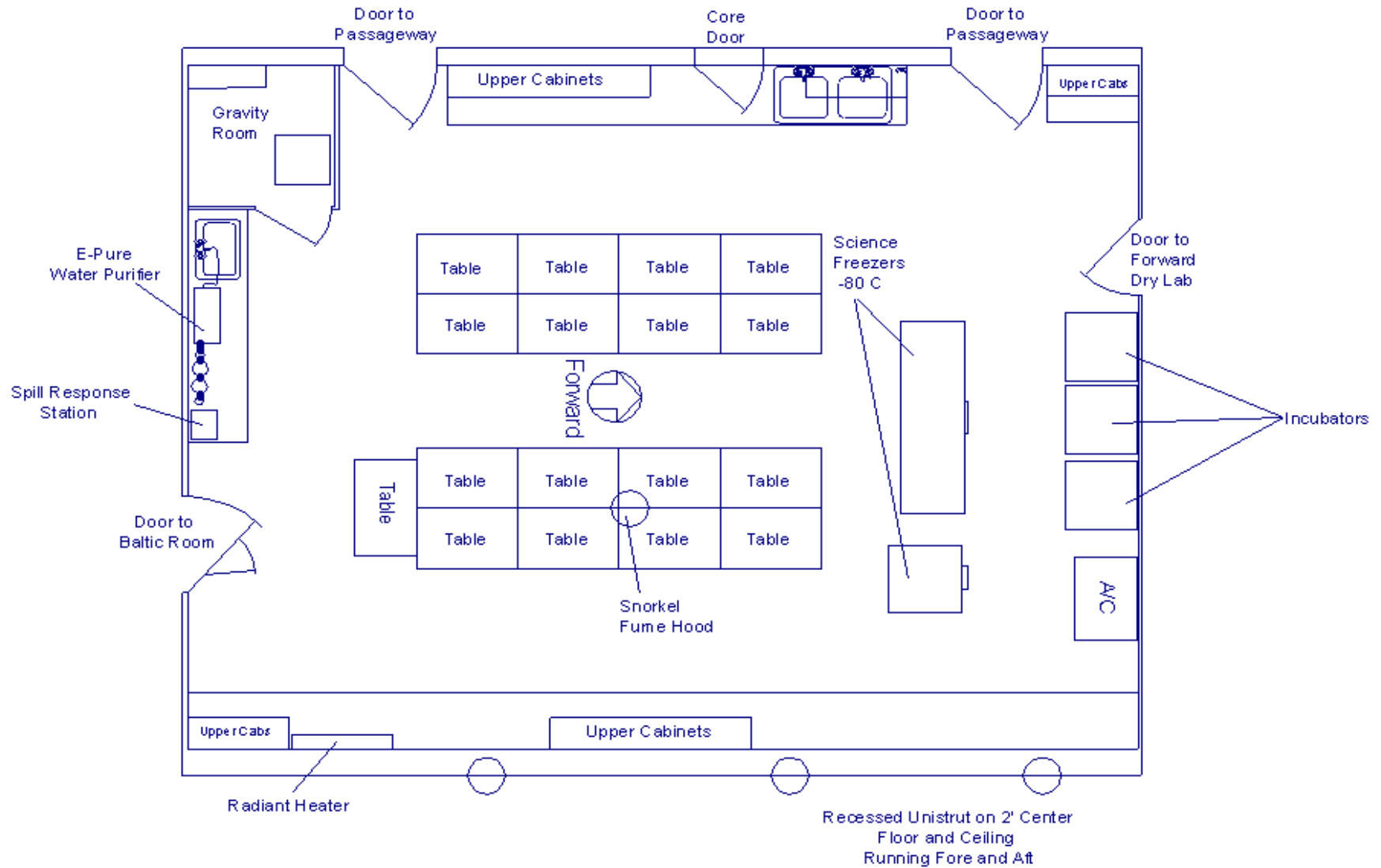
Forward Dry Lab

1150 sq. ft.

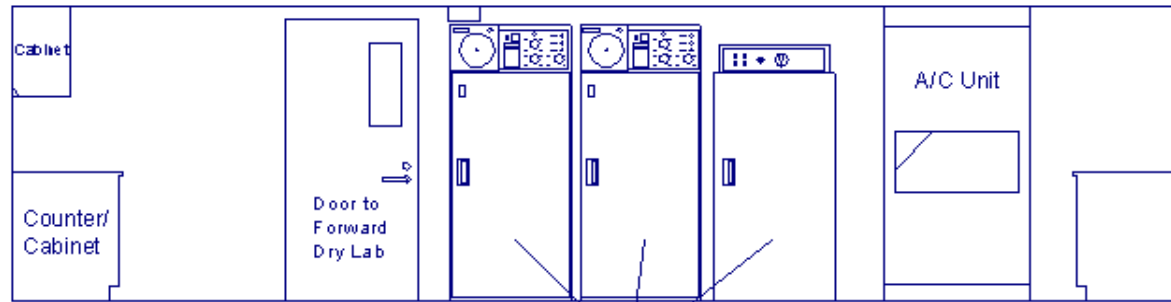


Aft Dry Lab

1036 sq. ft.

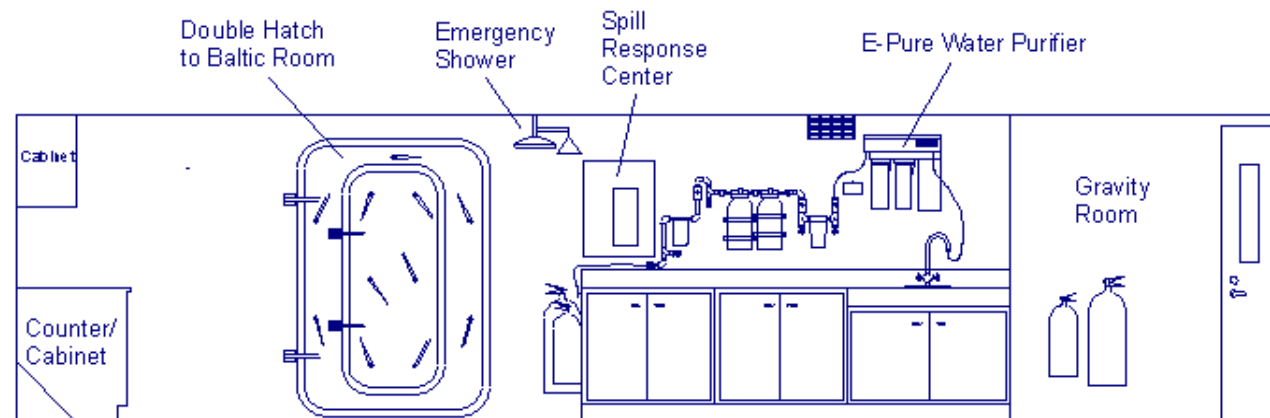


Aft Dry Lab Elevations



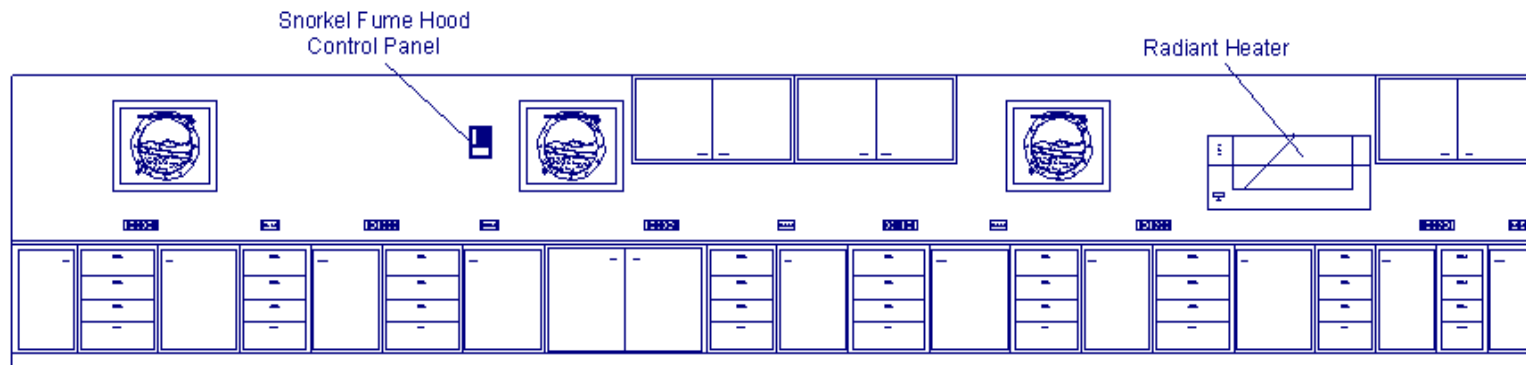
Forward

Science Incubators

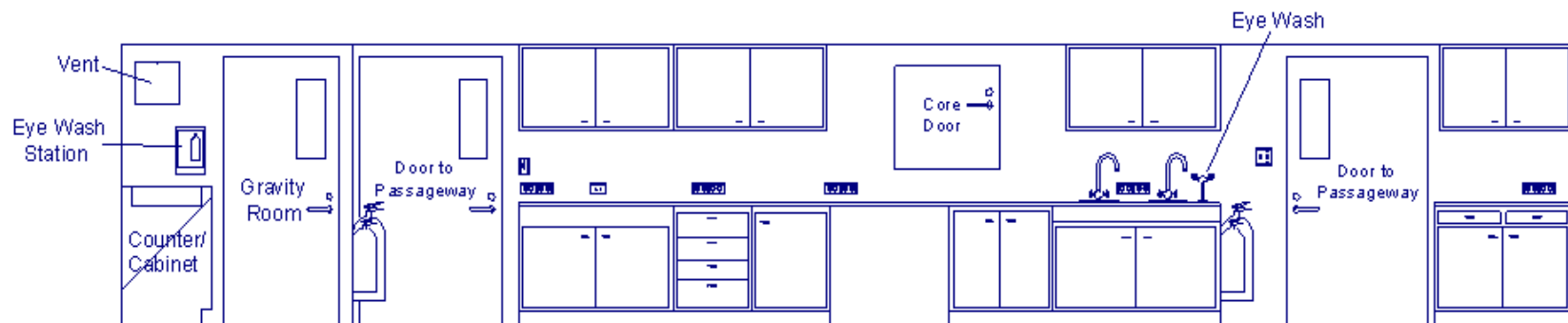


Aft

Aft Dry Lab Elevations



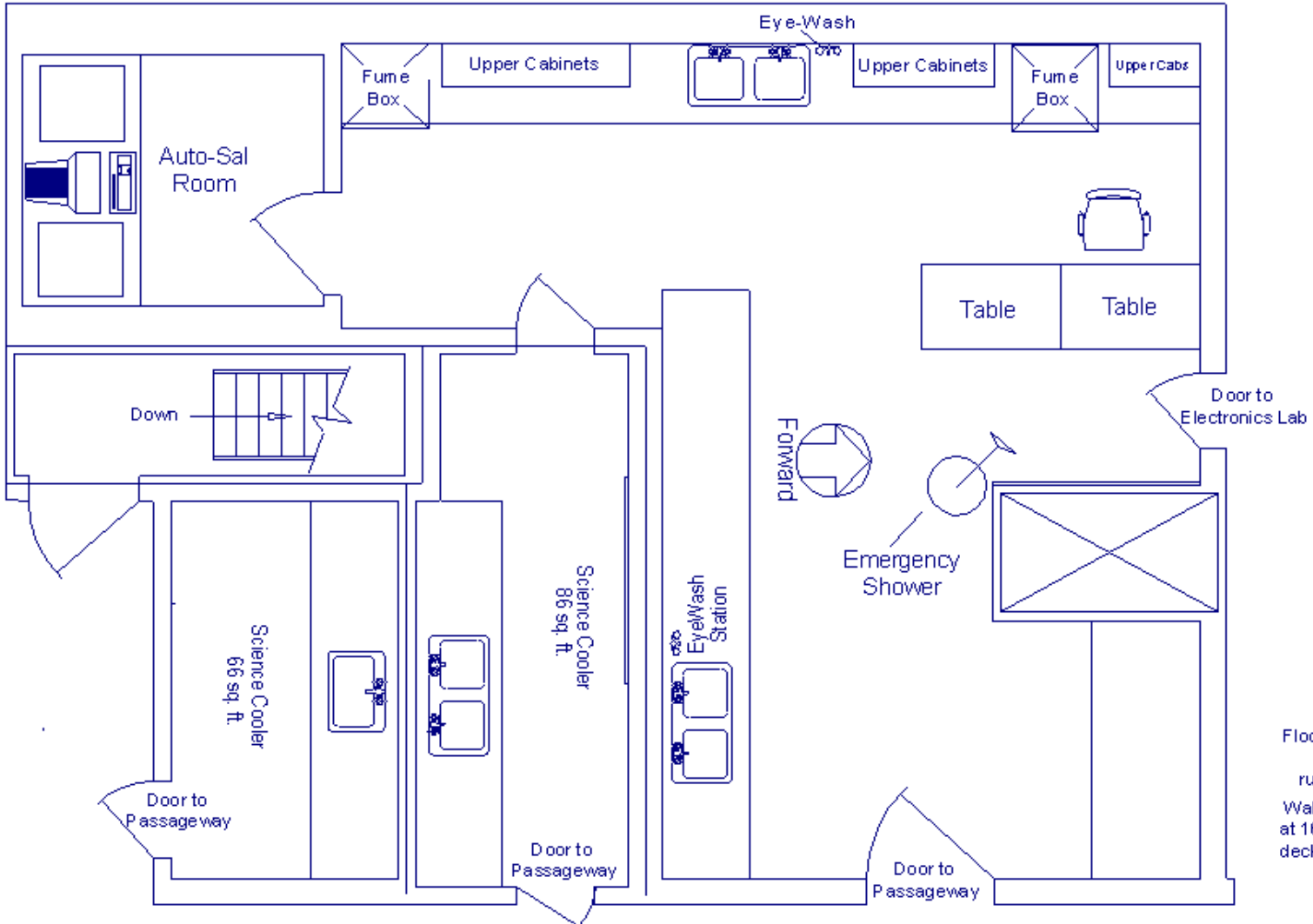
Starboard



Port

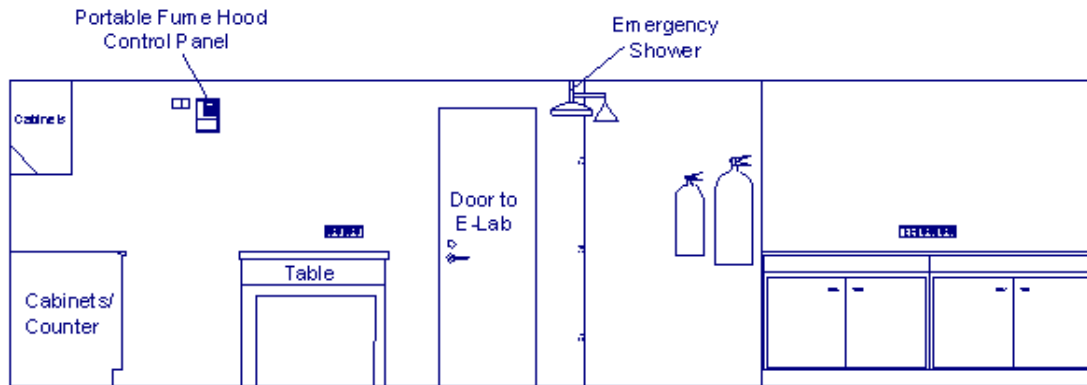
Bio Lab

460 sq. ft.

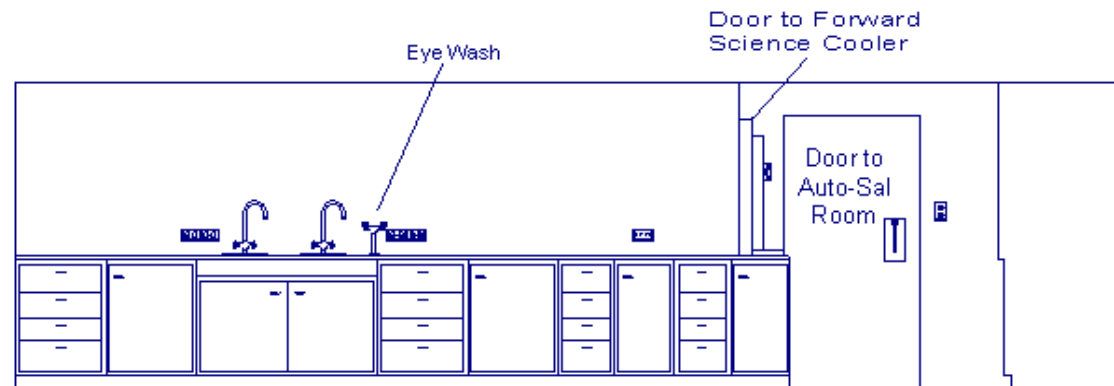


Floor and Ceiling Unistrut on 2' center running fore and aft.
 Wall Mounted Unistrut at 16", 32", and 48" from deck for gas bottle storage

Bio Lab Elevations

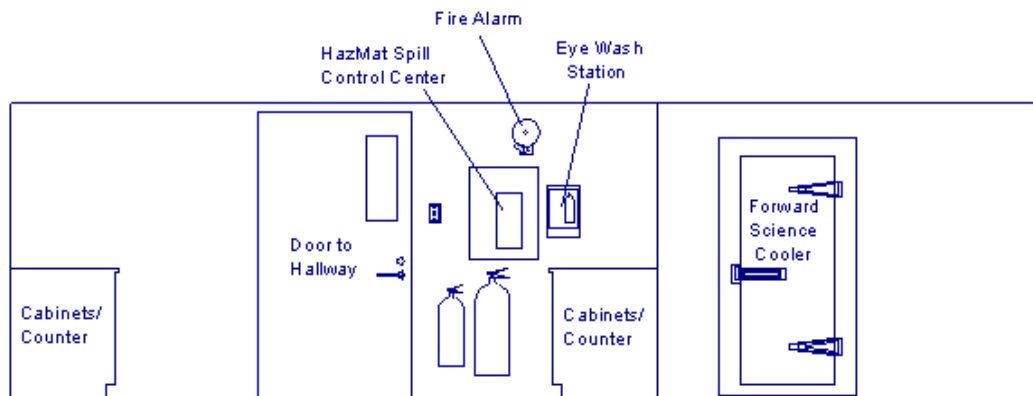


Forward

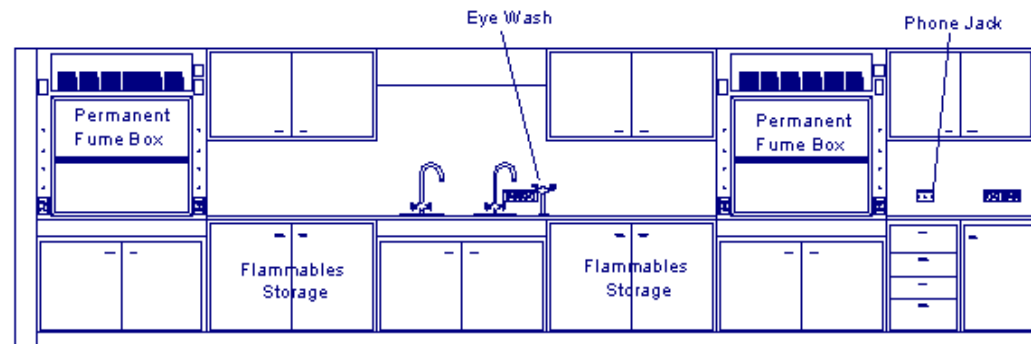


Aft

Bio Lab Elevations



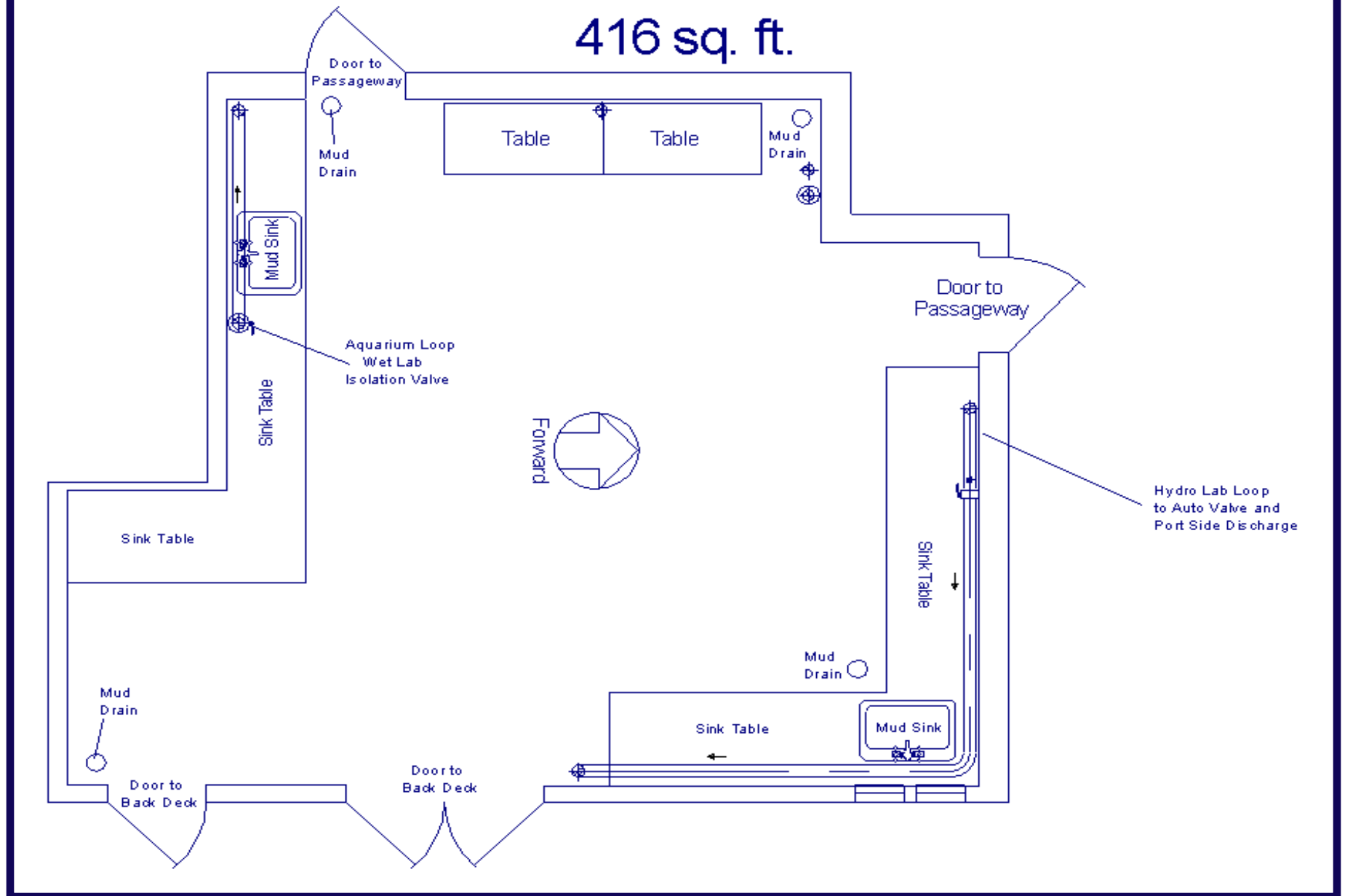
Starboard



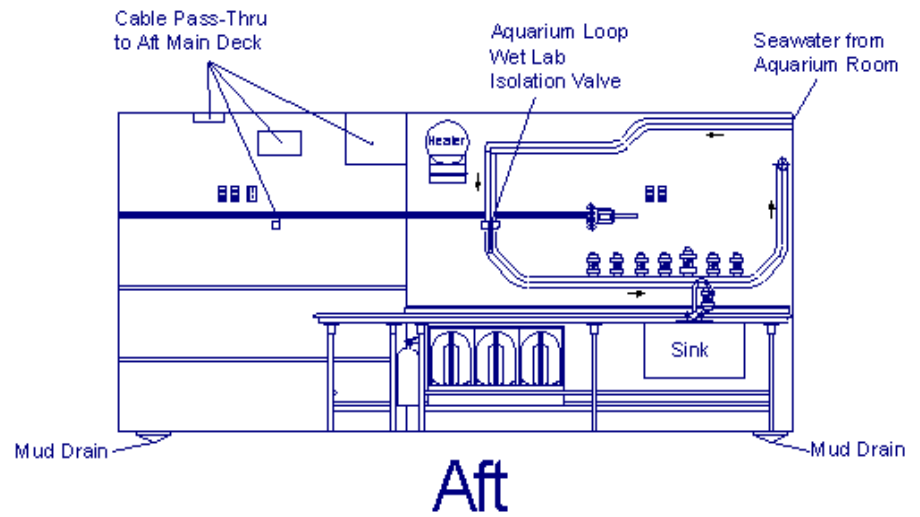
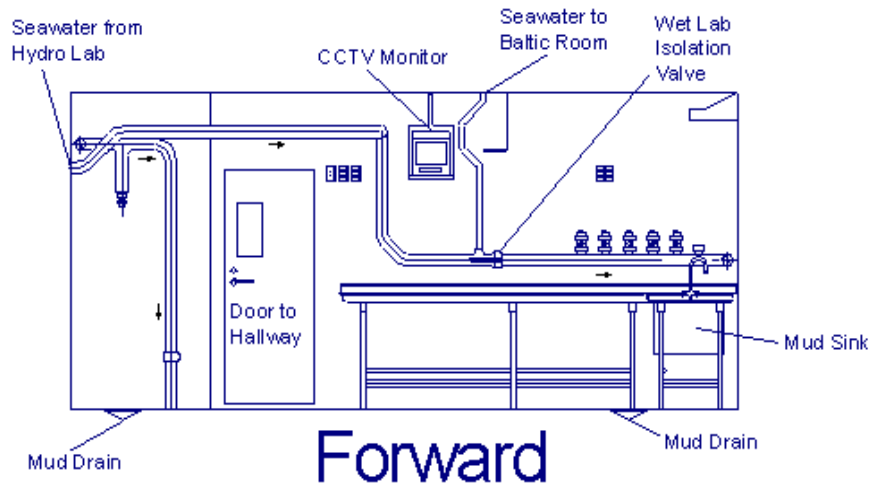
Port

Wet Lab

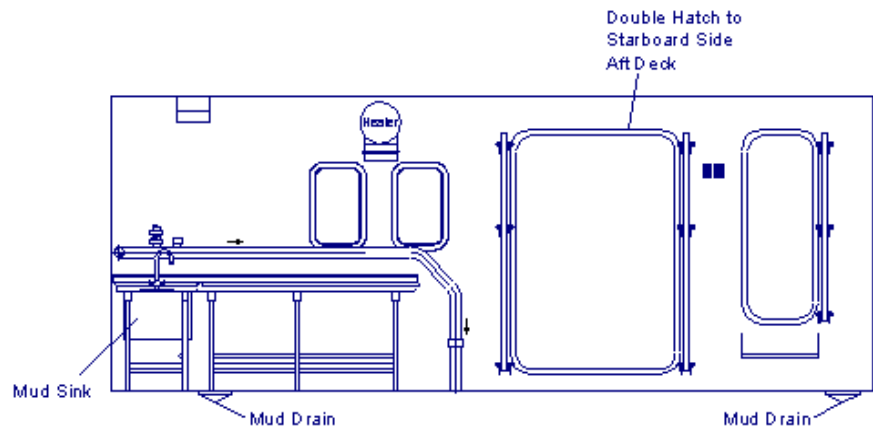
416 sq. ft.



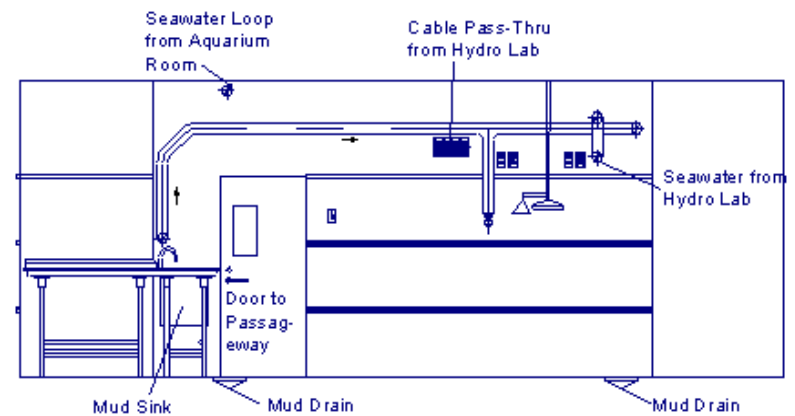
Wet Lab Elevations



Wet Lab Elevations



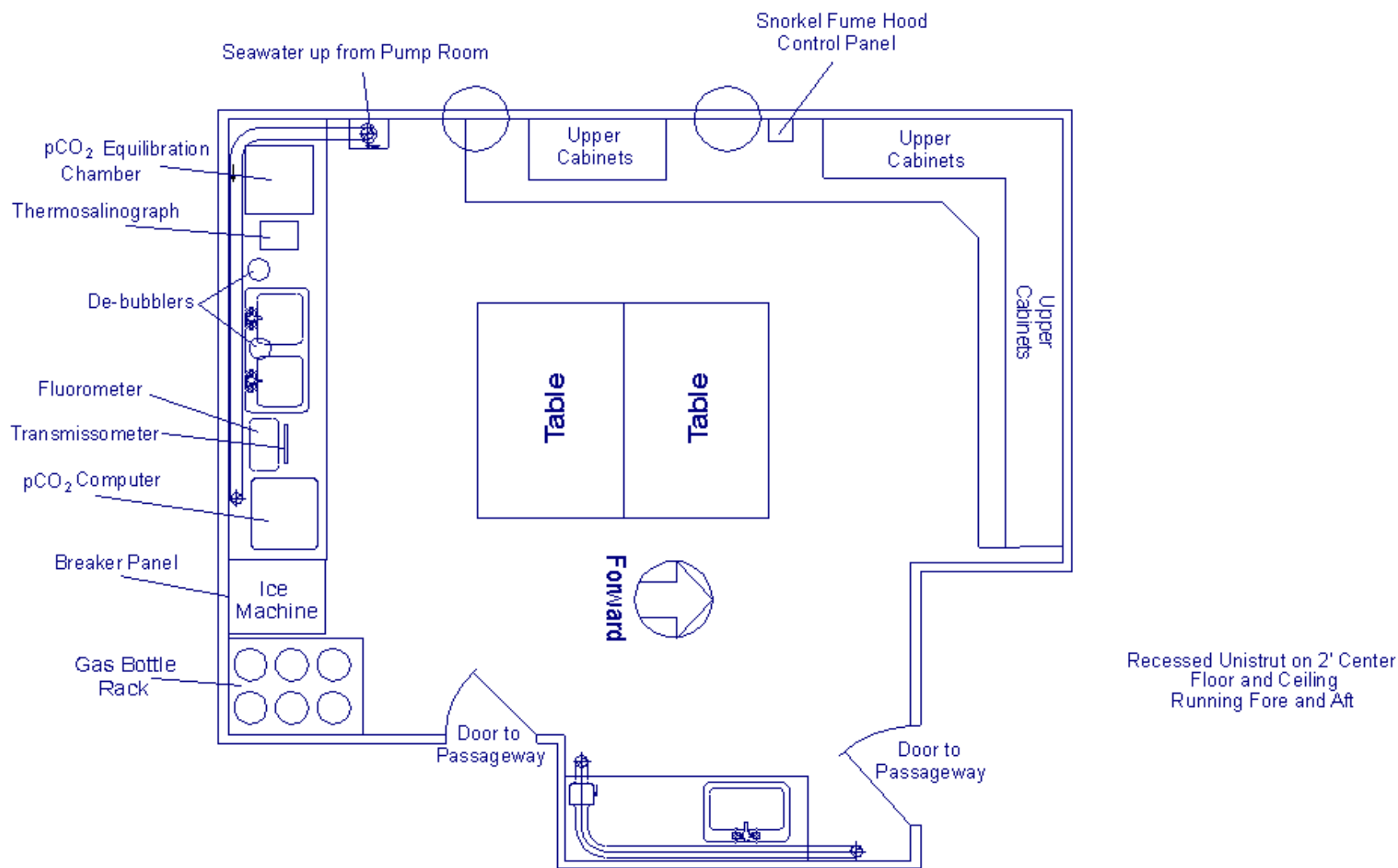
Starboard



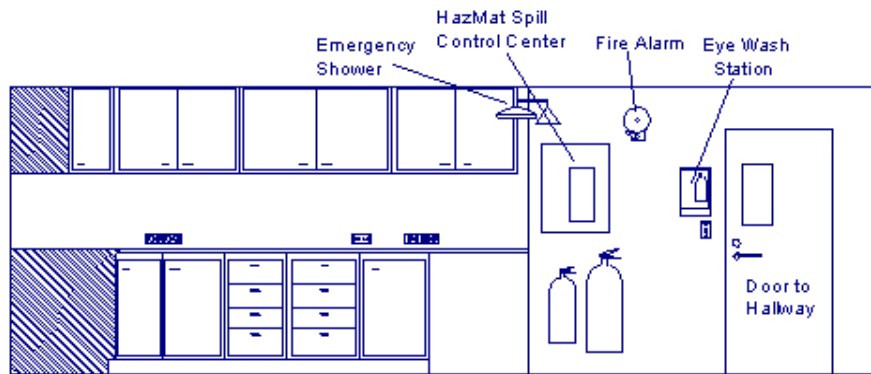
Port

Hydro Lab

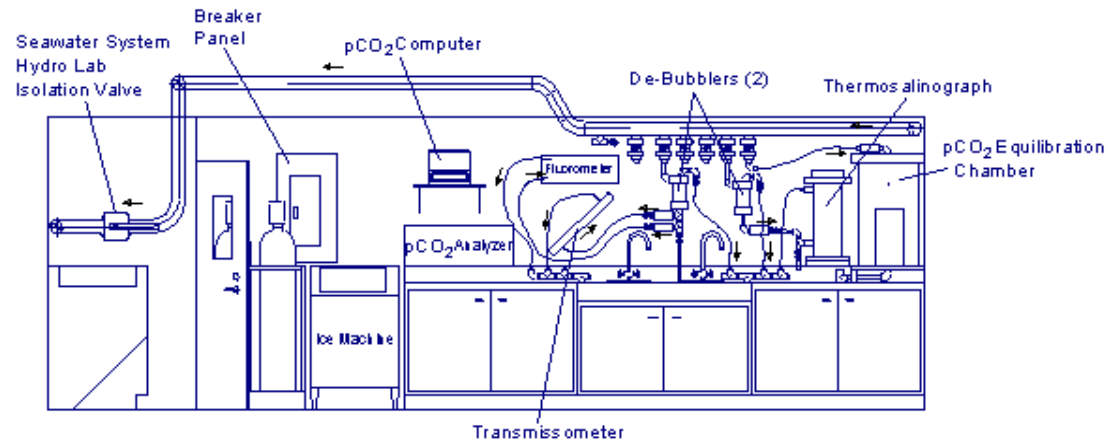
445 sq. ft.



Hydro Lab Elevations

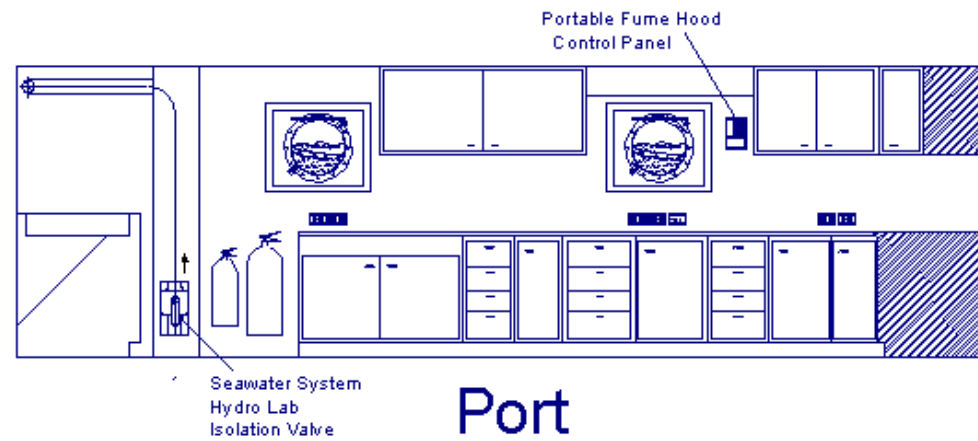
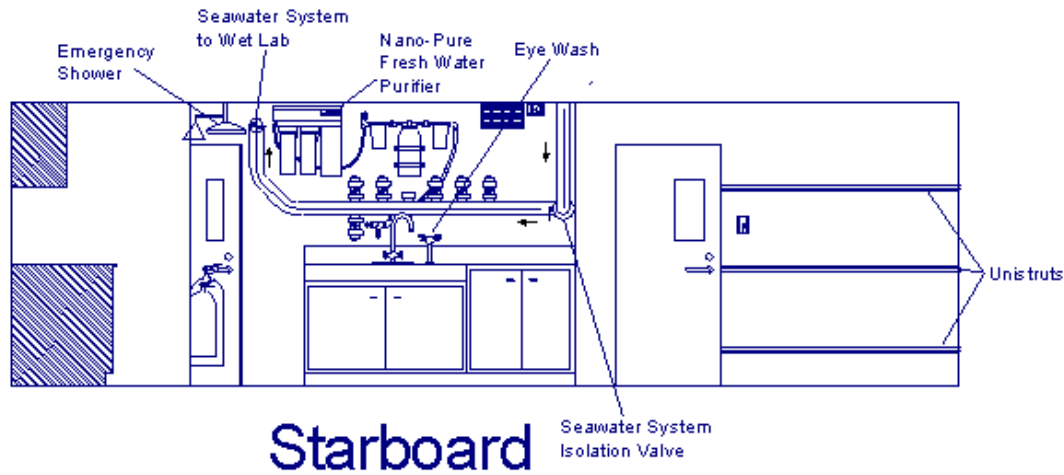


Forward



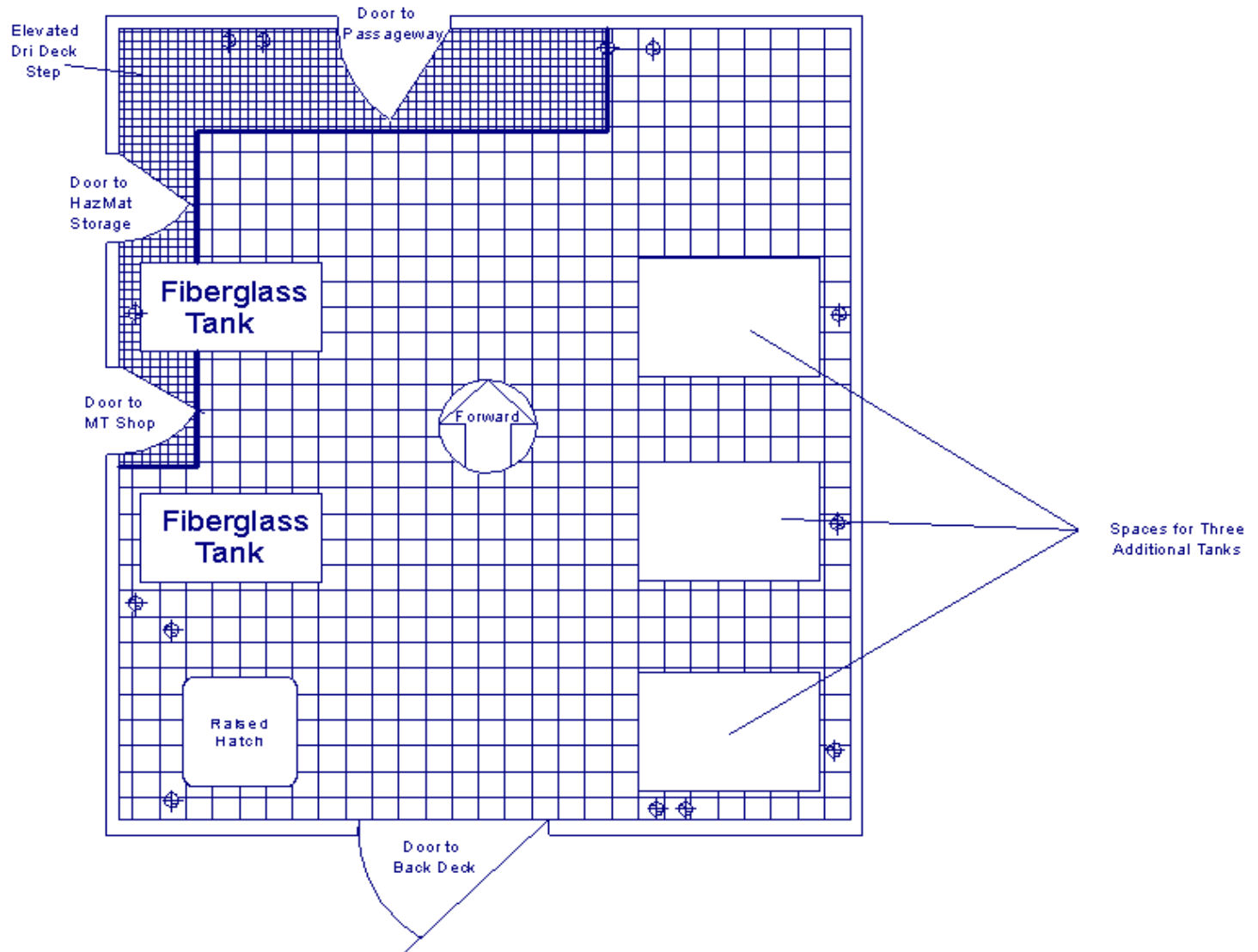
Aft

Hydro Lab Elevations



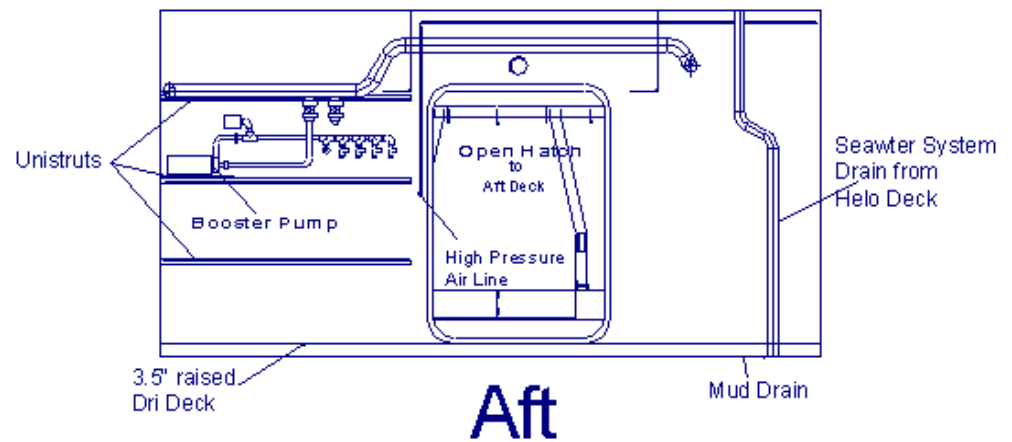
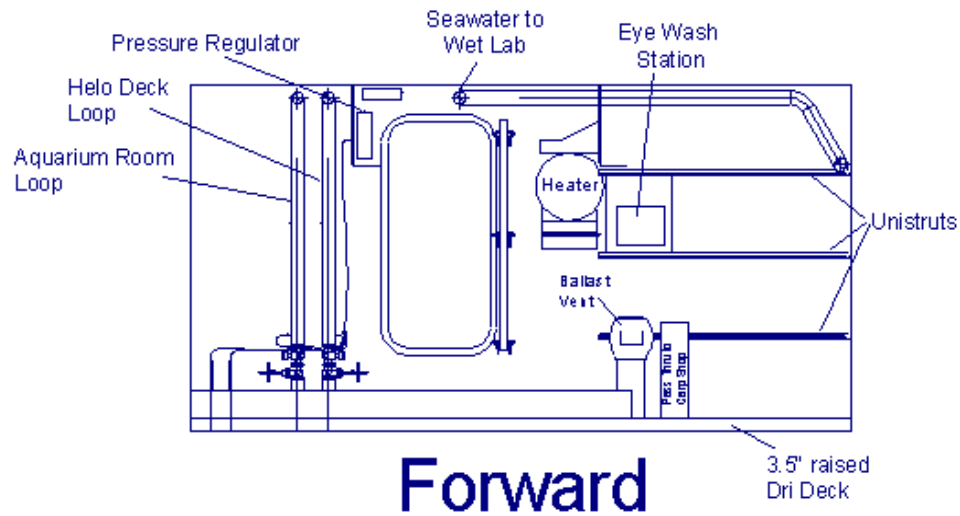
Aquarium Room

298 sq. ft.

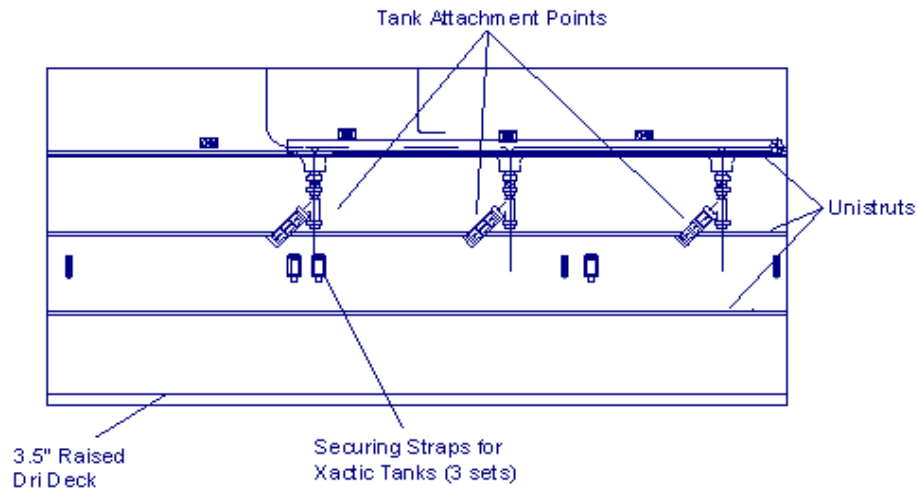


Flooring is
3.5" Raised
Dri-Deck

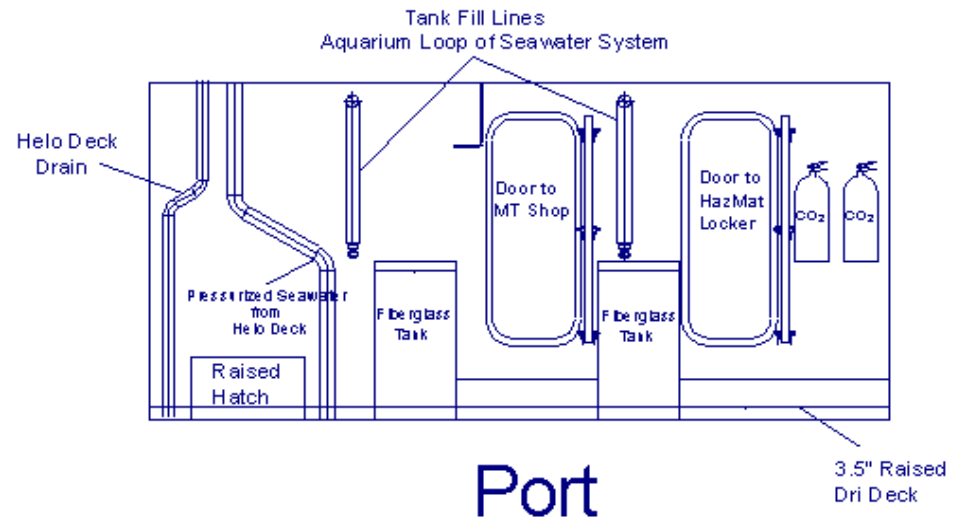
Aquarium Room Elevations

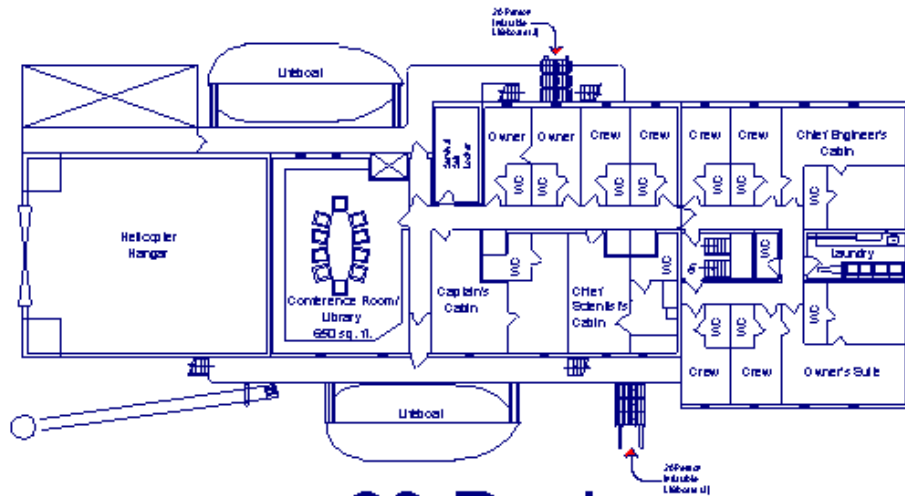


Aquarium Room Elevations

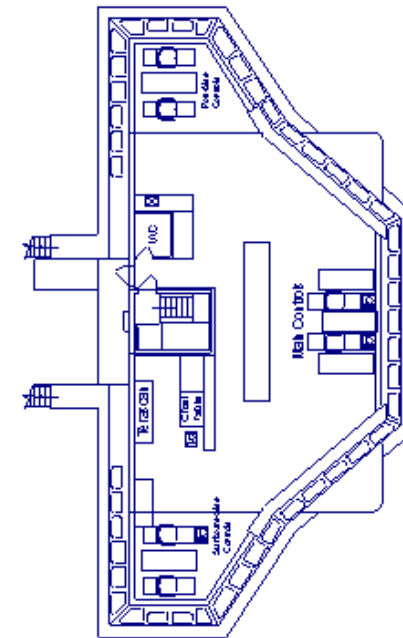


Starboard

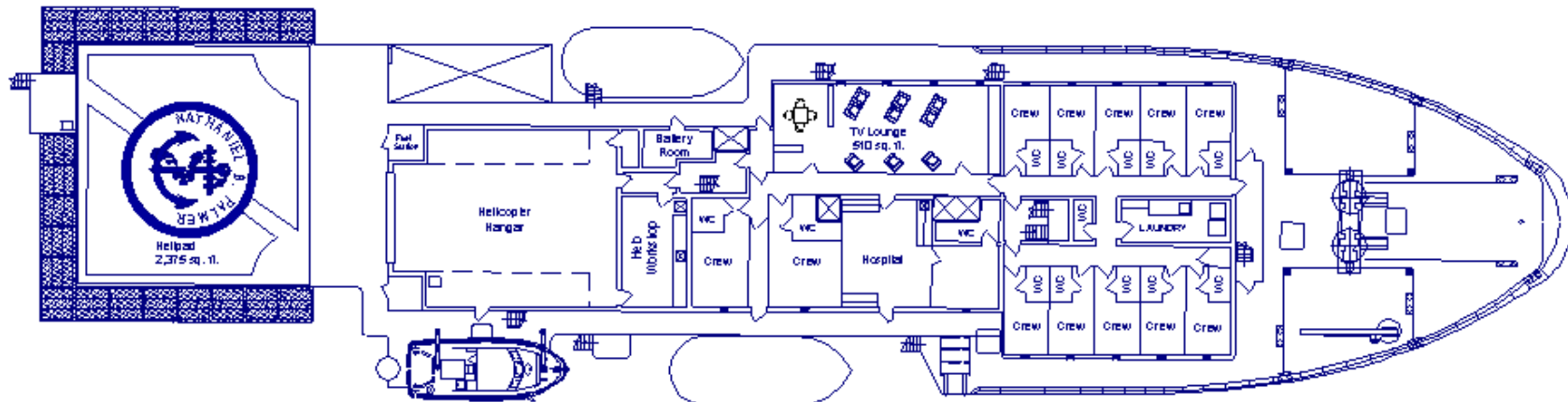




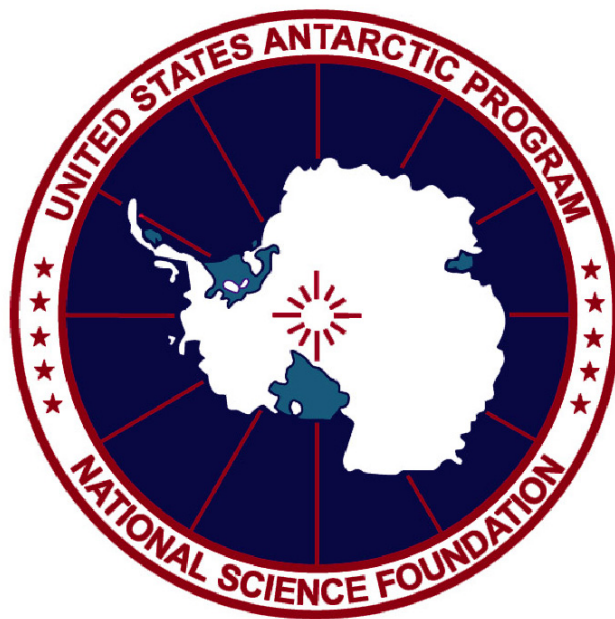
03 Deck



Bridge



02 Deck



ASC-18-200