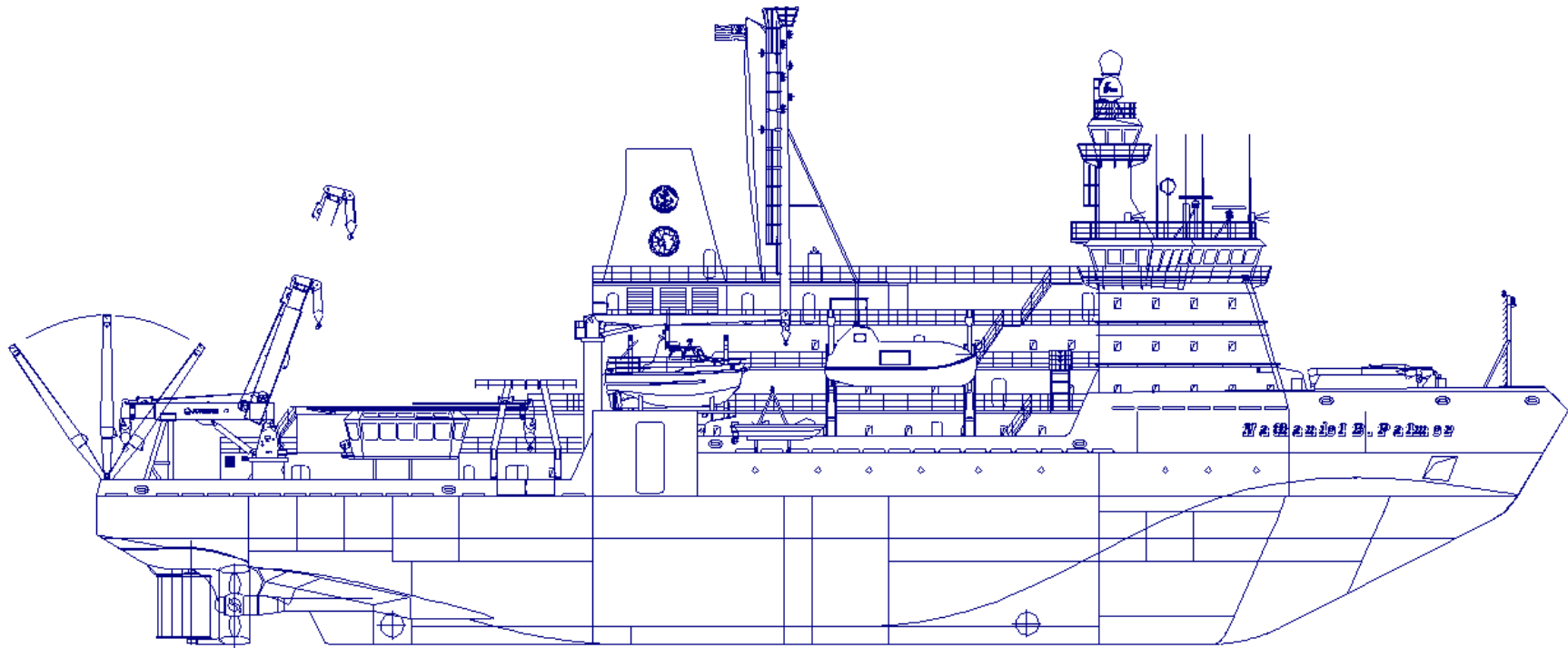

Nathaniel B. Palmer

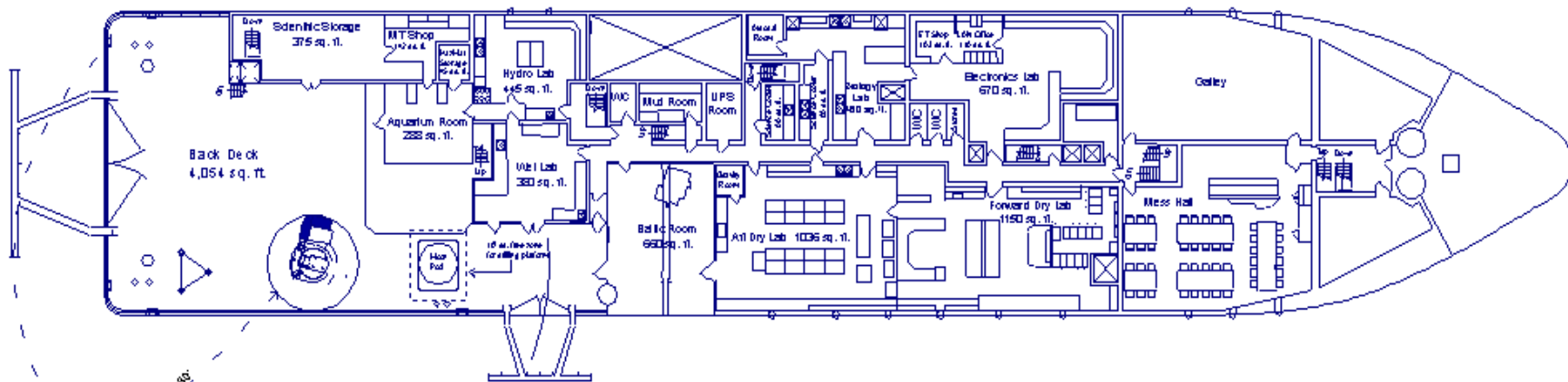
Research Vessel / Icebreaker



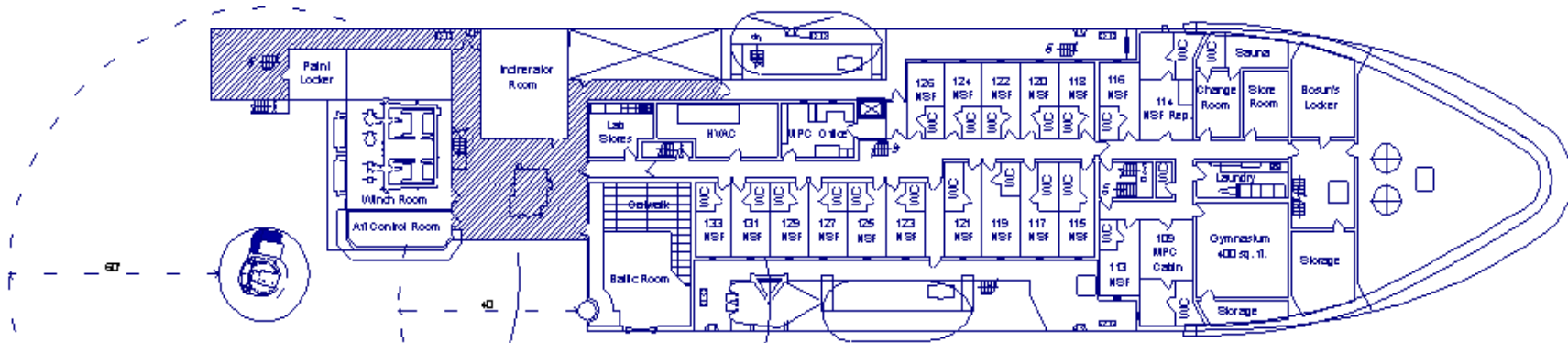
Operated for the
National Science Foundation Division of Polar Programs
by



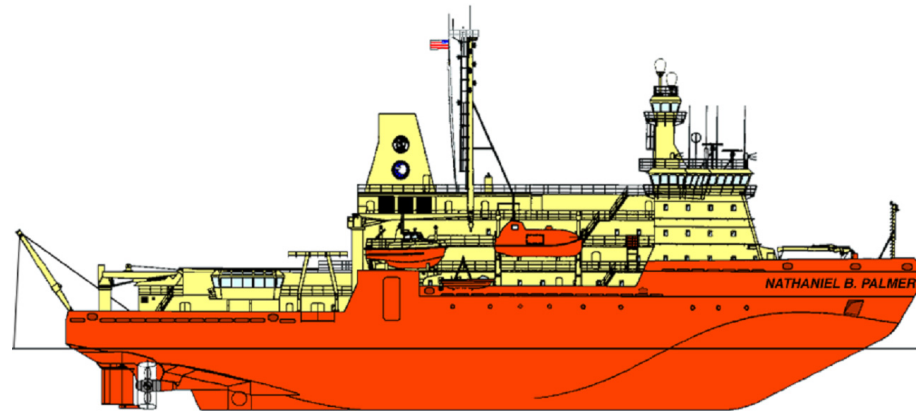
Under a charter with
Offshore Service Vessels LLC



Main Deck



01 Deck



The R/V Nathaniel B. Palmer is operated by Lockheed Martin 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 a technical staff to support science operations. Offshore Service Vessels LLC provides the vessel master, 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 ft 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 Ethernet 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 Vessel Services LLC	
Builder	North American Shipbuilding, U.S.A.	
Year Commissioned	1992	
Chartered to	Lockheed Martin 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 LT	6,909 t
Light Ship Weight	4,800 LT	4,877 t
Main Propulsion Machinery		
Shafts		
Number of Shafts	2	
Total Shaft HorsePower	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 heather 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	
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	
Incinerator	1		Spare	2	
Manufacturer	Golar 500		Total Accommodations	68	
Holding Tanks	2-hour duration		Special Features		
Emergency Diesel Generator			Helicopter hangar and ability to carry two small helicopters and 7,200 gallons of fuel		
Number	1		Low friction hull coating (Inerta 160)		
Rating	300 kW		No fuel oil in double bottom		
Manufacturer	Caterpillar		One compartment damage stability standard		
Glycol Heating System			Special Features (continued)		
Number	2		Overboard discharge on port side only		
Rating of each	6,600,000 BTU/hr		Uninterruptible and conditioned power in main work area and computer lab		
Manufacturer	Vapor Corporation		Two boilers to circulate water/antifreeze mixture under exterior deck on main level		
			Design Air Temperature	100° to -50° F	37.8° to 45.6° C
			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.</p> <p>It also maintains its structural integrity under low temperatures. Large diameter piping and a minimum of 90° turns helps prevent frazil ice formation in the system. The seawater system is also equipped with a centrifugal ice strainer/de-bubbler.</p>		
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			
Optical Plankton Counter					
Conductivity Temperature Depth (CTD) Sensor			Three Seawater Intakes		
<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>			Main	At Stern Thruster	6 in. diameter
			Secondary	At Moon Pool	6 in. diameter
			Tertiary	At Center of Hull	2.5 in. diameter
			Surface Seawater Sampling Equipment		
			Fluorometer	WET Labs	FLRTD
			Thermosalinograph	Sea-Bird	SBE-45
			Surface Seawater Sampling Equipment (continued)		
			Transmissometer	WET Labs	C-Star
			Digital Remote Temperature Sensor	Sea-Bird	SBE-38
			pCO ₂ Equilibration System	Lamont-Doherty Earth Observatory	
			Aquaria		
			Two permanent fiberglass tanks, space for four additional Xactic tanks (4 x 4 x 4 ft.)		
			Deck Incubators		
			Number	3	
			Material Type	Plexiglas	UV Transparent
			Water Purification Systems		
			E-pure four-holder system	Barnstead	Type I water (ultrapure) 2 L per minute
			Diamond UV	Barnstead	TOC-free water
			Bottom-Sampling Equipment		
			Dredges		
			Small Chain Dredge, Rock Dredge	Kahl Scientific	
			Large Chain Dredge, Rock Dredge	Kahl Scientific	
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	SBE 5			
CTD Pump	Sea-Bird	5T			
Fluorometer	WET Labs	AFLT			
Pinger 12 kHz	OIS	6000 (6,000 m)			
PAR	Biospherical Instruments	QSP-200L4S			
PAR	Biospherical Instruments	QCP-2300			
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

Coring Equipment			Sonar Systems		
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 Nathaniel B. Palmer.			Acoustic Doppler Current Profiler		
Jumbo Piston Corer	Woods Hole Oceanographic Institute		Teledyne RDI	OS-75	
Standard Piston Corer	Woods Hole Oceanographic Institute		Teledyne RDI	OS-38	
Gravity Corer			3.5 kHz sub-bottom profiler		
Kasten Corer	State University of New York/Ocean Instruments		Knudsen	3260 Chirp, 10 kW	
Mega Corer	Mark I			12 kHz bottom tracker	
Deep Sea Rock Dredge	Scripps Institute of Oceanography		EM 122 Multibeam System	Simrad	12 kHz full-ocean-depth swath mapping
Grab Sampler	Smith-MacIntyre		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.		
Seismic Instrumentation			38, 120, and 200 kHz Scientific Echo Sounder		
Seismic Data Logger	Geometrics	24-Channel Geode Seismic Recorder	Simrad	EK-60	
Research Vessel Data Acquisition System (RVDAS)	Lamont Doherty Earth Observatory / Raytheon Polar Services	Linux-Based Data Acquisition System	12 kHz PDR (for pinger tracking)		
Magnetometer	Marine Magnetics	Seaspy	O.D.E.C. / Raytheon		
Digital Benthic Camera, with Strobe	Ocean Imaging Systems	DSC 10000 Strobe Model: 3831	Chirp Sidescan Sonar / Sub-Bottom Profiler, towed	Teledyne Benthos	SIS-1625, max. depth: 2000 m
Seismic Gun Controller	Real Time Systems	HotShot Seismic Source Synchronizer	Diving Equipment		
Gravity Meter	Bell Aerospace	BGM-3	Dive Compressors (one (1) on board)	Bauer	Fills to 3,000 psi
Solid Single-Channel Seismic Streamer	Geometrics	Length: 10 m active section, 12 hydrophones	Dive Van (dive gear storage and setup)	20 x 8 x 8.5 ft.	
Seismic Sound Sources			DAN (Divers Alert Network) Oxygen Kit		
Generator Injector (GI) Seismic Air Guns (6)	Seismic Systems Inc.	210 cu in. configurable in volume and mode via volume & port reducers	Meteorological Sensor Suite		
Bolt Gun 1500 Long Life Airgun	Bolt Technology Corp.	Sizes in cu. in.: 1,000, 800, 500, 450, 400, 350, 300, 200, 145, 80	Humidity/Wet Temp	RM Young	41372LC
GI Water Gun (1)	Seismic Systems Inc.	15 cu in.	Barometer	RM Young	61201
Seismic Air Compressors	Borsig-LMF	1,200 scfm 2,000 psi	Anemometer	Gill	Wind Observer II (ultra-sonic)
			Precision Infrared Radiometer	Eppley	PIR
			Pyranometer	Eppley	PSP
			PAR Radiometer	Biospherical	QSR-240
			PRR (mast)	Biospherical	PRR-800/810
			GUV (mast)	Biospherical	GUV-2511
			PUV (underwater)	Biospherical	PUV-2500

RVIB Nathaniel B. Palmer

Principal Features and Technical Information

Time & Navigation Systems			Space Allocation		
Time & Frequency Receiver and Clock	Symmetricom	XLI	Lab spaces feature recessed unistrut on 2' centers, floor and ceiling, running fore and aft		
GPS	Furuno		Main Deck		
GPS, with heading and attitude	Seatex	SeaPath 200	Electronics/Computer Lab	670 sq. ft	
GPS, with heading and attitude	Seatex	SeaPath 330	Forward Dry Lab	1,150 sq. ft	
Gyrocompass (2)	Yokogawa	KM008-E	Aft Dry Lab	1,036 sq. ft	
3 cm Radar (X-band)	Furuno	FAR 2822X	Hydro Lab	445 sq. ft	
10 cm Radar (S-band)	Furuno	FAR 2837S	Wet Lab	416 sq. ft	
HF WEFAX	Furuno	DFAX	Bio Lab	460 sq. ft	
HF Radio Direction Finder (RDF)	Simrad		Science Coolers	2 @ 86 and 68 sq. ft	
VHF Radio Direction Finder	Taiyo	TDC338H2 MKI	Baltic Room / Staging Area	680 sq. ft	
TeraScan	TeraScan	DL500	Aquarium Room	298 sq. ft	
The TeraScan provides automated reception of NOAA, DMSP, and METOP meteorological/ environmental satellite data and processing of data into images and data overlays in real time.			Marine Tech Workshop	142 sq. ft	
Communication Equipment			Scientific Storage	375 sq. ft	
The NBP is Global Maritime Distress Safety System (GMDSS) compliant. This means there is automatic, complete redundancy for ship to ship & ship to shore communication.			Electronic Equipment Room	96 sq. ft	
Fleet Broadband	Thrane and Thrane	FBB500	Changing / Mud Room / Darkroom	100 sq. ft	
Inmarsat-C	Sailor		Lower Deck		
Iridium	Motorola	9505a	Scientific Storage	170 sq. ft	
VHF Radios			Scientific Storage	four 20-foot containers	
Sailor	RT146	Bridge to Bridge	Exterior Main Deck		
Sailor	RT2048	Main	Deck tie down points are located at 2 ft centers on the main deck and helo deck		
Sailor	RM2042	Watch Receiver	Science Vans		
HF SSB Radios			Radioisotope Vans	2 vans	20 x 8 x 8 ft.
Sailor	SP300		Freezer Lab Vans	2 vans	20 x 8 x 8 ft.
Sailor	T2130		Garage/Trace Metal Clean Van	1 van	20 x 8 x 8 ft.
Computers and Networking			Recreation / Leisure Spaces		
Windows, Macintosh, and Linux operating systems available. There are six to eight computers available for general usage in the E-Lab, Aft Dry Lab and in the 03 Level Conference Room.			Library / Conference Room (03 Deck)	700 sq. ft	
Network	400 LAN drops throughout ship, including cabins		TV Lounge (02 Deck)	510 sq. ft	
E-mail	Transmitted via satellite every 30 minutes.		Gymnasium (01 Deck)	400 sq. ft	
Individual email size restrictions	10 MB outgoing	10 MB incoming			

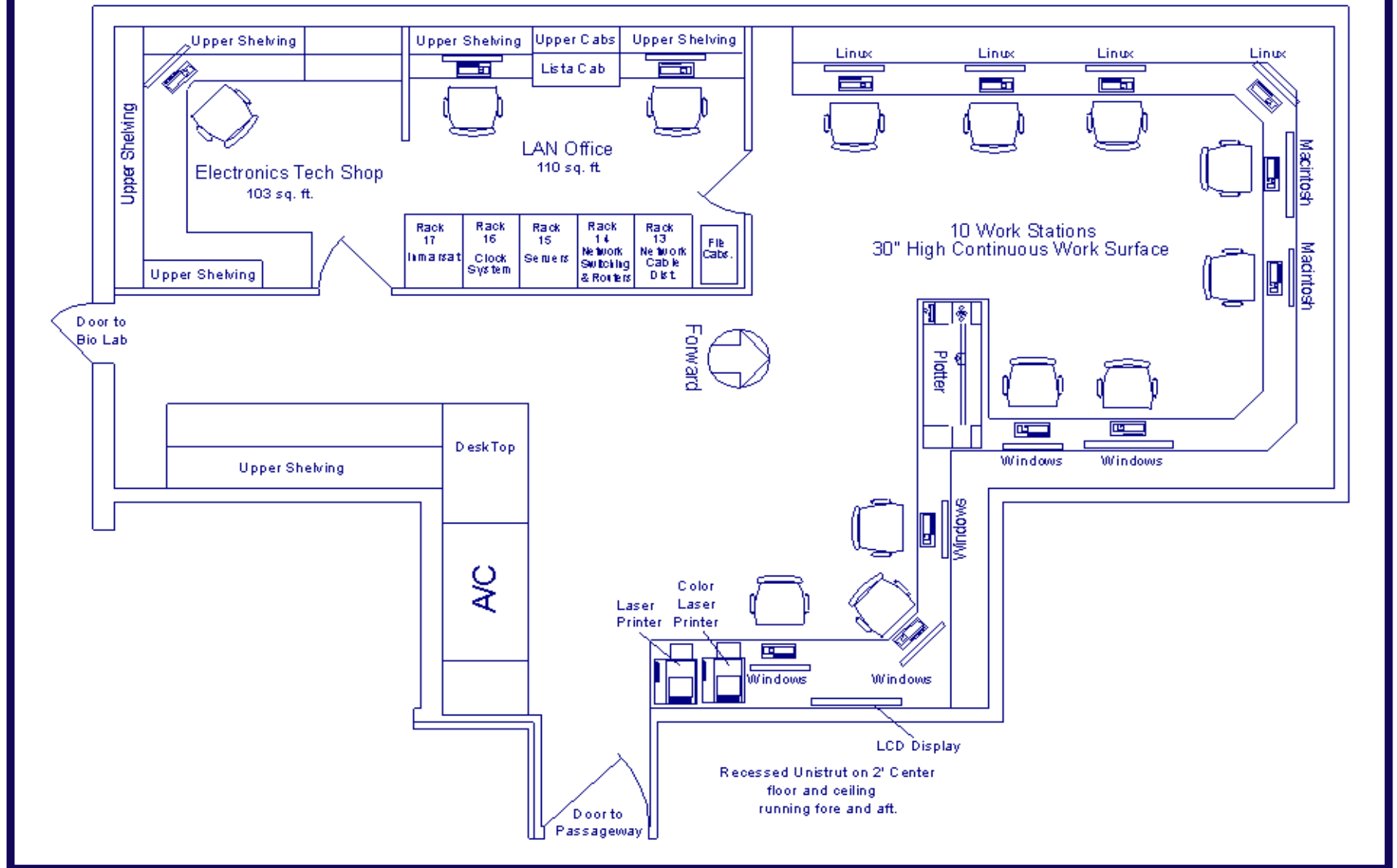
RVIB Nathaniel B. Palmer
Principal Features and Technical Information

NOTES

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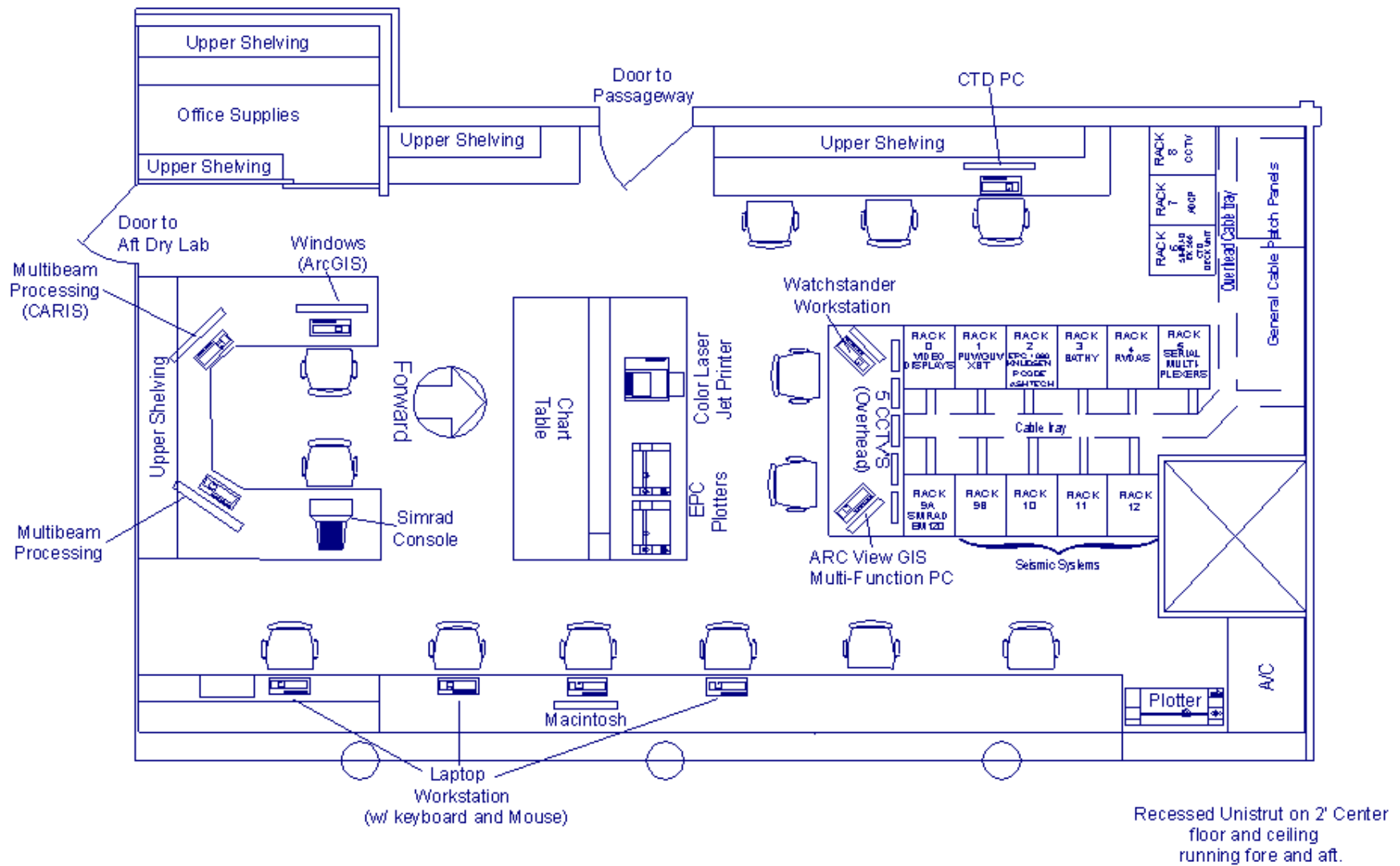
Electronics Lab

670 sq. ft.



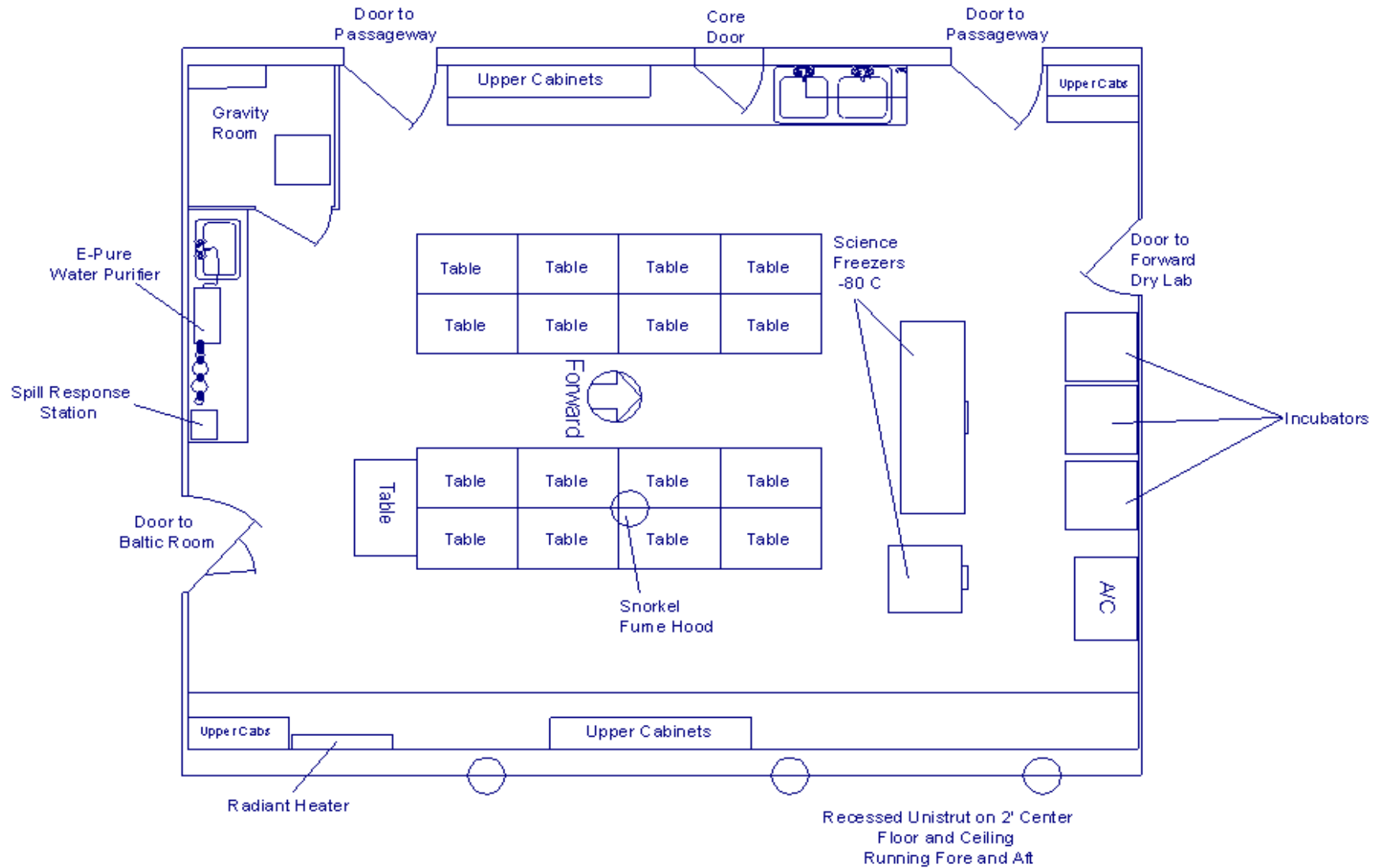
Forward Dry Lab

1150 sq. ft.

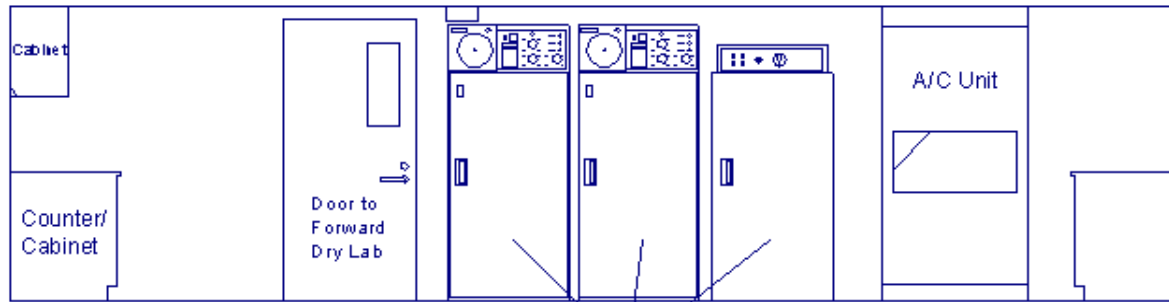


Aft Dry Lab

1036 sq. ft.

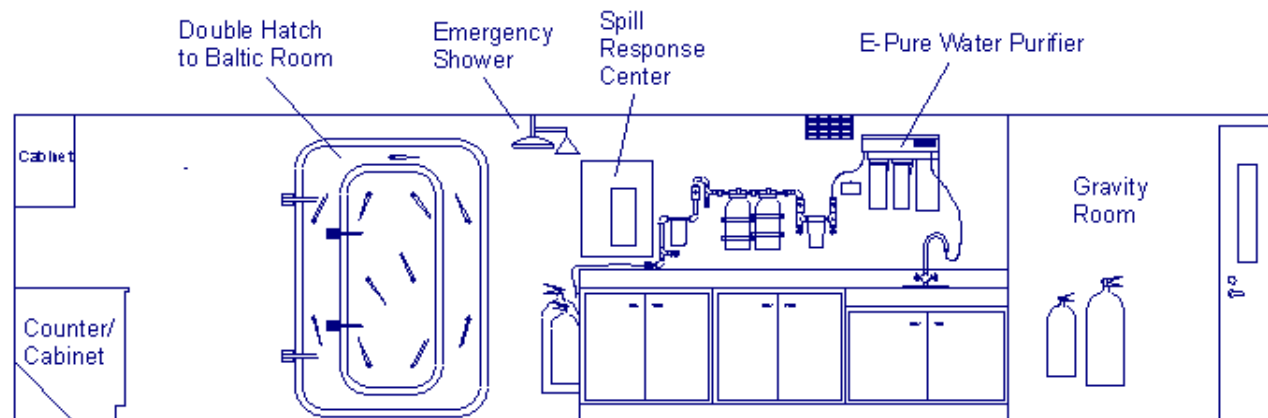


Aft Dry Lab Elevations



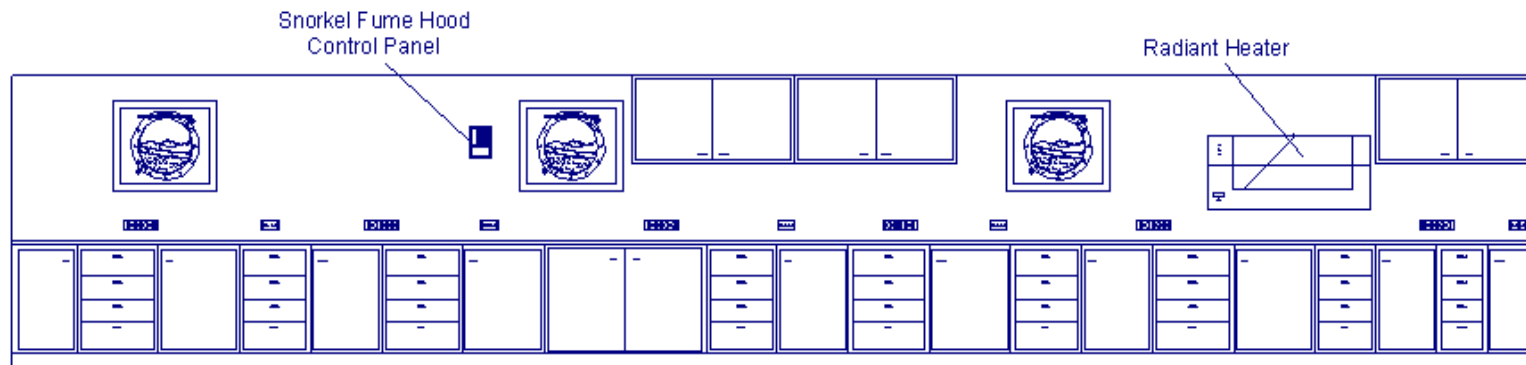
Forward

Science Incubators

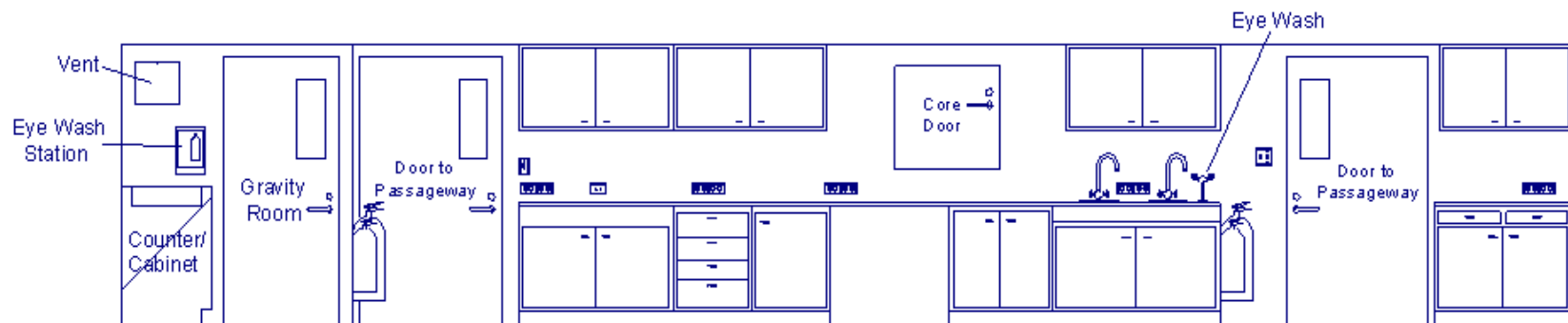


Aft

Aft Dry Lab Elevations



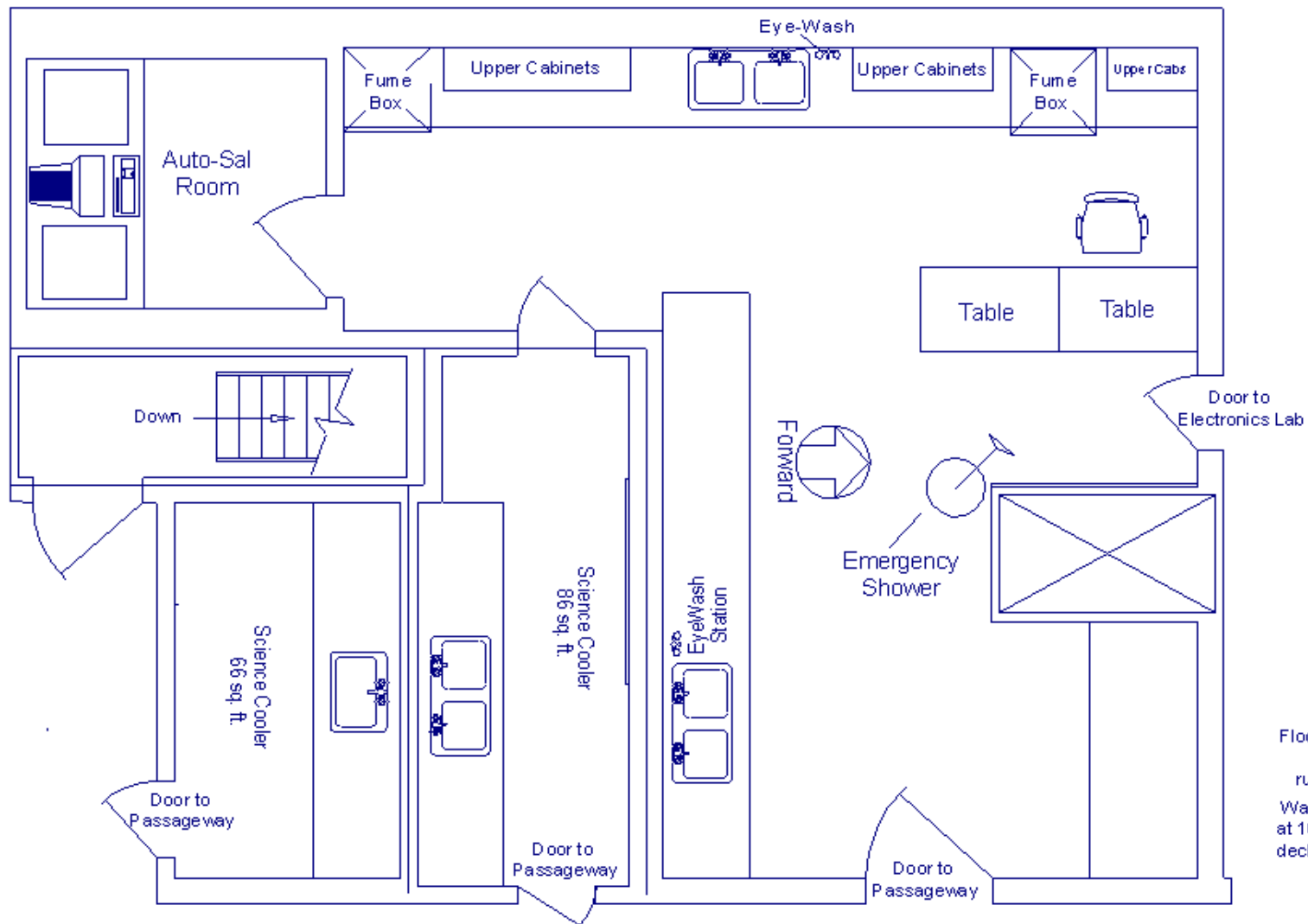
Starboard



Port

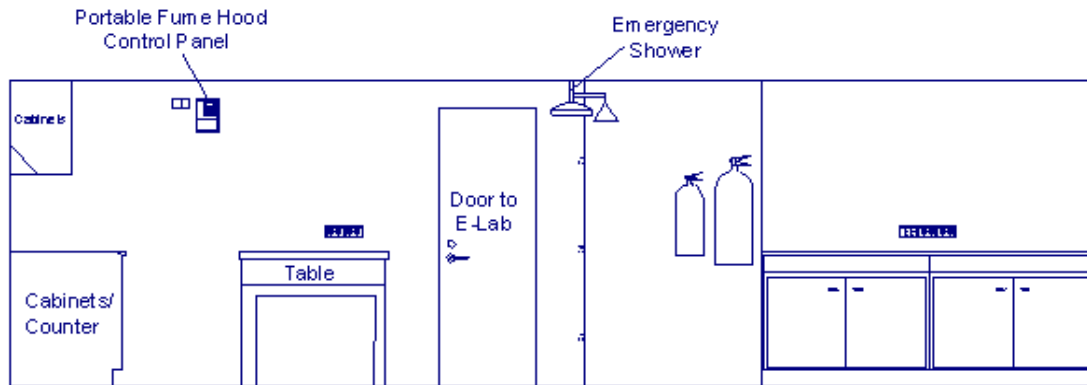
Bio Lab

460 sq. ft.

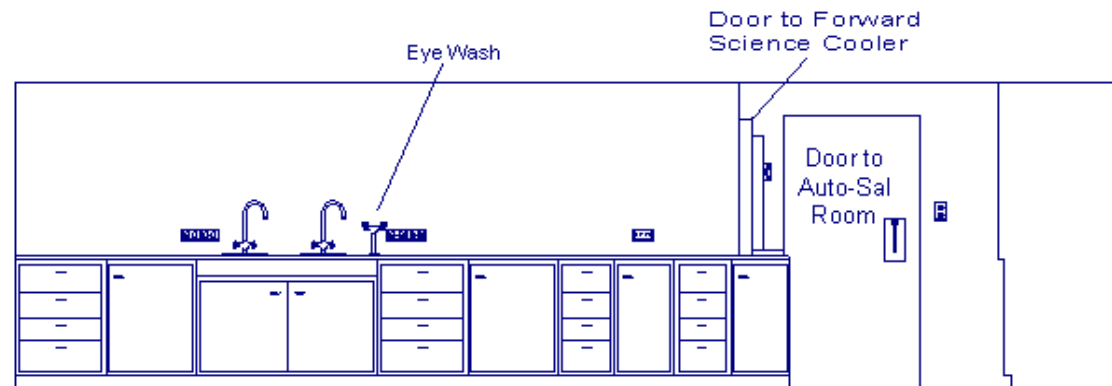


Floor and Ceiling Unistrut on 2' center running fore and aft.
Wall Mounted Unistrut at 16", 32", and 48" from deck for gas bottle storage

Bio Lab Elevations

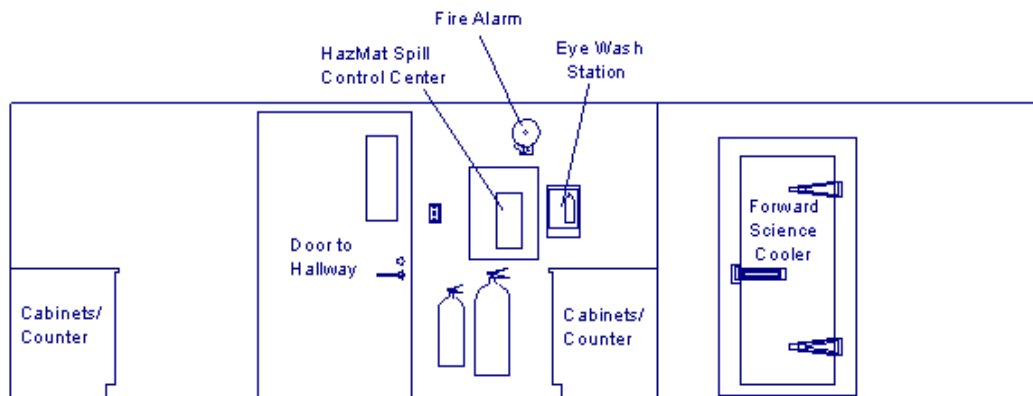


Forward

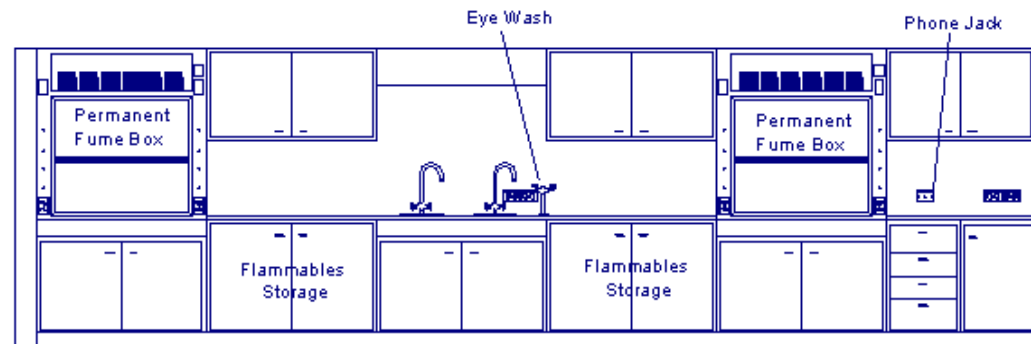


Aft

Bio Lab Elevations



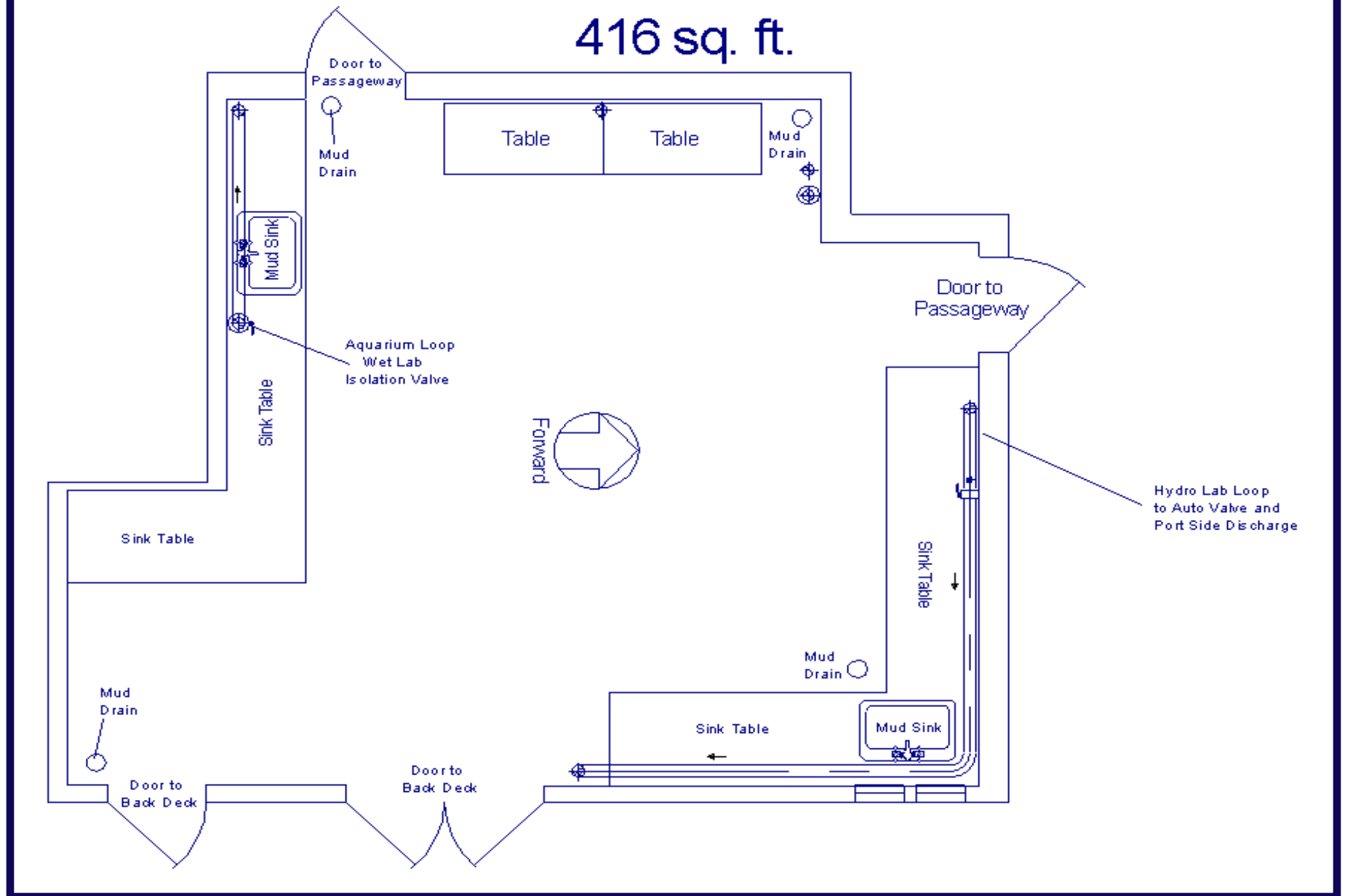
Starboard



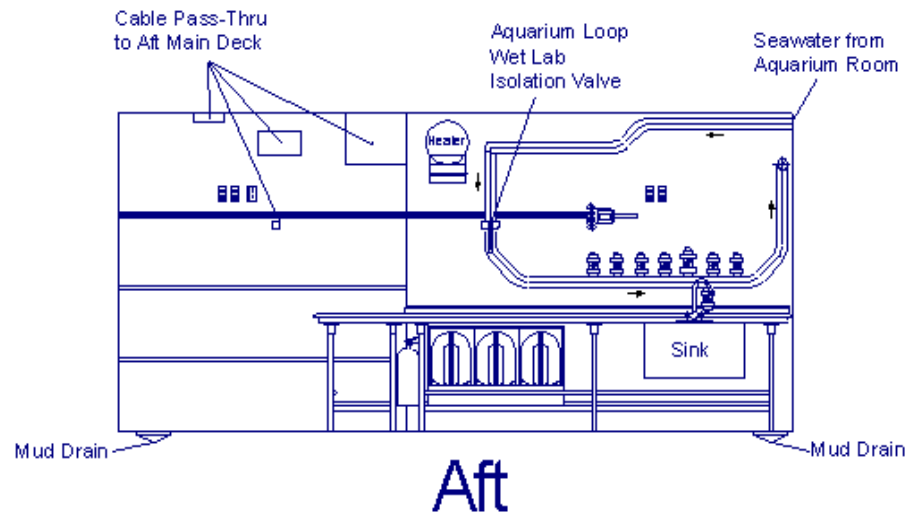
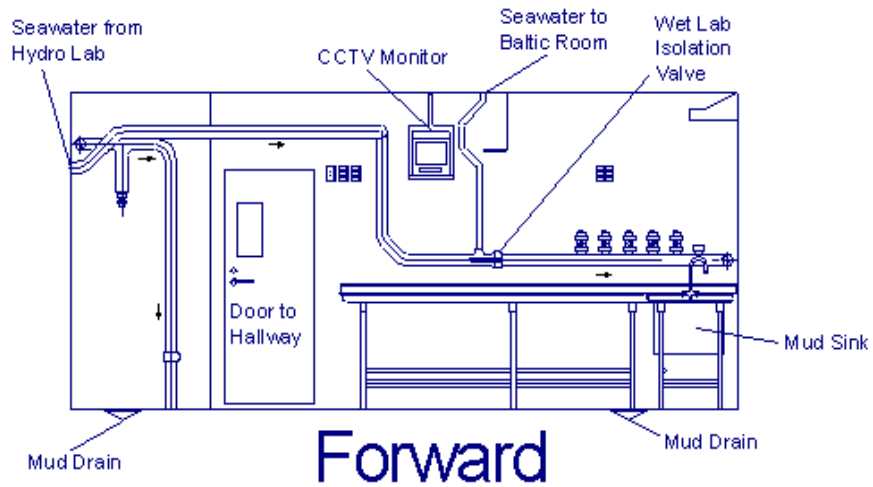
Port

Wet Lab

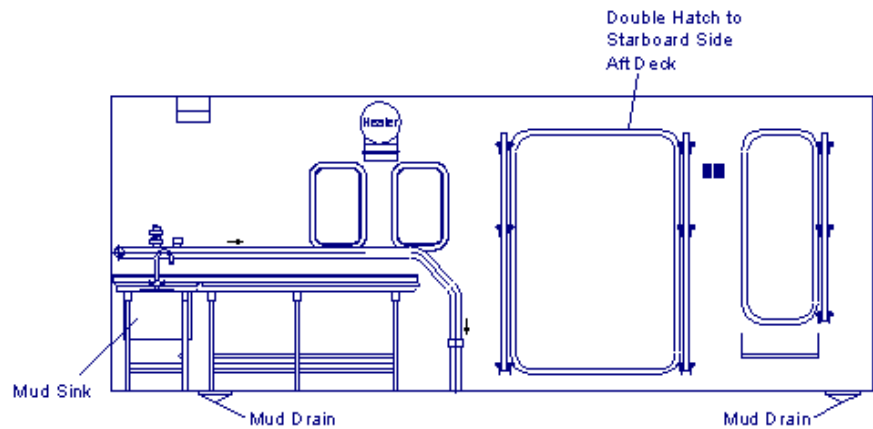
416 sq. ft.



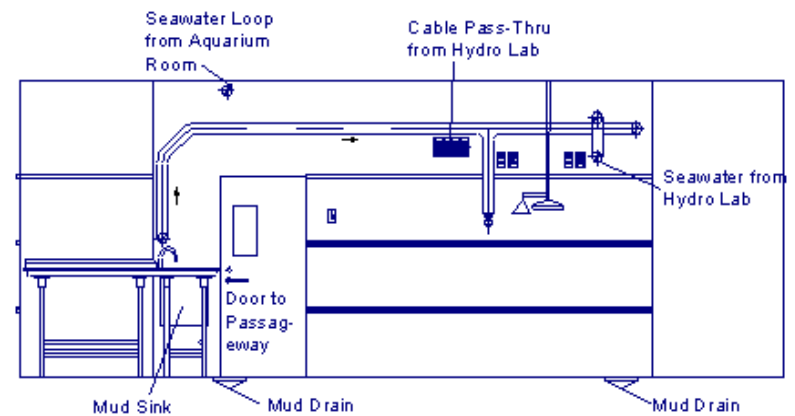
Wet Lab Elevations



Wet Lab Elevations



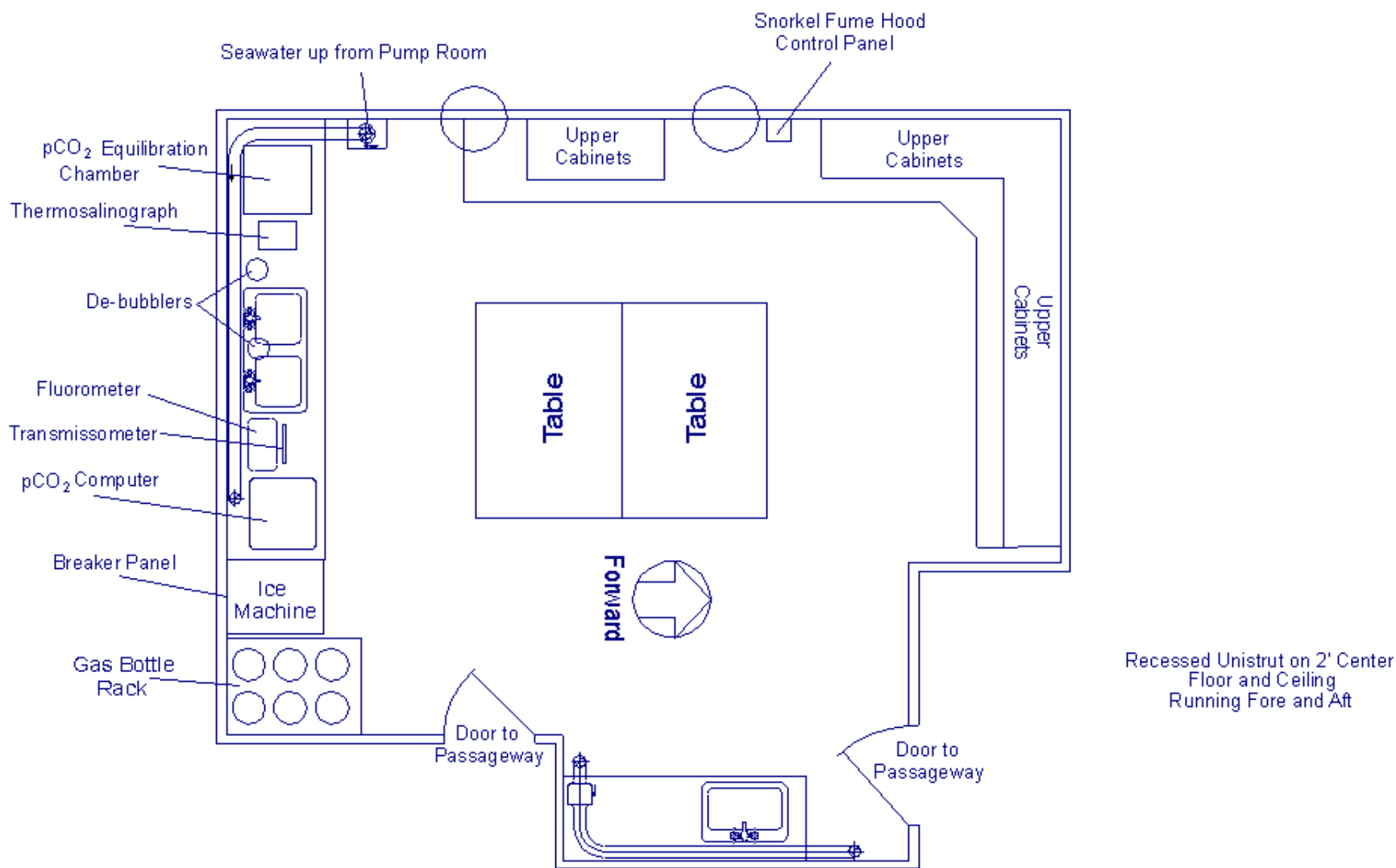
Starboard



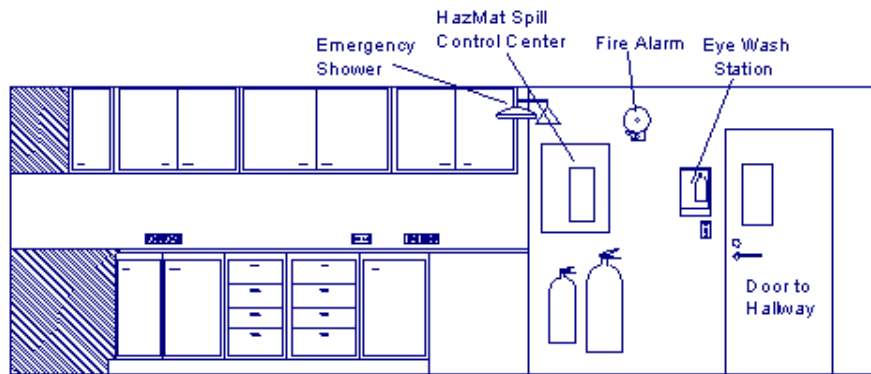
Port

Hydro Lab

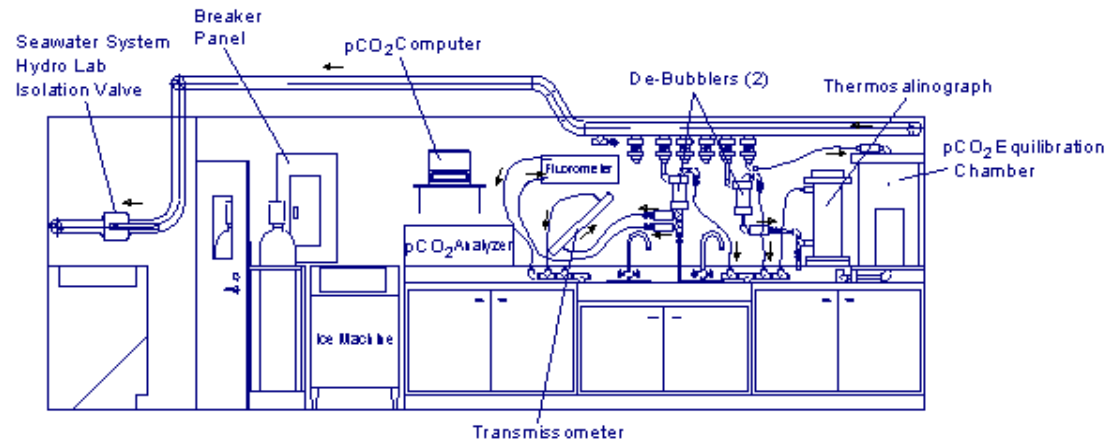
445 sq. ft.



Hydro Lab Elevations

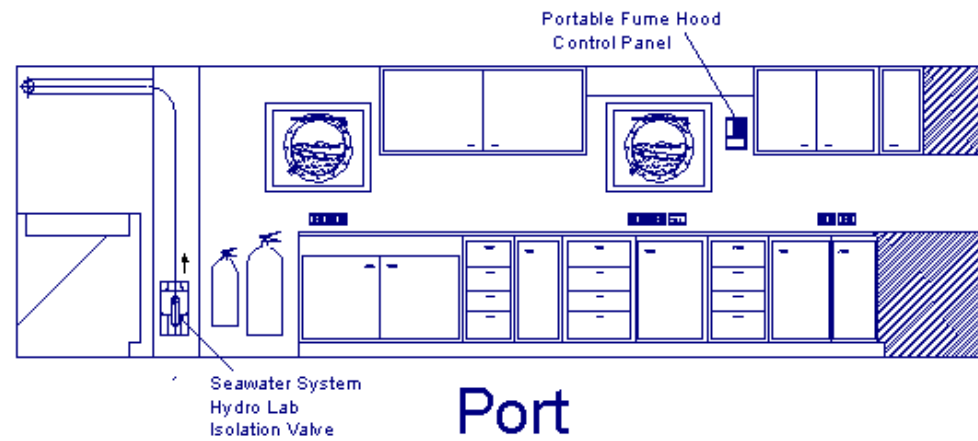
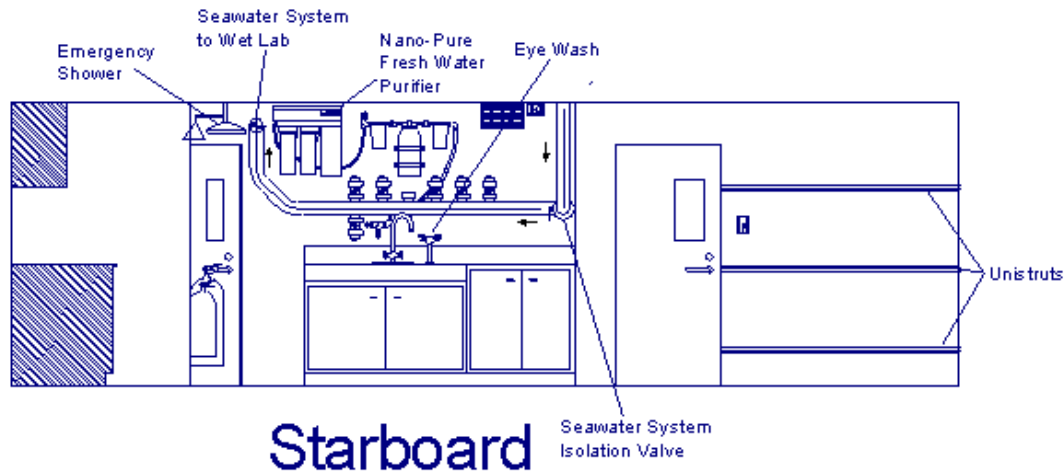


Forward



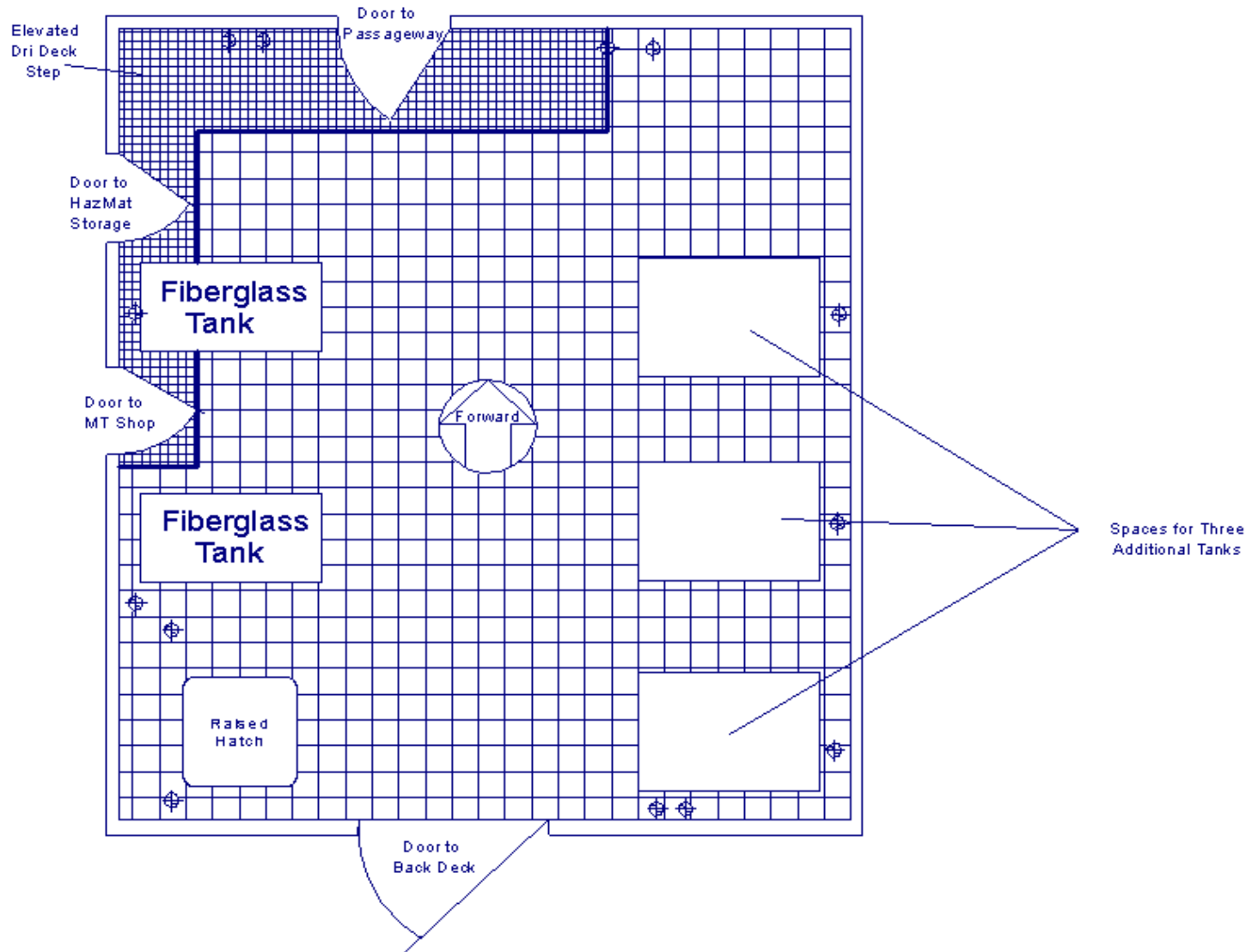
Aft

Hydro Lab Elevations



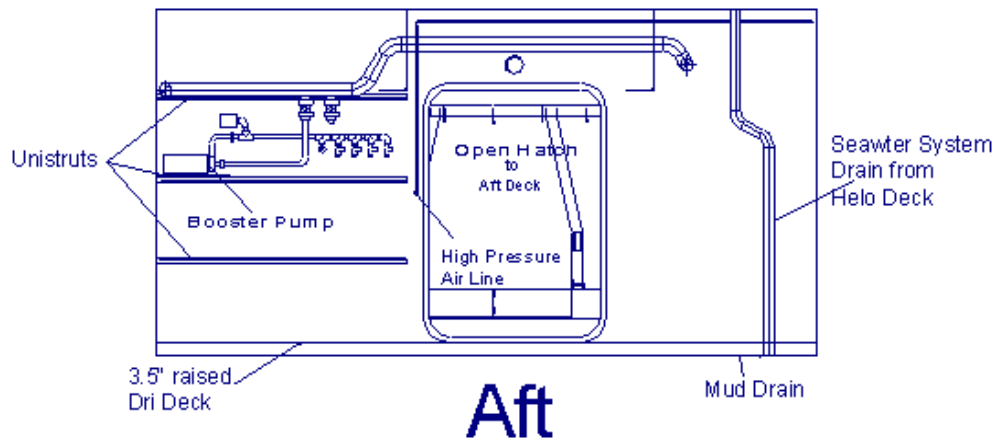
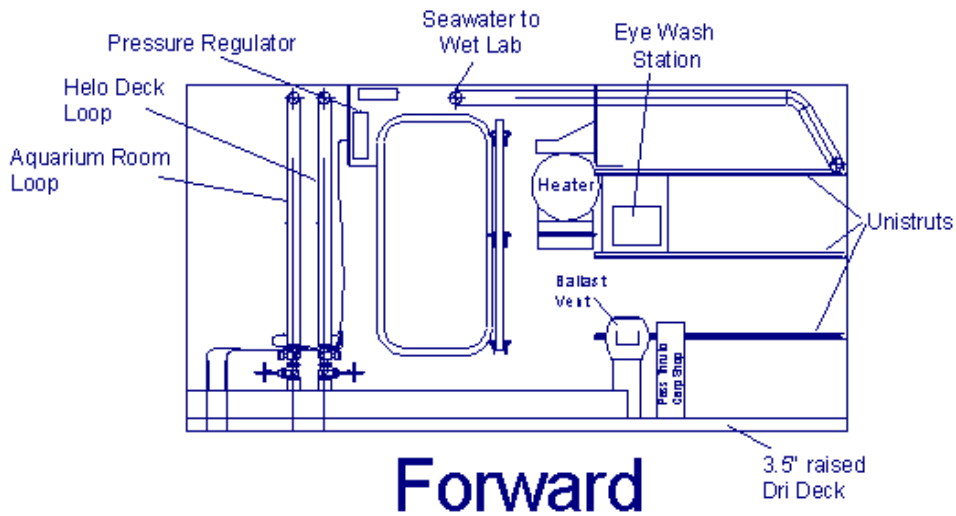
Aquarium Room

298 sq. ft.

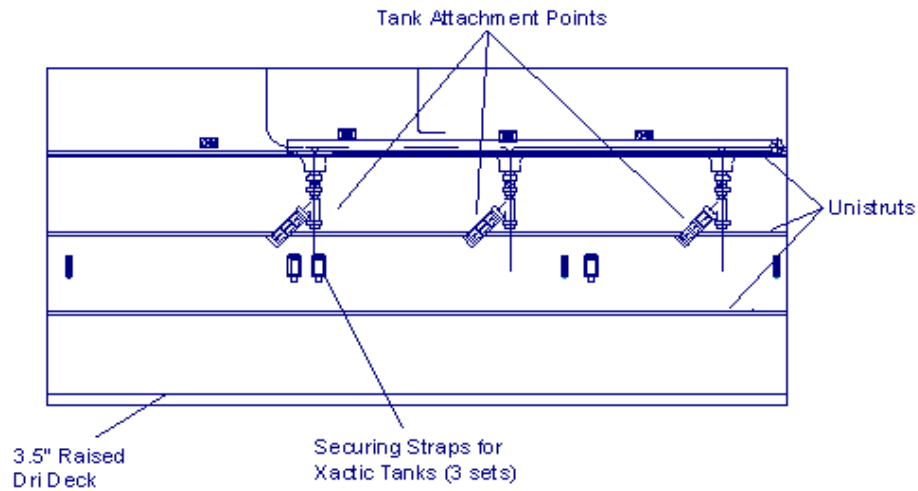


Flooring is
3.5" Raised
Dri-Deck

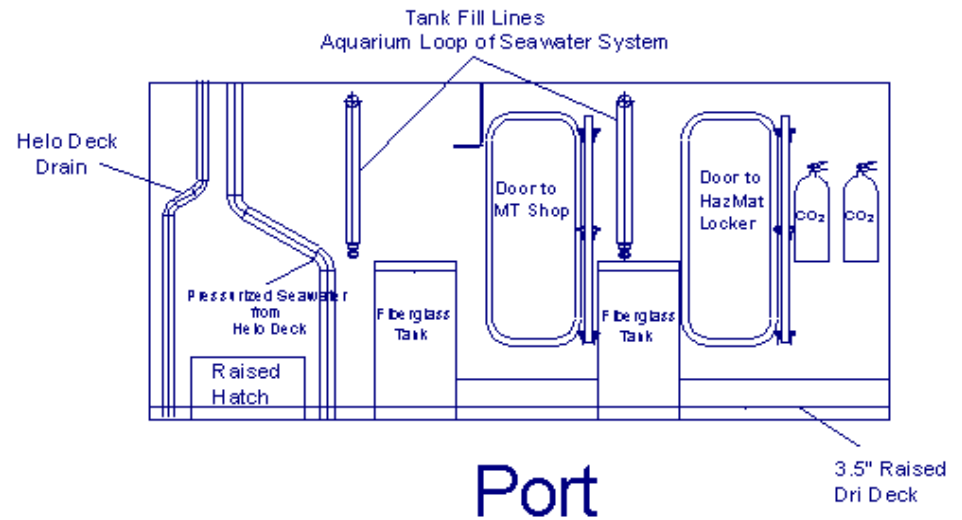
Aquarium Room Elevations

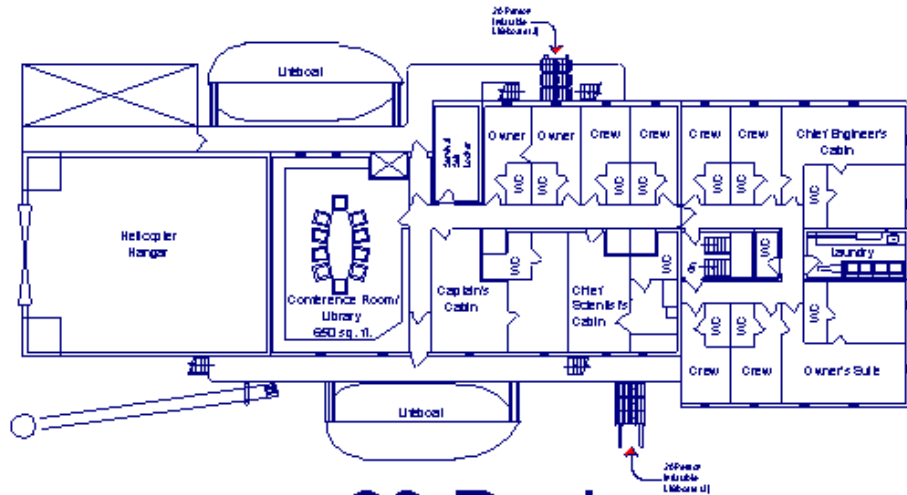


Aquarium Room Elevations

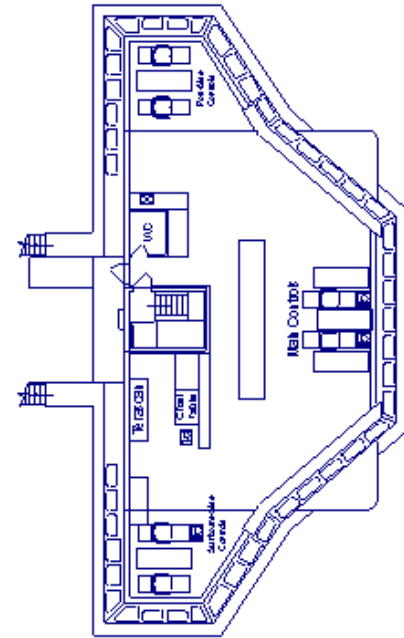


Starboard

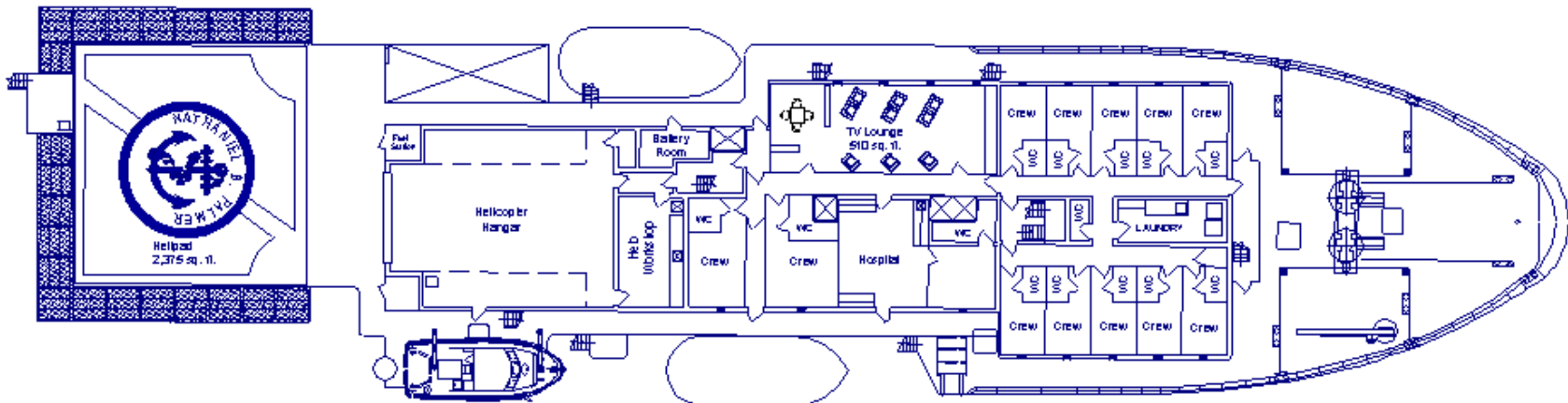




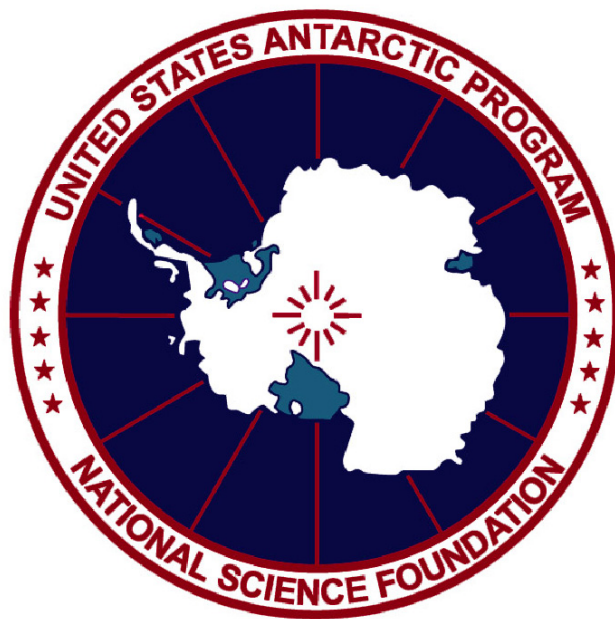
03 Deck



Bridge



02 Deck



ASC-15-200