

MATERIAL SCHEDULE													GENERAL NOTES	
PIPING SYSTEM	PIPE		TAKEDOWN JOINTS			VALVES		FLEX CONN'S	FITTINGS TYPE & MATERIAL	MAXIMUM WORKING CONDITIONS			REMARKS	
	SIZE	MATERIAL	MATERIAL	GASKETS	BOLTING	BODY	TRIM			SYSTEM	PRESSURE	TEMP		
SEAWATER COOLING (CLASS 2 PIPING)	2" & BELOW	CNA 90:10, C70600 ASME SB466 CLASS 200, SEAMLESS	UNION BRONZE, ASME SB61, BRAZED, MIL-F-1183	NEOPRENE CLOTH INSERTED FULL FACE ANSI B16.21	STEEL ASTM A307 ANSI B18.2.1 GRADE B	BRONZE, CLASS 150 ASME SB61 OR SB62, BRAZED MSS-SP-80	MONEL OR 316 STAINLESS STEEL	SEE GENERAL NOTE 12	BRONZE, ASME SB61, BRAZED MIL-F-1183	SW COOLING	50 PSIG	80°F	FOR SIZES ABOVE 6", WELDED TUBING MAY BE USED IN LIEU OF SEAMLESS.	
	2-1/2" & ABOVE		FLANGE, BRONZE, ASME SB61 OR SB62, BRAZED, ANSI B16.24, CLASS 150		STEEL, ASTM A563 ANSI B18.2.2 GRADE A	FLANGED BRONZE, CLASS 150 ASME SB61 OR SB62, MSS-SP-80, MSS-SP-67, WAFER OR LUG, DUCTILE IRON, ASTM A395	MONEL OR 316 STAINLESS STEEL RENEWABLE		CNA 90:10, ASME SB466 BUSHIPS DWG, 810-135880 CLASS 200, BUTTWELDED					
VENTS & OVERBOARD (CLASS 2 PIPING)	2" & BELOW	CARBON STEEL ASTM A53 OR A106, GR B. VENTS-SCH 40, OVBDS-SCH 80, ANSI B36.10, SEAMLESS	STEEL, UNION, ASTM A105 MSS-SP-83, CLASS 3000, NPT	NITRILE FULL FACE ANSI B16.21	STEEL ASTM A307 ANSI B18.2.1 GRADE B	STEEL, ASTM A105 OR A216 GR WCB, ANSI B16.34, NPT, CLASS 150	MONEL OR 316 STAINLESS STEEL	SEE GENERAL NOTE 12	STEEL, ASTM A105 OR A234, GR WPB, ANSI B16.11, CLASS 3000, NPT	VENTS OVERBOARDS	ATMOSPHERIC 50 PSI	80°F	VENTS SHALL BE MADE OF STEEL SCHEDULE 40 PIPE. OVERBOARDS SHALL BE MADE OF STEEL SCHEDULE 80 PIPE.	
	2-1/2" & ABOVE		STEEL, FLANGE, ASTM A105 OR A216, GR WCB, ANSI B16.5, CLASS 150, SLIP-ON OR WELDED NECK		STEEL, ASTM A563 ANSI B18.2.2 GRADE A	STEEL, ASTM A105 OR A216, GR WCB, ANSI B16.34, FLANGED, CLASS 150, MSS-SP-67, WAFER OR LUG	MONEL OR 316 STAINLESS STEEL RENEWABLE		STEEL, ASTM A234, GR WPB, ANSI B16.9 & B16.28, SCH 80 BUTTWELD					

- PIPING SYSTEM DESIGN, MATERIAL, INSTALLATION, TESTING AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH USCG REGULATIONS, ABS RULES, MARPOL AND THE INTERNATIONAL CONVENTION FOR SAFETY OF LIFE AT SEA.
- THIS DRAWING PROVIDES DIAGRAMMATIC ILLUSTRATIONS OF PIPING SYSTEMS. PIPING ARRANGEMENTS WITHIN THE VESSEL SHALL BE DEVELOPED BY THE SHIPYARD.
- EQUIPMENT AND MACHINERY PERFORMANCE CHARACTERISTICS AND PIPE SIZING INFORMATION SHALL BE CONFIRMED BY THE SHIPYARD BASED ON THE SYSTEM'S PIPING ARRANGEMENT AND DETAILS AND CERTIFIED MANUFACTURER'S DATA.
- PIPING INSTALLATIONS SHALL PERMIT FREE PASSAGE ALONG WALKWAYS AND LADDERWAYS; FREE ACCESS FOR OPERATION AND ROUTINE MAINTENANCE; FREE ACCESS TO ALL DOORS, HATCHES AND OPENINGS; AND, AS MUCH AS IS PRACTICABLE, BE FREE OF INTERFERENCE TO THE READY REMOVAL OF EQUIPMENT AND SYSTEM COMPONENTS.
- SUITABLE TAKEDOWN JOINTS SHALL BE PROVIDED IN PIPING SYSTEMS FOR READY REMOVAL OF MACHINERY AND EQUIPMENT.
- GAGE PIPING ASSEMBLIES AND MATERIALS SHALL BE IN ACCORDANCE WITH ASTM F721, EXCEPT PIPING ROOT VALVES SHALL BE AT LEAST 1/2-INCH.
- PIPE WELDING SHALL COMPLY WITH THE REGULATORY BODY REQUIREMENTS AND WITH THE DETAILS GIVEN IN ASTM F722.
- BULKHEAD AND DECK PIPING PENETRATIONS SHALL MAINTAIN THE WATERTIGHT AND FIRE RATING OF THE BOUNDARY AND BE IN ACCORDANCE WITH THE REGULATORY BODY REQUIREMENTS AND ASTM F682. REINFORCING PENETRATION SLEEVES SHALL BE FITTED.
- ALL PIPING SHALL BE ADEQUATELY SUPPORTED BY HANGERS IN ACCORDANCE WITH ASTM F708. PIPE SUPPORTS FOR SYSTEMS FOR "QUIET MODE OPERATION" (AS DEFINED IN REFERENCE 1) SHALL BE MOUNTED TO STIFFENED AREAS OF THE SHIP STRUCTURE WITH AN ISOLATED PIPE CLAMP THAT INCLUDES A MINIMUM 1/2" THICK INSERT MADE OF RUBBER WITH 40 TO 45 SHORE A DUROMETER. NO PIPE CLAMPS SHALL BE MOUNTED TO THE CENTER OF BULKHEAD OR DECK PLATING.
- SYSTEM DISPLAYS, INDICATORS & ALARMS SHALL BE IN ACCORDANCE WITH ABS ACCU RULES.
- THE 14" SW COOLING RETURN PIPING TO SEACHEST SHALL BE CAPPED AT THE END AND PERFORATED WITH DISCHARGE HOLES ON THE SIDES. THE TOTAL AREA OF THE HOLES SHALL NOT BE LESS THAN THE CROSS SECTIONAL AREA OF THE PIPE.
- FLEXIBLE PIPING CONNECTIONS SHALL BE USCG AND ABS APPROVED, AND SUITABLE FOR INTENDED SERVICE. FLEXIBLE CONNECTIONS SHALL PROVIDE FOR FULL SIX-DEGREES OF FREEDOM OF RESILIENTLY MOUNTED MACHINERY, INCLUDING MAXIMUM EXCURSIONS EXPERIENCED IN A SEAWAY AND DURING ICE TRANSITS. CRITICAL AND NON-CRITICAL MACHINERY (AS PER REFERENCE 1) SHALL BE OUTFITTED WITH A MULTI-LEG (TWO AT 90° ORIENTATION) AND SINGLE-LEG FLEXIBLE CONNECTION(S), RESPECTIVELY. FLEXIBLE HOSE ASSEMBLIES CONSTRUCTED OF NON-METALLIC MATERIALS INTENDED FOR INSTALLATION IN PIPING SYSTEMS FOR FLAMMABLE MEDIA AND SEAWATER SYSTEMS WHERE FAILURE MAY RESULT IN FLOODING ARE TO BE OF FIRE RESISTANT TYPE AS PER ABS REQUIREMENTS.
- SEA SUCTION VALVES SHALL ATTACH DIRECTLY TO THE SEACHESTS VIA A WELD NECK FLANGE. THE VALVES SHALL BE STEEL GATE VALVES (FULL BORE). VENT PIPES VALVES FOR SEACHEST AND SEABAY ARE TO BE SECURED DIRECTLY TO ICE BOX WITH A WELD NECK FLANGE. SEE REFERENCE 12.
- PIPE CONNECTIONS FITTED BETWEEN THE SHELL AND THE OVERBOARD VALVE (I.E., INSIDE THE BALLAST TANK) SHALL BE AT LEAST SCHEDULE 80 STEEL. A WELD NECK FLANGE SHALL BE FITTED TO THE INBOARD BULKHEAD OF THE BALLAST TANK ON THE SIDE OF THE MACHINERY ROOM. WHERE JOINTS OF FERROUS AND NON-FERROUS METAL CANNOT BE AVOIDED THE JOINT SHALL BE PROVIDED WITH A DIELECTRIC ISOLATION KIT THAT PREVENTS CONTACT BETWEEN DISSIMILAR METALS THAT WOULD LEAD TO CORROSION. ADDITIONALLY, A 14" WASTER PIECE SHALL BE PROVIDED PER REF. 1. THE OVERBOARD SHALL BE LOCATED AS CLOSE TO A MAJOR STRUCTURAL MEMBER AS PRACTICABLE.
- ALL SENSORS SHALL BE IN ACCORDANCE WITH REFERENCE 1.
- NOISE CRITICAL SYSTEMS ARE DEFINED AND LISTED IN REFERENCE 1. ISOLATION MOUNTED EQUIPMENT FOR CRITICAL AND NON-CRITICAL SYSTEMS SHALL BE MOUNTED WITH APPROPRIATE MARINE GRADE VIBRATION ISOLATORS SUCH AS CHRISTIE & GREY OR NAVY STANDARD, OR EQUAL, AND SHALL HAVE FLEXIBLE CONNECTIONS FOR FLUID, AIR AND ELECTRICAL SERVICE. CRITICAL APPLICATIONS WILL REQUIRE A 6 DEGREE OF FREEDOM ANALYSIS TO BE PERFORMED BY THE SHIPYARD TO ENSURE THAT THE CHANCE OF CAUSING EXCESS UNDERWATER RADIATED NOISE IS MINIMIZED. ALL VIBRATION ISOLATED CRITICAL EQUIPMENT SHALL HAVE EQUAL MOUNT LOADING TO WITHIN PLUS OR MINUS 10% AT EACH MOUNTING LOCATION. THE FOUNDATION DESIGN OF CRITICAL EQUIPMENT REQUIRES A TOP PLATE OF AT LEAST 3/4" AND GUSSETS TO THE SUPPORTING STRUCTURE. THE VIBRATION ISOLATORS WILL BE INSPECTED BEFORE SEA TRIALS BY AN OWNER'S REPRESENTATIVE.

PUMP DATA (SEE NOTE 3)

ITEM NO.	SERVICE	QTY	TYPE	CAPACITY (GPM)	TDH (FT)	MOTOR HP	RPM	REMARKS
1	GENERAL PURPOSE S.W. PUMP	3	CENTRIFUGAL	1050	44	20	1180	GOULDS 3196_A 6X8-13LTX ALLOY 20, 11.25" Ø IMPELLER, OR EQUAL

EQUIPMENT LIST

ITEM NO.	SERVICE	QTY	DETAILS	MANUFACTURER
2	SIMPLEX STRAINER	1	BRONZE WITH STAINLESS STEEL BASKET	EATON MODEL 72 STRAIGHT FLOW SIMPLEX STRAINER, OR EQUAL
3	DUPLEX STRAINER	2	BRONZE WITH STAINLESS STEEL BASKET	EATON MODEL 50 DUPLEX STRAINER, OR EQUAL
4	ULTRASONIC ANTI-FOULING SYSTEM	TBD	AS REQUIRED	HULL TENDER INTERNATIONAL, OR EQUAL

NOTE: THIS SYSTEM CONTAINS NOISE CRITICAL EQUIPMENT (SEE REF. 1). THE SYSTEM HAS BEEN DESIGNED TO MINIMIZE THE TRANSMISSION OF UNDERWATER RADIATED NOISE BY ISOLATION OF MECHANICAL EQUIPMENT. (SEE GENERAL NOTES 9, 12 AND 16)

REV - OF THIS DRAWING APPROVED BY ABS, LETTER REFERENCE 338144, DATED 5/8/2008. ALL ABS TECHNICAL COMMENTS HAVE BEEN INCORPORATED IN THIS REVISION.

REFERENCES
1. ALASKA REGION RESEARCH VESSEL CONTRACT SPECIFICATIONS, REV D
2. GLOSTEN DWG. NO. 07096-100-02, REV B, STRUCTURE 01 LEVEL & BELOW
3. GLOSTEN DWG. NO. 07096-200-01, REV A, MACHINERY ARRANGEMENT
4. GLOSTEN DWG. NO. 07096-537-01, REV A, WASTE HEAT RECOVERY & HOT WATER HEATING SYSTEM DIAGRAM
5. GLOSTEN DWG. NO. 07096-521-01, REV A, FIREMAIN SYSTEM DIAGRAM
6. GLOSTEN DWG. NO. 07096-528-01, REV A, SANITARY FLUSHING & AUXILIARY SEAWATER SYSTEM DIAGRAM
7. GLOSTEN DWG. NO. 07096-529-01, REV A, BILGE AND BALLAST SYSTEM DIAGRAM
8. GLOSTEN DWG. NO. 07096-532-01, REV A, FRESH WATER COOLING SYSTEMS DIAGRAM
9. GLOSTEN DWG. NO. 07096-533-01, REV B, POTABLE WATER SYSTEM DIAGRAM
10. GLOSTEN DWG. NO. 07096-593-01, REV A, MSD & SEWAGE TRANSFER SYSTEM DIAGRAM
11. GLOSTEN DWG. NO. 07096-551-01, REV A, COMPRESSED AIR SYSTEM DIAGRAM
12. ABS GUIDE FOR BUILDING AND CLASSING VESSELS INTENDED FOR NAVIGATION IN POLAR WATERS, MARCH 2008
13. GLOSTEN DWG. NO. 07096-514-01, REV A, CHILLED WATER DIAGRAM
14. GLOSTEN DWG. NO. 07096-100-05, REV A, SEACHEST ARRANGEMENT AND DETAILS
15. GLOSTEN DWG. NO. 07096-594-01, REV A, OILY WATER SEPARATOR SYSTEM

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED
14-C 16-C	A	1. CHANGED SYSTEM FROM SANITARY FLUSHING TO AUXILIARY SEAWATER	8/12/09	SAC
5-A		2. CHANGED DRAWING NAME OF REFERENCE 6.		
5-B		3. UPDATED REFERENCES TO LIST THE MOST CURRENT REVISION FOR EACH DRAWING AND THE CONTRACT SPECIFICATION.		
21-B		4. ADDED DIMENSION TO SHOW OFFSET DISTANCE FOR SEACHEST SUCTION BELLMOUTHS.		
13-C		5. DECREASED SW SUPPLY LINES TO 2" TO MATCH REQUIREMENTS OF THE NEW EVAPAPORATOR (SEE REF. 9)		
13-C		6. ADDED 1/2" SW SUPPLY LINE TO MEET THE REQUIREMENTS OF THE NEW OILY WATER SEPARATOR.		
4-A		7. ADDED OILY WATER SEPARATOR DIAGRAM TO DRAWING REFERENCES		
21-A 21-B		8. UPDATED SECTION 21-B AND PLAN 21-A TO REFLECT CHANGES TO SWB TANKS & VOIDS LOCATED BETWEEN FRAMES 49 AND 53.		
15-D		9. UPDATED SW OVERBOARD HULL PENETRATION TO VOID 4-49-2.		

SYMBOL LIST					
SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
—	SW PIPING	⊗	GAGE, TEMPERATURE	⊗	GATE VALVE
▶	FLOW ARROW	⊗ ^{VP}	GAGE, VACUUM/PRESSURE	⊗	SWING CHECK VALVE
⊖	PIPE DOWN	⊗ ^P	GAGE, PRESSURE	⊗	BALL VALVE
⊕	PIPE UP	⊗ ^{DP}	GAGE, DIFFERENTIAL PRESSURE	⊗	BUTTERFLY VALVE
— —	FLEX CONNECTION	TT	TEMPERATURE TRANSMITTER	⊗	CIRCUIT BALANCE VALVE
— —	REDUCER/ENLARGER	PT	PRESSURE TRANSMITTER	⊗	TEMPERATURE CONTROL VALVE
⊕	CENTRIFUGAL PUMP	DPPT	DIFFERENTIAL PRESSURE TRANSMITTER	⊗	3-WAY TEMPERATURE CONTROL VALVE
⊕	VIBRATION ISOLATORS	⊗	BASKET STRAINER, DUPLEX	NC	NORMALLY CLOSED
⊕	SUCTION BELLMOUTH	⊗	BASKET STRAINER, SIMPLEX	⊕	MOTOR OPERATOR



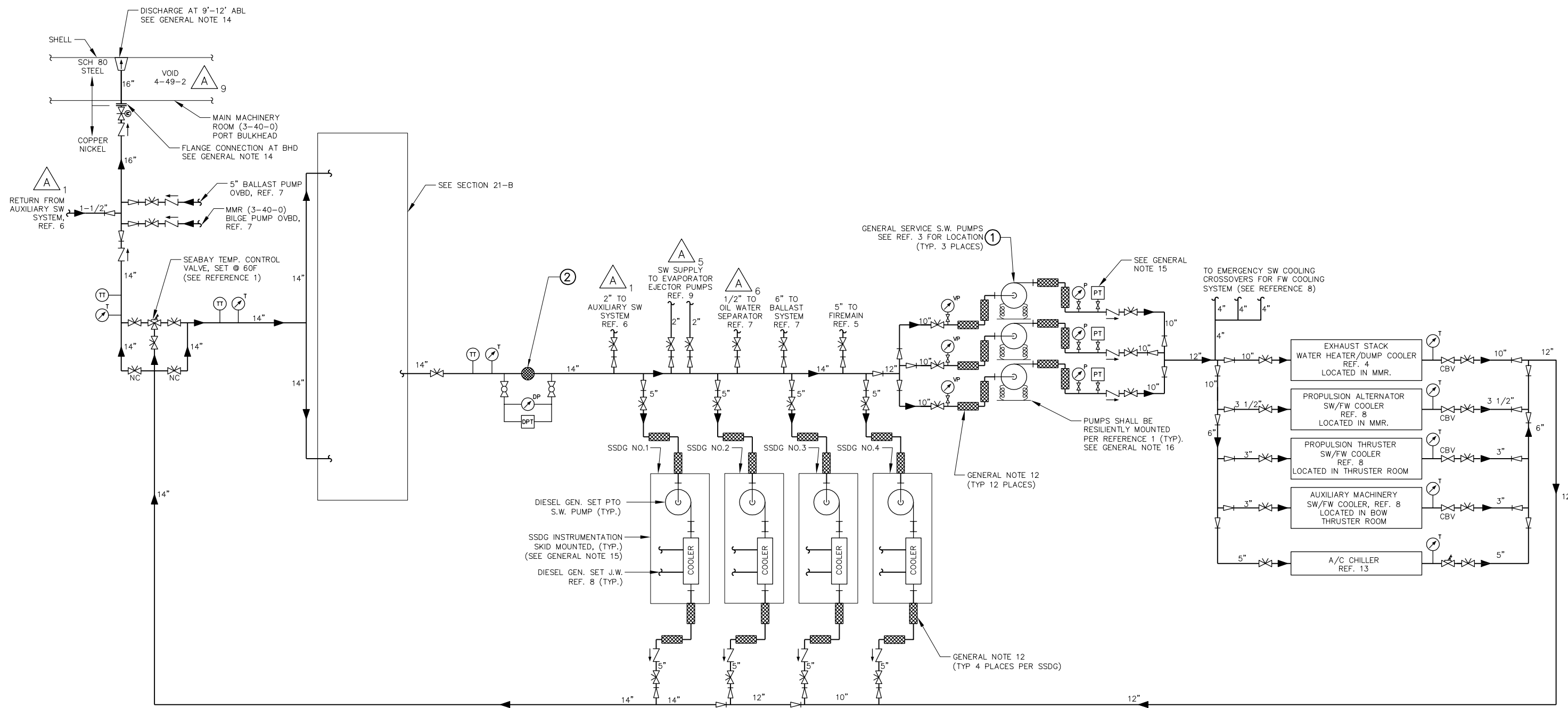
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FAIRBANKS, ALASKA

ALASKA REGION RESEARCH VESSEL
SEAWATER SYSTEM DIAGRAM

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JDC	8/12/09	SAC	8/12/09	DHK	8/12/09
Scale	Drawing Number		Rev		
AS NOTED	07096-523-01		Sheet 1 of 3		



DETAIL 13-A
SEAWATER SYSTEM

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Approved by	Date	Approved by	Date
DHK	8/12/09	DHK	8/12/09

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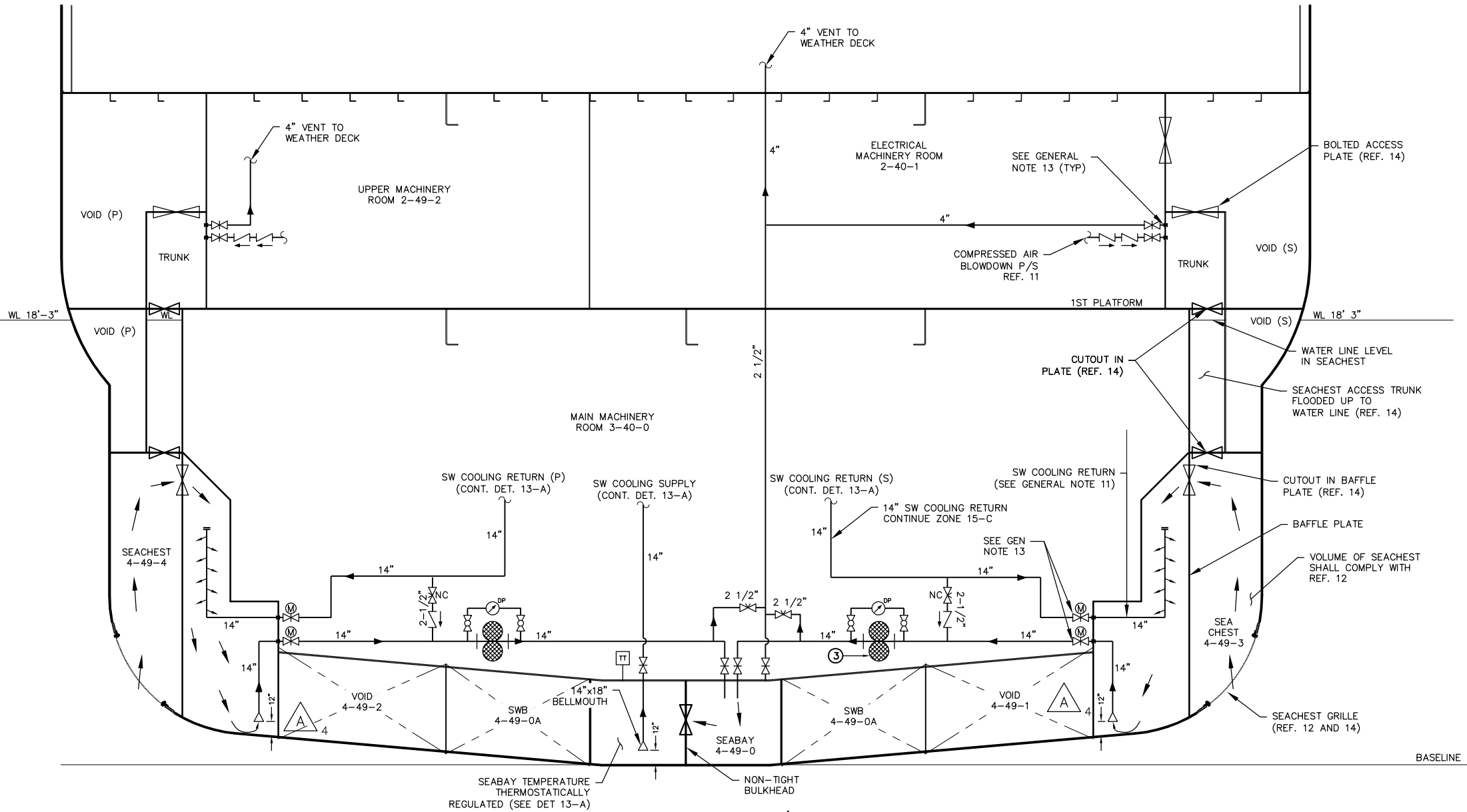
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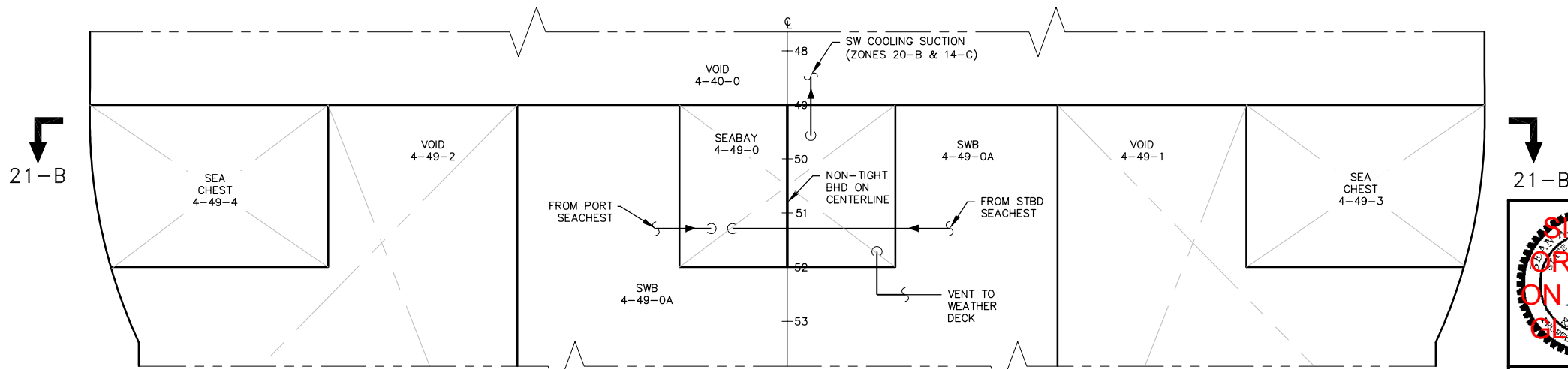
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SECTION 21-B $\triangle A_8$
 FRAME 52 LOOKING FWD



PLAN 21-A $\triangle A_8$
 SEABAY

21-B

21-B

SIGNED ORIGINAL ON FILE AT GLOSTEN

21-B

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ALASKA REGION RESEARCH VESSEL SEAWATER SYSTEM DIAGRAM			
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