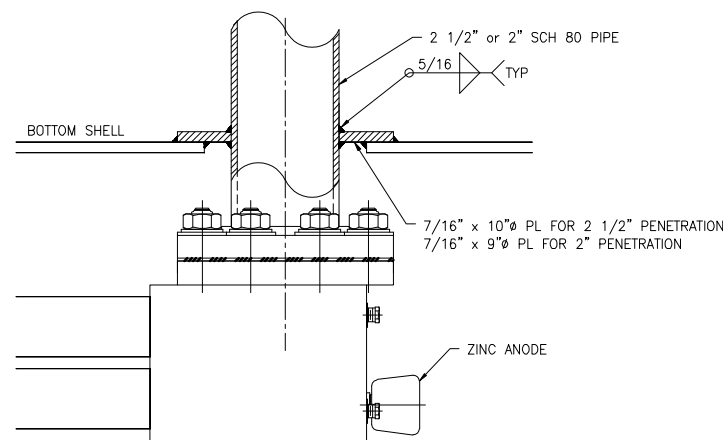


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MATERIAL SCHEDULE										
SERVICE	SIZE	PIPE	TAKEDOWN JOINTS			VALVES		FITTINGS	FLEXIBLE CONNECTIONS	COMMENTS
			MATERIAL	GASKETS	BOLTING	BODY	TRIM			
FW COOLING MAWP: 35 PSIG MAX TEMP: 230 F	2 1/2" & ABOVE	CARBON STEEL ASTM A53 OR A106, GRADE B SEAMLESS ANSI B36.10 SCH 40  SCH 80 SHALL BE USED AT HULL PENETRATIONS	FLANGE CARBON STEEL ASTM A105 ANSI B16.5 150# SLIP-ON OR WELD NECK	INORGANIC FIBERS WITH A NITRILE BINDER  ABS FIRE-SAFE TYPE APPROVED	BOLTS: CARBON STEEL ASTM A307 GRADE B ANSI B18.2.1  NUTS: CARBON STEEL ASTM A563 GRADE A ANSI B18.2.2	BUTTERFLY: DUCTILE IRON, ASTM A395, MSS-SP-67 150#, LUG TYPE  SEE NOTE 13	BUTTERFLY: SS DISC BUNA-N SEATS	CARBON STEEL ASTM A234, GR WPB ANSI B16.9 SCH 40 BUTT WELD LONG RADIUS	FLANGED EXPANSION JOINT  ASTM F1123	-
	2" & UNDER		UNION CARBON STEEL ASTM A105 ANSI B16.11 SOCKET WELD	-	-	BALL: CARBON STEEL ASTM A216 GR WCB THREADED 1500 PSI  SEE NOTE 13	BALL: CHROME PLATED CARBON STEEL BALL RPTFE SEATS	CARBON STEEL ASTM A105 ANSI B16.11 3000# SOCKET WELD	FLEX HOSE MEETING SAE J1942 AND J1475 FOR COOLANT SERVICE	

SYMBOLS LIST	
	PIPE
	BUTTERFLY VALVE
	BALL VALVE
	BALL VALVE WITH THREADED PLUG
	REDUCER
	FLEXIBLE CONNECTION
	THERMOMETER (IN THERMOWELL)
	LEVEL SWITCH

EQUIPMENT LIST						
QTY	SERVICE	TYPE	MODEL	CAPACITY	DRIVE	NOTES
2	MAIN ENGINE SCAC KEEL COOLER	KEEL COOLER	-	6,887 BTU/MIN 97 GPM	-	SEE NOTE 9
2	MAIN ENGINE J/W KEEL COOLER	KEEL COOLER	-	16,300 BTU/MIN 78 GPM	-	SEE NOTE 9
2	SSDG J/W KEEL COOLER	KEEL COOLER	-	6,711 BTU/MIN 86 GPM	-	SEE NOTE 9
2	SSDG SCAC KEEL COOLER	KEEL COOLER	-	2,112 BTU/MIN 40 GPM	-	SEE NOTE 9



DETAIL 1-3A  
HULL PENETRATION

2 GENERAL NOTES (CONT.)

- MAIN ENGINES SHALL BE PROVIDED WITH AN ENGINE MOUNTED, FULL FLOW, GEAR OIL COOLER IN THE AFTER COOLER CIRCUIT. CONTRACTOR SHALL CONFIRM COOLING REQUIREMENTS OF THE REDUCTION GEAR.
- KEEL COOLER GUARDS SHALL BE INSTALLED TO PROTECT THE KEEL COOLERS FROM FLOATING DEBRIS, IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. KEEL COOLERS SHALL BE RECESSED IN POCKETS AS SHOWN ON REFERENCES 2 AND 3.
- EACH EXPANSION TANK TO HAVE PRESSURE CAP OR OPEN VENT AS REQUIRED BY ENGINE MANUFACTURER.
- KEEL COOLER ISOLATION VALVES TO BE CATEGORY A FIRE RATED. BUTTERFLY OR BALL VALVES MEETING API 607 ARE ACCEPTABLE.
- EACH EXPANSION TANK SHALL BE EQUIPPED WITH A LOW LEVEL SWITCH INTEGRATED INTO THE ALARM AND MONITORING SYSTEM. SEE REF 1.
- ALL COOLING PIPING ROUTED ABOVE THE GRATING SHALL BE INSULATED.
- KEEL COOLERS SHALL BE EQUIPPED WITH BONDING STRAPS TO THE HULL TO PREVENT GALVANIC CORROSION.
- EXPANSION TANKS SHALL BE SIZED IN ACCORDANCE WITH THE ENGINE MANUFACTURER'S REQUIREMENTS.

1 REVISION HISTORY

REV	ZONE	DESCRIPTION	DWN	DATE	APVD

GENERAL NOTES

- VESSEL TO BE CONSTRUCTED IN ACCORDANCE WITH 46 CFR SUBCHAPTER H REGULATIONS.
- THIS DRAWING IS DIAGRAMMATIC AND DOES NOT REPRESENT A COMPLETE DETAILED DESIGN. EQUIPMENT LAYOUT IN A GIVEN AREA IS APPROXIMATE. THE CONTRACTOR SHALL DEVELOP A DETAILED DESIGN THAT PROVIDES A FULLY FUNCTIONAL ARRANGEMENT SUITABLE FOR INSTALLATION, TAKING INTO ACCOUNT ALL NECESSARY SYSTEM INTERFACES AND INTERFERENCES. DIMENSIONS SHALL BE VERIFIED FROM THE SHIP AND MANUFACTURERS' CERTIFIED DRAWINGS AS APPROPRIATE.
- PIPING SHALL BE RUN AS DIRECTLY AS PRACTICABLE WITH A MINIMUM NUMBER OF BENDS AND FITTINGS. PIPE SPOOLS SHALL BE SIZED AND ARRANGED TO PROVIDE FOR REMOVAL, INSPECTION, SERVICING, AND REPLACEMENT OF PIPING, VALVES, FITTINGS, AND EQUIPMENT WITHOUT CUTTING STRUCTURE OR PIPING.
- PROVIDE GAUGE PIPING ASSEMBLIES AND MATERIALS FOR GAUGES AND INSTRUMENTS CONFIGURED IN ACCORDANCE WITH ASTM F721. VALVES, TUBING, AND FITTINGS SHALL BE 316 STAINLESS STEEL.
- AVOID POCKETS IN THE PIPE LINES. LOW POINT DRAINS AND HIGH POINT VENTS SHALL BE FITTED TO ENABLE DRAINING AND VENTING OF PIPES WHERE POCKETS DO OCCUR. PROVIDE A 1" VALVED DRAIN WITH PLUG AT THE LOWEST POINT OF EACH COOLING CIRCUIT. PROVIDE 1/2" BOSSES WITH PLUGS AT ALL HIGH POINTS.
- THE PIPING SYSTEM SHALL BE PRESSURE TESTED, CLEANED, AND FLUSHED PRIOR TO BEING PLACED IN SERVICE. PER MANUFACTURER, DO NOT EXCEED 35 PSI WHEN TESTING THE KEEL COOLERS.
- PIPING SHALL BE ADEQUATELY SUPPORTED BY HANGERS IN ACCORDANCE WITH ASTM F708. HANGERS SHALL BE ATTACHED TO THE PIPE WITH BOLTED CLAMPS AND WELDED TO THE BASIC SHIP STRUCTURE. HANGERS SHALL NOT BE WELDED DIRECTLY TO PIPES.
- KEEL COOLER INLET AND OUTLET VALVES SHALL BE LOCATED CLEAR OF OBSTRUCTIONS, AND WITHIN EASY REACH FOR OPERATION. ALL VALVES SHALL BE PROVIDED WITH VISUAL POSITION INDICATION.
- MAIN ENGINE KEEL COOLERS SHALL BE SELECTED FOR A MAXIMUM SEA WATER TEMPERATURE OF 86F AND A SPEED OF 3 KNOTS. GENERATOR KEEL COOLERS SHALL BE SELECTED FOR A MAXIMUM SEA WATER TEMPERATURE OF 86F AND 0 KNOTS. THE CONTRACTOR SHALL VERIFY ENGINE REQUIREMENTS PRIOR TO SELECTING KEEL COOLERS.

REFERENCES

- 16101-200-832-1 TECHNICAL SPECIFICATIONS
- 16101-200-110-1 BOTTOM AND SIDE SHELL
- 16101-200-120-4 HULL TRANSVERSE FRAMES



**Elliott Bay Design Group**  
North Carolina, PLLC

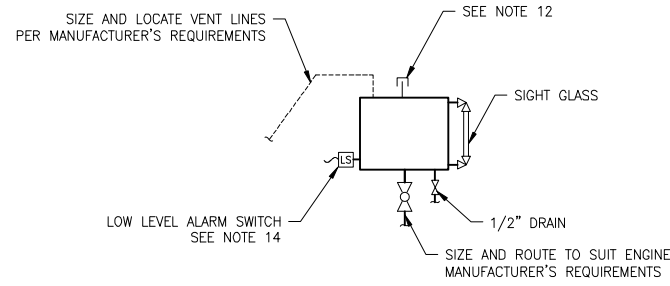
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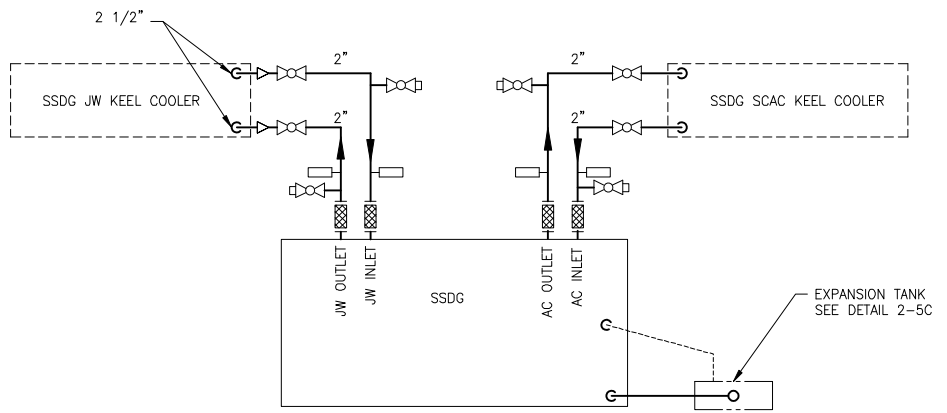
COOLING SYSTEM SCHEMATIC

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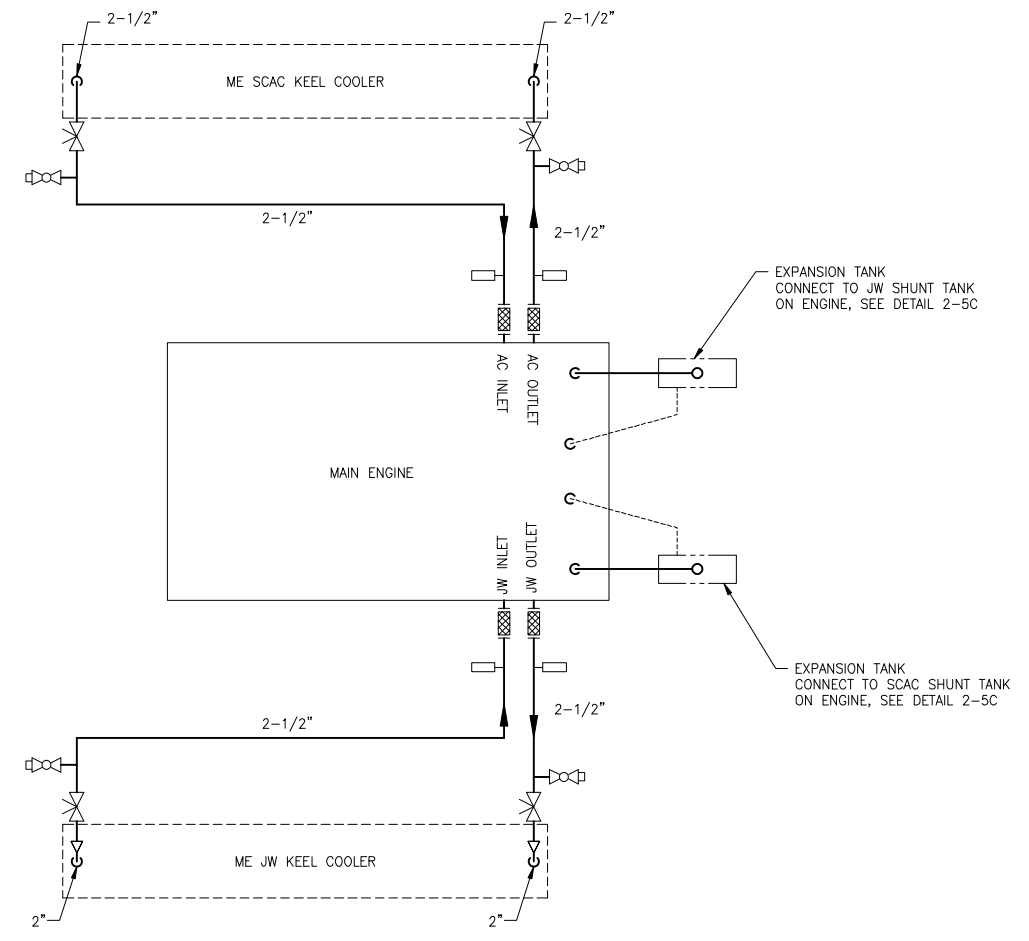
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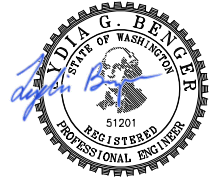
**DETAIL 2-5C**  
 TYPICAL EXPANSION TANK



**PLAN 2-5A**  
 SSDG COOLING PIPING DIAGRAM



**PLAN 2-2A**  
 MAIN ENGINE COOLING PIPING DIAGRAM



SIZE	D	DWG NO.	16101-200-256-1	REV	-
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