SYSTEM OPERATION INTENT

EACH ENGINE IS PROVIDED WITH INDEPENDENT COOLING CIRCUITS, IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.

SYMBOLS LIST

———	PIPE
	BUTTERFLY VALVE
	BALL VALVE
	BALL VALVE WITH THREADED PLUG
	GLOBE VALVE
	GATE VALVE
	CHECK VALVE
▷	REDUCER
	FLEXIBLE CONNECTION
P	PRESSURE GAUGE (LOCAL READING)
VP	VACUUM PRESSURE GAUGE (LOCAL READING)
	THERMOMETER
	CENTRIFUGAL PUMP
►	FLOW DIRECTION ARROW
	SIMPLEX BASKET STRAINER
FS	FLOW SWITCH
LS	LEVEL SWITCH

GENERAL MATERIAL SCHEDULE

SERVICE	SIZE	PIPE	TAKEDOWN JOINTS			VALVES		FITTINGS	FLEXIBLE CONNECTIONS	COMMENTS
			MATERIAL	GASKETS	BOLTING	BODY	TRIM			
FW COOLING MAWP: 20 PSIG MAX TEMP: 200°F	2 1/2" & ABOVE	CARBON STEEL ASTM 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	GARLOCK STYLE IFG 5500 OR EQUAL	BOLTS: CARBON STEEL ASTM A307 GRADE B ANSI B18.2.1 NUTS: CARBON STEEL ASTM A563 GRADE A ANSI B18.2.2	SEE B.O.M.	SEE B.O.M.	CARBON STEEL ASTM A234, GR WPB ANSI B16.9 SCH 40 BUTT WELD LONG RADIUS	SEE B.O.M.	SEE NOTE 6
	2" & UNDER		UNION CARBON STEEL ASTM A105 ANSI B16.11 SOCKET WELD	–	–	SEE B.O.M.	SEE B.O.M.	CARBON STEEL ASTM A105 ANSI B16.11 3000# SOCKET WELD	SEE B.O.M.	

EQUIPMENT LIST

ITEM #	QTY	SERVICE	TYPE	MODEL	CAPACITY	DRIVE	NOTES
1	2	MAIN ENGINE SCAC & GEARBOX OIL COOLER KEEL COOLER	KEEL COOLER		6,887 BTU/MIN 84-104 GPM (97 DESIGN) (0 KNOTS)	–	SEE NOTE 10
2	2	MAIN ENGINE J/W KEEL COOLER	KEEL COOLER		16,300 BTU/MIN 52-102 GPM (78 DESIGN) (0 KNOTS)	–	SEE NOTE 10
3	2	SSDG J/W KEEL COOLER	KEEL COOLER		4,631 BTU/MIN 38.2-50 GPM (44.1 DESIGN) (0 KNOTS)	–	SEE NOTE 10

BILL OF MATERIALS

PC MK	QTY	SIZE	DESCRIPTION	MATL SPEC
1	8	2 1/2"	BUTTERFLY VALVE; 200-PSI, LUG TYPE, A395 D.I. BODY, SS DISC, BUNA-N SEATS	ASTM A395
2	1	1-1/2"	GLOBE VALVE: 150#, FLANGED, C. STEEL	ASTM A-216 GR. WCB
3	2	1 1/2"	BUTTERFLY VALVE; PN 10, LUG TYPE, D.I. BODY, SS DISC, BUNA-N SEATS	ASTM A-536 GR 65-45-12
4	A/R	1"	BALL VALVE; 1000 CWP, STD PORT, S. STEEL, NPT, S. STEEL BALL, PTFE SEATS	ASTM A-351 CF8M
5	8	1/2"	THERMOMETER W/ THERMOWELL; BRASS CONNECTION, 30°-240°F RANGE	ASME B40.200/ASTM E2511
6	6	2 1/2"	SHIELDS MARINE EXHAUST/WATER HOSE SERIES 200; HOSES SECURED WITH TWO 1/2" WIDE S. STEEL T-BOLT HOSE CLAMPS	SAE J2006 TYPE R1
7	A/R	2"	SHIELDS MARINE EXHAUST/WATER HOSE SERIES 200; HOSES SECURED WITH TWO 1/2" WIDE S. STEEL T-BOLT HOSE CLAMPS	SAE J2006 TYPE R1
8	8	2"	BUTTERFLY VALVE; 200-PSI, LUG TYPE, D.I. BODY, SS DISC, BUNA-N SEATS	ASTM A-105

- GENERAL NOTES -

NO.	DESCRIPTION
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3.	PIPING SHALL BE RUN AS DIRECTLY AS PRACTICABLE WITH A MINIMUM NUMBER OF BENDS AND FITTINGS AND WITH SUFFICIENT TAKE DOWN JOINTS TO PROVIDE FOR REMOVAL, INSPECTION, SERVICING, AND REPLACEMENT OF PIPING, VALVES, FITTINGS, AND EQUIPMENT.
4.	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.
5.	AVOID POCKETS IN THE PIPE LINES. BOSSES AND VALVES OR SCREWED PLUGS SHALL BE FITTED TO ENABLE COMPLETE DRAINING OF PIPES WHERE POCKETS DO OCCUR.
6.	THE PIPING SYSTEM SHALL BE PRESSURE TESTED, CLEANED, AND FLUSHED PRIOR TO BEING PLACED IN SERVICE. PER MANUFACTURER, KEEL COOLERS MAY BE PRESSURE TESTED TO 20 PSI.
7.	PIPING SHALL BE ADEQUATELY SUPPORTED BY HANGERS IN ACCORDANCE WITH ASTM F708. HANGERS SHALL BE ATTACHED TO THE TO THE BASIC SHIP STRUCTURE. HANGERS SHALL NOT BE ATTACHED BY WELDING DIRECTLY TO PIPES. HANGERS SUPPORTING TUBING SHALL UTILIZE A RESILIENT NONMETALLIC LINER BETWEEN THE TUBING AND STEEL HANGER.
8.	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.
9.	THE CONTRACTOR SHALL VERIFY ENGINE REQUIREMENTS AND KEEL COOLER SELECTION PRIOR TO ORDERING KEEL COOLERS.
10.	TDH OF PUMPS FOR REQUIRED FLOW IS APPROXIMATE. THE CONTRACTOR SHALL PROVIDE PUMPS MEETING THE REQUIRED FLOW WITH THE INSTALLED PIPING SYSTEM. PUMP MOTORS SHALL BE SELECTED TO PREVENT MOTOR OVERLOAD OVER THE ENTIRE PUMP OPERATING RANGE.
11.	CONTRACTOR TO SIZE, LOCATE AND INSTALL EXPANSION TANKS IN ACCORDANCE WITH ENGINE MANUFACTURER'S RECOMMENDATIONS.
12.	PROVIDE A 1" VALVED DRAIN WITH PLUG AT THE LOWEST POINT OF EACH COOLING CIRCUIT.
13.	CONNECT SWITCHES TO SHIP'S ALARM AND MONITORING SYSTEM AND PROVIDE LOW COOLANT LEVEL ALARMS FOR EACH ENGINE.
14.	WHERE PRACTICABLE, ROUTE KEEL COOLER PIPING WITHOUT HIGH SPOTS THAT COULD TRAP AIR. A VENT SHALL BE PROVIDED AT EACH HIGH SPOT CAPABLE OF TRAPPING AIR IN THE SYSTEM.
15.	MOUNT REDUCTION GEAR COOLER AS CLOSE AS POSSIBLE TO REDUCTION GEAR. OIL FLOW MUST BE OPPOSITE OF WATER FLOW IN OIL COOLER.
16.	INTERFACE FLOW SWITCH WITH SHIPS ALARM AND MONITORING SYSTEM. LOW FLOW ALARM TO OCCUR WHEN FLOW DROPS BELOW 10 GPM.

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WILLIAM HAYDEN LICENSE NO. 60106 STATE OF FLORIDA PROFESSIONAL ENGINEER

William M. Hayden, PE

Digitally signed by William M. Hayden, PE
Date: 2018.10.15 15:15:58 -05'00'

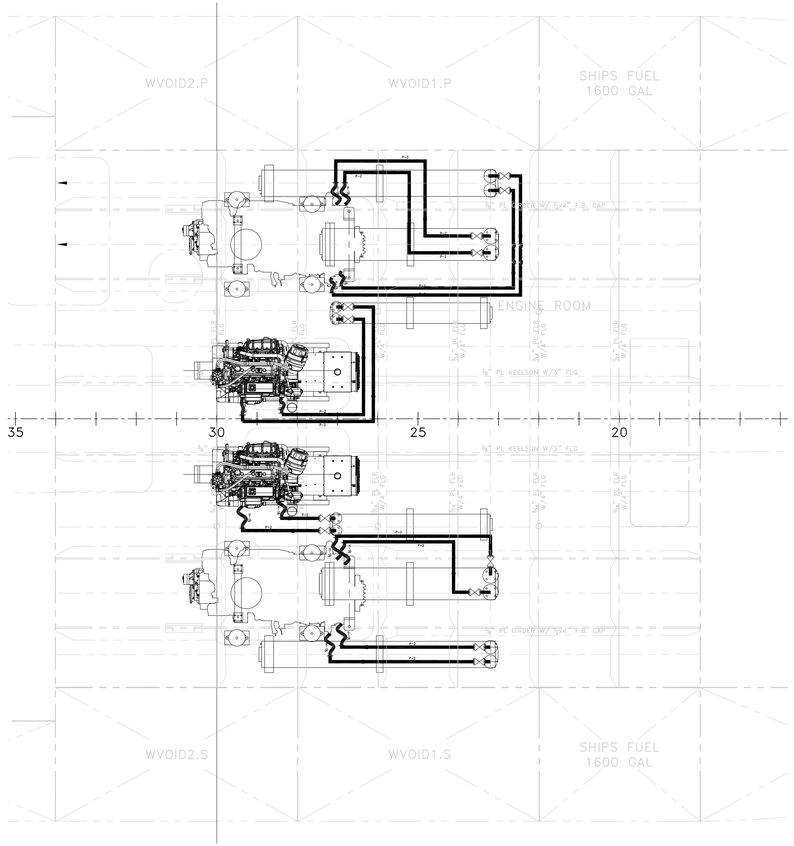
Title: 70.5'x30'x11' NCDOT TOWBOAT

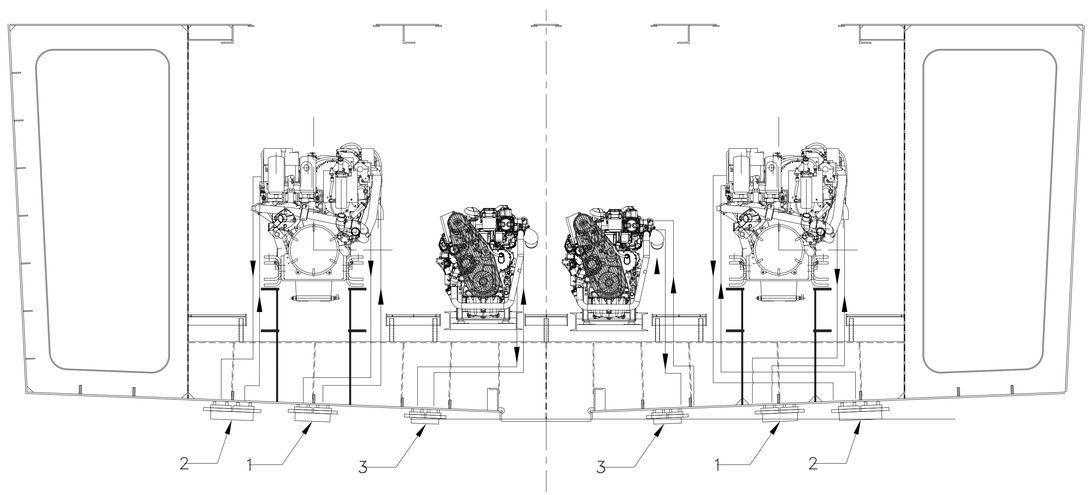
COOLING SYSTEM

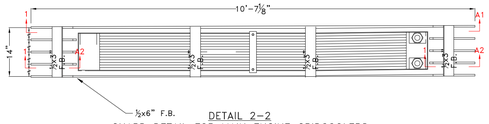
Dwg. No. 17-1372-256
Alt. No. 1
Sht. 1 of 1

Drawn By: JACOB CONNALLY Date: JUNE 05, 2018
Checked By: Date:
App'd By: Scale: 1/2" = 1'-0"
ABS App'l: USCG App'l.:

ANSI-D (24"x36")







DETAIL 2–2
GUARD DETAIL FOR MAIN ENGINE GRIDCOOLERS
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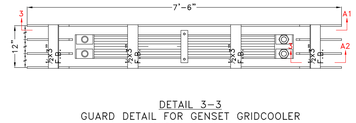

DETAIL 3–3
GUARD DETAIL FOR GENSET GRIDCOOLER
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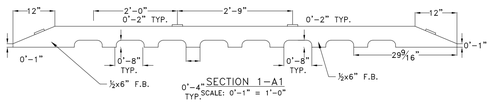
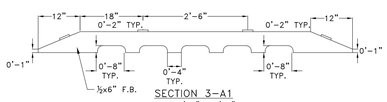
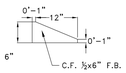


SECTION 1–A1
SCALE: 0'-1" = 1'-0"



SECTION 3–A1
SCALE: 0'-1" = 1'-0"

SECTION 1–A2
SCALE: 0'-1" = 1'-0"



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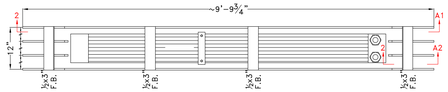
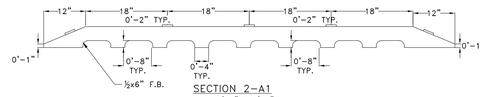


DETAIL 1–1
GUARD DETAIL FOR AFT A/C GRIDCOOLERS
SCALE: 0'-1" = 1'-0"



SECTION 2–A1
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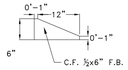

SECTION 2–A2
SCALE: 0'-1" = 1'-0"

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WILLIAM HAYDEN LICENSE NO. 60106 STATE OF FLORIDA PROFESSIONAL ENGINEER

William M. Hayden, PE
Digitally signed by William M. Hayden, PE
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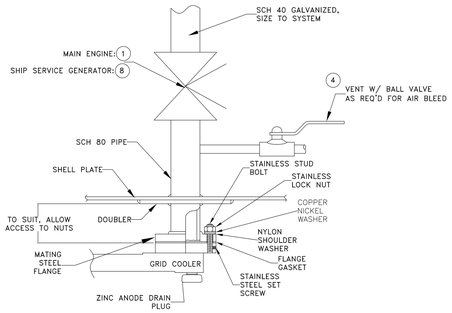
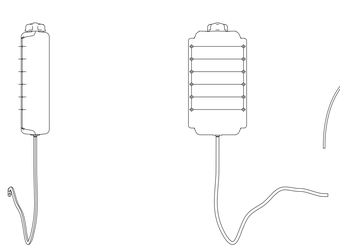
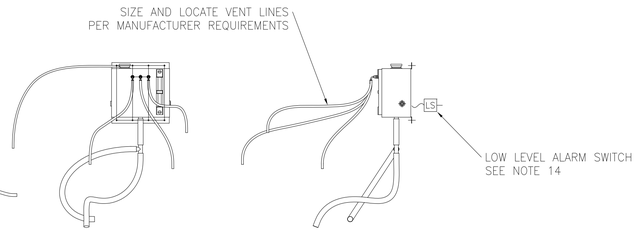


NOTE: COOLERS TO BE INSTALLED IN ACCORDANCE WITH MFG. RECOMMENDATIONS

DETAIL 2-2C
KEEL COOLER PENETRATION DETAIL
NO SCALE

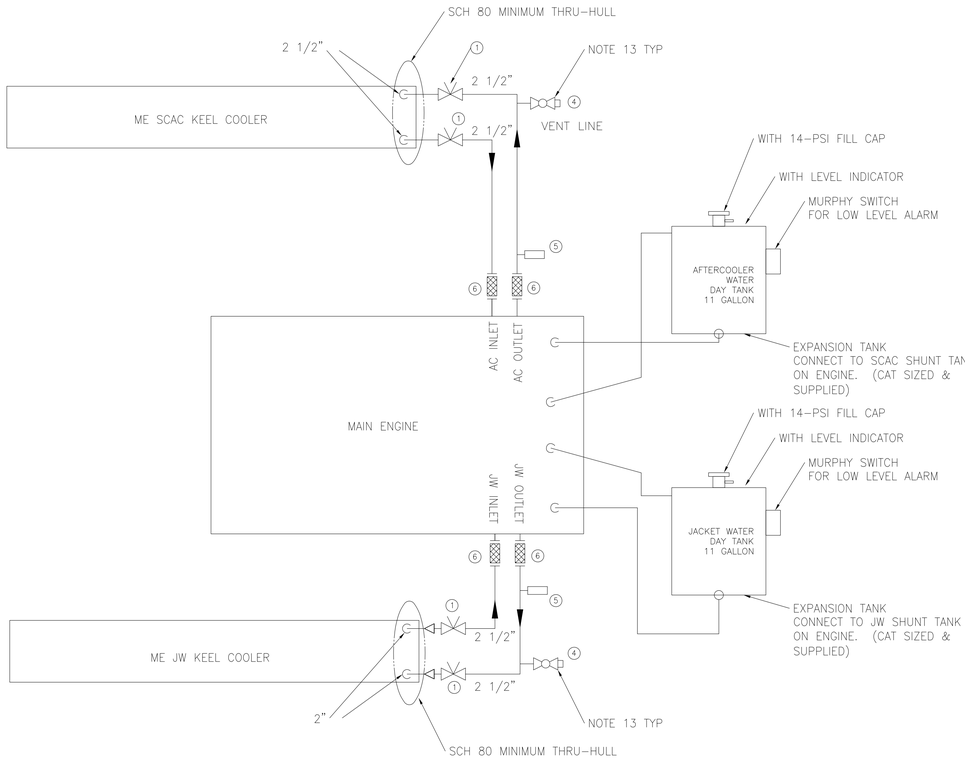


DETAIL OF COOLANT RECOVERY TANK
CAT PART #102-9220 CHG 04

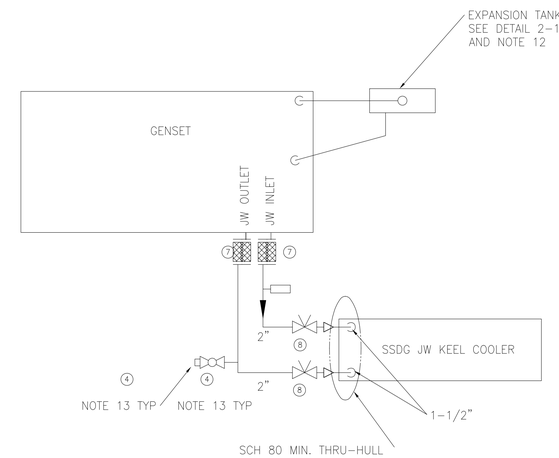


DETAIL OF KEEL COOLED EXPANSION TANK
CAT PART #432-6671 CHG 00

DETAIL 2-1C
GENSET EXPANSION & RECOVERY TANKS
NO SCALE



PLAN 2-5A
SSDG COOLING PIPING DIAGRAM
NO SCALE



PLAN 2-2A
SSDG COOLING PIPING DIAGRAM
NO SCALE

NO.	- GENERAL NOTES - DESCRIPTION	NO.	- GENERAL NOTES - DESCRIPTION
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4.	PROVIDE GAUGE PIPING ASSEMBLIES AND MATERIALS FOR GAUGES AND INSTRUMENTS CONFIGURED IN ACCORDANCE WITH ASTM F721.	13.	PROVIDE A 1" VALVED DRAIN WITH PLUG AT THE LOWEST POINT OF EACH COOLING CIRCUIT.
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