MATERIAL SCHEDULE

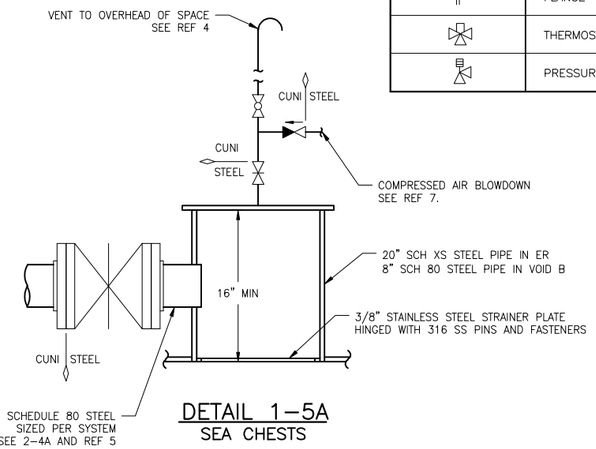
SERVICE	PIPING		TAKEDOWN JOINTS			VALVES		FITTINGS	FLEX CONNECTIONS	REMARKS
	SIZE	MATERIAL	MATERIAL	GASKETS	BOLTING	BODY	TRIM			
SEAWATER COOLING MAWP: 50 PSIG MAX TEMP: 110°F	2 1/2" & ABOVE	CU-NI 90/10 ASTM B466 SEAMLESS CLASS 200	FLANGE: CU-NI 90/10 ANSI B16.5 SLIP-ON OR WELD NECK, 150#	INORGANIC FIBER WITH NITRILE BINDER ABS FIRE-SAFE TYPE APPROVED	BOLTS: STAINLESS STEEL ASTM A193 GRADE B8M ANSI B18.2.1 NUTS: STAINLESS STEEL ASTM A194 GRADE 8M ANSI B18.2.2	BUTTERFLY: BRONZE OR LINED DUCTILE IRON, WAFER TYPE CHECK: BRONZE ASTM B61 OR B62, 150#, FLANGED	BUTTERFLY: BRONZE TRIM, RENEWABLE DISK CHECK: BRONZE DISK, RENEWABLE SEATS & SEALS	CU-NI 90/10, BUTT WELD	SEE NOTE 20	–
	2" & BELOW		CU-NI 90/10 UNION, SOCKET WELD, ASTM B369, 150#	–	–	BALL: BRONZE ASTM B61 OR B62, THREADED	BALL: CHROME PLATED BRONZE BALL PTFE SEATS	CU-NI 90/10 UNION, SOCKET WELD	SEE NOTE 20	–
FRESH WATER COOLING MAWP: 50 PSIG MAX TEMP: 110°F	ALL	STAINLESS STEEL ASTM A312, GRADE TP 316L SEAMLESS ANSI B36.19 SCH 10S	PRESS-FIT STAINLESS STEEL ASTM A351, A743 AND A744, GRADE CF8M TP 316 SCH 10S EPDM SEALS	ARAMID FIBERS WITH A NEOPRENE BINDER	BOLTS: STAINLESS STEEL ASTM A193 GRADE B8M ANSI B18.2.1 NUTS: STAINLESS STEEL ASTM A194 GRADE 8M ANSI B18.2.2	BALL: STAINLESS STEEL CF8M ASTM A351, THREADED	BALL: STAINLESS STEEL BALL, PTFE SEATS	PRESS-FIT STAINLESS STEEL ASTM A351, A743 AND A744, GRADE CF8M TP 316 SCH 10S EPDM SEALS	SEE NOTE 20	–
SHELL CONNECTIONS MAWP: 50 PSIG MAX TEMP: AMBIENT	ALL	CARBON STEEL ASTM A53 OR A106, GR B, ANSI B36.10 SCH 80 SEAMLESS	FLANGE CARBON STEEL ASTM A105 ANSI B16.5 SLIP-ON OR WELD NECK, 150#	INORGANIC FIBER WITH NITRILE BINDER ABS FIRE-SAFE TYPE APPROVED	BOLTS: STAINLESS STEEL ASTM A193 GRADE B8M ANSI B18.2.1 NUTS: STAINLESS STEEL ASTM A194 GRADE 8M ANSI B18.2.2	GATE: DUCTILE IRON ASTM A395 OR CARBON STEEL ASTM A216 FLANGED, 150#	GATE: STAINLESS STEEL RENEWABLE DISC AND SEAT ASTM A182	CARBON STEEL ASTM A234, GR WPB ANSI B16.9 BUTT WELD SCH 80	–	–

EQUIPMENT LIST

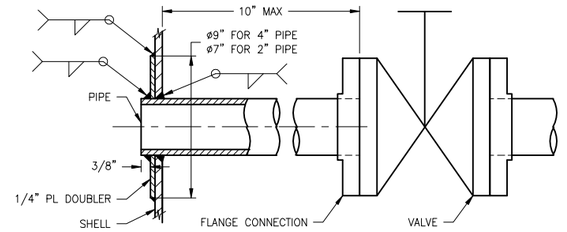
QTY	SERVICE	TYPE	MODEL	CAPACITY	DRIVE	NOTES
2	ENGINE ROOM SEA CHEST STRAINER	6" DUPLEX	–	560 GPM	–	PERFORATED CU-NI BASKET CU-NI BODY
2	AUXILIARY SEA WATER PUMP	CENTRIFUGAL	–	96 GPM @ 50' TDH	208V/3ϕ/60Hz 3 HP TEFC MOTOR 1800 RPM	BRONZE BODY AND IMPELLER SEE NOTES 10, 19
2	FW COOLING PUMP	CENTRIFUGAL	–	50 GPM @ 73' TDH	208V/3ϕ/60Hz 3 HP TEFC MOTOR 3500 RPM	STAINLESS STEEL BODY AND IMPELLER SEE NOTES 10, 19
2	FW COOLING HEAT EXCHANGER	TITANIUM PLATE AND FRAME	–	36 KW HEAT REJECTION	–	SEE NOTES 15, 23
2	PROPULSION DRIVE HEAT EXCHANGER	TITANIUM PLATE AND FRAME	BY PROPULSION DRIVE SUPPLIER	17 KW HEAT REJECTION	–	SEE NOTES 15, 23

SYMBOLS LIST

	PIPE		VALVE, STOP CHECK
▷	REDUCER		VENT
	GATE VALVE		OVERBOARD DISCHARGE
	BALL VALVE	P	PRESSURE GAUGE
	SWING CHECK VALVE	VP	VACUUM/PRESSURE GAUGE
	FLEXIBLE CONNECTION	DP	DIFFERENTIAL PRESS GAUGE
	HEAT EXCHANGER		PIPE PLUG
	DUPLEX STRAINER	PS	SWITCH, PRESSURE
	CENTRIFUGAL PUMP		PIPE PENETRATION, DECK/BHD
	SEA CHEST		THERMOMETER
‖	FLANGE		AUTOMATIC BALANCING VALVE
	THERMOSTATIC VALVE	PT	PRESSURE TRANSDUCER
	PRESSURE RELIEF VALVE		



DETAIL 1-5A
SEA CHESTS



DETAIL 1-3A
OVERBOARD DISCHARGE

GENERAL NOTES (CONT.)

11. MATERIAL TRANSITIONS FROM STEEL TO COPPER NICKEL PIPE SHALL BE ACCOMPLISHED VIA FLANGED JOINTS. THE JOINTS SHALL BE FITTED WITH GALVANIC ISOLATION KITS TO PREVENT DIRECT METAL TO METAL CONTACT.
12. WELDED FITTINGS SHALL BE TIG WELDED. SIL-BRAZING IS NOT ACCEPTABLE.
13. WHERE PIPING PENETRATES BULKHEADS OR DECKS, WELDED SLEEVES OR PENETRATION SLEEVES WITH SLIPSIL SEALING PLUGS OR RISE/NOFIRNO SEALING MAY BE USED. INSTALL PIPING TRANSITS IN ACCORDANCE WITH REGULATORY REQUIREMENTS AND MANUFACTURER'S APPROVED INSTALLATION DETAILS.
14. SEA CHEST CROSSOVER AND SEAWATER COOLING PIPING SHALL BE FITTED WITH TAKEDOWN JOINTS AT MAXIMUM 10 FT INTERVALS TO ALLOW COMPLETE DISASSEMBLY AND CLEANING OR REMOVAL OF THE PIPING ASSEMBLY WITHOUT REMOVAL OR MODIFICATION OF STRUCTURE.
15. HEAT EXCHANGERS SHALL BE SELECTED FOR A MAXIMUM SEA WATER TEMPERATURE OF 86F. EACH FW COOLING HEAT EXCHANGER SHALL BE SIZED TO ACOMMODATE THE FULL SYSTEM LOAD.
16. INSTALL PIPING INSULATION IN ACCORDANCE WITH REF 1.
17. EXPANSION TANKS SHALL BE SIZED IN ACCORDANCE WITH THE ENGINE MANUFACTURER'S REQUIREMENTS.
18. TEMPERATURE TRANSDUCERS AND THERMOMETERS SHALL BE INSTALLED IN THERMOWELLS.
19. AUXILIARY SEAWATER AND FRESH WATER COOLING PUMPS SHALL BE CONFIGURED FOR RUNNING/STANDBY OPERATION. STANDBY PUMP SHALL AUTOMATICALLY START IF RUNNING PUMP FAILS. PUMP RUNNING INDICATION AND FAILOVER FROM RUNNING TO STANDBY PUMP SHALL BE INDICATED IN THE SHIPS ALARM AND MONITORING SYSTEM. SEE REF 1.
20. FLEXIBLE HOSES SHALL BE AN APPROVED TYPE MEETING SAE J1942 WITH APPROVED FITTINGS. HOSES SHALL NOT BE MORE THAN 30" IN LENGTH.
21. EACH SEA WATER SUPPLY TO THE ENGINE MOUNTED SEA WATER PUMPS SHALL BE INSTALLED WITH A CHECK VALVE BELOW THE LEVEL OF LIGHTSHIP WATERLINE AND A PIPE LOOP UPSTREAM OF THE PUMP SUCTION TO MAINTAIN PRIME.
22. CONNECT TO SHIPS ALARM AND MONITORING SYSTEM TO PROVIDE REMOTE PRESSURE INDICATION AND LOW PRESSURE ALARM.
23. HEAT EXCHANGER CAPACITIES AND FLOW RATES ARE BASED ON PRELIMINARY VENDOR DATA AND SUBJECT TO CHANGE. THE CONTRACTOR SHALL SELECT HEAT EXCHANGERS TO SUIT THE INSTALLED EQUIPMENT AND ADJUST THE COOLING SYSTEM DESIGN TO SUIT.
24. AUTOMATIC BALANCING VALVES SHALL BE SUITABLE FOR SEAWATER SERVICE WITH NAVAL BRONZE BODIES, AND REPLACEABLE ORIFICE CARTRIDGES.

REVISION HISTORY

REV	ZONE	DESCRIPTION	DWN	DATE	APVD

GENERAL NOTES

1. VESSEL TO BE CONSTRUCTED IN ACCORDANCE WITH 46 CFR SUBCHAPTER H REGULATIONS.
2. 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.
3. 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.
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. 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.
6. THE PIPING SYSTEM SHALL BE CLEANED AND TESTED IN ACCORDANCE WITH USCG REQUIREMENTS. SEE REF 1.
7. 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.
8. VALVES LOCATED BELOW THE FLOOR PLATES SHALL BE PROVIDED WITH REACH RODS. ALL VALVES SHALL BE PROVIDED WITH VISUAL POSITION INDICATION.
9. OVERBOARD SHELL PENETRATIONS SHALL BE LOCATED AS FAR ABOVE BASELINE AS POSSIBLE WHILE STILL BEING UNDER THE GUARDS.
10. TOTAL DYNAMIC HEAD OF PUMPS FOR REQUIRED FLOW ARE APPROXIMATE ONLY. 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.

REFERENCES

1. 18026-200-832-1 TECHNICAL SPECIFICATIONS
2. 18026-200-110-1 BOTTOM AND SIDE SHELL
3. 18026-200-120-4 HULL TRANSVERSE FRAMES
4. 18026-200-506-1 FILLS, VENTS, AND SOUNDS
5. 18026-200-521-1 FIRE MAIN SYSTEM SCHEMATIC
6. 18026-200-529-1 BILGE AND BALLAST PIPING SCHEMATIC
7. 18026-200-551-1 COMPRESSED AIR PIPING SCHEMATIC
8. 18026-200-513-1 MACHINERY VENTILATION ARRANGEMENT

NORTH CAROLINA FERRY SYSTEM
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Michael E. Johnson
8/3/2018

Elliott Bay Design Group
North Carolina, PLLC

CLIENT: NORTH CAROLINA D.O.T.
RALEIGH, NORTH CAROLINA

PROJECT: DOUBLE-ENDED AZIMUTH DRIVE FERRY

TITLE: COOLING SYSTEM SCHEMATIC

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D	18026-200-256-1	–

SCALE	FILE NAME	SHEET	OF
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DWN	MOD	CKD	APVD	APVD DATE
NJB			MEJ	7/31/18

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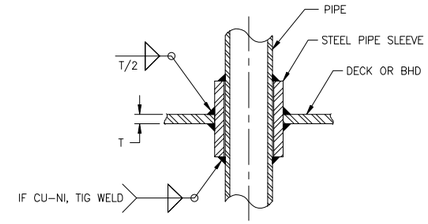
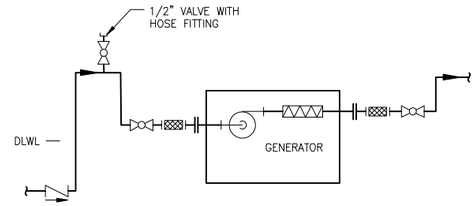


DETAIL 2-1D
TYP DECK/BHD PENETRATION
SEE NOTE 13



DETAIL 2-1C
TYP ENGINE CONNECTION
SEE NOTE 21

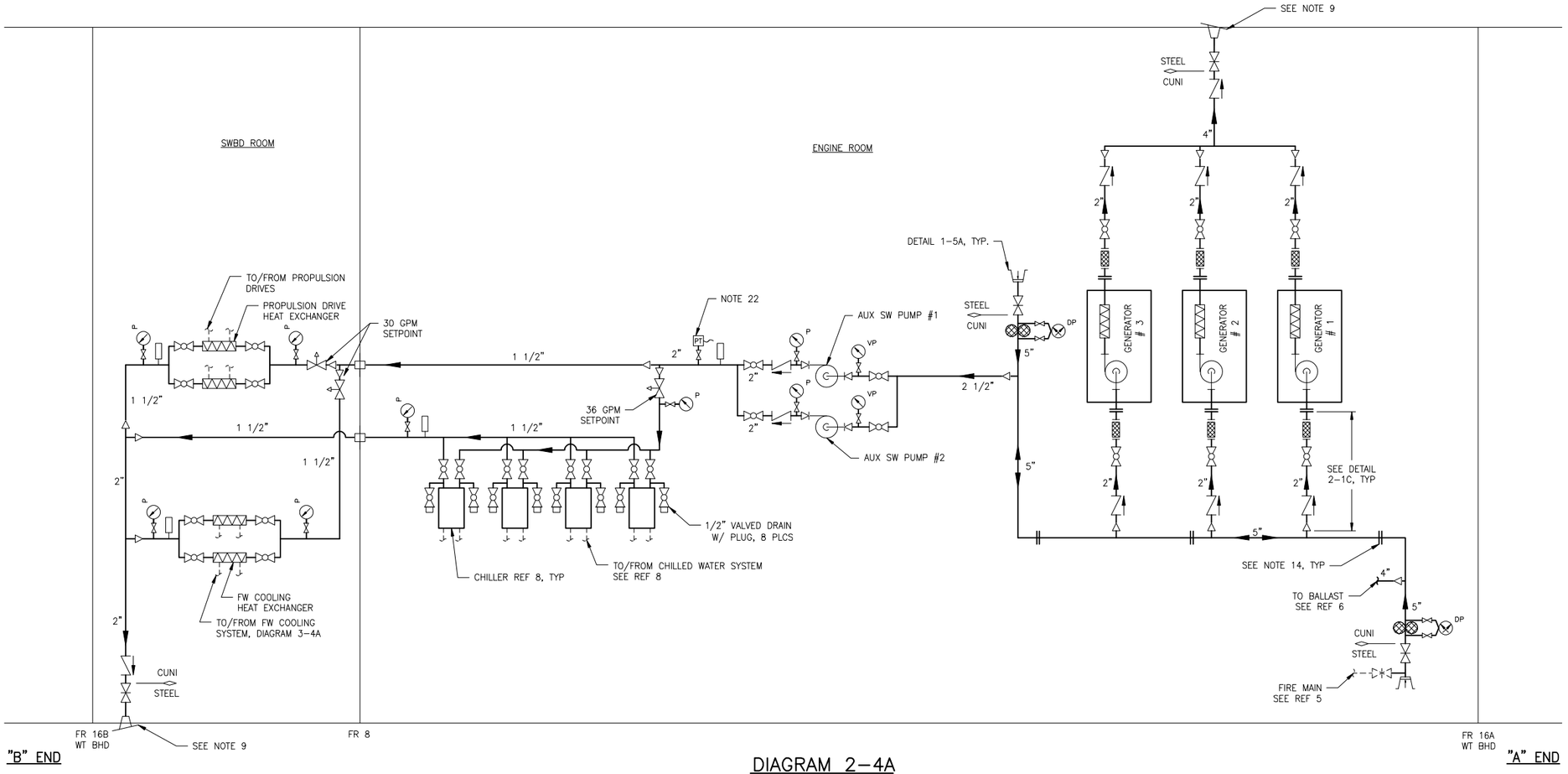


DIAGRAM 2-4A
AUXILIARY SEA WATER COOLING SYSTEM

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8/3/2018

SIZE	DWG NO.	REV
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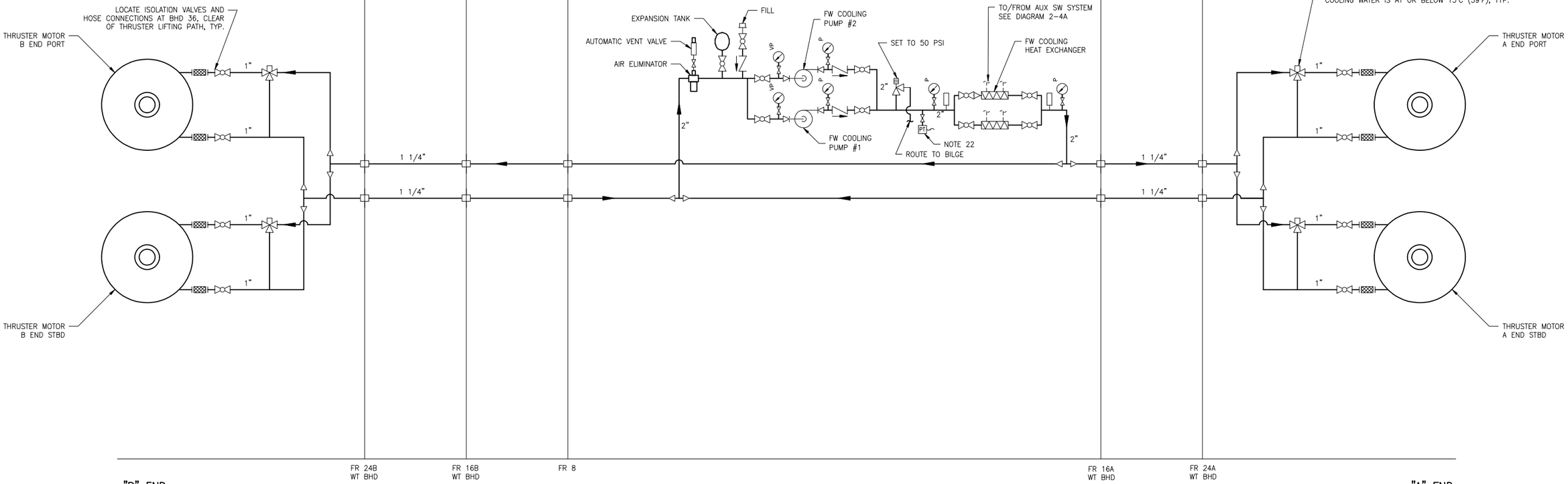

DIAGRAM 3-4A
AZIMUTH THRUSTER FW COOLING SYSTEM

8/3/2018

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