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GENERAL NOTES

1. THE FABRICATION, LAYOUT, AND INSTALLATION OF THE SEAWATER SERVICE SYSTEM SHALL BE IN ACCORDANCE WITH THE ARV PERFORMANCE SPECIFICATIONS, REV (-), REFERENCE 1, ABS MARINE VESSEL RULES (2021), REFERENCE 2, AND REGULATIONS AND STANDARDS CITED THEREIN.

2. THIS DRAWING REPRESENTS A DIAGRAMMATIC TYPE SYSTEM DESCRIPTION. SOME EQUIPMENT AND PIPE RUNS MAY BE SHOWN OUT OF PLACE TO ALLOW SYSTEM COMPONENTS TO BE CLEARLY ILLUSTRATED. DO NOT SCALE.

3. PIPING, MATERIALS, AND WORKMANSHIP TO BE IN ACCORDANCE WITH ABS MARINE VESSEL RULES (2021), PART 4, CH. 6.

4. PIPING SYSTEM SHALL BE CLEANED, FLUSHED, FILLED, AND PRESSURE TESTED IN ACCORDANCE WITH ABS MARINE VESSEL RULES, PART 4.

5. PIPING SHALL BE ADEQUATELY SUPPORTED BY HANGERS SUITABLE FOR THE SERVICE MATERIAL BEING SUPPORTED.

6. PIPING TO BE INSTALLED AS DIRECTLY AS PRACTICABLE WITH MINIMUM NUMBER OF BENDS.

7. PIPE INSTALLATIONS SHALL, TO THE EXTENT PRACTICABLE, PERMIT FREE PASSAGE ALONG WALKWAYS AND LADDER WAYS, FREE ACCESS FOR OPERATION AND MAINTENANCE, AND FREE ACCESS TO DOORS, HATCHES, AND OPENINGS.

8. PIPE SIZES HAVE BEEN SELECTED BASED ON FLUID DESIGN VELOCITIES AS DEFINED IN REFERENCE 1, SECTION 505. ALL PIPE SIZES ARE NOMINAL PIPE SIZE (NPS) UNLESS OTHERWISE NOTED.

9. COMPARTMENT BACKGROUNDS REFLECT THE GENERAL ARRANGEMENT, REFERENCE 3, REV P3.

10. SEA CHEST HULL OPENINGS SERVING THE SEA BAY SHALL BE FITTED WITH GRATINGS OR PERFORATED PLATES WHERE THE NET AREA OF THE OPENING IS FIVE TIMES THE AREA OF THE INLET PIPE. THE DIAMETER OF HOLES OR WIDTH OF SLOTS IN THE SHELL OPENING SHALL NOT BE LESS THAN 20MM (0.787 IN.)

11. FLEXIBLE CONNECTIONS SHALL BE INSTALLED BETWEEN PIPING ASSEMBLIES AND RESILIENTLY MOUNTED PUMPS AND EQUIPMENT.

12. SEAWATER OVERBOARD DISCHARGES SHALL BE LOCATED ABOVE THE DESIGN LOAD WATERLINE ON THE PORT SIDE OF THE VESSEL. OVERBOARD DISCHARGES SHALL NOT INTERFERE WITH BOAT LAUNCH/RETRIEVAL AND OVER THE SIDE OPERATIONS.

13. SEAWATER PIPING EXPOSED TO THE WEATHER SHALL BE HEAT TRACED. A CUTOUT VALVE AND DRAIN LOCATED IN A NEARBY HEATED SPACE SHALL BE PROVIDED FOR ISOLATION AND DRAINING OF EXPOSED PIPING.

14. SEAWATER HEAT EXCHANGERS SHALL HAVE HIGH POINT VENTS AND LOW POINT DRAINS TO FACILITATE MAINTENANCE. CONNECTIONS SHALL BE PROVIDED TO ALLOW ACID CLEANING OF HEAT EXCHANGERS IN PLACE.

15. SEAWATER INLET VALVES SHALL BE FULL BORE TYPE AND SECURED DIRECTLY TO THE ICE BOX/SEA CHEST IN ACCORDANCE WITH ABS MARINE VESSEL RULES (2021), PART 6 CH. 1. SEA CHEST AND SEA BAY VENT PIPING SHALL HAVE SHUTOFF VALVES CONNECTED DIRECTLY TO THE SHELL.

16. WASTER PIECES SHALL BE INSTALLED BETWEEN SHELL VALVES AND THE CU-NI SEAWATER PIPING. WASTER PIECES SHALL BE SCHEDULE 80 STEEL PIPES AND A MINIMUM OF 12 INCHES LONG. WASTER PIECES SHALL BE REPLACEABLE AND INSTALLED IN ACCESSIBLE LOCATIONS.

17. MOTOR-OPERATED VALVES SHALL HAVE BOTH LOCAL CONTROL AND REMOTE CONTROL. REMOTE CONTROL SHALL BE VIA THE INTEGRATED MONITORING, ALARM, AND CONTROL SYSTEM (IMACS). VALVE SHALL HAVE VISUAL AND FEEDBACK INDICATION OF VALVE STATUS (OPEN/CLOSED).

18. WHERE JOINTS OF FERROUS AND NON FERROUS MATERIALS CANNOT BE AVOIDED, INSULATING GASKETS, WASHERS, AND SLEEVES SHALL BE INSTALLED BETWEEN THE DISSIMILAR METALS.

19. ABBREVIATIONS USED ON THIS DRAWING ARE IN ACCORDANCE WITH ASME Y14.38 (2019) EXCEPT AS FOLLOWS:
IMACS INTEGRATED MONITORING, ALARM, AND CONTROL SYSTEM
NS NORMALLY SHUT

20. GRATINGS OF THE SEA CHEST HULL OPENINGS SERVING THE SEA BAY SHALL BE PROVIDED WITH A MEANS OF CLEARING. COMPRESSED AIR CLEARING PIPES ARE TO BE PROVIDED WITH SCREW-DOWN TYPE NON RETURN VALVES.

21. SEA CHESTS 4-81-3-W AND 4-91-4-W ARE ARRANGED AS ICE BOXES IN ACCORDANCE WITH ABS MARINE VESSEL RULES (2021) 6-1-3/17.3. EACH ICEBOX SHALL HAVE A VOLUME OF 35.314 FT³ FOR EVERY 1005 HP OF THE TOTAL INSTALLED POWER.

22. VENT CHECK VALVES SHALL COMPLY WITH MVR 4-6-4/9.3.7.

23. THE RECIRCULATION LINE ORIFICE SHALL BE SIZED TO LIMIT THE FLOW RATE THROUGH THE RECIRCULATION LINE TO 5% OF THE SEAWATER PUMP'S RATED FLOW.

24. EQUIPMENT REFERENCING THIS NOTE IS NOISE CRITICAL AND SHALL BE RESILIENTLY MOUNTED IN ACCORDANCE WITH REFERENCE 1.

25. MACHINERY SPACE PIPING LOCATED BELOW THE WATERLINE SERVING VIBRATION ISOLATED COMPONENTS SHALL BE SUPPORTED USING RESILIENT PIPE HANGERS UP TO THE FIRST HARD PENETRATION AT A BULKHEAD OR OVERHEAD DECK.

26. ALL PIPING WITHIN 20 FT OF THE SONAR TRANSDUCERS SHALL BE SUPPORTED USING RESILIENT HANGERS.

27. PIPING FOR VIBRATION ISOLATED COMPONENTS SHALL BE SUPPORTED USING ISOLATED PIPE CLAMPS THAT INCLUDE A MINIMUM 1/2" THICK RUBBER INSERT. ALL PIPE MOUNTS/CLAMPS SHALL BE ATTACHED TO STIFFENED AREAS OF THE VESSEL. NO PIPE MOUNTS OR CLAMPS SHALL BE LOCATED AT THE CENTER OF A BULKHEAD OR DECK PLATING PANEL.

28. FOR DETAILS REGARDING NOISE CONTROL OF MECHANICAL SYSTEMS, INCLUDING ARRANGEMENT OF FLEXIBLE CONNECTIONS, SEE THE AIRBORNE NOISE ANALYSIS REPORT, REFERENCE 12.

SYMBOLS

	PIPE, SEAWATER SUPPLY		VALVE, BALL, 3-WAY
	PIPE, SEAWATER DISCHARGE		VALVE, GATE
	PIPE, COMPRESSED AIR		VALVE, GATE, MOTOR OPERATED
	PIPE, FIREMAIN		VALVE, SWING CHECK
	PIPE, FRESHWATER COOLING		VALVE, BUTTERFLY
	VALVE, GLOBE STOP CHECK		GAUGE, PRESSURE
	PIPE CONTINUATION		GAUGE, DIFFERENTIAL PRESSURE
	VALVE, BALL		GAUGE, VACUUM PRESSURE
	HOSE CONNECTION		TRANSDUCER, PRESSURE
	STRAINER, SIMPLEX BASKET		TRANSDUCER, VACUUM PRESSURE
	PUMP, CENTRIFUGAL		HEAT EXCHANGER
	HOSE, FLEXIBLE		THERMOMETER, LIQUID IN GLASS TYPE
	VALVE, VENT BALL CHECK		OVERBOARD DISCHARGE
	ORIFICE		VALVE, GATE, LOCKED SHUT
	VALVE, 3-WAY MIXING, ELECTRIC MOTOR ACTUATED WITH MANUAL BYPASS		FLOW ARROW
	STRAINER, Y TYPE		

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MATERIAL SCHEDULE

SERVICE	PIPE		TAKE DOWN JOINTS		BOLTS	NUTS	FITTINGS		VALVES							
	MATERIAL	TYPE	SPECIFICATION	TYPE			MATERIAL	SPECIFICATION	TYPE	MATERIAL	SPECIFICATION	REMARKS				
SEAWATER SERVICE	CU-NI, 90-10	SEAMLESS	MIL-T-16420, CL 200	FLANGES, SILBRAZE	BRONZE	ASME SB62, ANSI B16.24	NICKEL COPPER ASTM F468 ALLOY 400	NICKEL COPPER ASTM F467 ALLOY 400	SILBRAZE	GATE, CHECK	ASME SB61 OR SB62, MSS-SP-80	BRONZE TRIM				
				UNION					FLANGED							
									SOCKET WELD, BUTT WELD							
SHELL CONNECTIONS AND VENTS	CARBON STEEL	SEAMLESS	ASTM A53 GRADE B TYPE S, OR A106 GRADE B, SCH40/STD WT	FLANGES, SOCKET OR BUTT-WELDED	CARBON STEEL	ASTM A105, ANSI B16.5	CARBON STEEL ASTM A 307 OR B, ANSI B18.2.1	CARBON STEEL ASTM A 563 OR A, ANSI B18.2.2	BUTT-WELD	GATE	ASTM A105 OR B62, ANSI B16.24	TRIM: CARBON STEEL				
									SOCKET WELD							

EQUIPMENT LIST

ITEM	QTY	ITEM NAME	RATING	REMARKS
1	2	ENGINE SEAWATER COOLING PUMP	3856 GPM, 30 PSI	SEE GN 24
2	2	ENGINE SEAWATER COOLING STRAINER	3856 GPM	SELF-CLEANING
3	2	PROPULSION & AUXILIARY SEAWATER COOLING PUMP	5131 GPM, 30 PSI	SEE GN 24
4	2	PROPULSION & AUXILIARY SEAWATER COOLING STRAINER	5131 GPM	SELF-CLEANING
5	2	SEA CHEST SUCTION STRAINER	100 PSI	-
6	2	AUXILIARY SEAWATER PUMP	100 PSI AT 100 PSI	SEE GN 24
7	2	AUXILIARY SEAWATER STRAINER	761 GPM	-
8	4	MAIN DIESEL GENERATOR (FATIGUE) LT FW/SW HEAT EXCHANGER	263 GPM	-
9	2	MAIN DIESEL GENERATOR (SEA) LT FW/SW HEAT EXCHANGER	282 GPM	-

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVED
ALL	P0	INITIAL ISSUE	6/20/2022	P. MCGINN
ALL	P1	SHEET 1: REMOVED RESERVATION. 1. REMOVED POTABLE WATER GENERATOR SEAWATER STRAINER FROM EQUIPMENT LIST. REVISED SHEET INDEX TO SUIT. SHEET 2: RELOCATED SHEET 2 CONTENTS TO SHEET 3. ADDED SEAWATER SERVICE CALCULATIONS TABLE. SHEET 3: DELETED DETAIL 3-3B. RELOCATED REMAINING SHEET 3 CONTENTS TO SHEET 4. ADDED SEAWATER COOLING PUMP (WAS QTY 2). ADDED AUXILIARY FW/SW HEAT EXCHANGER TO IMPROVE REDUNDANCY (WAS QTY 1). ADDED SEAWATER COOLING STRAINERS (WAS QTY 2). SHEET 4: ADDED SHEET 4	9/26/2022	M. GAHAGAN
ALL	P2	ALL SHEETS: REVISED IN ITS ENTIRETY TO REFLECT THE LATEST GENERAL ARRANGEMENT, REV P3. SHEET 1: ADDED GENERAL NOTES 24-28 AND REFERENCES 9-12. REVISED QUANTITY OF ENGINE SEAWATER COOLING PUMPS, WAS 3. ADDED MAIN DIESEL GENERATOR LOW TEMPERATURE HEAT EXCHANGERS. REVISED EQUIPMENT LIST RATINGS TO SUIT CALCULATION UPDATES. SHEET 2: REVISED SEAWATER SERVICE CALCULATIONS TO SUIT DESIGN DEVELOPMENT. SHEET 3: RELOCATED HEAT EXCHANGERS TO SHEET 5. REVISED QUANTITY OF ENGINE SEAWATER COOLING PUMPS, WAS 3. ADDED PROPULSION & AUXILIARY SEAWATER COOLING PUMPS. ADDED TEMPERATURE REGULATING VALVE. SHEET 4: ADDED TANK WASHDOWN AND SEWAGE PIPING FLUSH CONNECTIONS TO DETAIL 4-8C. SHEET 5: ADDED SHEET 5 TO DEPICT SW COOLING OF ENGINE FW LOOPS.	12/29/2022	M. GAHAGAN

SHEET INDEX

SH	REV	TITLE
1	P2	TITLE, SHEET INDEX, REVISIONS, GENERAL NOTES, RESERVATIONS, MATERIAL SCHEDULE, EQUIPMENT LIST, REFERENCES & SYMBOLS
2	P2	SEAWATER SERVICE SYSTEM CALCULATIONS
3	P2	SEA BAY ARRANGEMENT FR B4
4	P2	AUXILIARY SEAWATER SERVICE & DETAILS
5	P2	SEAWATER COOLING HEAT EXCHANGERS

AIRBORNE NOISE REPORT

12	AIRBORNE NOISE REPORT	5E1-073-R101
11	SEWAGE SYSTEM	5E1-528-D001
10	JACKET WATER COOLING SYSTEM	5E1-532-D101
9	WASTE HEAT RECOVERY SYSTEM & HOT WATER HEATING SYSTEM	5E1-517-D001
8	POTABLE WATER SERVICE SYSTEM	5E1-533-D001
7	BILGE AND OILY WASTE SYSTEM	5E1-529-D001
6	COMPRESSED AIR SYSTEM	5E1-551-D101
5	FIREMAIN SYSTEM	5E1-521-D001
4	FRESHWATER COOLING SYSTEM	5E1-532-D001
3	GENERAL ARRANGEMENT	5E1-001-D001
2	ABS MARINE VESSEL RULES (2021)	-
1	ARV PERFORMANCE SPECIFICATIONS	-
NO.	TITLE	DWG/DOC NO.

REFERENCES

12	AIRBORNE NOISE REPORT	5E1-073-R101
11	SEWAGE SYSTEM	5E1-528-D001
10	JACKET WATER COOLING SYSTEM	5E1-532-D101
9	WASTE HEAT RECOVERY SYSTEM & HOT WATER HEATING SYSTEM	5E1-517-D001
8	POTABLE WATER SERVICE SYSTEM	5E1-533-D001
7	BILGE AND OILY WASTE SYSTEM	5E1-529-D001
6	COMPRESSED AIR SYSTEM	5E1-551-D101
5	FIREMAIN SYSTEM	5E1-521-D001
4	FRESHWATER COOLING SYSTEM	5E1-532-D001
3	GENERAL ARRANGEMENT	5E1-001-D001
2	ABS MARINE VESSEL RULES (2021)	-
1	ARV PERFORMANCE SPECIFICATIONS	-
NO.	TITLE	DWG/DOC NO.

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TITLE

ANTARCTIC RESEARCH VESSEL (ARV)
SEAWATER SERVICE
SYSTEM

PREPARED:
N. LABELLE

DATE:
06/07/22

CHECKED:
C. KUEBEL

DATE:
06/08/22

DRAWN:
A. NEFF

DATE:
06/15/22

APPROVED:
P. MCGINN

DATE:
06/20/22

DWG NO

5E1-520-D001

SH

1

REV

P2

DWG NO

5E1-520-D001

SCALE:

NONE

SHEET

1 OF 5

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G													G
F													F
E													E
D													D
C													C
B													B
A													A
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SEAWATER SERVICE SYSTEM CALCULATIONS

ENGINE SEAWATER COOLING PUMP (FLOW RATE)

BASED UPON ESTIMATED FLOW REQUIREMENTS, THE HIGHEST COOLING WATER DEMAND IS SHOWN BELOW:
16V ENGINE LOW TEMP HEAT EXCHANGER = 263 GPM
16V ENGINE HIGH TEMP HEAT EXCHANGER = 337 GPM
12V ENGINE LOW TEMP HEAT EXCHANGER = 282 GPM
12V ENGINE HIGH TEMP HEAT EXCHANGER = 183 GPM
TOTAL DEMAND = 263(4) + 337(4) + 282(2) + 183(2) = 3330 GPM
ASSUME 10% DESIGN MARGIN = 333.0 GPM
TOTAL DEMAND WITH MARGIN = 3663 GPM
THERE SHALL BE AT LEAST TWO EQUALLY SIZED CIRCULATING PUMPS WHERE FULL CAPACITY OF THE SYSTEM IS ACHIEVED WITH ANY ONE PUMP NOT OPERATING, PER REF. 1 SECTION 532.
THE RECIRCULATION LINE IN THE SEAWATER PUMP DISCHARGE CONSUMES 5% OF THE FLOW RATE OF THE PUMP. THE PUMP SHALL BE SIZED TO ALLOW FOR 5% FLOW RATE LOSS AND MAINTAIN A MINIMUM OF 3663 GPM.
EFFECTIVE FLOW RATE = PUMP FLOW RATE - (PUMP FLOW RATE X .05) = 3663 GPM = 3856 - (3856 * 0.05)
TWO CIRCULATING PUMPS SHALL BE PROVIDED FOR THE ARV, SIZED TO A CAPACITY OF 3856 GPM EACH TO MAINTAIN THE MINIMUM 3663 GPM.

PROPULSION & AUXILIARY SEAWATER COOLING PUMP (FLOW RATE)
BASED UPON ESTIMATED FLOW REQUIREMENTS, THE HIGHEST COOLING WATER DEMAND IS SHOWN BELOW:
PROPULSION FW/SW HEAT EXCHANGER = 2750 GPM
AUXILIARY FW/SW HEAT EXCHANGER = 888 GPM
WASTE HEAT RECOVERY SYSTEM DUMPING COOLER = 793 GPM
TOTAL DEMAND = 2750(1) + 888(1) + 793(1) = 4431 GPM
ASSUME 10% DESIGN MARGIN = 443.1 GPM
TOTAL DEMAND WITH MARGIN = 4874.1 GPM
THERE SHALL BE AT LEAST TWO EQUALLY SIZED CIRCULATING PUMPS WHERE FULL CAPACITY OF THE SYSTEM IS ACHIEVED WITH ANY ONE PUMP NOT OPERATING, PER REF. 1 SECTION 532.
THE RECIRCULATION LINE IN THE SEAWATER PUMP DISCHARGE CONSUMES 5% OF THE FLOW RATE OF THE PUMP. THE PUMP SHALL BE SIZED TO ALLOW FOR 5% FLOWRATE LOSS AND MAINTAIN A MINIMUM OF 4874 GPM.
EFFECTIVE FLOW RATE = PUMP FLOW RATE - (PUMP FLOW RATE X .05) = 4874.1 GPM = 5131 - (5131 * 0.05)
TWO CIRCULATING PUMPS SHALL BE PROVIDED FOR THE ARV, SIZED TO A CAPACITY OF 5131 GPM EACH TO MAINTAIN THE MINIMUM 4874 GPM.

SEAWATER COOLING PUMP NET PRESSURE SUCTION HEAD AVAILABLE
THE NET PRESSURE SUCTION HEAD AVAILABLE (NPSHA) IS CALCULATED USING THE BELOW FORMULA:
NPSHA = HA + HZ - HF - HVP
ATMOSPHERIC PRESSURE (HA) = 33 FT
VERTICAL DISTANCE FROM DWL TO PUMP CENTERLINE (HZ) = 6 FT
FRICTION HEAD IN SUCTION PIPING (HF) (ESTIMATED) = 9 FT
VAPOR PRESSURE OF SEAWATER (HVP) = 0.57 FT
NPSHA = 33 + 6 - 9 - 0.57 = 29.43
NPSHR FOR TYPICAL CENTRIFUGAL PUMPS IS APPROXIMATELY 15 FT. SINCE THE CALCULATED NPSHA OF 29.43 FT IS GREATER THAN NPSHR OF 15 FT, THIS PUMP ARRANGEMENT IS ACCEPTABLE.

SEAWATER COOLING PUMP DIFFERENTIAL PRESSURE
FOR THIS STAGE OF THE DESIGN, IT IS ASSUMED THAT THE MAXIMUM DIFFERENTIAL PRESSURE REQUIRED IS WHEN THE COOLING PUMPS ARE SUPPLYING THE PROPULSION FRESHWATER HEAT EXCHANGERS.
DRAFT WATER LINE TO SUCTION:
TOTAL ELEVATION CHANGE (ESTIMATED) = 6 FT
STATIC PRESSURE GAIN = 2.6 PSI
SUCTION:
DYNAMIC PRESSURE LOSS (ESTIMATED) = 4 PSI
DISCHARGE:
TOTAL ELEVATION CHANGE = 20 FT
STATIC PRESSURE LOSS = 8.67 PSI ≈ 9 PSI
DYNAMIC PRESSURE LOSS (ESTIMATED) = 15 PSI
MINIMUM REQUIRED DIFFERENTIAL PRESSURE = -2.6 + 4 + 9 + 15 = 25.4 PSI
10% DESIGN MARGIN = 2.5
DIFFERENTIAL PRESSURE WITH MARGIN = 27.9 PSI
THE RATED PRESSURE OF EACH SEAWATER COOLING PUMP SHALL BE 30 PSI MINIMUM.

PIPE SIZING
PER REFERENCE 1, SECTION 505.2 SYSTEM DESIGN:
FLUID SYSTEMS SHOULD BE DESIGNED WITH THE LOWEST FLOW VELOCITIES CONSISTENT WITH OTHER SYSTEM REQUIREMENTS. A MAXIMUM VELOCITY OF 9 FT/SEC IS ALLOWED FOR SEAWATER SYSTEMS.

AUXILIARY SEAWATER SERVICE PUMP (FLOW RATE)

BASED UPON ESTIMATED FLOW REQUIREMENTS, THE HIGHEST FLOW DEMAND IS SHOWN BELOW:
WASHDOWN HOSE STATION = 95 GPM (ASSUMED)
ANCHOR CHAIN WASHDOWN = 88.5 GPM
LAB VAN CONNECTION = 100 GPM (ASSUMED, 1 IN USE)
TOTAL DEMAND = 95(4) + 88.5(2) + 100 = 657 GPM
ASSUME 10% DESIGN MARGIN = 65.7 GPM
TOTAL DEMAND WITH MARGIN = 723 GPM
A CENTRALIZED SYSTEM PROVIDING SEAWATER TO EQUIPMENT NOT SERVED BY A DEDICATED PUMP SHALL BE SERVED BY AT LEAST TWO EQUALLY SIZED PUMPS IN A PRIMARY STANDBY CONFIGURATION, PER REF. 1 SECTION 524.
THE RECIRCULATION LINE IN THE SEAWATER PUMP DISCHARGE CONSUMES 5% OF THE FLOW RATE OF THE PUMP. THE PUMP SHALL BE SIZED TO ALLOW FOR 5% FLOW RATE LOSS AND MAINTAIN A MINIMUM OF 723 GPM.
EFFECTIVE FLOW RATE = PUMP FLOW RATE - (PUMP FLOW RATE X .05) = 723 GPM = 761 - (761 * 0.05)
TWO SERVICE PUMPS SHALL BE PROVIDED FOR THE ARV, SIZED TO A CAPACITY OF 761 GPM EACH TO MAINTAIN THE MINIMUM 723 GPM.

AUXILIARY SEAWATER SERVICE PUMP NET PRESSURE SUCTION HEAD AVAILABLE
THE NET PRESSURE SUCTION HEAD AVAILABLE (NPSHA) IS CALCULATED USING THE BELOW FORMULA:
NPSHA = HA + HZ - HF - HVP
ATMOSPHERIC PRESSURE (HA) = 33 FT
VERTICAL DISTANCE FROM DWL TO PUMP CENTERLINE (HZ) = 6 FT
FRICTION HEAD IN SUCTION PIPING (HF) (ESTIMATED) = 7 FT
VAPOR PRESSURE OF SEAWATER (HVP) = 0.57 FT
NPSHA = 33 + 6 - 7 - 0.57 = 31.43

AUXILIARY SEAWATER SERVICE PUMP DIFFERENTIAL PRESSURE
FOR THIS STAGE OF THE DESIGN, IT IS ASSUMED THAT THE MAXIMUM DIFFERENTIAL PRESSURE REQUIRED IS WHEN THE SERVICE PUMP IS SUPPLYING THE ANCHOR CHAIN WASHDOWN IN THE MOORING EQUIPMENT ROOM (03-E-0-A) ON THE 03 LEVEL.
DRAFT WATER LINE TO SUCTION:
TOTAL ELEVATION CHANGE (ESTIMATED) = 6 FT
STATIC PRESSURE GAIN = 2.6 PSI
SUCTION:
DYNAMIC PRESSURE LOSS (ESTIMATED) = 3 PSI
DISCHARGE:
TOTAL ELEVATION CHANGE = 56 FT
STATIC PRESSURE LOSS = 24.3 PSI ≈ 25 PSI
DYNAMIC PRESSURE LOSS (ESTIMATED) = 15 PSI
MINIMUM PRESSURE REQUIRED AT HOSE NOZZLE (46 CFR § 193.10-5) = 50 PSI
MINIMUM REQUIRED DIFFERENTIAL PRESSURE = -2.6 + 3 + 25 + 15 + 50 = 90.4 PSI
10% DESIGN MARGIN = 9.0
DIFFERENTIAL PRESSURE WITH MARGIN = 99.4 PSI
THE RATED PRESSURE OF EACH SEAWATER SERVICE PUMP SHALL BE 100 PSI.

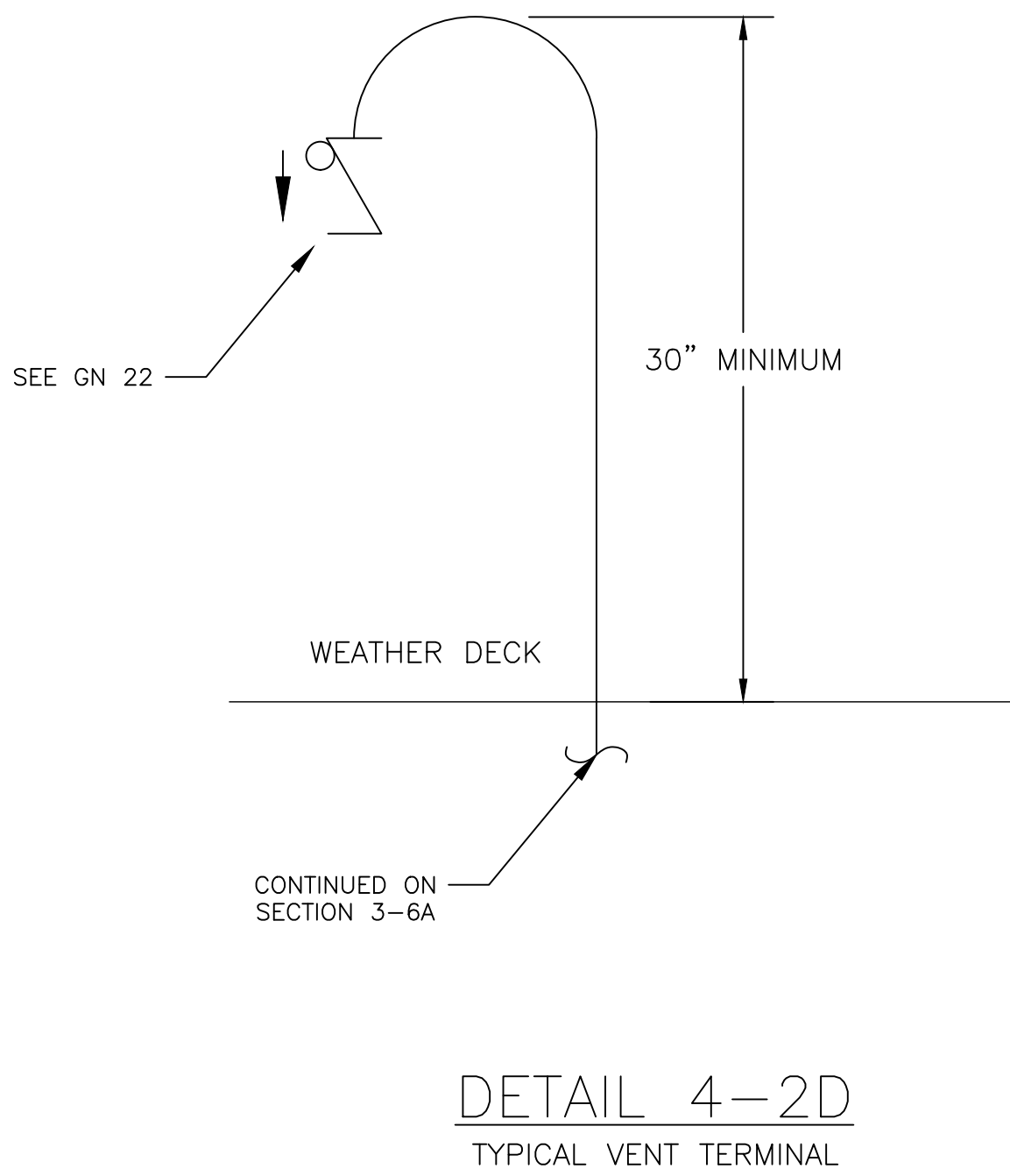
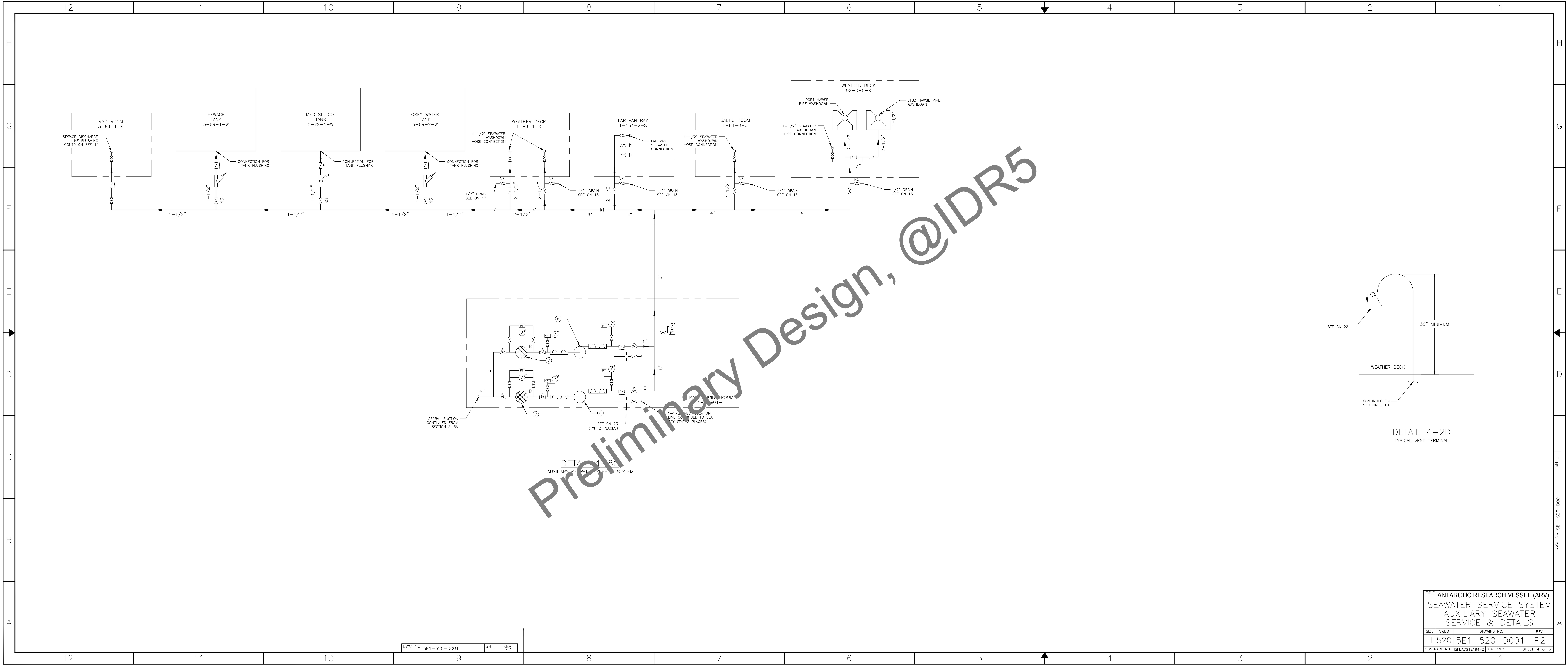
FILE: ANTARCTIC RESEARCH VESSEL (ARV)
SEAWATER SERVICE SYSTEM
CALCULATIONS

SIZE	SWBS	DRAWING NO.	REV
H 520	5E1-520-D001	P2	
CONTRACT NO. NSF/DACS1219442			SHEET 2 OF 5

DWG NO 5E1-520-D001SH 2REV 2

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TITLE: ANTARCTIC RESEARCH VESSEL (ARV)			
SEAWATER SERVICE SYSTEM			
AUXILIARY SEAWATER SERVICE & DETAILS			
SIZE	SWBS	DRAWING NO.	REV
H 520	5E1-520-D001	P2	
CONTRACT NO. NSFDACS1219442			SHEET 4 OF 5

