GENERAL NOTES

1. THIS SHIP SHALL BE CONSTRUCTED ACCORDING TO ABS 2001 UNDER 90 METER RULES AS AMENDED AND USCG 1999 CFR. THE SHIP SHALL BE CLASSIFIED ✠A1Ⓔ, ✠AMS, ✠ACCU, ✠DPS-1, UNRESTRICTED SERVICE, ICE CLASS C0 AND ABS RECORD OF NOTATION CRC FOR COMPLIANCE WITH ABS GUIDE FOR CERTIFICATION OF CRANES (INCLUDING THE REQUIREMENTS OF API 2C). THE SHIP SHALL BE CONSTRUCTED AND CERTIFICATED IN ACCORDANCE WITH 46 CFR, SUBCHAPTER U.
2. THE PRINCIPAL CHARACTERISTICS OF THIS VESSEL ARE LISTED AS FOLLOWS:
   LENGTH OVERALL: 63.6 M
   LENGTH BP: 58.0 M
   BEAM: 15.0 M
   DRAFT: 5.9 M (CENTERBOARD UP)
   9.15 M (CENTERBOARD DOWN)
   MOLDED DEPTH: 8.65 M
   ESTIMATED TONNAGE: 2100
3. PIPING SYSTEM SYMBOLS USED ON THIS DIAGRAM CONFORM TO MARITIME ADMINISTRATION STANDARDS.
4. ALL PIPING MATERIALS AND WORKMANSHIP TO BE IN ACCORDANCE WITH ABS & USCG RULES AND REGULATIONS.
5. ALL PIPING TO HAVE SUFFICIENT FLEXIBILITY TO PREVENT OVER STRESSING OF PIPING MATERIALS, LEAKAGE OF JOINTS OR DISTORTION OF CONNECTED EQUIPMENT.
6. PIPING SHALL BE ARRANGED SO THAT IT WILL NOT NORMALLY BE SUBJECT TO MECHANICAL INJURY AND TO PRECLUDE ITS USE FOR OTHER PURPOSES SUCH AS GRAB RODS, STEPPING POINTS AND HANDRAILS.
7. ALL WELDING IS TO BE IN ACCORDANCE WITH ABS & USCG REQUIREMENTS.
8. ISOLATION GASKETS SHALL BE PROVIDED BETWEEN PIPING SYSTEM COMPONENTS CONSISTING OF DISSIMILAR METALS TO PREVENT GALVANIC CORROSION.
9. BILGE SUCTIONS SHALL BE ENCLOSED IN STRAINER BOXES WITH AN OPEN AREA EQUIVALENT TO THREE TIMES THE AREA OF THE SUCTION PIPE.
10. DUMP VALVES TO BE REMOTELY OPERATED FROM THE WHEELHOUSE.
11. DURING BILGE OPERATION, MAINTAINING THE NET POSITIVE SUCTION HEAD REQUIRED MAY BE ACCOMPLISHED BY THROTTLING THE FLOWRATE THROUGH THE DISCHARGE LINE AND/OR INCREASING THE NUMBER OF BILGE SUCTION LINES BEING USED.
12. FOR STANDARD DETAILS NOT SHOWN SEE REF 4.
13. THE BILGE PUMP INDEPENDENT SUCTION SHALL BE OPERABLE FROM OUTSIDE MACHINERY SPACES.
14. M279 ABS APPROVAL DATE 9/17/02.

MATERIAL SCHEDULE

PIPING SYSTEM	PIPE		TAKEDOWN JOINTS		VALVES 3,1			FITTINGS 2	MAXIMUM WORKING CONDITIONS		
	SIZE	MATERIAL	MATERIAL	BOLTING	TYPE	BODY	TRIM	TYPE & MATERIAL	SYSTEM	PRESSURE	TEMP
BILGE AND BALLAST (CLASS 2 PIPING)	50 & BELOW	CARBON STEEL, ASTM A53, GR B SCHEDULE 80 TYPE S OR E	UNION, SWLDG OR THD STEEL, ASTM A105 SOCKET WELD ANSI B16.11 3000#	BOLTS AND STUDS STEEL ASTM A307 GR B ANSI B18.2.1 NUTS STEEL ASTM A563 GR A ANSI B18.2.2 CRES TO BE USED WHEN EXPOSED TO WEATHER OR SALTWATER	GATE, GLOBE, ANGLE, CHECK, BALL, BUTTERFLY	SWLDG AND THREADED, 150# STEEL, ASTM A105 OR A216 ANSI B16.11 BRONZE ASTM B61 OR B62	STEEL VALVES STEM, WEDGE/DISC OR SEAT RING CRES, ASTM A 182 GR F6A, HARD FACED SEATS OPTIONAL	STEEL, ASTM A105 ANSI B16.11 CLASS 3000, SWLDG & THRD	BILGE AND BALLAST	8.4 bar	50°C
	50 & ABOVE		FLANGE, SLIP-ON, 150# STEEL, ASTM A105 ANSI B16.5			FLANGED DUCTILE IRON, ASTM A395, ANSI B16.34 OR STEEL, ASTM A216, GR WCB OR A105 OR BRONZE, ASTM B61 OR B62 ALL 125# MIN.	IRON OR BRONZE VALVES STEM, WEDGE/DISC OR SEAT RING BRONZE, ASTM B61 OR B62 INTEGRAL SEATS SAME AS BODY MATERIAL	BTWLD, STEEL, ASTM A234, GR WPB, ANSI B16.9 EXTRA STRONG			

MATERIAL NOTES:
1. GAUGE STOP VALVES SHALL BE 2 PIECE BRONZE CATEGORY A.
2. FOR 50 AND BELOW FITTINGS MAY BE ELASTIC STRAIN PRELUDE (ESP) CARBON STEEL 207 BAR RATING, WITH ABS TYPE APPROVAL AND USCG ACCEPTANCE.
3. ALL RESILIENT SEATED VALVES TO BE USCG CATEGORY A.

REVISIONS

REV	ZONE	DESCRIPTION	DATE	APPROVED
1		1. ADDED VALVE 529-VL-72 FOR WASTE WATER TANK FILL. ITEM 1 PER ENG DEVELOPMENT	8/18/04	DMR
2		1. EXTENDED HULL APPLICABILITY TO INCLUDE HULL 1956.	5/17/05	DMR
3		1. EXTENDED HULL APPLICABILITY TO INCLUDE HULL 1957.	6/12/06	DMR
4		1. THIS DRAWING REFLECTS AS-BUILT CONDITIONS FOR HULL 1953.		

BILGE CALCULATIONS

(ABS 4/6.39.5a):

$$d_{Main}=25+1.68\sqrt{L(B+D)}\ \text{(mm)}$$

BILGE MAIN

$$d_{Main}=25+1.68\sqrt{58(15+8.65)} = 87.22\ \text{(mm)}$$

4" SCH 80 = 100 x 8.56 (mm)

(ABS 4/6.39.5b):

$$d_{Branch}=25+2.16\sqrt{c(B+D)}\ \text{(mm)}$$

BOW THRUSTER MACHY ROOM FR: 13-19

$$d_{Branch}=25+2.16\sqrt{3.6(15+8.65)} = 44.93\ \text{(mm)}$$

2" SCH 80 = 50 x 5.54 (mm)

TRANSDUCER ROOM FR: 29-39

$$d_{Branch}=25+2.16\sqrt{6(15+8.65)} = 50.73\ \text{(mm)}$$

2" SCH 80 = 50 x 5.54 (mm)

DOMESTIC EQUIPMENT ROOM FR: 29-39

$$d_{Branch}=25+2.16\sqrt{6(15+8.65)} = 50.73\ \text{(mm)}$$

(2) 2" SCH 80 = (2) 50 x 5.54 (mm)

AUXILIARY MACHINERY ROOM FR: 39-49

$$d_{Branch}=25+2.16\sqrt{6(15+8.65)} = 50.73\ \text{(mm)}$$

(2) 2" SCH 80 = (2) 50 x 5.54 (mm)

MAIN MACHINERY ROOM FR: 49-78

$$d_{Branch}=25+2.16\sqrt{17.4(15+8.65)} = 68.82\ \text{(mm)}$$

(2) 2" SCH 80 = (2) 50 x 5.54 (mm)

BILGE CALCULATIONS

SCIENTIFIC STORES ROOM FR: 68-82

$$d_{Branch}=25+2.16\sqrt{8.4(15+8.65)} = 55.44\ \text{(mm)}$$

2" SCH 80 = 50 x 5.54 (mm)

VOID (P) FR: 78-82

$$d_{Branch}=25+2.16\sqrt{2.4(15+8.65)} = 41.27\ \text{(mm)}$$

2" SCH 80 = 50 x 5.54 (mm)

VOID (S) FR: 78-82

$$d_{Branch}=25+2.16\sqrt{2.4(15+8.65)} = 41.27\ \text{(mm)}$$

2" SCH 80 = 50 x 5.54 (mm)

VOID FR: 78-89

$$d_{Branch}=25+2.16\sqrt{6.6(15+8.65)} = 51.99\ \text{(mm)}$$

2" SCH 80 = 50 x 5.54 (mm)

TRAWL WINCH ROOM FR: 82-101

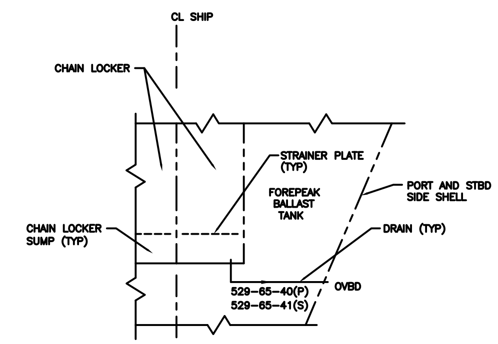
$$d_{Branch}=25+2.16\sqrt{11.4(15+8.65)} = 60.47\ \text{(mm)}$$

(2) 2" SCH 80 = (2) 50 x 5.54 (mm)

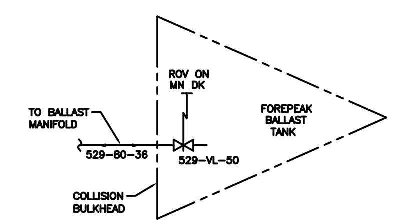
VOID FR: 49-72

$$d_{Branch}=25+2.16\sqrt{13.8(5+8.65)} = 54.65\ \text{(mm)}$$

2" SCH 80 = 50 x 5.54 (mm)



DETAIL 3-D
CHAIN LOCKER DRAIN



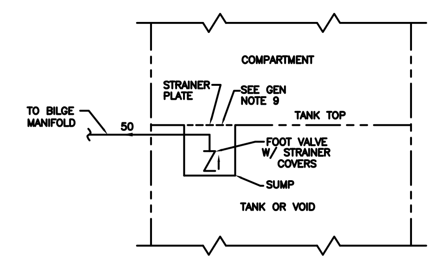
DETAIL 3-C
FOREPEAK BALLAST TANK

CONVERSION TABLE

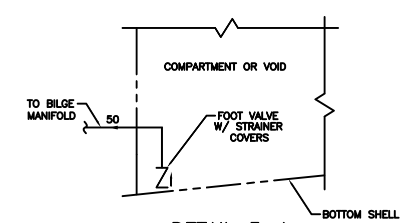
STANDARD ENGLISH NOM. PIPE SIZE UNITS (IN)	METRIC NOM. PIPE SIZE UNITS (MM)
1/2 IN	15 MM
3/4 IN	20 MM
1 IN	25 MM
1 1/4 IN	32 MM
1 1/2 IN	40 MM
2 IN	50 MM
2 1/2 IN	65 MM
3 IN	80 MM
4 IN	100 MM
5 IN	125 MM
6 IN	150 MM
8 IN	200 MM
10 IN	250 MM
12 IN	300 MM
14 IN	350 MM
16 IN	400 MM

CONVERSION TABLE

STANDARD ENGLISH PRESSURE UNITS (PSI)	METRIC PRESSURE UNITS (BAR)
50 PSI	3.44 BAR
100 PSI	6.89 BAR
150 PSI	10.34 BAR
200 PSI	13.79 BAR
300 PSI	20.68 BAR
400 PSI	29.58 BAR
500 PSI	34.47 BAR
1000 PSI	68.95 BAR
2000 PSI	137.70 BAR
3000 PSI	206.86 BAR



DETAIL 3-B
TYP BILGE WELL



DETAIL 3-A
TYP BILGE SUCTION

123-100-XX
- LINE NUMBER
- LINE SIZE
- LINE SWBS

LINE NO. IDENTIFICATION

123-AB-XX
- COMPONENT NUMBER
- COMPONENT TYPE (SEE COMPONENT LIST)
- COMPONENT SWBS

COMPONENT NO. IDENTIFICATION

AS-BUILT

COMPONENT LIST

ITEM No.	SIZE	SERVICE	DESCRIPTION/TYPE	REMARKS
529-VL-01	125	BILGE	VALVE, GATE	
529-VL-02	100	BILGE	VALVE, BUTTERFLY	
529-VL-03	50	BILGE	VALVE, GLOBE STOP CHECK	
529-VL-04	50	BILGE	VALVE, GLOBE STOP CHECK	
529-VL-05	50	BILGE	VALVE, GLOBE STOP CHECK	
529-VL-06	50	BILGE	VALVE, GLOBE STOP CHECK	
529-VL-07	50	BILGE	VALVE, GLOBE STOP CHECK	
529-VL-08	50	BILGE	VALVE, GLOBE STOP CHECK	
529-VL-09	50	BILGE	VALVE, GLOBE STOP CHECK	
529-VL-10	50	BILGE	VALVE, GLOBE STOP CHECK	
529-VL-11	15	BILGE	VALVE, BALL GAGE	
529-VL-12	40	BILGE	VALVE, GLOBE	
529-VL-13	100	BILGE	VALVE, WAFER SWING CHECK	
529-VL-14	100	BILGE	VALVE, GLOBE	
529-VL-15	100	BILGE	VALVE, BUTTERFLY	
529-VL-16	50	BILGE	VALVE, BALL	
529-VL-17	80	BALLAST	VALVE, BUTTERFLY	
529-VL-18	80	BILGE	VALVE, BUTTERFLY	
529-VL-19	80	BILGE	VALVE, GAG SCUPPER	ROV AT 2nd DK, POS CLOSING
529-VL-20	50	BILGE	VALVE, GATE	SELF ACT QUICK CLOSING W/ CAP & CHAIN
529-VL-21	50	BILGE	VALVE, GATE	SELF ACT QUICK CLOSING W/ CAP & CHAIN
529-VL-22				NOT USED
529-VL-23				NOT USED
529-VL-24	50	BILGE	VALVE, GATE	SELF ACT QUICK CLOSING W/ CAP & CHAIN
529-VL-25				NOT USED
529-VL-26	50	BILGE	VALVE, GATE	SELF ACT QUICK CLOSING W/ CAP & CHAIN
529-VL-27	50	BILGE	VALVE, GATE	SELF ACT QUICK CLOSING W/ CAP & CHAIN
529-VL-28	100	BILGE	VALVE, BUTTERFLY	USCG CATEGORY A, REMOTE ACTUATED
529-VL-29	150	BILGE	VALVE, BUTTERFLY	USCG CATEGORY A
529-VL-30	100	BL/BAL	VALVE, BUTTERFLY	
529-VL-31	125	BALLAST	VALVE, GATE	
529-VL-32	15	BALLAST	VALVE, BALL GAGE	
529-VL-33	40	BALLAST	VALVE, GLOBE	
529-VL-34	100	BALLAST	VALVE, WAFER SWING CHECK	
529-VL-35	100	BALLAST	VALVE,GLOBE	
529-VL-36	80	BALLAST	VALVE, BUTTERFLY	
529-VL-37	100	BALLAST	VALVE, BUTTERFLY	
529-VL-38	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-39	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-40	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-41	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-42	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-43	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-44	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-45	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-46	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-47	80	BALLAST	VALVE,GLOBE	SUPPLIED WITH MANIFOLD
529-VL-48	200	BALLAST	VALVE, BUTTERFLY	REMOTE ACTUATED
529-VL-49	200	BALLAST	VALVE, BUTTERFLY	REMOTE ACTUATED
529-VL-50	80	BALLAST	VALVE,GATE	ROV AT 01 LEVEL
529-VL-51	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-52	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-53	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-54	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-55	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-56	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-57	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-58	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-59	100	BILGE	VALVE, WAFER CHECK	
529-VL-60	150	BILGE	VALVE, WAFER CHECK	
529-VL-61	150	BALLAST	VALVE,GATE	ROV AT MAIN DECK
529-VL-62	50	BILGE	VALVE, GLOBE STOP CHECK	SUPPLIED WITH MANIFOLD
529-VL-63	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-64	50	BILGE	VALVE, GLOBE STOP CHECK	SUPPLIED WITH MANIFOLD
529-VL-65	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-66	50	BILGE	VALVE, GLOBE STOP CHECK	
529-VL-67	50	BILGE	VALVE, FOOT	W/ STRAINER COVER
529-VL-68	125	BALLAST	VALVE, BUTTERFLY	
529-VL-69	50	BILGE	VALVE, SWING CHECK	
529-VL-70	50	BALLAST	VALVE, BALL	
529-VL-71	15	BALLAST	VALVE, BALL	
529-VL-72	50	BALLAST	VALVE, BALL	LOCKED CLOSED
529-SR-01	125	BILGE	SIMLPEX STRAINER	
529-SR-02	125	BALLAST	SIMLPEX STRAINER	
529-PI-01	15	BILGE	PRESSURE INDICATOR	0-16 BAR
529-PI-02	15	BALLAST	PRESSURE INDICATOR	0-16 BAR
529-PI-03	15	BALLAST	PRESSURE INDICATOR	0-16 BAR
529-PM-41	80x65	BL/BAL/FIRE	2 SPEED 1750/3500 RPM PUMP, SEE REF 5	44m3h 16m TDH / 80.4m3h 67.4m TDH
529-PM-43	80x65	BAL/BL/FIRE	2 SPEED 1750/3500 RPM PUMP, SEE REF 5	44m3h 16m TDH / 80.4m3h 67.4m TDH
529-BM-42		BILGE	BILGE MANIFOLD	SEE REF. 5
529-BM-44		BALLAST	BALLAST MANIFOLD	SEE REF. 5
529-HA-01				NOT USED
529-HA-02				NOT USED
529-HA-03	125	BAL/BIL/FIRE	STRAUB-FLEX 1 RESILIENTLY SEATED COUPLING	ABS APPROVED
529-HA-04	100	BAL/BIL/FIRE	STRAUB-FLEX 1 RESILIENTLY SEATED COUPLING	ABS APPROVED

REFERENCES

NO.	TITLE	DRAWING NUMBER
9	SHIPS SERVICE COMPRESSED AIR SYSTEM DIAGRAM	M282-551-FP07
8	GAUGE, THERMOMETER & MISC INSTRUMENT LIST	M282-500-FL05
7	REACH ROD SCHEDULE	M282-500-FL03
6	GREY & BLACK WATER DIAGRAM	M282-528-FP05
5	MACHINERY ARRANGEMENT	M282-201-FA03
4	PIPING STANDARD DETAILS	M282-505-FP25
3	FIREMAIN SYSTEM DIAGRAM	M282-521-FP20
2	OILY WASTE & WASTE OIL SYSTEM DIAGRAM	M282-593-FP11
1	MAIN SEAWATER SYSTEM DIAGRAM	M282-256-FP08

REVISION STATUS										
REV									1	4
SHT	10	9	8	7	6	5	4	3	2	1

DOCUMENT DISTRIBUTION RECORD

ISSUE DATE	9-15-03	8-18-04	5-17-05	6-12-06	7-25-06
REV #	0	1	2	3	4
NOAA	1	1			
PROG MGR	1	1			
PROJ ENG	1				
HMP PC	12	12	12	1	1
NOISE CNTRL	1(1)				
CHAND LLC	1	1			
JOINER	0				
HVAC	0				
PROP SSV	0				
TRAWL SSV	0				
PRODUCTION DESIGN			(1)	1	1
HPG PC	1	1	1	1	1
ISSUED BY	BC	DR	DR	DR	

APPLICABILITY BLOCK

JOB: M282 HULL: 1953
JOB: M283 HULL: 1956
JOB: M284 HULL: 1957

VT Halter Marine, Inc.
Vision Technologies Systems

DRAWN BY: RGH 8/20/03	ABS APPV		
CHECKED BY: BC 8/26/03	USCG APPV		
APPROVED BY: DMR 9/15/03	OWNER APPV		
HULL NO: APPLICABILITY	CAGE CODE: 3BJ86	SIZE: F	
ESTIMATE NO: 00-104	SCALE: NONE		

VESSEL: FRV40 CLASS 63m FISHERIES RESEARCH VESSEL

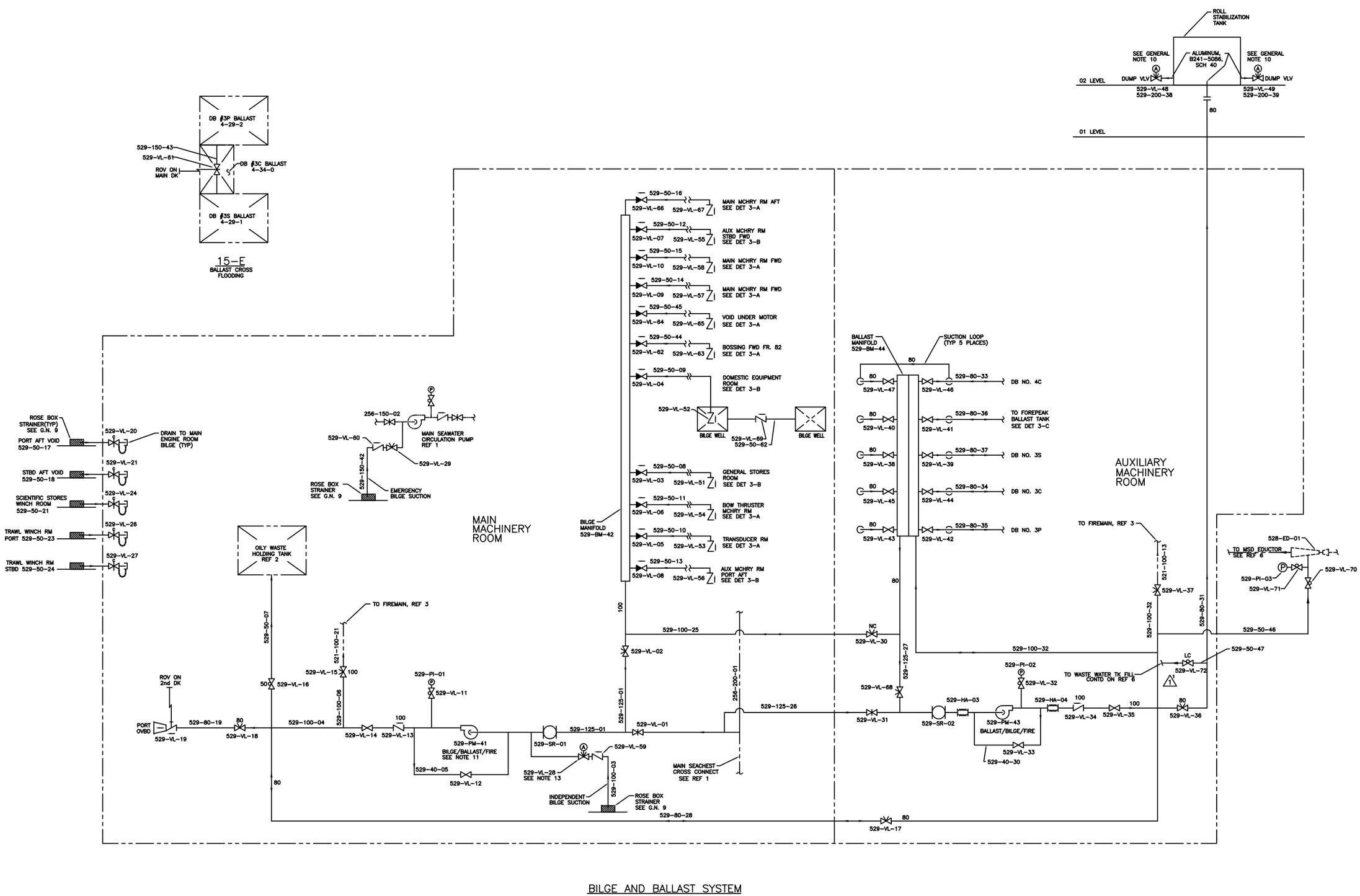
TITLE: BILGE & BALLAST SYSTEM DIAGRAM

JOB NO.	ITEM	DELIVERABLE	SHEET	REV
M282	529	FP01	001	04

FILE FP01-001-00 SHEET 1 OF 2

PLOT: 1:1

DWG NO. M282-529-FP01 SH 1



BILGE AND BALLAST SYSTEM

DWG NO. M282-529-FP01 SH 2

HULL NO	CAGE CODE	SIZE	JOB NO.	ITEM	DELIVERABLE	SHEET	REV
1953	38J86	F	M282	529	FP01	002	01
ESTIMATE NO	SCALE						
00-104	NONE		FILE FP01-002-00			SHEET 2 OF 2	

PLOT: 1:1