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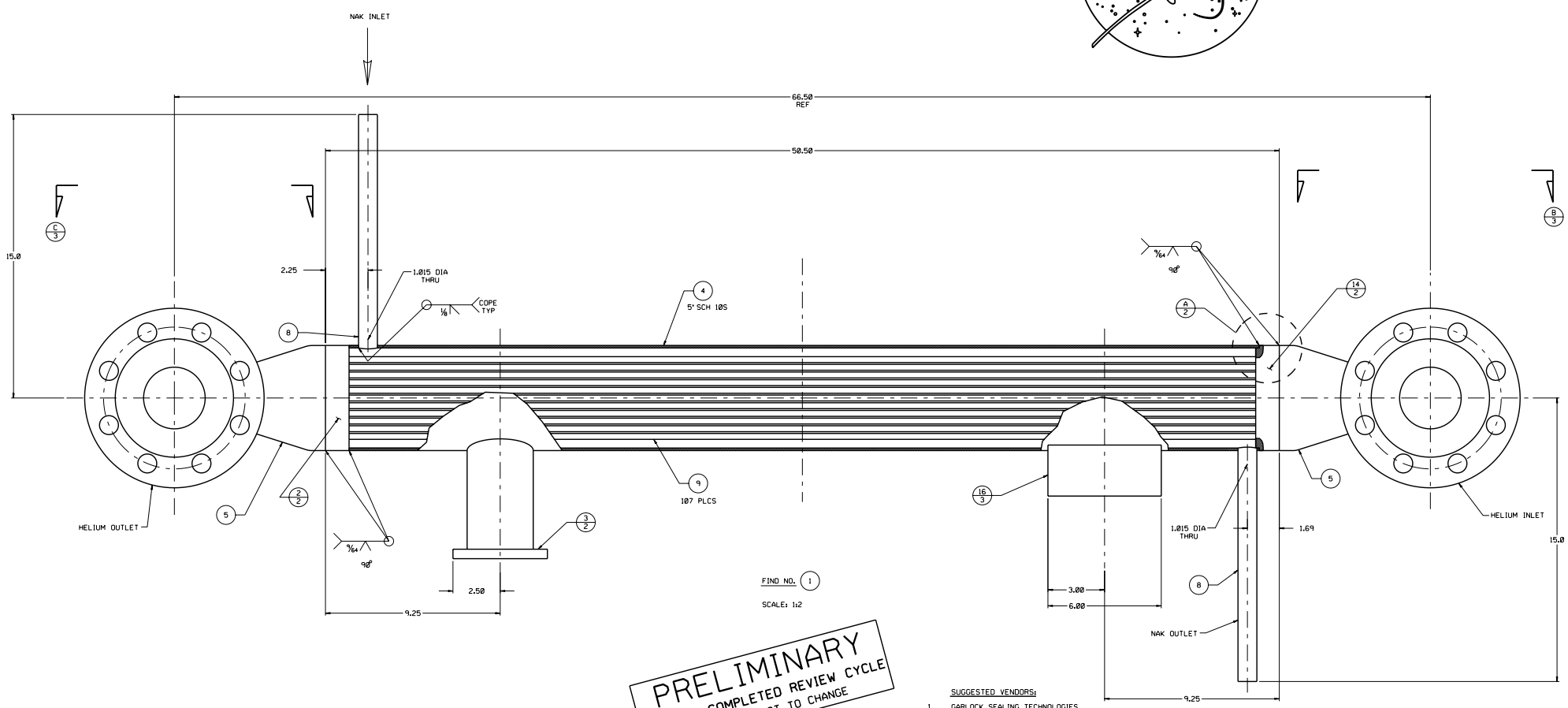
REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
		- -	
		- -	
		- -	
		- -	



PRELIMINARY
HAS NOT COMPLETED REVIEW CYCLE
AND IS SUBJECT TO CHANGE
4-13-04

SUGGESTED VENDORS:

1. GARLOCK SEALING TECHNOLOGIES
METALLIC GASKET DIVISION
1977 KINDRED ST.
HOUSTON, TX 77049
PH. (281) 459-7200

2. ANVIL INTERNATIONAL INC.
110 CORPORATE DRIVE
PORTSMOUTH, NH 03802
PH. (603) 422-8000

GENERAL NOTES (UNLESS OTHERWISE SPECIFIED)

1. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
2. FIELD TO VERIFY ALL TIE-IN CONNECTIONS.
3. ALL PIPE SIZES AND SCHEDULES SHALL CONFORM TO THE DIMENSIONS OF ASME-B36.10 OR ASME-B36.19.
4. ALL FITTINGS SHALL CONFORM TO THE DIMENSIONS OF ASME-B16.9 OR ASME-B16.28. NO BLOCK PATTERN FITTINGS SHALL BE USED. THE CROTCH AREA OF TEES AND CROSSES SHALL BE REINFORCED WITH LONG RADIUS DESIGN TO ELIMINATE SHARP CORNERS.
5. ALL BEVELS FOR BUTTWELDING ENDS OF PIPE FITTINGS, FLANGES, VALVES, AND COMPONENTS SHALL CONFORM TO ASME-B16.25.
6. ALL MACHINED PARTS TO HAVE A 125 MICROINCH ROUGHNESS HEIGHT RATING SURFACE FINISH.
7. THE SYSTEM SHALL BE HYDROSTATED TO 3.5) TIMES THE WORKING PRESSURE OF THE SYSTEM PER ASME SECTION VIII, DIV 1. THE WATER USED SHALL CONTAIN NO MORE THAN 25 PPM OF CHLORIDE FOR SST PIPE (50 PPM FOR C.S.) AND SHALL HAVE ½% BY WEIGHT SODIUM NITRITE AS AN INHIBITOR.
8. ALL SYSTEM WELDS AND STRUCTURAL ATTACHMENTS TO PIPING SHALL BE WELDED PER ASME SECTION VIII, DIVISION 1.
9. THE SYSTEM SHALL BE DESIGNED PER ASME SECTION VIII, DIVISION 1.
10. STEEL STAMP .25 HIGH CHARACTERS AS SHOWN.
11. ALL STEEL SUPPORTS SHALL BE WELDED AND 100% VISUALLY INSPECTED PER ASME SECTION VIII, DIVISION 1.

SPECIFIC NOTES

12. MATERIAL SPECIFICATIONS FOR STAINLESS STEEL SYSTEMS

PIPE:	ASTM-A312-TP316H SST. - SEAMLESS
PIPE FITTINGS:	ASTM-A403-WP-S 316H SST.
TUBE:	ASTM-A213 TYPE 316H SST. - SEAMLESS
BAR STOCK:	AISI-316H SST PER ASTM A479.
PLATE:	AISI-316H SST PER ASTM A240.
PIPE FLANGES:	ASTM-A182-F316H SST.
STUD BOLTS:	INCONEL 718
HEXAGON NUTS:	INCONEL 718

SPECIFIC NOTES

NAK SYSTEM

13. ALL GIRTH WELD JOINTS SHALL BE 100% VISUALLY AND 100% RADIOGRAPHICALLY EXAMINED PER ASME SECTION VIII, DIVISION 1.
14. THE PIPING SYSTEM SHALL BE HELIUM LEAK CHECKED USING A HELIUM MASS SPECTROMETER LEAK DETECTOR. ALLOWABLE LEAK RATE = 1 X 10^{-7} CC PER SECOND.
15. THE PIPING SYSTEM SHALL BE CLEANED FOR LIQUID OXYGEN SERVICE PER MSFC-SPEC-164B.
16. ALL VALVE MATERIAL IN CONTACT WITH NAK SHALL BE CERTIFIED AND APPROVED BY MATERIALS, PROCESSES AND MANUFACTURING DEPARTMENT.
17. FLAT GASKET MATERIAL: SPIRAL WOUND, FLEXIBLE GRAPHITE WITH 100% MICA OD & ID. SPIRAL WINDING MATERIAL: 316 SST (HEAT SHIELD EDGE GASKET).

SERVICE: NAK
TEMPERATURE: 50°F TO 1200°F
INTERNAL PRESSURE: 20 PSI
EXTERNAL PRESSURE: 0 PSI

SERVICE: HELIUM
TEMPERATURE: 50°F TO 1200°F
INTERNAL PRESSURE: 200 PSI
EXTERNAL PRESSURE: 0 PSI

FIND NO.	SHEET NO.	TOT. REQ'D		PART NO.	DESCRIPTION	VEND. NO.	REMARKS
20							
19							
18							
17							
16	1,3	1		90M11776-16	SADDLE ASSEMBLY		
15	3	1		90M11776-15	PIPE PROTECTION SADDLE FOR 5" PIPE	2	FIG. 162A ASTM-A240 316H SST
14	1,2	1		90M11776-14	TUBE PLATE		SST SEE NOTE 12
13	3	2		90M11776-13	FLAT GASKET FOR 3" 900# RF FLANGE	1	SEE NOTE 17
12	3	32		90M11776-12	7/8 HEX NUT		SEE NOTE 12
11	3	16		90M11776-11	7/8 X 5.75 LG STUD BOLT		SEE NOTE 12
10	3	2		90M11776-10	3" 900# RF WELD NECK FLANGE W/ SCH 10S BORE		SST SEE NOTE 12
9	1	A/R		90M11776-9	9/16" O.D. X .028" WALL SEAMLESS TUBE		SST SEE NOTE 12
8	1,2	A/R		90M11776-8	1" O.D. X .095" WALL SEAMLESS TUBE		SST SEE NOTE 12
7	2,3	A/R		90M11776-7	3" SCH 10S SEAMLESS PIPE		SST SEE NOTE 12
6	3	2		90M11776-6	3" SCH 10S 90° LONG RADIUS ELBOW		SST SEE NOTE 12
5	1	2		90M11776-5	5" X 3" SCH 10S CONCENTRIC PIPE REDUCER		SST SEE NOTE 12
4	1	A/R		90M11776-4	5" SCH 10S SEAMLESS PIPE		SST SEE NOTE 12
3	1,2	1		90M11776-3	SUPPORT		SST SEE NOTE 12
2	1,2	1		90M11776-2	TUBE PLATE		SST SEE NOTE 12
1	1	-		90M11776-1	MAIN ASSEMBLY		

A=ASSEMBLY/SUB-ASSEMBLY/INSTALLATION E=EXISTING ITEM/FACILITY F=FABRICATED ITEM M=MODIFIED ITEM P=PURCHASED ITEM

90M11776
~
REVISION

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ARE
DECIMAL ±
FRACTIONS ±1/16 .X- ±.06 .XX- ±.03 .XXX- ±.010 ANGLES ±1/2°
DO NOT SCALE DRAWING

LOCATION 9" VC. BLDG. 4655
NEXT ASSEMBLY 90M11774
LAST DETAIL, SECTION, OR VIEW LETTER USED

ITEM DESIGN ENGINEER - - DATE
TEST ENGINEER/ACCEPTER - - DATE
STRESS - - DATE
MATERIALS - - DATE
INDUSTRIAL SAFETY - - DATE
ITEM APPROVAL - - DATE

NAK
HEAT EXCHANGER

DETAILER
DATE 12- 5-03
DATE CODE E038
DESIGNER
SCALE NOTED

SPECIAL TEST EQUIPMENT DESIGN GROUP
GEORGE C. MARSHALL SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
HUNTSVILLE, ALABAMA

DRAWING SIZE E
90M11776
SHEET 1 OF 3