SPECIFICATION FOR THE FABRICATION, INSTALLATION, AND TESTING OF THE PIPING AND COMPONENTS FOR THE D-ZERO BUILDING PIPING

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D-ZERO ENGINEERING NOTE 3740.510-EN-59

1. DESCRIPTION

1.1 THIS SPECIFICATION COVERS THE REQUIREMENTS FOR FABRICATING, INSTALLING, AND TESTING PIPING AND COMPONENTS FOR USE IN THE D-ZERO BUILDING.

1.2 THE PIPING WILL BE INSTALLED AT THE D-ZERO FACILITY, FERMI NATIONAL ACCELERATOR LABORATORY, BATAVIA, ILLINOIS.

1.3 THE PIPING COVERED BY THIS SPECIFICATION WILL BE INSTALLED BOTH INDOORS AND OUTDOORS

1.4 IN THIS SPECIFICATION, THE INSTALLER OF THE PIPING SHALL BE REFERRED TO AS THE SELLER AND FERMILAB SHALL BE REFERRED TO AS THE BUYER.

2. SCOPE

2.1 THE SELLER SHALL FURNISH ALL LABOR AND EQUIPMENT, AND SHALL PERFORM ALL WORK AND SERVICES NECESSARY TO MANUFACTURE, INSTALL, AND FIELD TEST THE PIPING IN ACCORDANCE WITH THIS SPECIFICATION. THE NECESSARY EQUIPMENT, TOOLS, AND LABOR FOR ALL WORK SHALL BE PROVIDED BY THE SELLER.

2.2 THE SELLER SHALL FABRICATE, INSTALL, AND TEST ALL ITEMS (EXCEPT FOR THE HELIUM- MASS SPECTROMETER TEST) IN ACCORDANCE WITH THESE SPECIFICATIONS AND ATTACHED DRAWINGS. IN THE EVENT OF CONFLICT BETWEEN THE DRAWINGS AND THESE SPECIFICATIONS, THE SELLER SHALL REQUIRE THE BUYER TO DETERMINE THE GOVERNING DOCUMENT.

2.3 THE BUYER WILL FURNISH ALL PIPING, INCLUDING VACUUM JACKETED TRANSFER LINES, MATERIALS, AND COMPONENTS AS SPECIFIED ON THE DRAWINGS, EXCEPT FOR THE STRUCTURAL PIPE SUPPORTS, AND U-BOLTS.

2.4 THE SELLER SHALL FURNISH AND INSTALL THE PIPE SUPPORTS, AND U-BOLTS IN ADDITION TO PROVIDING THE CONSUMABLES AS REQUIRED TO COMPLETE THE INSTALLATION OF ALL PIPING COVERED BY THIS SPECIFICATION.

2.5 THE SELLER SHALL INSTALL ALL VALVES, LOCALLY MOUNTED INSTR-UMENTS, GAUGES, AND SENSORS AS SHOWN ON THE DRAWINGS. CONNECTIONS BETWEEN LOCALLY MOUNTED (PIPELINE) INSTRUMENTATION AND REMOTELY LOCATED CONTROLS AND READOUTS SHALL BE MADE BY THE BUYER.

2.6 THE INSTALLER OF THE ELECTRICAL WIRING AND AIR SUPPLY LINES TO INSTRUMENTS AND VALVES SHALL BE THE BUYER.

2.7 THE SELLER SHALL TEST ALL PIPING IN ACCORDANCE WITH THIS SPECIFICATION.

3. DRAWINGS

THE FOLLOWING DRAWINGS ARE TO BE CONSIDERED A PART OF THIS SPECIFICATION:

DRAWING NUMBER	REV	TITLE
3740.510-ME-222906		FINAL ASSY AND GEN. ARRANGEMENT
3740-ME-222394	D	CRYOGENIC FLOW DIAGRAM
3740.510-MD-222926		PIPE SUPPORT ASSEMBLY
3740.510-MD-222927		PIPE SUPPORT ASSEMBLY
3740.510-MD-222928		PIPE SUPPORT DET. (3X3' HORIZ CHASE)
3740.510-MD-222929		PIPE SUPPORT DET. (DETECTOR HALL)
3740.510-MD-222930		PIPE SUPPORT DET. (C.T. GAS VALVE SUPPORT)
3740.510-MD-222944		PIPE SUPPORT PLATFORM (EL 707'6")
3740.510-MC-222960		PIPE BRIDGE
3740.510-MD-222970		PIPE SUPPORT
3740.510-MD-222973		PIPE SUPPORT
3740.510-MB-222948		3" CLAMSHELL
3740.510-MB-222949		6" CLAMSHELL
3740.510-MB-222950		8" CLAMSHELL
3740.510-MB-222971		1.5X3 CLAMSHELL CONNECTION
3740.510-MB-222973		6X8 CLAMSHELL CONNECTION
3740.510-MC-222907		C.T. GAS SPOOL #1
3740.510-MC-222908		C.T. GAS SPOOL #2
3740.510-MC-222909		C.T. GAS SPOOL #3
3740.510-MC-222910		C.T. GAS SPOOL #4
3740.510-MC-222911		C.T. GAS SPOOL #5
3740.510-MC-222912		C.T. GAS SPOOL #6
3740.510-MC-222913		C.T. GAS SPOOL #7
3740.510-MC-222914		C.T. GAS SPOOL #8
3740.510-MC-222915		C.T. GAS SPOOL #9
3740.510-MC-222916		C.T. GAS SPOOL #10
3740.510-MC-222917		C.T. GAS SPOOL #11
3740.510-MC-222918		C.T. GAS SPOOL #12
3740.510-MC-222919		C.T. GAS SPOOL #13
3740.510-MC-222920		C.T. GAS SPOOL #14

3740.510-MC-222921	C.T. GAS SPOOL 15
3740.510-MC-222922	C.T. GAS SPOOL 16
3740.323-MC-222923	PDT GAS SPOOL #17
3740.323-MC-222924	PDT GAS SPOOL #18
3740.323-MC-222925	PDT GAS SPOOL #19
3740.514-MC-222932	INSULATING VAC. SPOOL #20 LINE 6-4007-V
3740.514-MC-222933	UTILITY VAC. SPOOL #21 LINE 4-4025-UV
3740.515-MD-222974	INSTRUMENT AIR SPOOL #22
3740.512-MC-223065	LAR CRYOSTAT SUPPLY SPOOL #23 LINE 1.5X3 -4027-LA
3740.512-MC-223066	SPOOL #23A LINE-1.5X3-4027-LA
3740.512-MC-223067	SPOOL #23B LINE-1.5X3-4027-LA
3740.512-MC-223068	SPOOL #23C LINE-1.5X3-4027-LA
3740.512-MC-223069	SPOOL #23D LINE-1.5X3-4027-LA
3740.512-MC-223070	SPOOL #23E LINE-1.5X3-4027-LA
3740.512-MC-223071	SPOOL #23F LINE-1.5X3-4027-LA
3740.512-MC-223072	SPOOL #23G LINE-1.5X3-4027-LA
3740.510-MC-223073	SPOOL #23H LINE 1.5X3-4027-LA
3740.512-MC-222952	AR/N2 EXHAUST SPOOL #24 LINE 6X8-4017-E
3740.512-MD-222953	SPOOL #24A LINE 6X8-4017-E
3740.512-MC-222954	SPOOL #24B LINE 6X8-4017-E
3740.512-MC-222955	SPOOL #24C LINE 6X8-4017-E
3740.512-MC-222956	SPOOL #24D LINE 6X8-4017-E
3470.512-MD-222957	SPOOL #24E LINE-6X8-4017-E
3470.512-MD-222958	SPOOL #24F LINE-6X8-4017-E
3740.512-MC-222959	SPOOL #24G LINE-6X8-4017-E
3740.513-MC-222934	LN2 CRYOSTAT SUPPLY SPOOL #25 LINE-1.5X3-4012-LN
3740.513-MC-222935	SPOOL #25A LINE-1.5X3-4012-LN
3740.513-MC-222936	SPOOL #25B LINE-1.5X3-4012-LN
3740.513-MC-222937	SPOOL #25C LINE-1.5X3-4012-LN
3740.513-MC-222938	SPOOL #25D LINE-1.5X3-4012-LN

3740.513-MC-222939	SPOOL #25E LINE-1.5X3-4012-LN
3740.513-MC-222940	SPOOL #25F LINE-1.5X3-4012-LN
3740.513-MC-222941	SPOOL #25G LINE-1.5X3-4012-LN
3740.513-MC-222942	SPOOL #25H LINE-1.5X3-4012-LN
3740.513-MC-222943	SPOOL #25J LINE-1.5X3-4012-LN
3740.510-MC-223073	SPOOL #25K LINE-1.5X3-4012-LN
3740.512-MC-223077	SPOOL #25L LINE 1.5X3-412-LN
3740.512-MC-223057	GAR CRYOSTAT SUPPLY SPOOL #26 LINE-1.5X3-4022-GA
3740.512-MC-223058	SPOOL #26A LINE 1.5X3-4022-GA
3740.512-MC-223059	SPOOL #26B LINE 1.5X3-4022-GA
3740.512-MC-223060	SPOOL #26C LINE 1.5X3-4022-GA
3740.512-MC-223061	SPOOL #26D LINE 1.5X3-4022-GA
3740.512-MC-223062	SPOOL #26E LINE 1.5X3-4022-GA
3740.512-MC-223063	SPOOL #26F LINE 1.5X3-4022-GA
3740.512-MC-223064	SPOOL #26G LINE 1.5X3-4022-GA
3740.510-MC-223073	SPOOL #26H LINE 1.5X3-4022-GA
3740.513-MC-223152	AR DEWAR EXHAUST SPOOL#27 LINE 1.5X3-4046-E
3740.513-MC-223153	SPOOL #27A LINE 1.5X3-4046-E
3740.513-MC-223154	SPOOL #27B LINE 1.5X3-4046-E
3740.513-MC-223155	SPOOL #27C LINE 1.5X3-4046-E
3740.512-MC-223156	SPOOL #27D LINE 1.5X3-4046-E
3740.513-MC-223072	SPOOL #27E LINE 1.5X3-4046-E
3740.513-MC-223085	AR DEWAR LN2 SUPPLY SPOOL #28 LINE 1.5X3-4043-LN
3740.513-MC-222935	SPOOL #28A LINE 1.5X3-4043-LN
3740.513-MC-222936	SPOOL #28B LINE 1.5X3-4043-LN
3740.513-MC-223086	SPOOL #28C LINE 1.5X3-4043-LN
3740.513-MC-223087	SPOOL #28D LINE 1.5X3-4043-LN
3740.512-MC-223072	SPOOL #28E LINE 1.5X3-4043-LN
3740.510-MC-223073	SPOOL #28K LINE 1.5X3-4043-LN

3740.512-MC-223077	SPOOL #28L LINE 1.5X3 3-4043-LN
3740.512-MC-223078	AR DEWAR FILL SPOOL #29 LINE 1.5X3-4047-LA
3740.512-MC-223079	SPOOL #29A LINE 1.5X3-4047-LA
3740.512-MC-223080	SPOOL #29B LINE 1.5X3-4047-LA
3740.512-MC-223081	SPOOL #29C LINE 1.5X3-4047-LA
3740.512-MC-223082	SPOOL #29D LINE 1.5X3-4047-LA
3740.512-MC-223072	SPOOL #29E LINE 1.5X3-4047-LA
3740.514-MC-223089	SPOOL #30 VAC PUMP EXHAUST LINE 3-4032-E
3740.513-MC-223090	SPOOL #31 VN2 PURGE LINE 1-4033-GN
3740.515-MC-222975	INSTRUMENTATION AND CONTROLS CONDUIT

4. GENERAL REQUIREMENTS

4.1 THESE SPECIFICATIONS, TOGETHER WITH THE DRAWINGS, COVER THE TYPE OF MATERIALS, FABRICATION, TESTING, AND INSPECTION REQUIREMENTS.

4.2 THE RELATED SPECIFICATIONS, STANDARDS, AND CODES SHALL BE OF THE LATEST ISSUE DATE AND SHALL BE INCLUDE ALL ADENDA, REVISIONS, OR SUPPLEMENTS THERETO ISSUED PRIOR TO THE EFFECTIVE DATE OF THIS CONTRACT.

4.3 ALL SAFETY VALVE DISCHARGE PIPING THAT IS NOT PIPED INTO A HEADER SHALL BE PIPED IN A MANNER THAT DIRECTS THE DISCHARGE STREAM AWAY FROM CARBON STEEL SURFACES AND PERSONNEL.

4.4 THE SELLER SHALL VERIFY PIPING DIMENSIONS AS NECESSARY TO ASSURE PROPER FIT-UP WITH THE EQUIPMENT OR COMPONENTS TO BE CONNECTED. THE SELLER SHALL BE RESPONSIBLE FOR ADJUSTING THE PIPING AS NECESSARY TO COMPLETE THE INSTALLATION.

4.5 THE SELLER SHALL SUPPLY AND INSTALL IDENTIFICATION TAGS ON ALL VALVES AND INSTRUMENTS. THE TAGS SHALL BE STAMPED WITH CORRESPONDING NUMBERS SHOWN ON THE FLOW SHEETS. THE TAGS AND THE INSTALLATION WIRE SHALL BE STAINLESS STEEL.

4.6 ALL CONNECTIONS ON COPPER LINES SHALL BE BRAZED.

4.7 IT SHALL BE THE RESPONSIBILITY OF THE SELLER TO PROTECT ALL FREE ISSUE MATERIAL SUPPLIED BY THE SELLER AGAINST PILFERAGE OR DAMAGE DURING STORAGE AND HANDLING. THE SELLER SHALL REPLACE FREE-OF-CHARGE TO THE BUYER ANY MATERIAL SPOILED DUE TO HIS NEGLIGENCE OR THAT OF HIS AGENTS.

5. FABRICATION REQUIREMENTS

5.1 WELDING

5.1.1 ALL WELDERS SHALL BE QUALIFIED IN ACCORDANCE WITH SECTION IX OF THE ASME CODE.

5.1.2 ALL WELDING SHALL MEET THE REQUIREMENTS OF THE ANSI B.31.3 PIPING CODE.

5.1.3 ALL STAINLESS STEEL PIPING SHALL BE WELDED BY THE TIG PROCESS.

5.1.4 ONLY WELDERS QUALIFIED TO WELD THE MATERIALS BEING WELDED SHALL BE PERMITTED TO WELD ANY PART OF THE PIPING.

5.1.5 A FULL PENETRATION WELD IS REQUIRED FOR ALL BUTT WELDS IN PIPING.

5.1.5.1 THE ENDS OF PIPING COMPONENTS TO BE JOINED SHALL BE ALIGNED AS ACCURATELY AS IS PRACTICABLE WITHIN EXISTING COMMERCIAL TOLERANCES ON DIAMETERS, WALL THICKNESSES, AND OUT-OF-ROUNDNESS. ALIGNMENT SHALL BE PRESERVED DURING WELDING.

5.1.5.2 MACHINING OF SURFACES OF PARTS TO BE JOINED TO ACHIEVE THE MISALIGNMENT TOLERANCE SHALL NOT REDUCE THE WALL THICKNESS BELOW THE REQUIRED MINIMUM.

5.1.6 THE SURFACE FINISH OF BUTT WELDS SHALL BE FREE OF UNDERCUTS. SURFACE IRREGULARITIES SHALL BE REMOVED BY ANY SUITABLE MECHANICAL PROCESS TO A DEGREE SUCH THAT THE REMAINING IRREGULARITIES IN THE COMPLETED WELD WOULD NOT MASK OR CONFUSE THESE DEFECTS WITH OTHER OBJECTIONABLE DEFECTS THAT WOULD BE REVEALED BY RADIOGRAPHIC EXAMINATION.

5.1.7 FILLET WELDS SHALL BLEND SMOOTHLY INTO THE BASE METAL AT THE TOE OF THE WELD, WITHOUT UNDERCUTTING.

5.1.8 THE REQUIREMENTS FOR WELDING APPLY TO ALL WELDS. TEMPORARY ATTACHMENTS FOR HANDLING DURING FABRICATION SHALL BE AVOIDED AS FAR AS POSSIBLE; WHEN THEY CANNOT BE AVOIDED, SUCH WELDMENTS SHALL BE MADE BY USING QUALIFIED PROCEDURES AND CAREFULLY REMOVED. REPAIRS TO THE SURFACES NECESSARY BECAUSE OF REMOVAL OF TEMPORARY CLIPS OR OTHER REASONS SHALL BE PERFORMED BY QUALIFIED PROCEDURES, GROUND SMOOTH, AND CAREFULLY EXAMINED.

5.1.9 WELDING MATERIALS SHALL BE COMPATIBLE WITH THE MATERIAL BEING WELDED. SPECIAL ATTENTION SHALL BE GIVEN TO THE CHOICE OF MATERIALS USED FOR JOINING DISSIMILAR MATERIALS; I.E. CARBON STEEL TO STAINLESS STEEL. FOR THIS APPLICATION, ICONNEL 812 ELECTRODES (82 FOR THE TIG PROCESS) OR AN EQUIVALENT MATERIAL SHALL BE USED.

5.1.10 DIMENSIONAL REQUIREMENTS, TOLERANCES, ETC. SHALL BE IN CONFORMANCE WITH THE DRAWINGS.

5.1.11 ALL WELDING OF VACUUM JACKETED TRANSFER LINE SHALL FOLLOW THE PROCEDURE OUTLINED ON DWG 3740.510-MB-222971 FOR 1.5X3 LINES AND DWG 3740.510-MB-223088 FOR 6X8 LINE

5.2 BRAZING

5.2.1 ALL BRAZING MATERIALS SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR THE MATERIAL BEING BRAZED. PARTICULAR ATTENTION SHALL BE GIVEN TO THE CHOICE OF BRAZING MATERIALS BEING USED TO JOIN DISSIMILAR MATERIALS; I.E. STAINLESS STEEL TO COPPER.

5.2.2 TUBING AND PIPING SHALL BE CUT WITH ENDS SQUARE, BURRS REMOVED, AND MALE AND FEMALE PIECES CLEANED WITH ABRASIVE BEFORE BRAZING. FLUX SHALL BE APPLIED EVENLY TO BOTH MALE AND FEMALE PIECES. HEAT SHALL BE APPLIED SO AS TO INSURE THAT THE BRAZING ALLOY ENTERS INTO THE ENTIRE JOINT. A SMALL FILLET ON THE OUTSIDE OF THE JOINT IS PERMISSIBLE.

6. CLEANING

6.1 THE INTERNAL SURFACES OF ALL PIPING AND PIPELINE COMPONENTS SHALL BE CLEANED AS FABRICATION PROGRESSES.

6.2 THE SELLER SHALL EXCERSIZE CARE TO MAINTAIN THE CLEANLINESS THROUGHOUT THE FABRICATION AND ASSEMBLY OF THE PIPING.

6.3 ALL PIPING AND COMPONENTS SHALL BE CLEANED IN ORDER THAT DIRT, SCALE, WELD SPLATTER, METAL CHIPS, SHARP EDGES, AND OTHER DEFECTS AND CONTAMINANTS ARE REMOVED FROM THE INTERNAL SURFACES. MECHANICAL CLEANING MAY BE USED FOR THIS PURPOSE.

6.4 IN ADDITION, THE INTERNAL SURFACES OF ALL PIPING AND COMPONENTS, OTHER THAN WATER AND AIR, SHALL BE SOLVENT WASHED TO REMOVE ALL TRACES OF OIL, GREASE, AND OTHER CHEMICAL CONTAMINANTS. THE SOLVENT SHALL BE REPLENISHED REGULARLY TO PREVENT EXCESSIVE BUILDUP OF DISSOLVED SOILS. THE SELLER SHALL BE RSPONSIBLE FOR THE SELECTION AND USE OF ANY APPROPRIATE MEANS TO ACCOMPLISH THE REQUIRED CLEANLINESS.

6.5 PIPING WILL BE CONSIDERED CLEANED WHEN THE FOLLOWING REQUIREMENTS ARE MET:

6.5.1 WATER AND AIR PIPING:

VISUAL EXAMINATION UNDER STRONG WHITE LIGHT REVEALS THE ABSENCE OF ALL CONTAMINANTS AND DEFECTS SPECIFIED IN PARAGRAPH 6.3.

6.5.2 PIPING OTHER THAN WATER AND AIR

6.5.2.1 VISUAL EXAMINATION UNDER STRONG WHITE LIGHT REVEALS THE ABSENCE OF ALL CONTAMINANTS AND DEFECTS SPECIFIED IN PARAGRAPH 6.3.

6.5.2.2 A WIPE TEST REVEALS NO APPRECIABLE DISCOLORATION OF THE WIPING MEDIA, EXCEPT THAT WHICH IS DUE TO OXIDATION OF THE PARENT METAL AND NO EVIDENCE OF OIL RESIDUE.

7. SITE CLEANING

7.1 THE SELLER SHALL BE RESPONSIBLE THROUGHOUT THE CONSTRUCION PERIOD TO MAINTAIN THE BUILDINGS AND SITE IN A CLEAN AND ORDERLY FASHION.

7.2 THE SELLER SHALL RETAIN ALL STORED ITEMS IN AN ORDERLY ARRANGEMENT TO ALLOW FOR MAXIMUM INGRESS AND EGRESS.

7.3 THE SELLER SHALL NOT ALLOW THE ACCUMULATION OF SCRAP, DEBRIS, WASTE MATERIALS, AND OTHER ITEMS NOT REQUIRED FOR THE WORK.

7.4 THE SELLER SHALL AT A MINIMUM TWICE EACH MONTH OR AS DIRECTED BY THE BUYER COMPLETELY REMOVE ALL SCRAP, DEBRIS, AND WASTE MATERIAL FROM THE JOB SITE.

7.5 THE SELLER SHALL PROVIDE ADEQUATE STORAGE FOR ALL ITEMS AWAITING REMOVAL FROM THE SITE, OBSERVING ALL REQUIREMENTS FOR FIRE PROTECTION AND THE PROTECTION OF THE ECOLOGY.

7.6 THE SELLER SHALL DAILY INSPECT THE SITE, PICK UP ALL SCRAP, DEBRIS, AND WASTE MATERIALS, REMOVING SAME TO DESIGNATED STORAGE.

7.7 PRIOR TO COMPLETION OF THE WORK, THE SELLER SHALL REMOVE ALL TOOLS, SURPLUS MATERIALS, EQUIPMENT, SCRAP, DEBRIS, AND WASTE.

7.8 SITE: THE SELLER SHALL BROOM CLEAN THE CONCRETE FLOOR AND PAD AREAS IN THE AFFECTED WORK AREAS, UNLESS OTHERWISE DIRECTED BY THE BUYER. THE SELLER SHALL BE RESPONSIBLE FOR DISPOSAL OF DEBRIS.

8. INSPECTION AND TESTS

8.1 INSPECTION

8.1.1 FABRICATION, INSTALLATION, AND TESTING IS SUBJECT TO INSPECTION BY THE BUYER OR HIS REPRESENTITIVE.

8.2 TESTS

8.2.1 THE SELLER SHALL CONDUCT LEAK TESTS ON ALL PIPING INSTALLED BY THE SELLER.

8.2.2 ALL OTHER PIPING SHALL BE PNEUMATICALLY TESTED WITH DRY, OIL-FREE NITROGEN GAS IN ACCORDANCE WITH SPECIFICATION S-31-508-TEK. THE TEST PRESSURES SHALL BE AS SPECIFIED IN PARAGRAPH 8.3.

8.2.3 ALL JOINTS WITHIN THE SELLERS INSTALLED PIPING SHALL BE LEAK TESTED WITH "SNOOP" OR EQUAL LEAK DETECTOR. THE LEAK TEST SHALL BE CONDUCTED AT 75% OF INTEGRITY TEST PRESSURE SPECIFIED IN PARAGRAPH 8.3

8.2.4 THE BUYER WILL SUPPLY THE NITROGEN GAS AS REQUIRED FOR FIELD TESTING.

8.2.6 WHEN CONDUCTING PRESSURE TESTS, THE SELLER SHALL TAKE ALL NECESSARY PRECAUTIONS TO PROTECT LOW PRESSURE CIRCUITS FROM BEING PRESSURIZED, VIA LEAKAGE OR OTHER MEANS, FROM A HIGH PRESSURE CIRCUIT UNDER TEST. THE SELLER SHALL ADEQUATELY VENT ALL SUCH LOW PRESSURE LINES TO ATMOSPHERE.

8.2.7 THE SELLER SHALL PROVIDE ASSURANCE THAT ALL LINES CONTAINING CHECK VALVES ARE PRESSURIZED TO THE REQUIRED TEST PRESSURE ON BOTH SIDES OF THE VALVES

8.2.8 ON VACUUM JACKETED TRANSFER LINES ALL INNER PIPIES WILL BE WELDED (END TO END) AND THEN HELIUM MASS SPECTROMETER LEAK TESTED BY THE BUYER BEFORE THE OUTER PIPING IS WELDED. TO QUALIFY, AND LOCATE LEAKS SECTION 8.3 WILL PROVIDE A LIST OF LINES THAT MUST BE TESTED ACCORDING TO THIS PARAGRAPH.

8.2.9 THE SELLER SHALL REPAIR ALL LEAKS FOUND DURING THE TESTS

8.2.10 THE SELLER SHALL PROVE THAT LEAKS HAVE BEEN ELIMINATED BY RETESTING

8.2.11 THE SELLER SHALL COORDINATE ALL TESTING WITH THE BUYER.

8.3 PNEUMATIC INEGRITY TESTING

PIPING REQUIRING PNEUMATIC TESTING SHALL BE TESTED IN ACCORDANCE WITH THE REQUIREMENTS HERIN

SPOOL NO.	TEST PRESS	DESCRIPTION
SPOOL #1-16	150 (PSI)	5/8" C.T. GAS
SPOOL #17	150	5/8" PDT GAS
SPOOL #18	150	2" COPPER PDT GAS
SPOOL #19	150	3" COPPER PDT GAS
SPOOL #20	150	INSULATING VACUUM LINE 6-4007-V
SPOOL #21	150	UTILITY VACUUM LINE 4-4025-UV
SPOOL #22	150	INST AIR (REFERENCE ONLY)
SPOOL #23	150	LAR CRYOSTAT SUPPLY LINE 1.5X3-4027-E
SPOOL #24	150	AR/N2 EXHAUST LINE 6X8-4017-E
SPOOL #25	150	LN2 CRYOSTAT SUPPLY LINE 1.5X3-4012-LN
SPOOL #26	150	GAR CRYOSTAT SUPPLY LINE 1.5X3-4022-GA
SPOOL #27	150	ARGON DEWAR EXHAUST LINE 1.5X3-4046-E
SPOOL #28	150	ARGON DEWAR LN2 SUPPLY LINE 1.5X3-4043-LN
SPOOL #29	150	ARGON DEWAR FILL LINE 1.5X3-4047-LA
SPOOL #30	150	VAC PUMP EXH LINE 3-4032-E
SPOOL #31	150	N2 PURGE LINE LINE 1-4033-GN

9. DOCUMENTATION

9.1 THE SELLER SHALL PROVIDE THE BUYER WITH THREE (3) COPIES OF EACH OF THE FOLLOWING ITEMS:

9.1.1 CLEANING CERTIFICATIONS: THE SELLER SHALL CERTIFY THAT ALL PIPING AND COMPONENTS INSTALLED BY HIM HAVE BEEN CLEANED IN ACCORDANCE WITH THESE SPECIFICATIONS.

9.1.2 TESTING CERTIFICATIONS: CERTIFICATIONS SHALL BE PROVIDED FOR ALL TESTS REQUIRED BY THIS SPECIFICATION. THIS REQUIREMENT SHALL APPLY TO TESTING DONE BOTH BY THE SELLER AND HIS VENDORS.

SPECIFICATION S-31-508-TEK

PNEUMATIC PRESSURE TESTING PROCEDURE

THE PROCEDURE OUTLINED BELOW SHOULD BE FOLLOWED WHEN PERFORMING PNEUMATIC TEST:

1. PRESSURE TEST GAUGES SHALL BE OF THE INDICATING TYPE AND CONNECTED DIRECTLY TO THE ITEM BEING TESTED. THE INDICATING GAUGE SHALL BE PROVIDED AT A SPOT VISIBLE TO THE OPERATOR THROUGHOUT THE TEST.

2. THE INDICATING PRESSURE GAUGE SHALL BE BETWEEN 1-1/2 TO 4 TIMES THE TEST PRESSURE. THE GAUGE SHALL BE ACCURATE TO +- 1 POUND.

3. TEST GAUGES SHALL HAVE BEEN CALIBRATED WITHIN TWO MONTHS OF THE TEST, UNLESS PRESCRIBED OTHERWISE.

4. THE TEST EQUIPMENT SHALL BE INSPECTED TO INSURE THAT IT IS TIGHT AND THAT APPURTENANCES THAT SHOULD NOT BE SUBJECTED TO THE TEST PRESSURE HAVE BEEN DISCONNECTED OR ISOLATED BY VALVES OR OTHER MEANS.

5. THE TEST PRESSURE SHOULD NOT BE APPLIED UNTIL THE ITEM TESTED AND THE PRESSURIZING MEDIUM ARE AT ABOUT THE SAME TEMPERATURE.

6. THE TEST PRESSURE SHALL BE GRADUALLY INCREASED TO 1/2 OF THE SPECIFIED PRESSURE AND HELD FOR ABOUT 10 MINUTES.

7. THE FINAL TEST PRESSURE SHALL BE 1.5 TIMES THE WORKING PRESSURE.