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APPLICATION		PART NO.	MF	REVISIONS			
NEXT ASSY	USED ON			SYM	DESCRIPTION	DATE	APPROVAL
				A	REVISED AND REDRAWN SHEET 1, 3, 4, 5, 9, 11, 13-18 REDRAWN - NO CHANGE SHEETS 2, 6, 7, 8, 10 & 12 ADDED SHEET 19 1. WAS 1 OF 18	9/17/01	B.L. CLEMONS R. SMITHSON
				B	EXTENSIVELY REVISED ALL SHEETS SHEETS 2 THRU 19 REDRAWN 1.SHEET 1, REVISED REV BLOCK ONLY	4/18/05	T. ADAMS H. HANNAH
				C	REVISED SH 1, 3, 12, 13 & 16 REDRAWN W/NO CHANGE SHEETS 2, 4 THRU 11, 14, 15 & 17 THRU 19. 1.SHEET 1, REVISED REV BLOCK ONLY PROCUREMENT QUALITY REQUEST, MAXIMO 836936A-1	11/21/07	T. ADAMS H. HANNAH
				D	REVISED PER LSR 11-3042 REVISED SH 1, 3, 4, 11, 12 & 16 REDRAWN, NO CHANGE SHEETS 2, 5 THRU 10, 13 THRU 15 & 17 THRU 19. 1) REVISED REV BLOCK ONLY	2008/ 11/21	T. ADAMS H. HANNAH

THIS COMPUTER DRAWING WAS
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FILED UNDER THE DRAWING NUMBER

UNLESS OTHERWISE SPECIFIED	ORIGINAL DATE OF DRAWING JUNE 21, 1999	HOSE ASSEMBLY, CONVOLUTED METAL, SPECIFICATION FOR	JOHN F. KENNEDY SPACE CENTER, NASA	
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES _____	DRAFTSMAN H. HANNAH			
MATERIAL _____	CHECKER			
HEAT TREATMENT _____	ENGINEER H. HANNAH			
FINAL PROTECTIVE FINISH _____	SUBMITTED R. SMITHSON 10/27/99	SCALE NONE	DWG SIZE A	80K57897
	APPROVED B. CLEMONS 10/28/99	UNIT WT _____	SHEET 1 OF 19	

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ABBREVIATIONS AND ACRONYMS

AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
CRCA	Component Refurbishment and Cleaning Area
GH ₂	Gaseous Hydrogen
GHe	Gaseous Helium
GN ₂	Gaseous Nitrogen
GO ₂	Gaseous Oxygen
HCL	Hydrochloric Acid
HMSLD	Helium Mass Spectrometer Leak Detector
KSC	Kennedy Space Center
LH ₂	Liquid Hydrogen
LO ₂	Liquid Oxygen
LN ₂	Liquid Nitrogen
MAWP	Maximum Allowable Working Pressure
MMH	Monomethylhydrazine
MSS	Manufacturers Standardization Society
NASA	National Aeronautics and Space Administration
N ₂ H ₂	Hydrazine
N ₂ O ₄	Nitrogen Tetroxide
NASA	National Aeronautics and Space Administration
NDT	Non-Destructive Testing
O&M	Operation and Maintenance
SAE	Society of Automotive Engineers
SCC/S	Standard Cubic Centimeters per Second
SFOC	Shuttle Flight Operations Contract
UNS	Uniform Numbering System

1. Scope. - This document replaces 79K19000 and establishes the general characteristics, performance, design, test, and quality assurance requirements for procurement of new convoluted metal hoses. These hoses are intended for use in the ground propellant systems for which SFOC is responsible for O & M. The intended use is conveyance of cryogenic or "Type M" fluids as defined by ANSI/ASME B31.3.

2. Applicable Documents. - The following documents form a part of this document to the extent specified herein. When this document is used for procurement, including solicitations, or is added to an existing contract, the specific revision levels, amendments and approval dates of said documents shall be specified in an attachment to the Solicitation/Statement of work/Contract.

2.1 Governmental

2.1.1 Specifications.

John F. Kennedy Space Center (KSC), NASA

KSC-C-123	Surface Cleanliness of Fluid Systems, Specification for
NASA-SPEC-5004	Welding of Aerospace Ground Support Equipment and Related Non-conventional Facilities

2.1.2 Standards.

John F. Kennedy Space Center (KSC), NASA

KC145	Spud, Buttweld Tube
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(Copies of specifications, standards, drawing, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the Contracting Officer.)

2.2 Nongovernmental.

American National Standards Institute (ANSI)

ANSI/ASME B16.5	Pipe Flanges and Flanged Fittings
ANSI/ASME B31.3	Chemical Plant and Petroleum Refinery Piping

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018)

American Society for Testing and Materials (ASTM)

ASTM A 182	Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service, Standard Specification for
ASTM A 240	Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
ASTM A 269	Seamless and Welded Austenitic Stainless Steel Tubing for General Service, Standard Specification for
ASTM A 276	Stainless Steel Bars and Shapes, Standard Specification for
ASTM A 312	Seamless and Welded Austenitic Stainless Steel Pipes, Standard Specification for
ASTM A 380	Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems, Standard Practice for
ASTM A 403	Wrought Austenitic Stainless Steel Piping Fittings, Standard Specification for
ASTM A 580	Standard Specification for Stainless Steel Wire
ASTM A 967	Chemical Passivation Treatments for Stainless Steel Parts, Standard Specification for

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa 19103)

American Society of Mechanical Engineers (ASME)

ASME	Boiler and Pressure Vessel Code, Section VIII Pressure Vessels, Division 1 (Unfired)
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(Application for copies should be addressed to the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017)

Manufacturers Standardization Society (MSS)

MSS-SP-6	Standard Finishes for Contact Faces of Pipe Flanges and Connecting- End Flanges of Valves and Fittings
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(Application for copies should be addressed to the Manufacturers Standardization Society, 1815 North Fort Myer Drive, Arlington, VA 22209)

Society of Automotive Engineers (SAE)

AS1098	Fitting End, Flared Tube, For Seal Ring, Standard Dimensions For, Design Standard
AS4326	Nut, Coupling
AS4327	Sleeve, Flared Tube Fitting
SAE J514	Hydraulic Tube Fittings

(Application for copies should be addressed to the Society of Automotive Engineers, Department 331, 400 Commonwealth Drive, Warrendale PA 15096)

3. Requirements.

3.1 Definition. - Hose assemblies supplied under this specification shall be a product, which consists of an annular corrugated metal pressure carrier with external braided wire reinforcement and end fittings. Nominal hose inner diameter from 1/4" to 8" shall be within the scope of this specification. Physical, performance and other characteristics shall be as described in the paragraphs, which follow.

3.2 Characteristics.

3.2.1 Performance Characteristics. - The capabilities of the hose assemblies supplied under this specification shall equal or exceed the requirements in the subsequent paragraphs.

3.2.1.1 Service. - The flexible hose shall be compatible with MMH (liquid and vapor), N₂O₄, (liquid and vapor), N₂H₄ (liquid and vapor) GN₂ /LN₂, GO₂/LO₂, GH₂/LH₂, GHe, and Isopropyl Alcohol.

3.2.1.2 Operating Pressure. - The hose assembly's maximum allowable working pressure (MAWP) shall not be less than that shown in Table 1. For flanged hoses, the hose assembly's MAWP may be limited by the MAWP of the flanges as specified by ANSI B16.5.

3.2.1.3 Proof Pressure. - The hose assembly shall withstand initial proof testing without visual evidence of permanent deformation of either the fluid carrier or braided reinforcement as specified in paragraph 4.2, special tests and inspections.

3.2.1.4 Leakage. - Leakage shall not exceed 1×10^{-7} standard cubic centimeters of helium per second (SCC/S GHe), using a Helium Mass Spectrometer Leak Detector (HMSLD) as specified in paragraph 4.2, special tests and inspections.

3.2.1.5 Operating Temperature. - The hose assembly shall be capable of continuous operation over a temperature range of -65° F. to $+200^{\circ}$ F. without degradation or failure due to temperature extremes. Hoses designated by part number for cryogenic service shall be capable of continuous operation over a temperature range of -423° F. to $+200^{\circ}$ F. without degradation or failure due to temperature extremes.

3.2.1.6 Flow. - The hose assembly shall be capable of withstanding, without any damage to the assembly, a minimum flow velocity of 175 ft. / sec. for gases and 75 ft. / sec. for liquids.

3.2.2 Physical Characteristics.

3.2.2.1 Length. - The hose assembly shall be furnished in lengths as specified by the part number coding. The hose length shall be measured as shown in Figure 1. The hose assembly shall not consist of spliced or separate sections of hose assemblies joined/welded together.

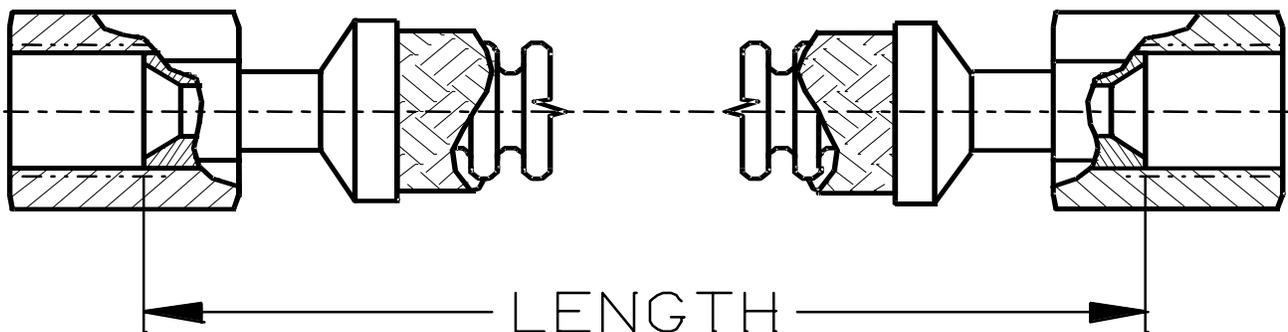


FIGURE 1
STANDARD FOR MEASUREMENT OF HOSE LENGTH

3.2.2.1.1 Tolerance on Hose Length. - Tolerance on hoses under 18 inches in length shall be $\pm 1/8$ inch. Tolerance on hoses 18 to 36 inches long shall be $\pm 1/4$ inch. Tolerance on hoses 36 to 50 inches long shall be $\pm 1/2$ inch. Tolerance on hoses over 50 inches long shall be $\pm 1\%$.

3.2.2.2 Bend Radius. - The hose assembly shall be capable of repeated flexure, while pressurized, to the minimum bend radius specified in Table 1 over its useful life.

3.2.2.3 End Connections. - End connections shall be 37 degree flared tube fittings, class 150 or class 300 flanges as indicated by the part number code.

3.2.2.3.1 Flared Tube End Connections. - The hose assembly shall mate with the 37 degree flared fitting as specified by SAE AS1098, SAE J514 section 1 or MS33656.

3.2.2.3.1.1 Flare and Sleeve. - A one piece machined flare and sleeve assembly, similar in design to KC145, butt welded to the convoluted tube is preferred. A three piece (tube, sleeve, and coupling nut) assembly is acceptable. The sleeve shall conform with SAE AS4327 or SAE J514 section 1.

3.2.2.3.1.2 Coupling Nut. - The coupling nuts shall conform to SAE AS4326 or SAE J514 section 1 type B.

3.2.2.3.2 Flanged End Connections. - Flanged end connections shall conform to ANSI B16.5 class 150 or 300 as specified in the hose part number coding. Flange faces or lap joint stub end faces shall be raised style with concentric serrations. Serrations shall conform to MSS SP-6 except depth of serrations shall be .01" minimum and 24 serrations per inch shall be required.

3.2.2.3.2.1 Style. - Flanges shall be weld neck, lap joint (floating) flange, or flared tube end connection. The part number coding shall indicate end style, as listed in 3.3.4.1. Slip on or socket weld flanges are not permitted.

3.2.3 Reliability. - When operated within the limits of this specification, the hose shall be designed for a minimum useful life of 20 years.

3.2.4 Maintainability. – Not applicable.

3.2.5 Environmental Conditions. - Hose assemblies provided under the conditions of this specification shall be designed for exposure to a normal range of climatic conditions including blowing dust or sand. In addition to normal climatic conditions, hoses coded for severe exposures shall be designed for exposure to an atmosphere rich in HCL and salt spray.

3.2.6 – Transportability. – Not applicable.

3.3 Design and Construction.

3.3.1 Design.

3.3.1.1 Burst Pressure. - The flexible hose assembly shall be designed to withstand a pressure of at least four (4) times its MAWP (Ref. Table 1) without bursting. If the manufacturer's standard safety factor is less than four, the hose assembly's MAWP shall be de-rated to provide a safety factor of four.

3.3.1.2 Reinforcement. - The exterior hose reinforcement or protective cover shall consist of braided plies of stainless steel wires. Reinforcement separation materials, if used, shall permit gas effusion to escape to atmosphere. There shall be no broken or spliced reinforcing wire.

3.3.2 Materials, Parts, and Processes

3.3.2.1. Materials. - The corrugated hose section shall be made from Type 316L or 321 stainless steel. The exterior braid shall be made of Type 316/316L stainless steel wire. Type 304L/316L stainless steel shall be used for any welded parts except the corrugated hose section. Stainless steel sheet or strip, AISI Type 304/304L, 316/316L, and 321, shall conform to the requirements of ASTM A 240 or ASTM A 276. Pipe and tubing shall be seamless, AISI type 304/304L, 316/316L or 321 conforming to ASTM A 312 (pipe) or ASTM A 269 (tube). Stainless steel wire shall conform to ASTM A 580. ANSI B 31.3 Chapter III temperature limitations shall apply to materials supplied. Castings of metallic components are not permitted.

3.3.2.2 Materials for Severe Exposures. - The corrugated hose section and exterior braid shall be made from low-carbon nickel-molybdenum-chromium alloy UNS N06022. These materials shall conform to the requirements of ASTM B 574 or B 575. Pipe and tubing shall be seamless UNS N06022 conforming to ASTM B 622. ASME B 31.3 Chapter III temperature limitations shall apply to materials supplied.

3.3.2.3 Flared Tube End Fittings. - Fittings shall be AISI type 316 or 316L conforming to ASTM A 276. AISI 316L shall be the preferred material for one-piece machined flare and sleeve assemblies.

3.3.2.4 Flanges. - Flanges shall be 316L or 316, except when using an UNS N06022 corrugated hose section, and shall conform to ASTM A182. Lap joint stub ends shall conform to ASTM A 403. Type 316L is preferred for butt weld flanges or lap joint stub ends. For UNS N06022 convoluted tube, flange material shall conform to ASTM A 182 and lap joint stub ends to ASTM A 403, type 316 or 316L.

3.3.2.5 Parts. - Standard or commercial parts and components shall be used to the maximum extent possible provided that the hardware conforms to the requirements of this specification.

3.3.2.6 Fabrication. - Fabrication shall be in accordance with ASME boiler and pressure vessel code sections VIII and IX, and ASME B 31.3. In accordance with NASA-SPEC-5004, welding shall conform to the requirements of ASME B 31.3. Welding and weld inspection shall conform to ASME B 31.3 requirements for type M fluid service except as noted below.

3.3.2.7 Pressure Containing Welds for Cryogenic Service. - Severe cyclic service requirements of ASME B 31.3 shall apply to hoses for cryogenic service.

3.3.2.8 Longitudinal Seam Weld. - NDT shall not be required for the longitudinal seam of the convoluted tube, provided the seam weld is done with an automatic weld process without the addition of filler material.

3.3.2.9 Fillet Welds. - Any fillet weld subject to effects of the service medium pressure shall be examined along its full length. Examination shall be by liquid penetrant method. No cracks or porosity open to the surface shall be permitted.

3.3.2.10 Welds Not Subject to Media Pressure. - Welds that will not be subject to the effect of the service media pressure shall be visually inspected. No cracks or porosity open to the surface are permitted.

3.3.2.11 Passivation. - Passivate in accordance with ASTM A 967 using “nitric 2” treatment solution. Only internal surfaces require passivation. When specified by the user, outer surfaces may also be passivated. Passivation shall be performed by the current CRCA facility contractor unless otherwise specified by the purchase order.

3.3.2.12 Cleaning. - Hose assemblies shall be cleaned in conformance with KSC-C-123, test method I, level 300A. Cleaning shall be performed by the current CRCA facility contractor unless otherwise specified by the purchase order.

3.3.3 Electromagnetic Interference. – Not applicable.

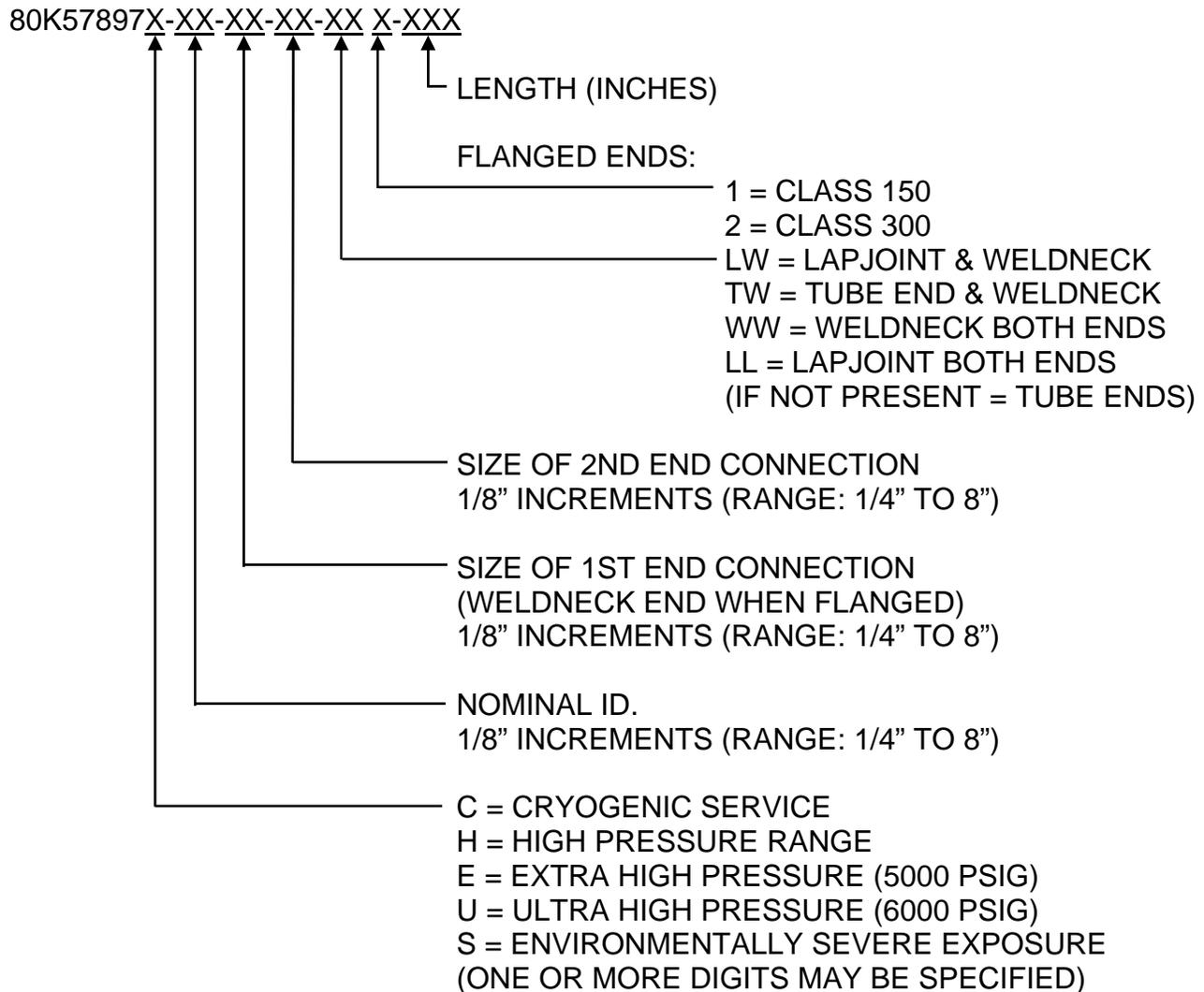
3.3.4 Product Marking. - The manufacturer shall identify the hose assembly with a permanently attached corrosion resistant steel tag or band bearing the following information:

- a. Government part number (80K57897-...)
- b. Manufacturer's Name
- c. Manufacturer's Part Number (If different from Government Part Number)
- d. Fabrication Date (Month and Year)
- e. Hydrostat/Pneumostat Test Date (Month and Year)
- f. Rated Working Pressure (Ref. Paragraph 3.3.1.1)
- g. Serial Number, if applicable

3.3.4.1 Identification for Severe Exposures. – The manufacturer shall identify hoses, fabricated for use in severe exposures in accordance with 3.3.2.2, with a permanently attached corrosion resistant steel tag or band bearing the following information:

“FOR USE IN NASA-STD-5008 ZONE 1, 2, 3A, 3B OR 4A ENVIROMENTS”

3.3.4.2 Part Numbering: - Hose assemblies shall be numbered in accordance with the following system:



NOTE: FOR END STYLE CODE LW OR TW THE FIRST END SIZE CODE SHALL APPLY TO THE WELDNECK END.

3.3.4.3 Example Part Numbers -

80K57897CS-08-08-10-072 - (1" HOSE WITH 1" AND 1-1/4" TUBE ENDS, 6' LONG, FOR ENVIRONMENTALLY SEVERE, CRYOGENIC SERVICE)

80K57897-16-16-12-LW1-120 - (2" HOSE WITH 2" CLASS 150 WELDNECK FLANGED END, 1-1/2" LAPPED JOINT FLANGED END, 10' LONG)

3.3.5 Workmanship. – Not applicable.

3.3.6 Interchangeability – Not Applicable.

3.3.7 Safety – Not applicable.

3.3.8 Human Engineering. – Not applicable.

3.3.9 Government Furnished Property. – Not applicable

3.4 Documentation. - The manufacturer shall furnish the procuring agency copies of the following documents. Each document shall be identified with this specification number. In case of multiple procurement of like hose assemblies, documents pertaining to test data shall be further identifiable to the individual hose assembly. Documentation shall be shipped with the hose assembly.

A) Certified test reports. (Proof, leakage and when applicable cold shock)

B) Inspection report. (Cleaning, passivation, and overall hose condition)

C) Material certifications of conformance.

D) All reports required by the welding specification and ANSI/ASME B31.3.

3.5 Logistics. – Not applicable.

3.6 Personnel and Training. – Not applicable

3.7 Major Component Characteristics. – Not applicable

3.8 Precedence. - If in conflict, the requirements of this document shall take precedence over referenced documents. Governmental specifications and standards shall take precedence over non-governmental specifications and standards. The contractor shall notify the procuring agency of each instance of conflicting or apparently conflicting requirements.

3.9 Qualification – Not applicable

3.10 Samples - Not applicable.

4. Quality Assurance Provisions

4.1 Responsibility for Inspection. - Unless otherwise specified in the contract or order, the supplier is responsible for performance of all inspection requirements specified herein. Except as otherwise specified, the supplier may use his own facilities or any commercial laboratory acceptable to the government. The Government reserves the right to perform any inspections set forth in the specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.2 Special Tests and Inspections. - The procuring activity reserves the right to perform one or more of the following functional tests upon receipt of hoses and prior to final acceptance. Failure of the hose assembly to meet requirements shall be brought to the attention of the contracting officer for disposition. The hose assemblies may be returned to the manufacturer if they fail to meet any of the following tests.

4.2.1 Operating / Working Pressure Test. - Place the hose assembly in a pneumatic test setup and pressurize with GHe. Maintain the MAWP as specified by paragraph 3.2.1.2 for (5) minutes. No leakage as specified by paragraph 3.2.1.4 is allowed.

4.2.2 Burst Pressure Test. - Place the hose assembly in a hydrostatic test setup. Slowly increase pressure until the burst pressure as specified by paragraph 3.3.1.1 is reached. The hose assembly shall not burst, the fittings shall not blow off or loosen, and there shall be no leakage below the pressure stated in paragraph 3.3.1.1. Failure of the hose assembly to meet the requirements of paragraph 3.3.1.1 shall be brought to the attention of the contracting officer for disposition. The entire lot, or any part of the lot including the failed hose assembly, may be returned to the manufacturer.

4.2.3 Flow Test. - Place the hose assembly in a pneumatic test setup. Maintain the operating pressure as specified by Paragraph 3.2.1.2. Increase the flow rate to the conditions specified by Paragraph 3.2.1.6 and maintain for (3) minutes. Failure of the hose assembly to meet the requirements of paragraph 3.2.1.6 shall be brought to the attention of the contracting officer for disposition, and the hose assembly may be returned to the manufacturer.

4.3 Quality Conformance Inspections. - The manufacturer shall perform on each hose assembly a general inspection and proof test followed by a leak test as specified in paragraph 4.3.1, and 4.3.4 through 4.3.4.2. In addition, hoses designated for cryogenic service shall be cold shock tested as specified in paragraph 4.3.2.1 prior to proof testing. Results of these tests shall be in accordance with Section 3.2 and 4.3.2.2 of this specification. (Date of proof test shall be recorded on the hose assembly's parts tag in conformance with the Product Marking provisions of this specification.)

4.3.1 General Inspection. - Component damage, poor workmanship, non-conformance to material requirements or non-conformance to any of the requirements of section 2 or 3 shall be brought to the attention of the contracting officer for disposition. Any of the above listed items may be cause for rejection of the hose assembly.

4.3.2 Cryogenic Service Test and Inspection. - Hoses designated by part number for cryogenic service shall be subjected to a "Cold Shock" test.

4.3.2.1 Cryogenic Service Test Requirements. - Cold shock testing shall be performed prior to proof testing and subsequent leak testing. The hose assembly shall be tested by tilting the hose upward at approximately fifteen degrees (15°). LN₂ shall be introduced into the hose from the lower end, allowing the boil-off gas to escape from the opposite end. The chill down and filling shall continue until a steady stream of LN₂ is forced out of the high end. The LN₂ supply shall be maintained and the hose be allowed to cold soak for one hour.

4.3.2.2 Cryogenic Service Test Inspection. - Following completion of the cold shock test, a visual inspection of the hose shall be performed. No permanent deformation shall be permitted.

4.3.3 Proof Pressure Test. – Place the hose assembly in a hydrostatic test setup. Apply and maintain the proof pressure of one and one half (1 ½) times its MAWP for five (5) minutes using clean demineralized water at 66° to 74° Fahrenheit. No visual evidence of permanent deformation or of leakage of either the fluid carrier or braided reinforcement is allowed.

4.3.4 Leak Test. – The following leak test shall be performed after completion of the proof pressure test. The hose shall be thoroughly purged and dried prior to initiating the leak test. The leak test shall be performed using a helium mass spectrometer (HMSLD) set. (Calibrate) For a sensitivity of 1×10^{-9} standard cubic centimeter per second (SCC/S) GHe. Leakage shall not exceed 1×10^{-7} SCC/S using either of the following alternative detection techniques.

4.3.4.1 Pressurized Hose. – The hose shall be thoroughly purged using GHe to remove all traces of air then pressurized with GHe to its MAWP. The HMSLD shall be moved methodically about the hose to detect leakage.

4.3.4.2 Evacuated Hose. – The hose shall be connected to the HMSLD and evacuated to less than 10 microns Hg. GHe shall be sprayed over the outer surface of the hose. If an auxiliary vacuum pump is used to assist in evacuation of the hose, its use must be discontinued prior to performing any leakage measurement.

4.4 Final Acceptance – Cleaning and Passivation – The completion of cleaning and passivation operations to be accomplished at KSC shall not be required for the acceptance of the hose assembly from the vendor.

5. Packaging. - Packaging shall comply with the manufacturer's standard commercial practice provided packing shall be sufficient to protect hose assemblies against damage and maintain cleanliness as specified in Para. 3.3.2.11 during shipment. Shipping containers shall conform to freight classification rules and applicable container specifications.

6. Notes.

6.1 Exceptions and Deviations. - Request for exceptions and/or deviations from the requirements of this specification shall be submitted to the procuring agency for review.

6.2 Intended Use. - The hoses controlled by this specification are intended primarily for conveyance of toxic or hazardous gases or liquids used in propellant systems. They may also be used for inert fluids in other systems and services, material compatibility permitting, not specified in paragraph 3.2.1.1. Generally these hoses may be specified for use when teflon lined hoses are incompatible with the service fluid or environmental conditions.

6.3 Use of Government Drawings.

NOTICE. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever: and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permissions to manufacture, use, or sell any patented invention that may in any way be related thereto.

TABLE 1
HOSE CHARACTERISTICS

PART NUMBER	NOMINAL ID (INCHES) (REF.)	MAX. ALLOWABLE WORKING PRESSURE ¹ (PSIG)	MINIMUM BEND RADIUS (INCHES)
80K57897-02	1/4"	2000	4-3/4"
80K57897H-02	1/4"	3675	5-1/4"
80K57897E-02	1/4"	5000	5-1/4"
80K57897U-02	1/4"	6000	12"
80K57897-03	3/8"	1475	6"
80K57897H-03	3/8"	2645	6-1/2"
80K57897-04	1/2"	1195	7"
80K57897H-04	1/2"	2095	7-1/4"
80K57897-06	3/4"	885	8-1/4"
80K57897H-06	3/4"	1505	8-1/2"
80K57897-08	1"	715	9-1/4"
80K57897H-08	1"	1195	9-1/4"
80K57897-10	1-1/4"	605	10-1/4"
80K57897H-10	1-1/4"	995	10-1/2"
80K57897-12	1-1/2"	530	11"
80K57897H-12	1-1/2"	860	11-3/4"
80K57897-16	2"	425	13-1/4"
80K57897H-16	2"	680	14-1/4"
80K57897-20	2-1/2"	360	15-1/2"
80K57897H-20	2-1/2"	565	17"
80K57897-24	3"	315	18"
80K57897H-24	3"	490	20"
80K57897-28	3-1/2"	280	21"
80K57897H-28	3-1/2"	430	23-1/4"
80K57897-32	4"	255	23-3/4"
80K57897H-32	4"	385	26-3/4"
80K57897-40	5"	215	30-1/4"
80K57897H-40	5"	325	34"
80K57897-48	6"	190	36-1/4"
80K57897H-48	6"	280	41"
80K57897-64	8"	155	48"
80K57897H-64	8"	220	52-3/4"

NOTE 1: SEE PARAGRAPH 3.2.1.2 FOR FLANGED HOSES

APPENDIX A
PART NUMBER SUBSTITUTIONS

The 80K57897 hose basic part number listed in Table 2 is an equal or better substitution for the listed 79K19000 hose. (See 3.3.3.1 for the complete part numbering system)

TABLE 2
79K19000 PART NUMBER CONVERSION

79K19000 DASH NUMBER	80K57897 DASH NUMBER
79K19000-4-XXXX	80K57897H-02-
79K19000-5-XXXX	80K57897U-02
79K19000-6-XXXX	80K57897E-02-
79K19000-7-XXXX	80K57897H-02-
79K19000-8-XXXX	80K57897H-04-
79K19000-9-XXXX	80K57897H-04-
79K19000-10-XXXX	80K57897-04-
79K19000-12-XXXX	80K57897-H06-
79K19000-13-XXXX	80K57897-06-
79K19000-16-XXXX	80K57897H-08-
79K19000-17-XXXX	80K57897-08-
79K19000-20-XXXX	80K57897H-10-
79K19000-21-XXXX	80K57897-10-
79K19000-24-XXXX	80K57897H-12-
79K19000-25-XXXX	80K57897-12-
79K19000-32-XXXX	80K57897-16-
79K19000-40-XXXX	80K57897-20-
79K19000-48-XXXX	80K57897H-24-