

CRITICAL ITEMS LIST (CIL)

SYSTEM:	Propulsion/Mechanical	FUNCTIONAL CRIT:	1
SUBSYSTEM:	LH2 Propellant Feed	PHASE(S):	a, b
REV & DATE:	J, 12-19-97	HAZARD REF:	P.06, S.11
DCN & DATE:			
ANALYSTS:	J. Kuttruff/H. Claybrook		

FAILURE MODE: Loss of Filtering Capability

FAILURE EFFECT: a) Loss of mission and vehicle/crew due to clogging of Orbiter feedline screens, inadequate LH2 supply to engines during start and uncontrolled SSME shutdown.  
 b) Loss of mission and vehicle/crew due to clogging/rupture of Orbiter feedline screens and uncontrolled SSME shutdown.

TIME TO EFFECT: Seconds

FAILURE CAUSE(S): A: Structural Failure  
 B: Structural Failure of Support Frame  
 C: Fracture of Attachment Hardware

REDUNDANCY SCREENS: Not Applicable

FUNCTIONAL DESCRIPTION: The 46 inch diameter, 400 micron screen is mounted on the siphon bell to prevent ingestion of debris into the LH2 feedline.

<u>FMEA ITEM CODE(S)</u>	<u>PART NO.</u>	<u>PART NAME</u>	<u>QTY</u>	<u>EFFECTIVITY</u>
2.5.4.1	PD4800176-039	Screen	4	LWT-54 & Up

REMARKS:

CRITICAL ITEMS LIST (CIL)  
CONTINUATION SHEET

SYSTEM: Propulsion/Mechanical  
SUBSYSTEM: LH2 Propellant Feed  
FMEA ITEM CODE(S): 2.5.4.1

REV & DATE: J, 12-19-97  
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RATIONALE FOR RETENTION

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DESIGN:

The LH2 propellant screen assembly provides 400 micron filtration and is designed to meet the required yield (1.1) and ultimate (1.4) safety factors (ET Stress Analysis Report 826-2188, Section D.7.4, and SA 2114-503-91, Wintec), and other operating and nonoperating requirements specified by PD4800176. The screen assembly, consisting of 4 identical segments, is fabricated with a top and bottom square weave support screen (22 x 22 x .015 Dia) and center filter screen (50 x 50 x .0045 Dia). Fusion welding is specified and controlled by WSF-008-237 (Wintec). Frame stiffness and fastener spacings are designed to prevent flange deflections under maximum loading to any gap greater than the allowable pore size.

- A: The screen assembly frame and mounting surface materials are 321 CRES and 2219 aluminum respectively.
- A: The screen mesh is fabricated in a square weave pattern using 304L CRES wire. The frame is fabricated from 321 CRES plate. Material selection is in accordance with MMC-ET-SE16 which assures conformance of composition, material compatibility and properties.
- B: The screen support is provided by a frame that is attached to the siphon inlet.
- B: Materials were selected in accordance with MMC-ET-SE16 which assures repetitive conformance of composition and properties. The assembly has been designed to meet the required yield (1.1) and ultimate (1.4) safety factors (ET Stress Report 826-2188) and other operating and nonoperating requirements specified per 80924901918.
- C: Attachment hardware was selected from the Approved Standard Parts List (ASPL 826-3500), installed per STP2014 and torqued using values specified on Engineering drawings.

TEST:

The Screen Assembly is qualified. Reference COQ MMC-ET-TM06-110.

Development: LH2 Tank Filter Screens successfully completed all required Development Level Vibration Testing as specified by PD4800176 (Martin Marietta Aerospace Acoustic/Vibration Laboratory TR4756). These tests included sine and random vibration tests in the X, Y and Z axis. After completion of vibration tests the 400 micron filtration was verified by bubble point test.

Qualification: Testing of four screen segments included proof load and bubble point for acceptance. Other tests performed when installed in the siphon assembly included 5 thermal cycles (-320<sup>o</sup> to 120<sup>o</sup>F) and vibration in three axes. Proof and ultimate load testing was then performed on the individual screen segments. Structural integrity was verified (MMC-ET-RA09-106).

Vendor:

- A: Perform proof load and bubble point tests on each production screen segment (ATP 9-1067, Wintec).
- C: Attachment hardware are procured and tested to Standard drawings 26L17 and 26L2.

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INSPECTION:

Vendor Inspection - Lockheed Martin Surveillance:

A-C: Verify materials selection and verification controls (MMC-ET-SE16, PD4800176 and Standard drawings 26L17 and 26L2 and drawing 80924901914).

Lockheed Martin Procurement Quality Representative:

A: Witness Proof Pressure, Bubble Point Test and visual inspection for structural integrity (ATP 9-1067, Wintec).

MAF Quality Inspection:

B: Verify ultrasonic inspection (drawing 80924901914).

C: Inspect bolts for freedom of damage prior to installation (drawing 80924011901).

C: Verify installation and witness torque (drawing 80924011901).

FAILURE HISTORY:

Current data on test failures, unexplained anomalies and other failures experienced during ground processing activity can be found in the PRACA data base.