

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
 DCN & DATE:
 ANALYSTS: J. Kuttruff/H. Claybrook

FAILURE MODE: Blockage
 FAILURE EFFECT: a) Loss of mission and vehicle/crew due to LH2 pump cavitation resulting in uncontrolled engine shutdown on pad.
 b) Loss of mission and vehicle/crew due to LH2 pump cavitation resulting in uncontrolled shutdown of all three SSME's.
 TIME TO EFFECT: Seconds
 FAILURE CAUSE(S): Foreign Obstruction
 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>
2.5.4.2	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): 2.5.4.2

REV & DATE: J, 12-19-97
DCN & DATE: 002, 2-28-99

RATIONALE FOR RETENTION

DESIGN:

The LH2 propellant screen provides 400 micron filtration and is designed to meet the required yield (1.1) and ultimate safety factors (1.4) (ET Stress Report 826-2188 and SA2114-503-91, 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).

The 46 inch screen diameter, with a frontal area of 1280 square inches and filter screen open area of 60%, provides ample contamination capacity within the specified requirement of PD4800176.

Major blockage of the screen is minimized by contamination control inside the tank of 1000 microns in accordance with STP5011. Origination of blockage is controlled by contamination control in accordance with STP5008 during the tank cleaning process.

TEST:

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

Development: Development tests were performed to define flow/delta P characteristics as a function of screen mesh type and to determine the effect of contamination on pressure loss. Tests showed that the 50 x 50 (mesh weave configuration) screen utilizing a flat geometry met the flow and contamination requirements of PD4800176 (MMC-3541-75-453).

Contamination Distribution Test - LWT:11: Post cleaning inspection of LWT-11 LH2 tank conducted at MAF, found particle population which did not compare to the contamination described by the 1000 micron curve of MIL-STD-1246A used during development testing of the screen.

Particle samples similar to those obtained from the tank were duplicated in sufficient quantities and screen contamination tests were performed to determine adequacy of design. Flow test results showed that the contamination found in the ET did not increase the pressure drop across the filtration screen over that expected for a MIL-STD-1246A particle population. Its presence poses no threat to the satisfaction of the Space Shuttle Main Engine Net Positive Suction Pressure requirements (MMC Engineering Test Order Report 001).

INSPECTION:

Lockheed Martin Procurement Quality Representative:

Verify cleanliness (WSQ-4045, Wintec).

MAF Quality Inspection:

Inspect for freedom of damage or contamination during installation (drawing 80924011901).

Inspect Aft Dome for freedom of contamination during post installation shakedown (MPP 80904000SCL for LWT-54 thru 68, 80934003719 for LWT-69 thru 88 & 80924901919 for LWT-89 & up).

Verify fence and attaching hardware cleanliness (80914951969 & STP 5008 for LWT-89 thru 599).

Maintain cleanliness during installation (80914901900 & STP 5011 for LWT-89 thru 599).

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.