

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LIFE SUPPORT FMEA NO 06-2C -0443 -1 REV:09/28/87
 ASSEMBLY : URINE COLLECTION EQUIPMENT CRIT. FUNC: :
 P/N RI : MC282-0069, MC276-0020-1101/-3104 CRIT. HDW: :
 P/N VENDOR: 47C265889 VEHICLE 102 103 104
 QUANTITY : 1 EFFECTIVITY: X X X
 : PHASE(S): PL LO OO X DO LS
 : ONE PER SUBSYSTEM

REDUNDANCY SCREEN: A- B- C-
 PREPARED BY: APPROVED BY: APPROVED BY (NASA):
 DES D. SANDERSFELD DES *[Signature]* SSM *[Signature]* 10/21
 REL L. SCHASCHL REL *[Signature]* REL *[Signature]* 10/25
 QE M. SAVALA QE *[Signature]* QE *[Signature]* 10/28

ITEM:

LINES, FITTINGS AND QUICK DISCONNECT (QD), SECOND CHECK VALVES TO WCS/WASTE TANK SYSTEM QD

FUNCTION:

PROVIDES FLOW PATH FROM SECOND CHECK VALVES TO WCS/WASTE SYSTEM INTERFACE QD SO THAT WASTE WATER CAN BE TRANSFERRED TO WASTE TANK.

FAILURE MODE:

RESTRICTED FLOW, PLUGGED

CAUSE(S):

CONTAMINATION, CORROSION, DEBRIS, BIOLOGICAL GROWTH

EFFECT(S) ON:

(A)SUBSYSTEM (B)INTERFACES (C)MISSION (D)CREW/VEHICLE

(A, B) COLLECTED URINE AND EMU WASTE WATER COULD NOT BE PROCESSED AND REACH THE WASTE TANK - FAN/SEPARATORS WOULD FICOD.

(C) INABILITY TO TRANSFER WASTE WATER TO WASTE TANK OR CONTINGENCY WATER CONTAINER (CWC), OR DUMP OVERBOARD. LOSS OF WASTE WATER STORAGE CAPABILITY MAY LIMIT MISSION DURATION.

(D) NO EFFECT.

DISPOSITION & RATIONALE:

(A)DESIGN (B)TEST (C)INSPECTION (D)FAILURE HISTORY (E)OPERATIONAL USE

(A) DESIGN

HOSE ASSEMBLY IS A RESISTOFLEX FLEX HOSE CONSTRUCTED OF TEFLON TUBING WITH AN OUTER PROTECTIVE CRES BRAID WELDED TO CRES TUBING WITH A DYNATUBE FITTING ON ONE END. QD IS ALL STAINLESS STEEL CONSTRUCTION WITH AN ETHYLENE PROPYLENE (EPR) O-RING SEAL AND A TEFLON BACKUP RING SEAL. POPPET IS SPRING-LOADED CLOSED. TWO CHECK VALVES IN SERIES. TEST PORT BETWEEN VALVES TO VERIFY REDUNDANCY. 17-4 PH CRES HOUSING, TEFLON POPPET, SILICONE VALVE SEAT, 17-7 PH CRES SPRING, INTERNAL PARTS OF 304 OR 316 CRES, SILASTIC 675 O-RING. DYNATUBE FITTING AT BOTH ENDS AND TEST PORT CAP ARE TORQUED TO SPECIFIED VALUES AND LOCKWIRED. ALL MATERIALS ARE COMPATIBLE WITH WORKING FLUIDS (URINE, EMU DRAIN WATER, AND DISINFECTANT).

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(B) TEST

QUALIFICATION TESTS FOR 100 MISSION LIFE - QD WAS SHOCK TESTED AT 20 G. OPERATION TEST OF 5 CYCLES AT 0 PSIG AND AT 55 PSIG. BURST TESTED AT 180 PSIG FOR 5 MINUTES (MAX OPERATION PRESSURE OF 22 PSIG). RANDOM VIBRATION - 0.2 G SQ/HZ AT 10 PSIG FOR FIRST 24 MINUTES/AXIS FOLLOWED AT 90 PSIG FOR 24 MINUTES/AXIS. 5% SALT/85% RH FOR 50 HOURS. THERMAL TEST AT 250 F FOR 15 MINUTES AND AT -65 F FOR 3 HRS. LINES, FITTINGS AND CHECK VALVES SUBJECTED TO RANDOM VIBRATION, 48 MINUTES PER AXIS AT A RATE OF PLUS 6 dB/OCTAVE FROM 20 TO 150 HZ; CONSTANT AT 0.03 G SQ/HZ FROM 150 TO 1000 HZ; DECREASING AT THE RATE OF MINUS 6 dB/OCTAVE FROM 1000 TO 2000 HZ. SINUSOIDAL VIBRATION SWEEPS 5 TO 35 HZ AT 1 OCTAVE/MINUTE AT 0.25 G PEAK. SHOCK TEST OF 20 G SAWTOOTH SHOCK IMPULSE - 11 MILLISECOND DURATION.

SYSTEM FUNCTIONAL TEST - 210 MAN DAYS WITH NO CORROSION OR MATERIAL INCOMPATIBILITY PROBLEMS.

ACCEPTANCE TEST - FLOW OF 2450 CC/MINUTE THROUGH QD, CHECK VALVES, LINES AND FITTINGS IS VERIFIED AT A BACKPRESSURE OF 21.0 PSIG.

OMRSD: FLOW THROUGH QD, LINES, FITTINGS AND CHECK VALVES IS VERIFIED BEFORE EACH FLIGHT. ALL LIQUID PROCESSING COMPONENTS ARE FLUSHED WITH A DISINFECTANT SOLUTION AFTER EACH FLIGHT, PRIOR TO WCS REMOVAL.

(C) INSPECTION

RECEIVING INSPECTION

CERTIFICATION OF RAW MATERIALS AND PROCESSES VERIFIED.

CONTAMINATION CONTROL

CONTAMINATION CONTROL AND DIMENSIONS VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

CORROSION PROTECTION IS VERIFIED BY INSPECTION PRIOR TO INSTALLATION. VISUAL INSPECTION FOR DAMAGE DURING INSTALLATION AND ACCEPTANCE TEST PROCEDURE.

CRITICAL PROCESSES

WELDING CERTIFICATION AND HEAT TREATMENT VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

RADIOGRAPHIC INSPECTION IS VERIFIED BY SUPPLIER.

HANDLING/PACKAGING

PARTS PROTECTION, HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED.

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(D) FAILURE HISTORY

NO RESTRICTED FLOW FAILURE HISTORY.

CONTAMINATION HISTORY (DID NOT CAUSE RESTRICTED FLOW FAILURE); POPPET FAILED OPEN ON WCS CAUSED BY BUILDUP OF URINE SOLIDS; URINE LINE IS NOW FLUSHED WITH A DISINFECTANT SOLUTION PRIOR TO WCS REMOVAL TO CONTROL SOLIDS BUILDUP. (CAR #AC5096)

TWO INSTANCES OF A METAL SLIVER LODGED BETWEEN POPPET AND SEAL; IMPROVE ASSEMBLY PROCEDURES (CLEANING, WORKMANSHIP). (CAR #AB5643, #AB5921)
CHECK VALVES HAVE NO FLIGHT FAILURES.

(E) OPERATIONAL USE

CREW SHOULD USE CONTINGENCY URINE BAGS.