

SHUTTLE CRITICAL ITEMS LIST - ORBITER

SUBSYSTEM : LIFE SUPPORT FMEA NO 06-2E -0431 -2 REV:10/29  
 ASSEMBLY : WASTE WATER STORAGE CRIT. FUNC:  
 P/N RI : MC276-0020-1101 CRIT. HDW:  
 P/N VENDOR: VEHICLE 102 103 104  
 QUANTITY : 1 EFFECTIVITY: X X X  
 : PHASE(S): PL LO X OO X DO X L  
 : ONE PER SUBSYSTEM

REDUNDANCY SCREEN: A-FAIL B-FAIL C-P.  
 PREPARED BY: APPROVED BY: APPROVED BY (NASA)  
 DES S. CASTILLO DES *[Signature]* SSM *[Signature]*  
 REL L. SCHASCHL REL *[Signature]* REL *[Signature]*  
 QE M. SAVALA QE *[Signature]* QE *[Signature]*

ITEM:

QUICK DISCONNECT (QD) AND CAP, WASTE WATER CROSS-TIE

FUNCTION:

PROVIDES THE CAPABILITY FOR CROSS DUMPING SUPPLY OR WASTE WATER AND DIRECT OVERBOARD DISPOSING OF LIQUID SPILLS.

FAILURE MODE:

FAILS OPEN, INTERNAL LEAKAGE OF POPPET/CAP

CAUSE(S):

VIBRATION, CORROSION, CONTAMINATION, MECHANICAL SHOCK

EFFECT(S) ON:

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

(A) LOSS OF ONE REDUNDANT SEAL IN WASTE WATER SYSTEM. LOSS OF ABILITY TO DUMP WASTE WATER AFTER SECOND FAILURE (CAP LEAKAGE).

(B) NO EFFECT. CAP PROVIDES REDUNDANT SEAL.

(C) NO EFFECT FOR FIRST FAILURE.

(D) NO EFFECT.

(E) FUNCTIONAL CRITICALITY EFFECT - SECOND ASSOCIATED FAILURE (CAP LEAKAGE) WILL RESULT IN FREE WATER IN CREW CABIN, AND LOSS OF WASTE WATER DUMP CAPABILITY CAN LIMIT MISSION DURATION. CAP SEAL CAN NOT BE VERIFIED DURING GROUND TURNAROUND, AND QD POPPET LEAK IS UNDETECTABLE WHEN CAP IS INSTALLED.

DISPOSITION & RATIONALE:

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

(A) DESIGN

QD IS ALL STAINLESS STEEL CONSTRUCTION WITH AN ETHYLENE PROPYLENE (E) O-RING SEAL AND A TEFLON BACKUP RING SEAL. CAP IS STAINLESS STEEL WITH EPR O-RING SEAL. CAP IS INSTALLED BEFORE FLIGHT AND PROVIDES REDUNDANT SEAL TO QD POPPET. POPPET IS SPRING-LOADED CLOSED.

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(B) TEST

QUALIFICATION TESTS FOR 100 MISSION LIFE INCLUDE: SHOCK TESTED AT 20 OPERATION TEST OF 5 CYCLES AT 0 PSIG AND AT 55 PSIG, BURST TEST AT 180 PSIG FOR 5 MINUTES (MAXIMUM OPERATING PRESSURE OF 22 PSIG), RANDOM VIBRATION - 0.2G SQ/HZ AT 10 PSIG FOR FIRST 24 MINUTES/AXIS FOLLOWED BY 90 PSIG FOR 24 MINUTES/AXIS, 5% SALT/85% RH FOR 50 HOURS, AND THERMAL TEST AT 250 F FOR 15 MINUTES AND AT -65 F FOR 3 HRS.

ACCEPTANCE TESTS - LEAKAGE AND PROOF PRESSURE - PRESSURIZED AT 10, 55 AND 90 PSIG IN THE MATED, DEMATED, AND CAPPED CONFIGURATIONS. LEAKAGE WILL NOT EXCEED 0.0001 SCCS He. CAP LEAK TESTED WHILE MATED TO TOOLS MAXIMUM AND MINIMUM DIMENSIONS TO ASSURE A PROPER FIT TO ALL QD'S.

OMRSD: LEAK CHECK OF QD IS CONDUCTED AFTER GSE DEMATING AND PRIOR TO CAP INSTALLATION. VISUAL INSPECTION OF CAP INCLUDING O-RING SEAL PRIOR TO INSTALLATION.

(C) INSPECTION

RECEIVING INSPECTION

CERTIFICATION OF RAW MATERIALS AND PROCESSES IS VERIFIED.

CONTAMINATION CONTROL

CONTAMINATION CONTROL PLAN AND CORROSION PROTECTION PROVISIONS ARE VERIFIED BY INSPECTION.

ASSEMBLY/INSTALLATION

VISUAL INSPECTION FOR DAMAGE DURING INSTALLATION AND ASSEMBLY IS VERIFIED BY INSPECTION. DIMENSIONS ARE VERIFIED BY INSPECTION.

CRITICAL PROCESSES

WELDING CERTIFICATION AND HEAT TREATMENT ARE VERIFIED BY INSPECTION.

NONDESTRUCTIVE EVALUATION

WELD X-RAYS ARE VERIFIED BY INSPECTION.

TESTING

ACCEPTANCE TEST PROCEDURE IS VERIFIED BY INSPECTION.

HANDLING/PACKAGING

PARTS PROTECTION, HANDLING AND PACKAGING REQUIREMENTS ARE VERIFIED.

(D) FAILURE HISTORY

POPPET FAILED OPEN ON WCS CAUSED BY BUILDUP OF URINE SOLIDS; URINE LINE IS NOW FLUSHED PRIOR TO WCS REMOVAL TO CONTROL SOLIDS BUILDUP.

(CAR #AC5096)

TWO INSTANCES WHERE DEMATED QD'S LEAKED DUE TO SCRATCH ON POPPET; PERSONNEL CAUTIONED TO USE APPROVED TOOLS DURING QD INSTALLATION.

(CAR #AC2552, AB2840)

TWO INSTANCES OF A METAL SLIVER LODGED BETWEEN POPPET AND SEAL; IMPROVED ASSEMBLY PROCEDURES (CLEANING, WORKMANSHIP). (CAR #AB5643, AB5921)

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(E) OPERATIONAL USE

FIRST FAILURE HAS NO EFFECT UNTIL SECOND SEAL LEAKS. IF FREE WASTE WATER IS LEAKING INTO CABIN, LEAK CAN BE STOPPED BY ATTACHING CONTINGENCY QD ADAPTER TO CROSS-TIE QD. CREW IS TRAINED IN FREE WATER DISPOSAL.