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FEB 26 1993  
SAA09FT08-028  
REV. A

B/L: 246.00  
SYS: 250-TON  
HYDRA-SETS

Critical Item: Bal Seal (piston head) (2 Items Total)  
Find Number: None  
Criticality Category: 2

SAA No:	09FT08-028	System/Area:	250-Ton Hydra-Sets/VAB
NASA Part No:	None	PMN/Name:	H72-0828-11/ 250-Ton Hydra-Sets
Mfg/Part No:	Bal Seal Engineering Inc. 307A-465G	Drawing/Sheet No:	VEN-1324/All Del Pub 77-2L/All

Function: Form pressure proof dynamic seal between the piston head and the cylinder wall.

Critical Failure Mode/Failure Mode No: Leakage (Internal)/09FT08-028.002

**Failure Cause:**

- 1) Worn or cut seal
- 2) Broken loading spring
- 3) Scored mating surfaces

**Failure Effect:** Unable to control lifting, lowering or to hold load in a fixed position. Catastrophic seal failure (total loss of seal) would cause lowering of a 500,000 pound load a maximum of 12 inches at a maximum rate of 36.72 in/min. Possible loss (damage) of a vehicle system (segment field joint) if failure occurs during precision positioning with insufficient clearance for the operator to take action or the piston to bottom out. Seal failure would be immediately detectable by the tempsonics or linear travel readout. Time to effect, seconds.

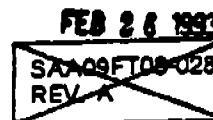
**ACCEPTANCE RATIONALE**

**Design:**

- In the event of a seal failure, piston and piston rod travel would be limited to a maximum of 12 inches by mechanical stops.
- Slow degradation type failure would be detectable during operation and maintenance (O&M) inspections and tests. Close tolerance (.001-.005 in) between mated parts precludes catastrophic seal failure.
- The seal cross section is .245 x .346 inches.
- The seal is subjected to a maximum of 1991 psig when supporting a 500,000 pound load. It is rated for 3000 psig.

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- Multiple sealing ridges (3) form labyrinth type seal and reduce friction.
- Graphite filled Teflon material is extremely resistant to wear.
- Loading spring is made of 302 stainless steel wire, .026 in. diameter.
- The Hydra-Set is used at less than 75% of its rated load capacity (500,000 lb) in SRB stacking operations.
- The seal is subjected to approximately 50% of its rated pressure (3000 psig) during mating operations with the heaviest SRM segment and Four Point Lifting Beam (370,000 lb).

**Test:**

- Manufacturer's and KSC operational acceptance tests (functional test at full rated load) were performed prior to first use.
- OMRSD File VI requires:
  - That a 30,000 lb. load (four point lifting beam) is applied to the unit to test seal integrity (slow degradation type leakage), load adjust and weight readout correlation prior to SRM attachment.

**Inspection:**

- Government and Lockheed source inspections were performed at the Del-Mar plant.
- No preventive maintenance inspection is available that would be applicable to the critical failure mode.

**Failure History:**

- One problem report, PV-6-092285, was written against Hydra-Set S/N 1 for minor external leakage and inability to hold a test load in a fixed position. Initial investigation by the Hydra-Set manufacturer revealed that the fast lower valve V7 had failed to close completely due to metal shavings. Replacement of the valve and retest showed continued internal leakage. Further investigation which included disassembly revealed that the piston head seal leaked due to severe scoring of the cylinder walls by the piston. The damage was repaired and a new seal was installed. The Hydra-Set was returned to service.
- The GIDEP failure data interchange system has been researched and no data on this component was found.

**Operational Use:**

- Correcting Action:
  - No corrective action is available to mitigate this failure.
- Timeframe: NA.

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