U.S. Gov't

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~~REV-A~~

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

Critical Item: Bal Seal (piston rod) (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. 305A-248G	**Drawing/ Sheet No:**	VEN-1324/All Del Pub 77-2L/All

Function: Form pressure proof dynamic seal between the piston rod and the piston rod bushing.

Critical Failure Mode/Failure Mode No: Leakage (external)/09FT08-028.003

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 the load a maximum of 12 inches. 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. Drip pan will prevent contamination of the load by leaking hydraulic fluid. Seal failure would be immediately detectable by tempesonics and 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 gross seal failure.
- The seal cross section is .123 x .177 inches.

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- The effective orifice created by the total instantaneous removal of the seal would be approximately 25% of that of the piston head seal.
- The seal is subjected to a maximum of 1991 psig when supporting a 500,000 pound load. It is rated for 2000 psig.
- 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, .014 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 75% of its rated pressure (2000 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 under 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.
- OMRSD File VI requires verification that a visual inspection for external leakage was conducted prior to four point lifting beam connection.

Failure History:

- One problem report, PV-6-092265, was written against this component for suspected minor external leakage and inability of the Hydra-Set S/N 1 to hold a load in a fixed position. Downward drift rate was between 0.024 to 0.0345 inches in 15 minutes. Further investigation by the Hydra-Set manufacturer determined that this was not the cause of the anomaly and the observed leakage was consistent with normal operations. It was determined that the downward drift was caused by failure of the fast lower valve V7 and the piston head seal.
- 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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