Critical Item: Relay, Main Hoist (2 Total, 1/Crane)

Find Number: 1KR

Criticality Category: 1

SAA No:	09FY12-005	**System/Area:**	250-Ton Bridge Crane (#1 & #2)/VAB
NASA Part No:	NA	**PMN/ Name:**	K60-0533, K60-0534/ 250-Ton Bridge Crane (#1 & #2)/VAB
Mfg/ Part No:	General Electric/ CR105CO, NEMA Size 1	**Drawing/ Sheet No:**	69-K-L-11388/ 12, 15

Function: The relay energizes when power is applied to the hoist motor-generator set closing the normally open (N.O.) contact to energize relay 1SRX. Relay 1SRX contact closes to bypass resistor RESA which allows an increase in current to the DC motor field windings to strengthen the field for normal operations.

Critical Failure Mode/Failure Mode No: N.O. contact fails open/09FY12-005.102

Failure Cause: Corrosion, binding mechanism

Failure Effect: The N.O. contact will be open to deenergize relay 1SRX. This places resistor RESA in series with the DC motor field windings. The field will be weakened by the reduction of current through the windings. The hoist will descend at a higher rate of speed than expected (speed will be approximately double of the commanded input). The worst case scenario would be lowering a critical load (SRB segment, Orbiter, or ET) in the coarse speed mode (maximum coarse speed is 10 ft/min), the failure occurring causing the hoist speed to increase to approximately two times the commanded speed, and the effect being the critical load descending and striking the VAB floor, transporter, work platforms, MLP, or Shuttle Stack resulting in a potential loss of life and/or vehicle, or damage to a vehicle system. Time to effect: seconds.

ACCEPTANCE RATIONALE

Design:

Contact Ratings	Actual
600 volts	183 volts
30 amps	Testing required

- Contact Material: Silver Cadmium Oxide.

- This relay was off-the-shelf hardware selected by the crane manufacturer for this application.

Test:

- OMRSD file VI requires verification of proper performance of hoist operational test annually.
- OMI Q3008, Operating Instructions, requires all crane systems to be operated briefly in all speeds to verify satisfactory operation before lifting operations.

Inspection:

- OMI Q6003, Maintenance Instructions, requires annual inspection of contacts and contact members for burning, pitting, proper alignment, and discoloration caused by overheating; visual check of closing coils for deteriorated insulation and evidence of overheating or burning.

Failure History:

- The PRACA database was researched and no failure data was found on this component in the critical failure mode.
- The GIDEP failure data interchange system was researched and no failure data was found on this component in the critical failure mode.

Operational Use:

- Correcting Action:
    1) The failure can be recognized via the Selsyn (positions change) that is in view of both operators.
    2) When the failure indication is noticed, the operator can stop all crane operations by pressing the E-Stop button.
    3) Operators are trained and certified to operate these cranes and know and understand what to do if a failure indication is present.
    4) During all critical lifts, there is at least one remote Emergency Stop (E-Stop) operator observing the load lift, and can stop the crane if a failure indication is noticed.
    5) Operationally, the crane must be operated in the fine or float speed mode if a critical load is within 10 feet of any structure in the direction of travel.
    6) During final SRB mate, all crane operations are ceased and final mate is accomplished by use of the 250-Ton Hydra-Set.
- Timeframe:
    - Estimated operator reaction time is 3 to 10 seconds.