

Critical Item: Intermediate Gear and Pinion Assembly  
and Drum Gear

Find Number: N/A

Criticality Category: 2

SAA No: 09FY12-003

System/Area: Shuttle SRB Refurbishment  
Facility/YAB - Low Bay  
Areas K&L, Cells 1, 2, & 4

NASA  
Part No: N/A

PMN/  
Name: K60-0531/10-Ton Bridge  
Cranes (3 each)

Mfg/  
Part No: Yale Engineering Co./  
6454904-09, 6454745-24

Drawing/  
Sheet No: Yale Electric Hoists,  
C-E Series/NA

Function: Transmits power and reduces rotational speed from prime mover to  
cable drum.

Critical Failure Mode: Gear Disengagement - FM No. 09FY12-003.001.

Failure Cause: Gear comes out of engagement.

Failure Effect: Torque for holding load will be lost. Load will drop, possi-  
bly damaging flight hardware.

#### Acceptance Rationale

##### Design:

- o Gear and shaft designs are in accordance with CMAA/AGMA Standards. Load bearing members, such as the gear case and shafts, have been designed so that the calculated static stress, based upon the rated load, does not exceed 20% of the average ultimate strength of the material, i.e., safety factor of 5:1 (at 10-tons).
- o Gearing is captured on shafts by interference fits, pins and shoulders which would require a structural failure for disengagement.

##### Test:

- o Acceptance test was performed in the YAB in 1982 at 125% of rated load. (27,500 lbs.)
- o An annual operational check of the hoist is performed in accordance with OMI Q6166.
- o Load test at 100% of rated load is performed annually. KSC-STD-SF-00010 requirement, and verified prior to each use per OMI.

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Intermediate Gear and Pinion Assembly (Continued)

- o UMRSO, File VI requires verification of current load test prior to critical lifts.
- o Oil sample testing is performed annually by spectrographic or chemical analysis per OMI. The analysis will be returned to System Engineering for review and is documented in the crane log book to document wear trends.
- o An operational check of the hoist will be performed prior to each use in accordance with OMI Q6166.

Inspection:

A visual inspection of the hoist gearbox for signs of the following conditions is performed annually, OMI Q6161 requirement:

- o excessive or uneven wear of gear teeth
- o corrosion
- o loose fasteners
- o oil level/leakage

Failure History:

- o The PRACA Data Base was queried, and there was no failure data found for these components in this failure mode.
- o The GIDEP Failure Data Interchange System has been researched, and no data on these components was found.

Operational Use:

The 10-Ton Bridge Cranes are used to satisfy lifting/moving requirements for servicing SRB components in the VAB Low Bays 1, 2, and 4.

A variance to exceed the rated capacity of the cranes to lift the SRB AFT Skirt will have to be approved by Safety Engineering prior to lifting the SRB AFT Skirt.

Aft Skirt  
Structure = 18,000 lbs. plus 3,000 lbs. GSE = total weight 21,000 lbs.  
(Safety Factor of 4.76-1)

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REV. A  
B/L: 389  
SYS: 10-Ton  
Bridge Crane  
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Forward Skirt  
Structure = 8,200 lbs. plus 3,000 lbs. GSE = total weight 11,200 lbs.

Frustum w/chutes  
Structure = 12,000 lbs. plus 2,000 lbs. GSE = total weight 14,000 lbs.