



## Safety Alert: Hydraulic Hoist Cylinder Failure on Komatsu 680-E Trucks

A Komatsu 685-E haul truck was operating at a surface coal mine when the bolts for the third stage piston bearing retainer from both Hoist Cylinders failed, allowing the dump bed to fall abruptly onto the frame of the truck. The truck operator was not injured; however the operator withstood a severe jolt. The Komatsu truck utilizes a hoist limit switch intended to stop the cylinders from full extension. However, it was determined that this switch was not properly maintained and allowed the cylinders to extend beyond their normal limit. When the cylinders extended to the maximum travel, a “slide hammer” effect occurred between the piston and barrel head, causing repeated jolts. This condition most likely stressed the bolts and caused the failure over the dump cycles. Upon inspection of the two hoist cylinders, it was determined that one of the cylinders had six (6) bolts that held the retainer and the other cylinder had twelve (12) bolts.

A Haulpak service bulletin, number 529, Section L (18 March '94) was issued for the 685E truck that provided for a Hoist Cylinder Rework Kit, MK3567. This kit provided parts and instructions for improving the method of retaining the third stage piston bearing retainer. The rework kit uses 12 - 5/8” UNRC grade 9, 12-point capscrews, and a single, hardened washer plate. Even though this rework kit has been available for years, it appears that 6-bolt cylinders are still in service. As in this case, the hoist cylinders on the truck were mismatched with different bolts in the cylinders. This mismatch may have contributed to the failure. It is recommended that maintenance records for the hoist cylinders be reviewed or that the cylinders be inspected to ensure that both cylinders have the twelve bolt modification. In addition, mines should inspect the hoist limit switch to make sure it is properly adjusted and working. Mine operators should discuss this situation with their maintenance departments, truck operators, and their cylinder rebuild shops. Mines should not accept rebuilt cylinders that have the 6-bolt design. Mine operators should also determine if truck operators are experiencing occurrences where the hoist cylinders are extending to the maximum limit. This may be detected by the operator feeling a hard jolt when the truck is dumping or a change in the sound of the hydraulic pump when the cylinders are fully extended.



Hoist Cylinder Failure



**EQUIPMENT:** All 445E, 510E, 630E, AND 685E HAULPAK® Trucks with "Super Cylinder" Hoist Cylinders

**SUBJECT:** Product Improvements to Hoist Cylinders

Recent improvements have been made to the hoist cylinders used on new production 445E through 685E HAULPAK® trucks. When existing "Super Cylinders" are rebuilt, these improvements may be included to reduce future maintenance costs.

The Hoist Cylinder Rework Kits, MK3567 for the 630E and 685E and MK3569 for the 445E and 510E, provide the parts and instructions for improving the method of retaining the third stage piston bearing retainer. On existing cylinders, the retainer is held by six 5/8" UNC grade 8 hex head capscrews with hardened flat washers. The new method uses twelve 5/8" UNRC grade 9, twelve point capscrews (1, Figure 1) and a single, hardened washer plate (2). This provides a significant increase in the clamping force exerted on the piston bearing retainer (3).

When a cylinder is disassembled, the Rod Eye Structure (5) should be modified according to rework drawing ED5217 for the 630E/685E or ED5201 for the 445E/510E which adds six more tapped holes. When reworking the Rod Eye Structure, plug all external piston openings to prevent internal contamination. A new bearing retainer ED5224 will be required (3). The quill assembly (4) must be removed from the cylinder head (6) and chamfered as shown on rework drawing ED5219. After modification, the following parts should be renumbered with the same part numbers as used in the production cylinders, but with a prefix "R" in front of the number to indicate a reworked part.

The quill, check balls, and plugs should be reinstalled using the procedures described in Section I and II of Parts and Service Topic #506.

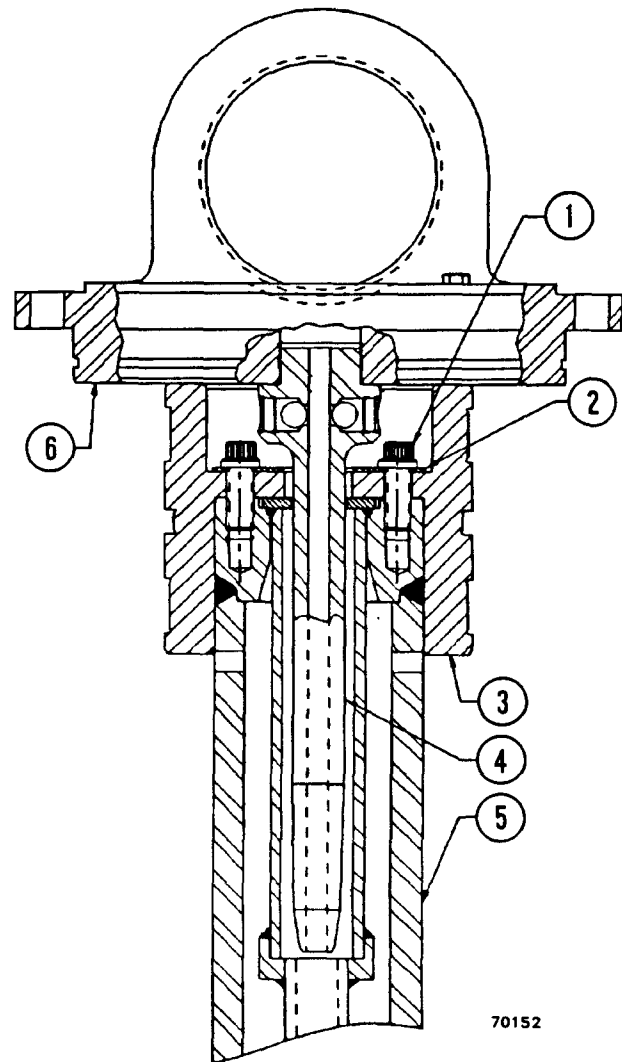


FIGURE 1. CYLINDER, 3rd STAGE

- 1. Cap screw, 12 pt.
- 2. Hardened Washer
- 3. Bearing Retainer
- 4. Quill Assembly
- 5. Rod Eye Structure
- 6. Cylinder Head

MODEL	Description	Old P/N	Reworked P/N
630E	Hoist Cyl. Assy.	TZ6909	RED5204
685E	Hoist Cyl. Assy.	TZ6901	RED5205
630E/685E	Rod Eye Str.	TZ6902	RED5202
630E/685E	Quill	TN9441	RED5210
445E/510E	Hoist Cyl. Assy.	TZ5517	RED5203
445E/510E	Rod Eye Str.	TZ6360	RED5212

When reinstalling the piston head, the following procedure should be used:

1. Make certain threads on capscrews and threads in rod eye structure are clean and dry (free of oil and solvent).
2. Using Loctite 'LOCQUIC' Primer "T" (TL8753, or equivalent), spray mating threads on capscrews and threads in rod eye structure.

Allow primer to dry 3 to 5 minutes.

3. Apply Loctite Sealant #277 (VJ6863, or equivalent) to mating threads of both capscrews and threads in the rod eye structure.
4. Install capscrews (1, Figure 4) and hardened washer plate (2) and tighten capscrews to 250 ft. lbs. (209 N.m) torque.

Allow parts to cure for 2\* hours before exposing threaded areas to oil

*\*NOTE: If "LOCQUIC" primer "T" (TL8753) was not used, the cure time will require 24 hours instead of 2 hours.*

The rod eye structure should be checked using non destructive testing procedures before reworking. Cracks or other defects may require replacement. The new part(s) can be ordered using the part numbers shown in the reworked column but omitting the "R".

*NOTE: Cylinders reworked as described above can be used for individual cylinder replacement on a truck without affecting operation of the other cylinder.*

*However, if a truck has experienced a failure of the third stage piston bearing retainer/rod eye structure, the opposite cylinder may also have been overstressed, and should be checked for broken or stretched bolts in the 3rd stage piston area. Such damage would require BOTH cylinders to be repaired and/or reworked to the new configuration.*

MK3567 CONTENT (630E/685E)		
Qty.	Part No.	Description
1	ED5207	Plate
12	WA0839	C/S 5/8 UNRC Grade 9 12 pt.
1	ED5224	Bearing Retainer
Ref.	ED5219	Quill (rework)
Ref.	ED5217	Rod Eye Str (rework)
Ref.	ED5220	Hoist Cylinder Assembly (rework)

MK3569 CONTENT (445E/510E)		
Qty.	Part No.	Description
1	ED5207	Plate
12	WA0839	C/S 5/8 UNRC Grade 9 12 pt.
1	ED5224	Bearing Retainer
Ref.	ED5219	Quill (rework)
Ref.	ED5201	Rod Eye Str (rework)
Ref.	ED5206	Hoist Cylinder Assembly (rework)

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