# Bulletin: TMIB-0179

**Date:** July 20, 2011

**Bulletin Type:** Service

**Topic:** Input Shaft Breakage

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**Issue Description:**
The input shaft is broken, preventing torque from being transferred from the engine to the transmission. This failure consists of two failure types:

- 45 Degree Angle Fracture (Figure 1.)
- Star Fracture (Figure 3.)

**Containment/Corrective Action:**
Always use the proper shifting techniques as defined in the driver instructions located in the vehicle, or download online at www.Roadranger.com.

**Affected Models/Population:**
All Eaton Heavy-Duty Manual Transmissions

**Field Strategy:**
***45 Degree Fracture:*** A 45 degree fracture is the result of an extreme torque spike. The torque spike causes a surface crack which grows over time. As the crack grows, it weakens the shaft until it cannot transfer torque, and fractures. Crack growth can take days, weeks or months before the input shaft fails.

Root cause of a 45 degree input shaft fracture is believed to be aggressive lever shifts or splitter shifts—a shift completed out of the RPM synchronous range for a normal shift. Examples:

- A shift where the lever is forced into gear
- A splitter shift that is not selected properly

Refer to Figure 1.

Another possible operating condition resulting in a 45 degree fracture occurs when the tandem wheels are spinning and they come in contact with pavement, causing an extreme torque spike. Refer to Figure 1.

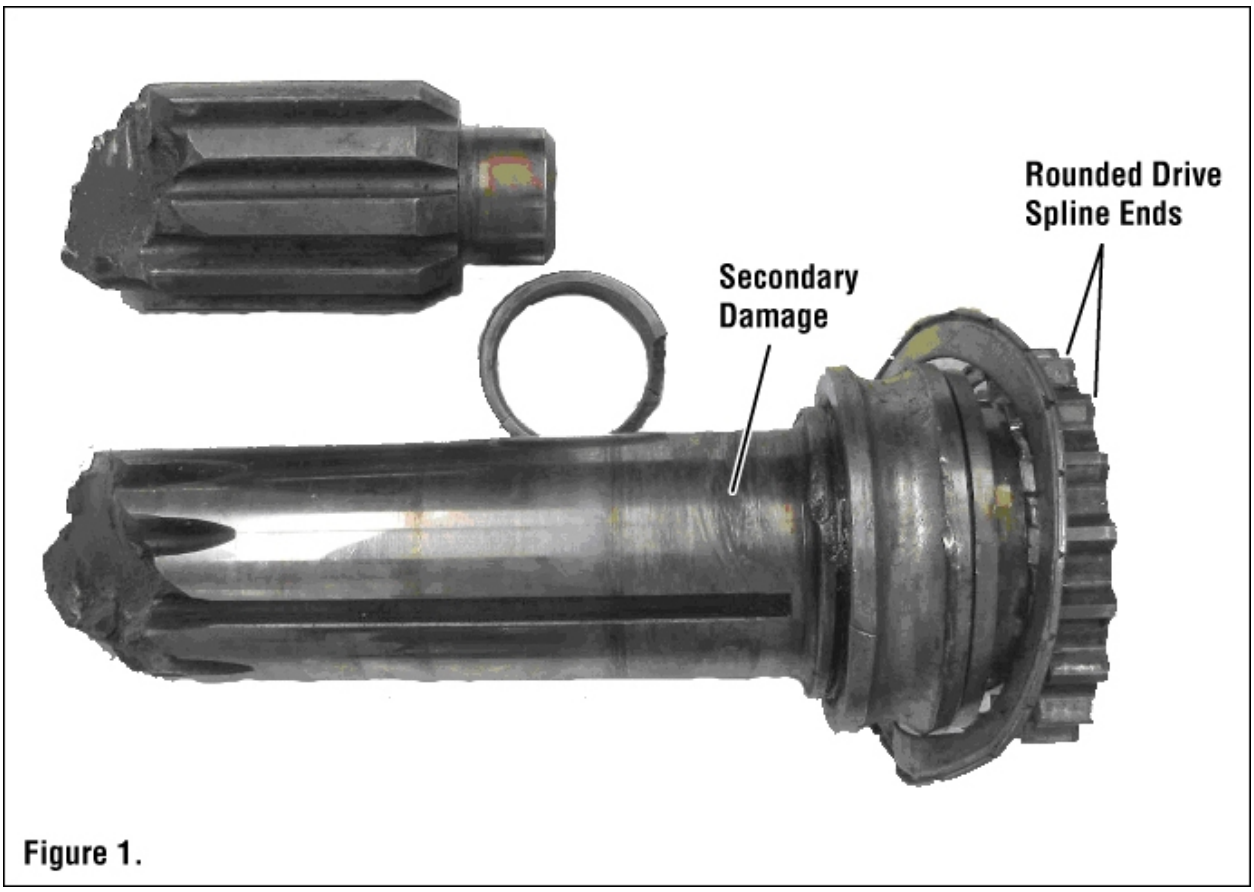


**Figure 1. 45 Degree Fracture:** Typical secondary damage to the shaft diameter just forward of the input bearing. Also, the main drive gear drive spline ends are rounded. This type of fracture (surface initiated torsional fatigue) with the 45 degree helical fracture, often results in secondary damage to either (or both) the engine or transmission. This damage is due to the separating thrust forces—the fracture surfaces act as screw threads forcing the rearward section of the shaft into the transmission case and the forward section of the now failed shaft into the engine flywheel area.

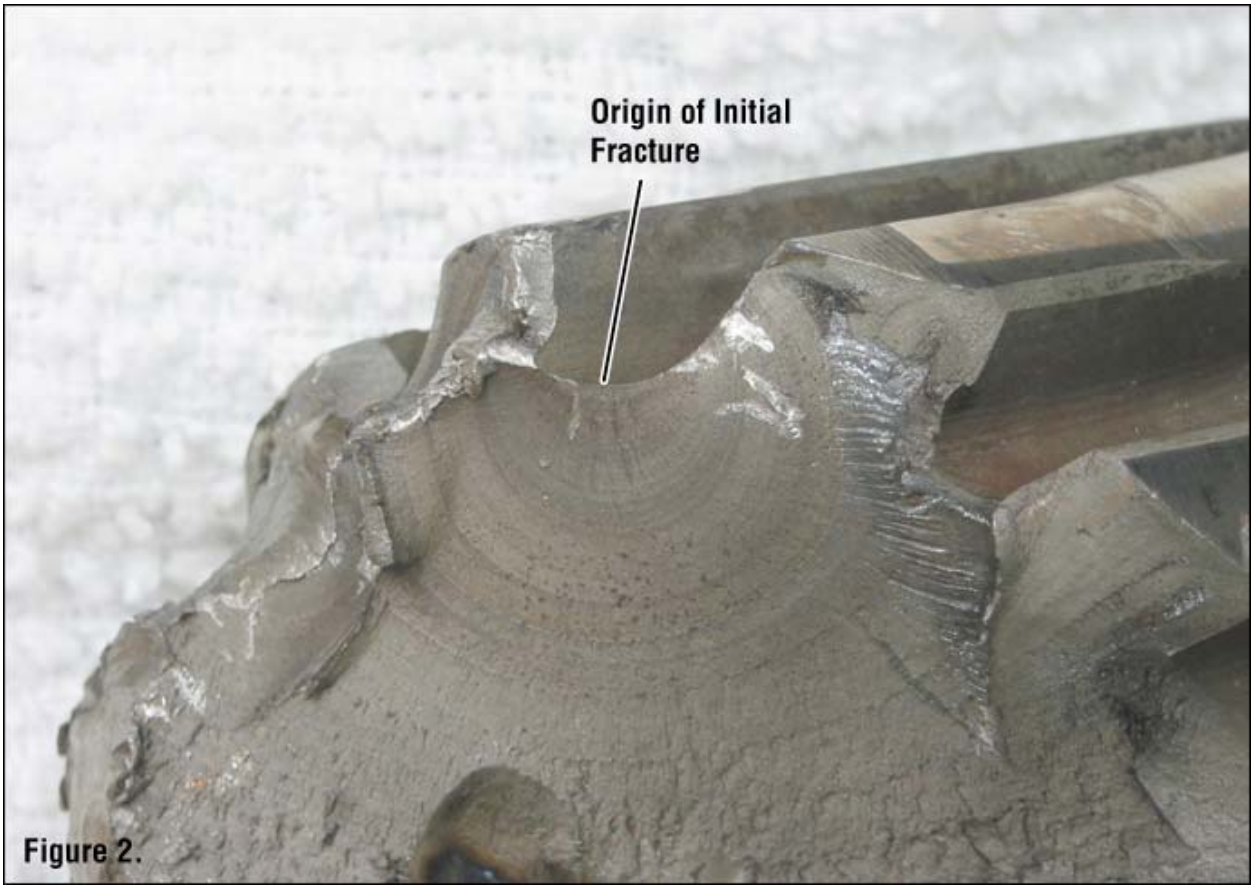


**Figure 2. Rearward End of 45 Degree Fracture:** A close-up of the rearward end of the fracture—origin of the initial fracture. The fracture began at the bottom of a spline root and progressed slowly across the diameter of the shaft at a 45° angle. The crack grew until the cross section was reduced to a threshold where the shaft could no longer transfer torque and the final fracture occurred.

***Star Fracture:*** A star type fracture results from a shaft being subjected to continuous operation at or near the design limit of the shaft strength. Unlike the previously mentioned failure, these cracks often initiate below the surface.

A star fracture is the result of operating the vehicle at the engine's maximum torque for extended periods of time. Refer to Figure 3.

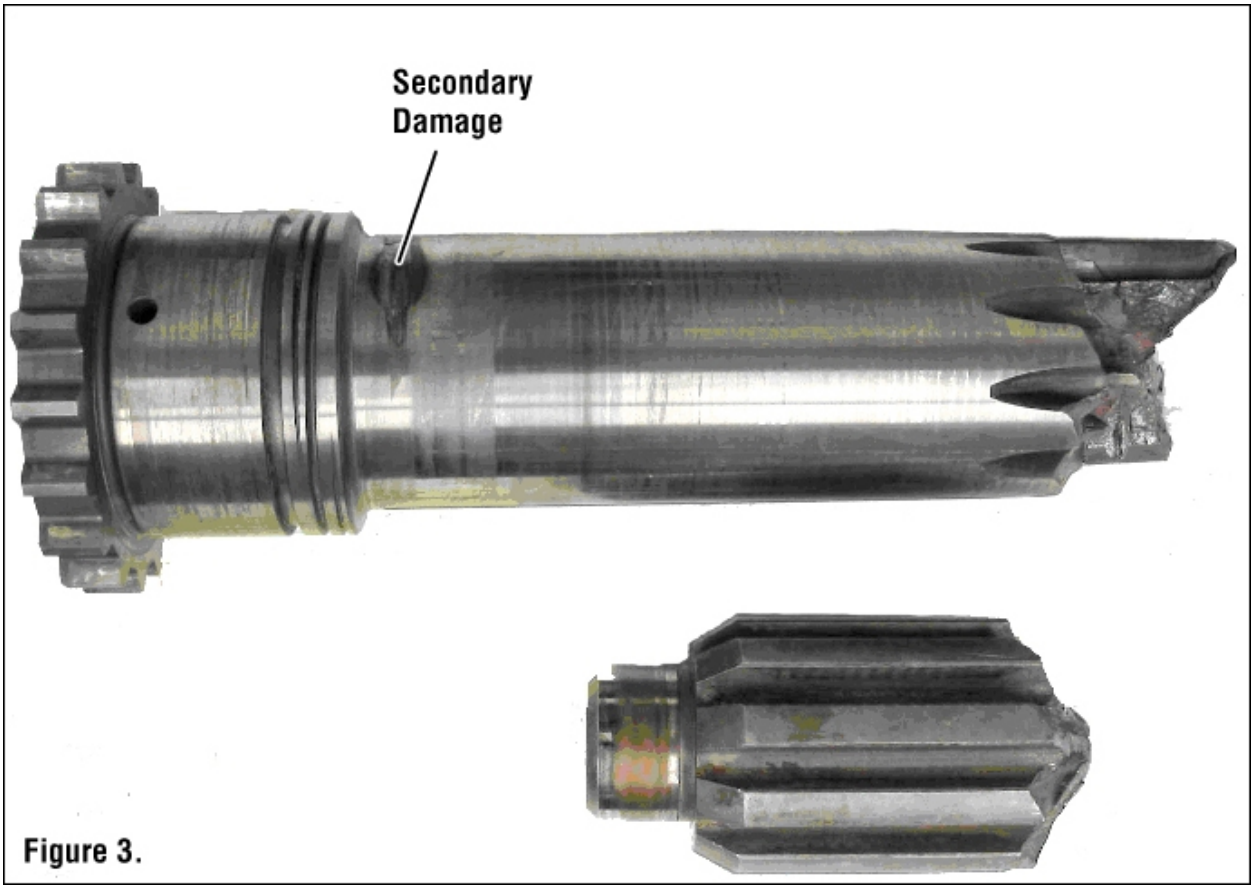


**Figure 3. Star Type Fracture:** Typical secondary damage caused by the input shaft being driven by the vehicle and flailing around due to lack of restraint. The shaft rubs against the bearing cover resulting in severe scoring on the shaft diameter just forward of the input bearing.

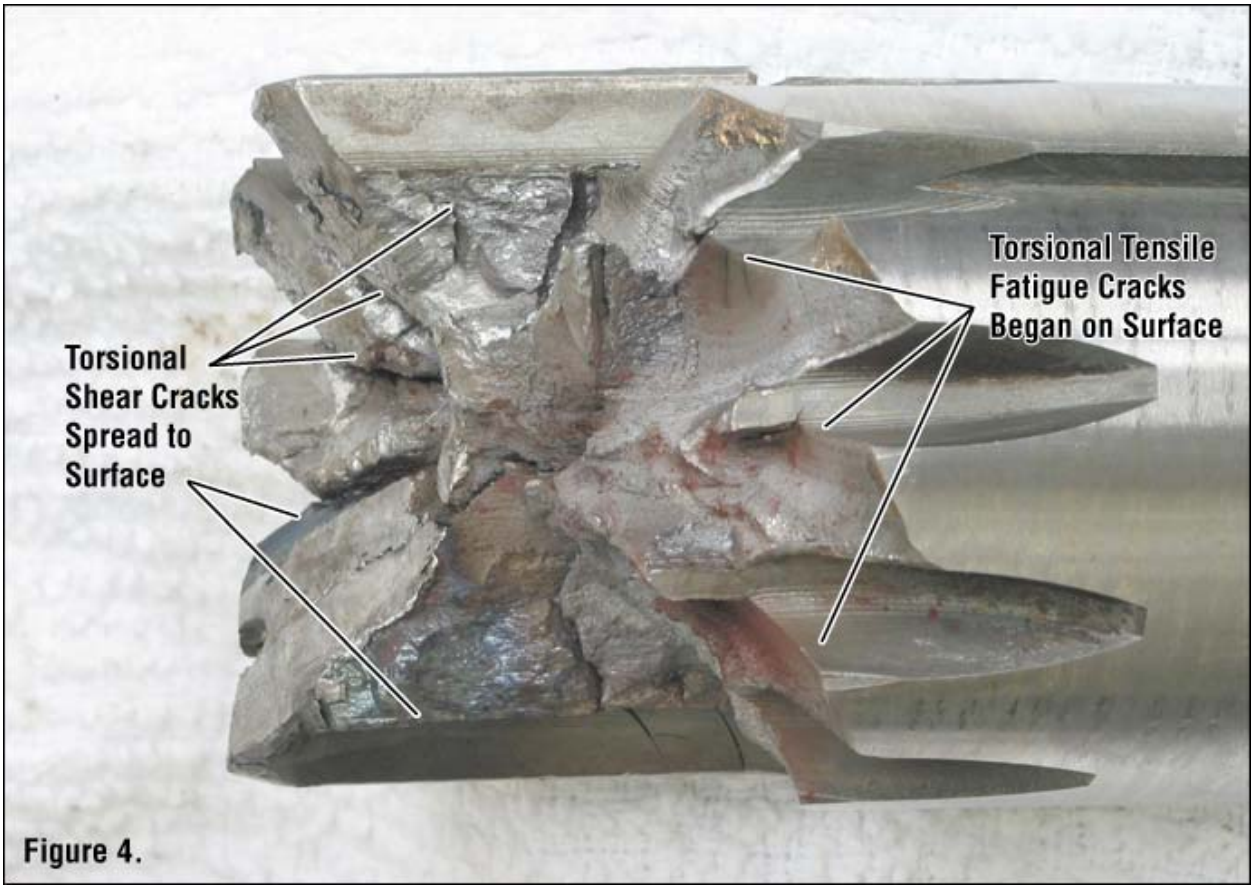


**Figure 4. Rearward End of Star Type Fracture (Side View 1):** The area rearward of the clutch engagement area, forward of the end of spline full depth, is the area of highest stress on the shaft. There are multiple torsional shear cracks that began internally and spread to the surface where they were connected by torsional tensile fatigue cracks which began at the surface.

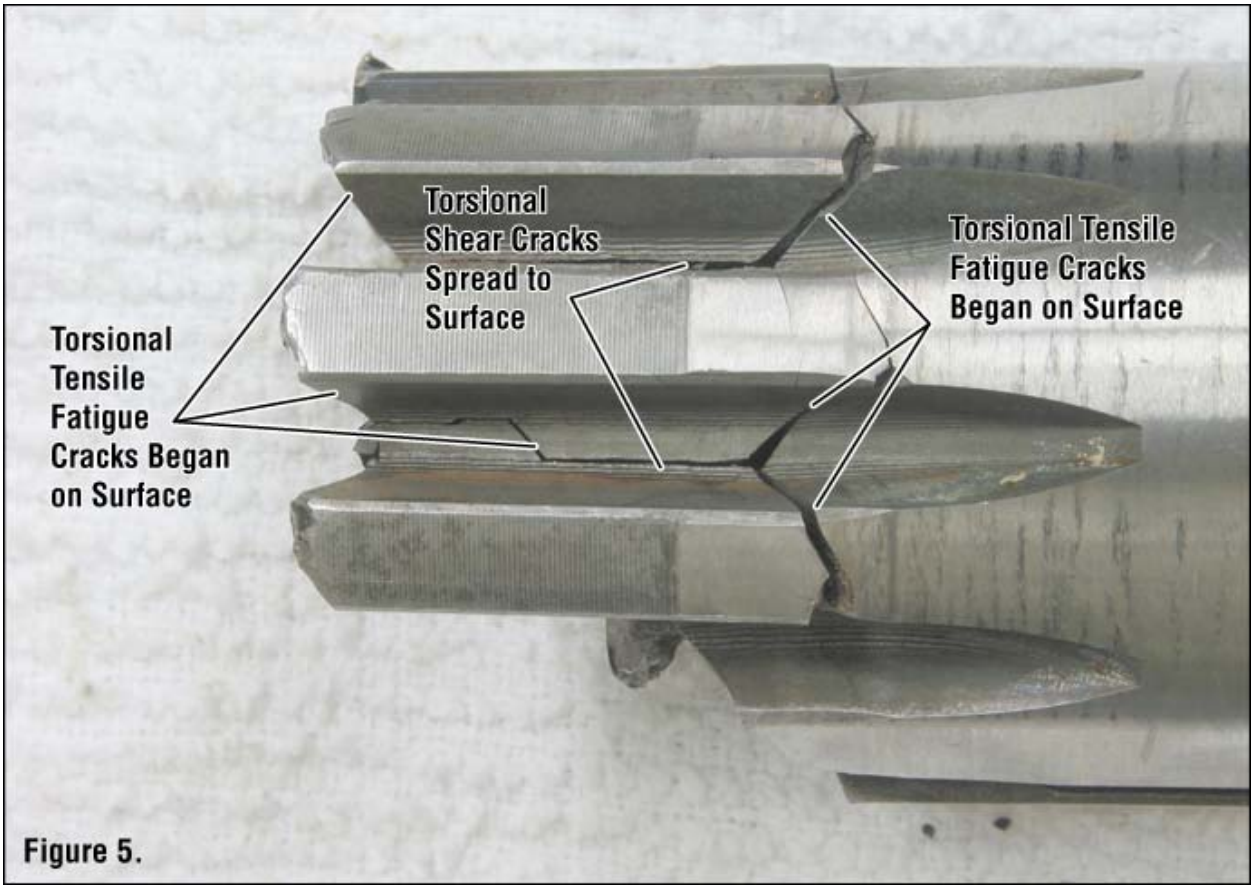


**Figure 5. Rearward End of Star Type Fracture (Side View 2):** Same area as Figure 4, rotated 180 degrees. The torsional shear cracks and surface initiated torsional tensile fatigue cracks are visible. Torsional tensile fatigue cracks from the surface connect with internal torsional shear cracks, leaving the 'starry' type fracture. See Figure 6.

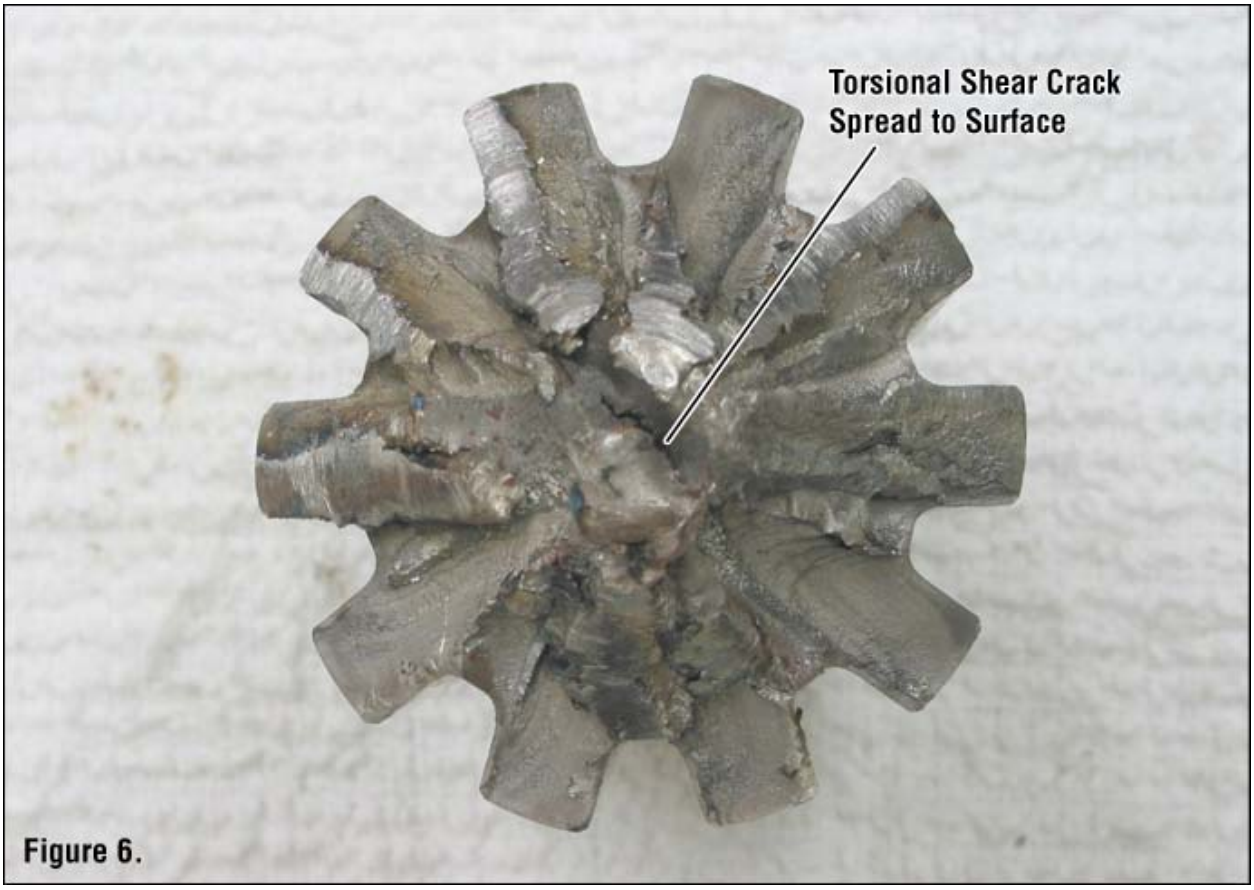


**Figure 6. Forward End of Star Type Fracture (Cross Section):** A cross section of the forward end of the fracture shown in Figures 4 and 5. Torsional shear cracks often initiate below the surface of each spline, extending to the surface and center of the shaft.

**Warranty Information:**

**Warranty Parts:**

- Warranty does not cover fractured or broken input shafts

**Warranty Coverage:**

Input shaft breakage is not considered a warrantable defect and cannot be covered under warranty with the exception of UltraShift and UltraShift *PLUS* transmissions.

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