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U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

August 30, 2004

George Person (NVS-215)
Chief of Recall Management
National Highway Traffic Safety Administration
U.S. Department of Transportation
400 Seventh Street SW
Washington DC 20990

04V-567
(3 pages)

Vehicle Recall 04V-567 All Wheel Steer II Encoders

Dear Mr. Person:

Pierce has decided that a defect exists in certain all wheel steer axles on certain Pierce custom chassis. We therefore furnish notification of a defect to the National Highway Traffic Safety Administration in accordance with 49 CFR Part 573, *Defect and Noncompliance Reports*.

Manufacturer's Identification Code: 39-0139830

1. Name of Manufacturer and Corporate contact:

Pierce Manufacturing Inc.
Roger Lackore, Director of Research and Development
Phone: 920 832-3249
FAX: 920 832-3092
E-Mail: rlackore@piercemfg.com

2. Identification of Vehicle Classification:

Make:	Pierce
Model Years:	2002 - 2004
Models:	Custom Chassis

Production Date Beginning 07-16-02

Production Date Ending 08-30-04

3. Number of Potentially Affected Vehicles: 64

4. Estimated Percentage of Vehicles Containing the Defect or Noncompliance: 10%.

5. Description of the defect or non-compliance:

The position of the front axle is sensed by an optical encoder mounted to the bottom of the front axle kingpin, which is protected from the elements by a metal case. This case shares a common grease cavity with the kingpin. Oil that leaches from the grease can migrate through the encoder seal, causing contamination of the optical encoder disc. Oil on the disc can cause the encoder to send incorrect wheel position information. Incorrect wheel position information can cause the rear wheels to steer without warning.

6. Chronology of Principal Events Since Original Report:

- 7-16-02 Shipped the first All Steer II® equipped truck using optical encoders rather than potentiometers to sense wheel steering position.
- 3-28-03 Grease fittings were replaced with plugs on all units shipped after this date and a service procedure established to avoid grease pressure at the encoder seal.
- 10-13-03 Encoder supplier (BEI Technologies, Inc.) analyzed four encoders that had been returned under warranty. One unit was contaminated with an oil film, one with water, and two worked properly.
- 11-06-03 Four more encoders analyzed by BEI, three with oil film and one worked properly. Pierce and BEI suspected that grease gun pressure was forcing grease through the seal and depositing an oil film on the optics.
- 11-24-03 Grease fittings were replaced with plugs on all units in the field
- In Process Grease ports checked to ensure that the fitting had been replaced with a plug as part of the All-Steer tie-rod campaign.
- 04-06-04 Received the first warranty claim describing erratic steering. Previous warranty claims described the AWS system as functioning in conventional steering mode only.

- 08-23-04 Failed encoders from units with erratic steering complaints were inspected by the encoder supplier who reported oil contamination on the encoder disc. Pierce began investigation to determine whether oil contamination was coming from the application, or whether the observed oil was present when the encoder was manufactured. Tests included shaft cycling, temperature cycling, vibration, and grease pressure.
- 11-18-04 Pierce determined that the oil must be leaching out of the grease over time and seeping past the shaft seal. Tests on encoders with a more robust shaft seal as well as sealed bearings were completed without any oil seeping past the seals.

7. Test Results or Data on which the Noncompliance was Determined:

Physical inspection of the encoders and chemical analysis that showed that an oil film found deposited on the encoder optics has the same chemistry as the grease.

8. Corrective Action:

Replace the encoders with the new encoders with the improved sealing. Eliminate grease in the cavity between the encoder and the housing. Improve the sealing of the encoder wires within the cable. Modify the software algorithm to return an error code and disable the rear steering if unrealistic encoder inputs are detected.

9. Representative Notices:

Pending

Sincerely,
Pierce Manufacturing, Inc



Roger Lackore, P.E.
Director of Research and Development