

Air Brake Analysis and Accident Investigation / Reconstruction

Robert Reed 9/10/2006

The issues involved with trucks, tractor-trailers and other air brake equipment involved in crashes has become more complex since the final rules issued by the Federal Motor Carrier Safety Administration in 2005. The regulations were proposed on April 14, 1997 and were part of general amendments in the final rule issued August 15, 2005 covering Parts and Accessories Necessary for Safe Operation. The amendments specifically discussed in this article involve air-brake vehicles.

Whether brakes are a concern depends on the facts associated with each circumstance involved in an incident or crash. The maintenance and performance of the brake system are issues that are changed by regulation. Part 393.47 of the Federal Motor Carrier Regulations no longer has the heading of Brake lining it is Brake actuators, slack adjusters, linings / pads and drums / rotors. This has a huge influence on maintenance practices, on-road and post-crash inspections and reconstruction issues. Industry standards have always dictated that the components of an air brake system should be within operational limits prescribed by the manufacturer. The incorporation of these limits for brake drums and rotors thickness, manufacturer adjustment limits, and length of slack adjusters, brake lining thickness and component integrity are new to the regulations. Appendix G of Subchapter B has had some of these same items as guidance for the Periodic Inspection purposes under 396.17 for annual inspections. The on-road CVSA inspection and out-of-service criteria are dissimilar as wear limits for brake drums and rotors and wear specifications of other components are not calculated. The CVSA criteria also has flexibility allowing for 20% defective brakes and brake adjustment levels beyond limits for vehicles to continue in service whereas the new regulations have no exceptions. The vehicle is not be operated unless in compliance with the regulations.

The reliability and performance of air brakes depend on the air system components (compressor, valves, chambers, lines, hoses, etc.) and the foundation (mechanical) components such as drums, rotors, S-cam mechanism, brake shoes and lining, links, pins, springs, bushings, mountings and housings. Maintenance and inspection of these systems are critical to provide for safe operation of commercial vehicles.

In incident and crash situations reliance on CVSA criteria and inspection procedures alone may provide incomplete information. Brake drums and rotors, S-camshafts and bushings, linkages, slack adjusters and etc. have wear limits that affect safe use and operation and are items newly mandated by regulation. These limits should be calculated by precise instruments for suitability of use in maintenance system, post-crash inspection and the reconstruction procedures. Components such as broken brake springs, worn S-camshafts and bushings, missing rollers, brake drums and rotors worn beyond limits can affect a brakes stopping power. Worn beyond limit brake drums do not dissipate heat properly, provide less braking surface, and expedite expansion, brake fade and loss of braking power. In an S-cam type brake system a broken brake-shoe spring will let the bottom shoe ride against the drum surface causing premature and uneven wear and heating of the drum and possible fires. Worn S-camshafts and bushings will also let the bottom shoe ride against the drum surface, producing heat and preventing proper adjustment. Missing rollers can result from both defects causing loss of braking action. These items can be overlooked if wheels and brake drums are not removed from the vehicle for complete inspection and analysis.

These new regulations should reduce the level of unsafe vehicles on the highway, reduce out-of-service vehicles in roadside inspections and provide a basis for complete analysis of components to reduce assumptions in the investigation / reconstruction process.

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References

www.cvsa.org

www.fmcsa.dot.gov

2006 North American Standard Out-of-Service Criteria

49CFR § 393.1

49CFR § 393.47

Federal Register Vol. 70 8/15/06

Federal Register Vol. 62 4/14/97