Training Bulletin: Pushrod stroke measurement procedure described in the CVSA North American Standard Level I Inspection Procedure and the North American Standard Out-of-Service Criteria

Important Reminder for Inspections of Brakes with Clamp and Roto-Chamber Actuators

All commercial vehicle inspectors conducting air brake pushrod stroke measurements to determine compliance with 49 CFR 393.47 are reminded to build the air system pressure to between 90 and 100 pounds per square inch (PSI) (620-690 kPa) prior to the initial brake application. When applying the brakes, the driver must apply full foot force to the treadle valve. Failure to follow these steps as outlined in the Commercial Vehicle Safety Alliance (CVSA) North American Standard Level I Inspection Procedure will result in inaccurate brake adjustment measurements. For reference, the following ***excerpt*** from Step 13 of the Inspection Procedure is provided:

> ***Advise the driver that chock blocks have been placed at the drive axle.***
>
> ***Instruct the driver to prepare the vehicle as follows:***
>
> - ***Place the vehicle transmission out of gear and release all brakes.***
> - ***Confirm that the air system pressure is between 90 – 100 PSI before continuing with the inspection.***
> - ***Engine must be off; key must be in the "on" position to inspect the proper operation of the lights (i.e. tail, stop, ABS lamp, etc.) and release all brakes.***
> - ***Explain that it will be necessary to turn the key "off" and "on" to inspect the operation of the ABS malfunction lamp on the trailer (if applicable).***

Note: Please refer to the Inspection Procedure provided in the CVSA certification course for the complete procedure to be used to properly measure brake stroke. The above is only an excerpt from that Procedure, and is provided to reinforce the starting conditions for measuring brake stroke measurement.

This bulletin serves as a reminder to inspectors to carefully follow the proper brake inspection procedures.

In addition, if an external air supply source is needed to complete a post-crash inspection of the air brake system, inspectors are reminded to make sure the reservoir air pressure is brought to between 90-100 PSI and the air supply is turned off, before brakes are applied for proper stroke measurement. Also, avoid "backing off" air brake slack adjusters after a vehicle has been involved in a crash, and instruct tow truck operators not to back of the brakes until the evidence has been collected. Doing so can destroy evidence and may preclude further brake measurements that may be instrumental in the post-crash investigation. The spring brake should be mechanically compressed using a caging bolt, so as not to alter the position of the slack adjusters prior to inspection.

Why is this bulletin being issued?

In response to a June 24, 2011 highway-railroad grade crossing collision that occurred in Miriam, Nevada, the National Transportation Safety Board (NTSB) issued the following Safety Recommendation to both the Federal Motor Carrier Safety Administration (FMCSA) and CVSA:

> ***Inform commercial vehicle inspectors of (1) the importance of taking pushrod stroke measurements within the specified pressure range, (2) the relationship between pushrod stroke and specific air pressure, and (3) the consequence of taking measurements outside of this range. (49 CFR 393.47)***

Background:

On June 24, 2011, a 2008 Peterbilt truck-tractor pulling two empty 2007 side-dump trailers failed to stop at a highway–railroad grade crossing on US Highway 95 in Miriam, Nevada, and struck the left side of Amtrak train No. 5, which was passing through the grade crossing. The collision destroyed the truck-tractor and several passenger railcars. The train came to a stop without derailing; however, a fire ensued, engulfing two railcars and damaging a third railcar. The accident killed the truck driver, the train conductor, and four train passengers; 15 train passengers and one crewmember were injured.

During its investigation, the NTSB examined the condition of the brake system on the truck and noted the following concerns in its Highway Accident Report (NTSB/HAR-12/03 PB2013-103891):

- Because the pushrod stroke measurement procedure described in the Commercial Vehicle Safety Alliance's *North American Standard Out-of-Service Criteria* was not followed precisely, it is not possible to make a definitive statement regarding the number of brakes that were out of adjustment on the accident truck.
- A tow truck company that responded to the accident scene "backed-off" the brakes during vehicle recovery operations, thereby destroying evidence and precluded taking further brake measurements.
- The trucking company used improper brake maintenance procedures by manually adjusting the automatic slack adjusters, disabling the antilock braking system on the trailers, failing to maintain brakes in adjustment, equipping two axles with mismatched and incorrectly sized brake chambers, and operating with 11 of the 16 brake drums in service worn beyond specified limits.
- Had the accident truck been equipped with an onboard brake stroke monitoring system, the truck driver would have had information about the out-of-adjustment and inoperative brakes.

Information:

The importance of taking pushrod stroke measurements within the specified pressure range.

Proper system pressure is imperative because brake stroke measurements taken outside the specified range can result in inaccurate and misleading assessments of compliance with 49 CFR 393.47. Improper pressure can also result in reduced quality of inspection data, and in the case of post-crash analysis, a potential for misinterpretation of evidence.

The relationship between pushrod stroke and specific air pressure.

There is a general relationship, on average, between application pressure and brake pushrod stroke of approximately one-tenth inch per 10 PSI pressure. While this relationship does not hold with accuracy across all varieties of brake systems and operating conditions, it does illustrate that a system pressure that is 20 PSI too low or 20 PSI too high could each result in a variance in measured brake stroke of nearly ¼ inch in stroke measurement error. Improper results also cannot be effectively interpreted after the fact. Proper stroke measurement must be measured with system pressure between 90 and 100 PSI.

The consequences of taking measurements outside of this range.

Brake system pressure that is too low may result in an inspector finding a non-compliant brake to appear within the brake adjustment limit. Inadequate force on the treadle valve (too little foot force by the driver) can lead to a similar result. Brake system pressure that is too high during a test may result in the inspector finding an otherwise compliant brake to appear beyond the allowable adjustment limit, resulting in an improperly assigned violation.

For further information, please contact the FMCSA Division office in your State.