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Automated Brake Analysis and Undercarriage Inspection

Overview

- History of Performance Based Brake Testers (PBBT's) in North America
- Benefits of PBBT's
- VIS Check Features and Functions
- Industry Benefits

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History of (PBBT's) in North America

What is a Performance Based Brake Tester? (PBBT)

A PBBT is a measuring device that assess the capability of a vehicle's brakes through a quantitative measurement of both individual brake ends and overall vehicle performance. This is done through direct measurements of the brake forces at each wheel, axle or the vehicle as a whole without restriction to brake type (disk or drum) or energy supply (air, hydraulic or electric).

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Historical Reference

On-board Decelerometer for Vehicle Braking Assessment (Tapley Meter, England)

Roller Brake Testers First Used in Europe — Schenck in Germany, HPA in Denmark

U.S. Introduction of Stopping Distance and Deceleration Tests for In-Service Vehicle Brake Performance Assessment (Forerunner of FMCSR 393.52)

Flat Plate Brake Testers Used in Washington, D.C. Area Inspection Stations

1910 1920 1930 1940 1950

History of FMCSA-Sponsored PBBT Program through 2008

Memoranda of MCSAP-Eligibility for Funding:
Apr. 1, 1996 — first 2 PBBTs
Oct. 8, 1996 — additional PBBTs
Mar. 13, 1997 — additional PBBTs
Nov. 3, 1998 — additional PBBTs

Fall 1993: Field Test and Evaluation Planning Begins

Initiation of Testing of PBBTs at NHTSA's VRTC in 1992

PBBT Functional Specification Development:
Nov. 13, 1997: 62 FR 60817, Public Meeting Announced
Dec. 8, 1997: Public Meeting Held
Jun. 5, 1998: 63 FR 30678, Request for Comments
Aug. 9, 2000: 65 FR 48799, Final Determination

CMV Brake Performance Regulations:
Aug. 27, 1998: 63 FR 45792, Public Meeting Announced
Oct. 2, 1998: Public Meeting Held
Aug. 9, 2000: 65 FR 48660, Request for Comments
Aug. 9, 2002: 67 FR 51770, Final Rule

Feb. 5, 2003: PBBT-Based Brake Performance Rule In Effect
Apr. CVSA Meeting in Toronto: PBBT Demo, OOS Criterion Proposed to Vehicle Committee, Trial Period Requested
Oct. 2003: OOS Criterion Accepted by Vehicle Committee, Rejected by Executive Committee

Oct. 2005: OOS Criterion Passes CVSA Vehicle Committee and Executive Committee; Not Approved by Jurisdictions

Mar. 21-22, 2005: PBBT Accuracy/Calibration and Repeatability Tests Conducted

Nov. 9, 2006: ATA Adopts Policy Supporting PBBT-based OOS Criterion

October 2007: PBBT-based OOS Criterion Passes CVSA Vehicle and Executive Committees; Is Approved by Jurisdictions

Apr. 1, 2008: PBBT-based OOS Criterion Goes Into Effect

1992 93 94 95 96 97 98 99 2000 01 02 03 04 05 06 07 08

Beginning of PBBT Program

PBBT Field Test and Evaluation

PBBT Round Robin Test at VRTC, Jul. 27-29, 1998

6-Month Trial Period

PBBT User's Working Group

*Standard Test Procedure formalized; Universal Test Results screen and printout developed; Return-to-Service item list developed; ASPEN inspection documentation developed.

Milestones in North America

92 - Evaluation commenced

94 to 97 - Field Testing

00 – Function Specification final determination

03 – CVSA vehicle committee accepts OOS criteria

05 – Repeatability and Accuracy testing completed

06 – ATA Endorses use of PBBT

08 – North American OOS criteria includes PBBT's

Benefits of PBBT's

Many benefits are discussed in this presentation regarding the economic and safety benefits a PBBT can offer fleet, regulatory and enforcement users, However one key benefit is common to all;

Only two methods may be used to confirm vehicle stopping distance to FMCSR 393.52. A skid test or a PBBT. A PBBT does not have the risks to personnel or property that traditional methods may pose.

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VIS Check Features and Functions

VIS-Check is an undercarriage diagnostic system that automates the inspection of brake, steering and suspension components.

- The brake tester measures the braking force produced by each wheel on a vehicle, right to left and axle by axle. It produces a definitive report on the health of a vehicle's brakes including a PASS or FAIL rating to DOT specifications.
- The road simulator allows technicians to dynamically view steering and suspension components under normal operating conditions. Otherwise undetectable mechanical issues are easily spotted on the VIS-Check simulator.

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Inspection Protection

VIS-CHECK

Industry Benefits

- Enhances Safety Initiatives
- Objective & Consistent Inspection (Increased Efficiency)
- Identifies Faults that Traditional Shop Methods cannot
- Reduces Breakdowns and OOS Citations.
- Eliminates Conditions that lead to Higher Operating Costs- Premature Tire Wear, Increased Fuel Consumption and Risk Exposure.

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Other Tangible Benefits

- **Insurance Savings**
  - Lowers risk and accident rating which lowers premiums.
- **Warranty Recovery**
  - Increased warranty recovery reduces maintenance cost.
- **Budget and Vehicle Forecasting**
  - Identify trend failures and component life expectancy.
- **Record of Accountability**
  - Computer Generated DOT approved Brake Reports.

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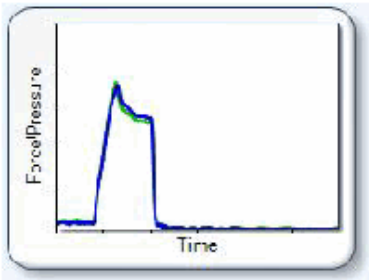
Reports of Brake Performance

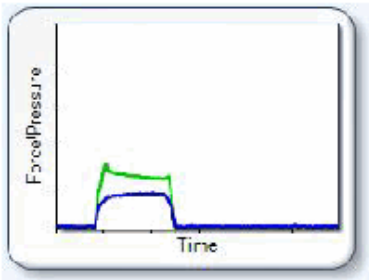
VIS-CHECK SAFETY AND EFFICIENCY REPORT

VIS S/N	45,184	DATE	2/21/2007	VIN		ODOMETER	898185	REF/RO#	
TEST #	230	LIC.PLATE	EF	AXLES	3	INSPECTOR	RA	CUSTOMER ID	

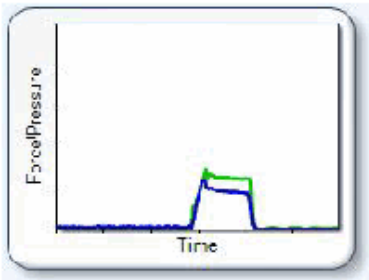
Cal Valid | Due | Valid Test | Total Vehicle Deceleration 0.61 g | Total Vehicle Weight 18699 lb | Overall Result Failed



Axle 1	Requirement	Left	Right	Total	P/F	Unit
Max. Rolling Res.		256	204	460		lb
Max. Brake Force		3275	3376	6651		lb
Brake Balance	<65	97	97	97	Passed	%
Max. Deceleration	>0.49	0.59	0.63	0.61	Passed	g
Weight		5462	5367	10829		lb
Park Brake Force		0	0	0		lb
Rolling Res Ratio		0.029	0.026	0.027		g
Park Brake Decel	>0.38	0	0	0		g
Weight Balance		98	98	98		%



Axle 2	Requirement	Left	Right	Total	P/F	Unit
Max. Rolling Res.		86	107	193		lb
Max. Brake Force		1446	853	2299		lb
Brake Balance	<65	58	58	58	Failed	%
Max. Deceleration	>0.49	0.66	0.42	0.55	Failed	g
Weight		2151	2020	4171		lb
Park Brake Force		1024	707	1731		lb
Rolling Res Ratio		0.023	0.032	0.027		g
Park Brake Decel	>0.38	0.47	0.35	0.41	Failed	g
Weight Balance		93	93	93		%



Axle 3	Requirement	Left	Right	Total	P/F	Unit
Max. Rolling Res.		65	86	151		lb
Max. Brake Force		1343	1166	2509		lb
Brake Balance	<65	86	86	86	Passed	%
Max. Deceleration	>0.49	0.74	0.61	0.67	Passed	g
Weight		1802	1897	3699		lb
Park Brake Force		0	0	0		lb
Rolling Res Ratio		0.02	0.028	0.023		g
Park Brake Decel	>0.38	0	0	0		g
Weight Balance		94	94	94		%

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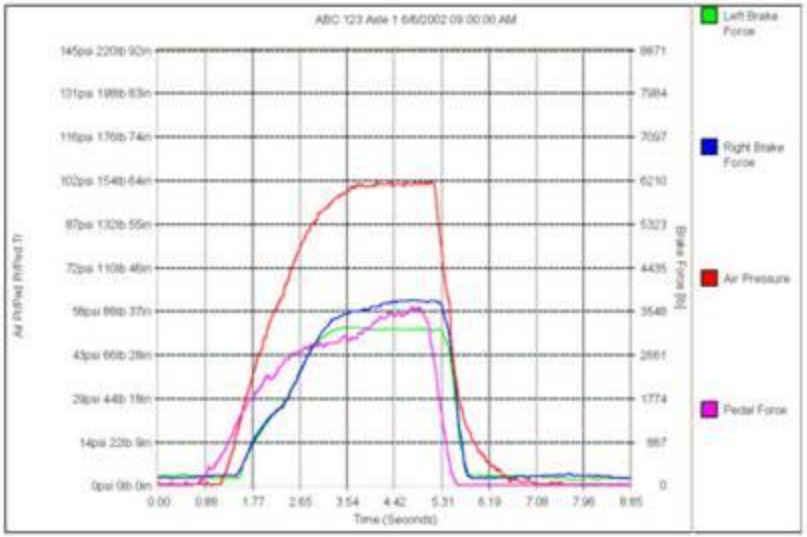
AXLE RESULTS REPORT

Axle No.	1	Test Date	6/6/2002
Tag/Lic. Plate	ABC 123	Test Time	09:00:00 AM
Test No.	123	Download Date	6/6/2002
VIT No.	27,555	Download Time	09:08:00 PM



		Left	Right	Bal/Avg/Tot		Pass/Fail
Weight	lb	4,223	3,992	8,215	T	
Max. Brake Force	lb	3,227	3,774	0.85	B	Pass
Max. Deceleration	g	0.75	0.93	0.84	A	Pass
Max. Park Br. Force	lb	0	0	0.00	B	
Min. Roll Res.	lb	108	124			
Max. Roll Res.	lb	216	222			
Avg. Roll Res.	lb	167	173	340	T	
Rol. Res. Ratio	g	0.03	0.04	0.04	A	
Pressure Threshold	psi	23	20			
Pedal Threshold	lb	36	34	Threshold Definition: K x Roll Res		
Max. Syst. Pressure	psi			0		
Min. Ctrl Pressure	psi			0		
Max. Ctrl Pressure	psi			100		
Max. Pedal Force	lb			90		
Sideslip Toe In	mm			0.0		

Type Of Stop: Timeout Apply Time s: Release Time s:

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Your service technician can evaluate using actual reports charting the vehicle's condition on many key undercarriage components.

Inspection Protection

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VIS Check use for enforcement

VisCheckPBBT

Vehicle ID: TS042
Inspector: JS
Test#: 58
Date: 4/30/2008 2:00:48 PM
Time: 14:00:48

PASS or FAIL RESULT:
Overall Vehicle
54
PASSED

Failure Limits (FMCSR 393.52)

Passenger Carrying Vehicles

- [ ] 62.5 -- Vehicles w/ seating capacity of 10 or less (w/driver) built on pass. car chassis.
- [ ] 52.8 -- Vehicles w/ seating cap. more than 10 (w/driver), built on pass. car chassis or truck chassis with GVWR<10,000 lbs.
- [ ] 43.5 -- All other passenger carrying vehicles.

Property Carrying Vehicles

- [ ] 52.8 -- Single unit vehicles less than 10,000 lb. GVWR.
- [x] 43.5 -- All other property carrying vehicles or combinations of property carrying vehicles.

Individual Wheel Position Results
Advisory Only

Front

Axle#	Left	Right
1	0.43	0.63
2	0.5	0.66
3		
4		
5		
6		

Rear

Disclaimer: These results represent the vehicle's current brake performance. Any changes to the

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Inspection Protection

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Federal Motor Carrier Safety Regulation (FMCSR) compliance.

Effective 4/1/2008 a revised Out of Service Criteria (OOSC) for FMCSR 393.52 that allows an approved FMCSA PBBT **(VIS-Check)** to be used as a stand alone enforcement tool.

CVSA Revised OOSC for 393.52
(Paragraph "p") Performance-Based Brake Test (PBBT)
Failing to develop a total brake force as a percentage of gross vehicle or combination weight of 43.5 or more on an approved PBBT. (393.52(a))
The out-of-service notice will be satisfactorily completed: 1) If an approved PBBT is available, the vehicle shall be retested on an approved PBBT and achieve a total brake force as a percentage of gross vehicle or combination weight of 43.5 or more; or 2) If an approved PBBT is unavailable, each of the brake fault areas identified on the inspection report shall be inspected and repaired.
NOTE: In the United States, an approved PBBT must meet the FMCSA functional specifications 65 FR 48799, August 9, 2000.

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Inspection Protection

VIS-Check Re-Cap of Benefits

VIS-CHECK

HOW COULD YOU BENEFIT?

- Enhances your safety initiatives.
- Validates Regulatory Compliance and Brake Performance.
- Reduces Maintenance/Operational Cost- Fuel, Tires , and Risk Exposure.
- Streamlines Labor Times and Creates a Labor Savings that can be allocated to other priorities.
- Increases warranty dollars recovered.
- Matches Repair Corrections to Driver's concerns the first time.
- Eliminates CDL requirements and applicable Road Testing.
- Provides a more consistent/objective inspection process.
- Creates "Peace-of-Mind", An objective record of accountability.
- Validates Repair Procedures/Corrections.
- Driver / Customer / Upper Management Satisfaction.

VIS-Check in Repair Facility Inspection Bay

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