SURFACE VEHICLE RECOMMENDED PRACTICE

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Antilock Brake Systems Energy Consumption Test Procedure for Air-Brake-Equipped Truck Tractors, Buses, Trailers, and Dollies

RATIONALE

Document has been updated as part of the Five-Year Review. Revisions made to the test procedure include some editorial changes and updates to reflect current and applicable test procedures and to align the document with SAE J1626. The document contains no performance requirements.

SAE J2255 has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

This SAE Recommended Practice provides instructions and test procedures for measuring air consumption of air braked vehicles equipped with Antilock Brake Systems (ABS) used on highways.

1.1 Purpose

This document provides a method to determine the air consumption of highway vehicles when the brake system must maintain performance when the service brake control is applied for long periods of time.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1626 Braking, Stability, and Control Performance Test Procedure for Air- and Hydraulic- Brake-Equipped Trucks, Truck-Tractors, and Buses

2.1.2 FMVSS Publications

Available from the Superintendent of Documents, U.S. Government Printing Office, Mail Stop: SSOP, Washington, DC 20402-9320.

FMVSS 121 Air Brake Systems

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/J2255_202411/

2.2 Related Publications

The following publications are provided for information purposes only and are not a required part of this SAE Technical Report.

2.2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

SAE J1911 Test Procedure for Air Reservoir Capacity - Truck and Bus

3. INSTRUMENTATION AND EQUIPMENT

3.1 A device to measure wind speed, ±2.0 mph, and direction.

3.2 A device to measure ambient temperature, ±0.5 °F.

3.3 Timing device accurate to within 1% of elapsed time.

3.4 Pressure measuring systems accurate to within 5% of the pressure readings.

3.5 Dummy coupler for attachment to the emergency line for sealing the supply (emergency) line.

3.6 An 820 cc (50 in^3) reservoir attached to the control/service line.

3.7 A device to isolate the system from the air compressor, (i.e., electronic solenoid, valve, etc.).

3.8 Pressure transducers, ±1.0% of the indicated value, for measuring brake control pressure and system pressure.

4. VEHICLE CONDITION

4.1 All air connections shall be assembled so that the leakage rate for the entire air system, with all service brakes applied at a pressure of 655 kPa ± 33 kPa (95 psi ± 5 psi), shall not be more than 6.9 kPa (1 psi) per minute. For leakage rate evaluation of towing vehicles, the 820 cc (50 in^3) reservoir coupler shall be connected to the rear control line coupler and the dummy coupler to the rear supply line coupler. For truck-tractors, the air control knobs in the cab shall be positioned so that the parking brakes are released and air flows to couplers provided for towing trailers. For trailers, the supply line coupler shall be pressurized to 654 kPa ± 33 kPa (95 psi ± 5 psi).

4.2 Brakes shall be burnished per SAE J1626 procedure.

4.3 Brakes (including those with automatic adjusters) are to be adjusted to the vehicle manufacturer's published instructions. Where the instructions differ for new and burnished linings, the adjustment specified for burnished linings shall be followed.

4.4 Inspect tires and replace if worn beyond manufacturers recommended limits or abnormal tire condition. Adjust tire pressure per vehicle manufacturer’s load recommendations.

4.5 If the vehicle is equipped with any air reservoir(s) to operate systems other than the brake system, such reservoirs shall be isolated. All air operated accessories other than the brake system shall be in the "off" position.

4.6 Record the required vehicle information on the test data sheet (see Figures 1 and 2).

5. TEST CONDITIONS

5.1 Test Lanes

3.7 m (12 feet) wide, 152.4 m (500 feet) straight, and level with a PFC = 0.5 or less (wet Jennite in good condition).

5.2 Vehicle Position

Centered in lane at the initiation of braking.

5.3 Steering

Driver to steer as necessary during braking to maintain vehicle control.

5.4 Full Brake Application

Air full brake application means an application of the brake control (treadle or brake pedal) in which pressure in any of the valve's output circuits reaches 85 psi, or the brake control has reached maximum displacement, within 0.2 second after application is initiated.

5.5 Initial Brake Temperature

As required by FMVSS 121. 65 to 93 °C (150 to 200 °F) in the brake lining of the hottest brake. Install thermocouples per FMVSS 121 (see Figure 3).

5.6 Brake Warming

If necessary, warm the brakes by making snubs from 64 to 32 km/h (40 to 20 mph) at 3 m/s (10 ft/s) deceleration at 1-mile intervals.

5.7 Transmission

Neutral (or clutch depressed).

5.8 Full Load

Vehicle at GVWR.

5.8.1 Tractors

Are loaded with an unbraked control trailer, as defined in SAE J1626.

5.8.2 Trailers

Are loaded to GAWR.

5.8.3 Dollies

Are loaded to GAWR with an unbraked control trailer, as defined in SAE J1626.

5.9 Surface Friction

Peak friction coefficient (PFC) as identified in SAE J1626.

5.10 Ambient Air Temperature

Ambient air temperature must be between 32 °F and 100 °F.

5.11 Wind Velocity

Wind velocity should not exceed 15 mph.

GENERAL INFORMATION:

Test No.:_____ Test Date:_____

Test Facility and Location:_____

Vehicle Year, Make, and Model:_____

Vehicle Identification Number:_____

Minimum Governor "Cut-Out" Air Pressure:_____

BRAKE DATA:	Front Steer Axle	Forward Drive Axle	Rear Drive Axle
Brake Type:			
Brake Size:			
Lining Code:			
Slack Ajuster Length:			
Brake Chamber Size:			
Left Brake Chamber Stroke @ 586 kPa (85 psi)			
Right Brake Chamber Stroke @ 586 kPa (85 psi)			

Front Axle Limiting: **YES** **NO** Bobtail Proportioning: **YES** **NO**

AIR RESERVOIR VOLUME: (liters) or (cubic inches) - as applicable

Common:_____ System I:_____ System II:_____ Total:_____

TIRES:

Front-Steer-Size:_____ Mfgr:_____ Model: _____ Pressure: _____

Rear-Drive-Size: _____ Mfgr:_____ Model: _____ Pressure _____

CONTROL TRAILER INFORMATION:

Wheelbase (kingpin to axle):_____ mm (ft) Empty Weight - Kingpin:_____ N (lb)

Deck Length:_____ mm (ft) Tire Size:_____ Axle:_____ N (lb)

ABS:

System Manufacturer:_____ System Type:_____

Number of Channels: _____ Axle Controlled:_____ Axle Sensed:_____

Figure 1 - Truck/tractor/bus data sheet

GENERAL INFORMATION: Test No.:_____ Test Date:_____

Test Facility and Location:_____

TRAILER/DOLLY INFORMATION:

	LOADED	EMPTY
Gross Vehicle Weight:	_____ N (lb)	_____ N (lb)
Axle Load: L1 _____ L2 _____ L3 _____ L4 _____		N (lb)

Wheelbase (kingpin to axle): _____ mm (ft)

Vehicle Year, Make, and Model: _____

Vehicle Identification Number: _____

BRAKE DATA:	Front Axle	Middle Axle	Rear Axle
Brake Type:			
Brake Size:			
Lining Code:			
Slack Ajuster Length:			
Brake Chamber Size:			
Left Brake Chamber Stroke @ 586 kPa (85 psi)			
Right Brake Chamber Stroke @ 586 kPa (85 psi)			

AIR RESERVOIR VOLUME: (liters) or (cubic inches) - as applicable

Common:_____ System I:_____ System II:_____ Total:_____

SUSPENSION: Manufacturer: _____ Type: _____

Spring Deflection (Loaded/Empty): _____ mm (in) Balanced Unbalanced

Bellow Pressure (Loaded/Empty): _____ kPa (psi)

Axle lift? NO YES Axle: 1 2 3 4

TIRES: Size: _____ Mfgr: _____ Model: _____ Pressure: _____

ABS: System Manufacturer:_____ System Type:_____

Number of Channels:_____ Axle Controlled:_____ Axle Sensed:_____

Figure 2 - Trailer/dolly data sheet

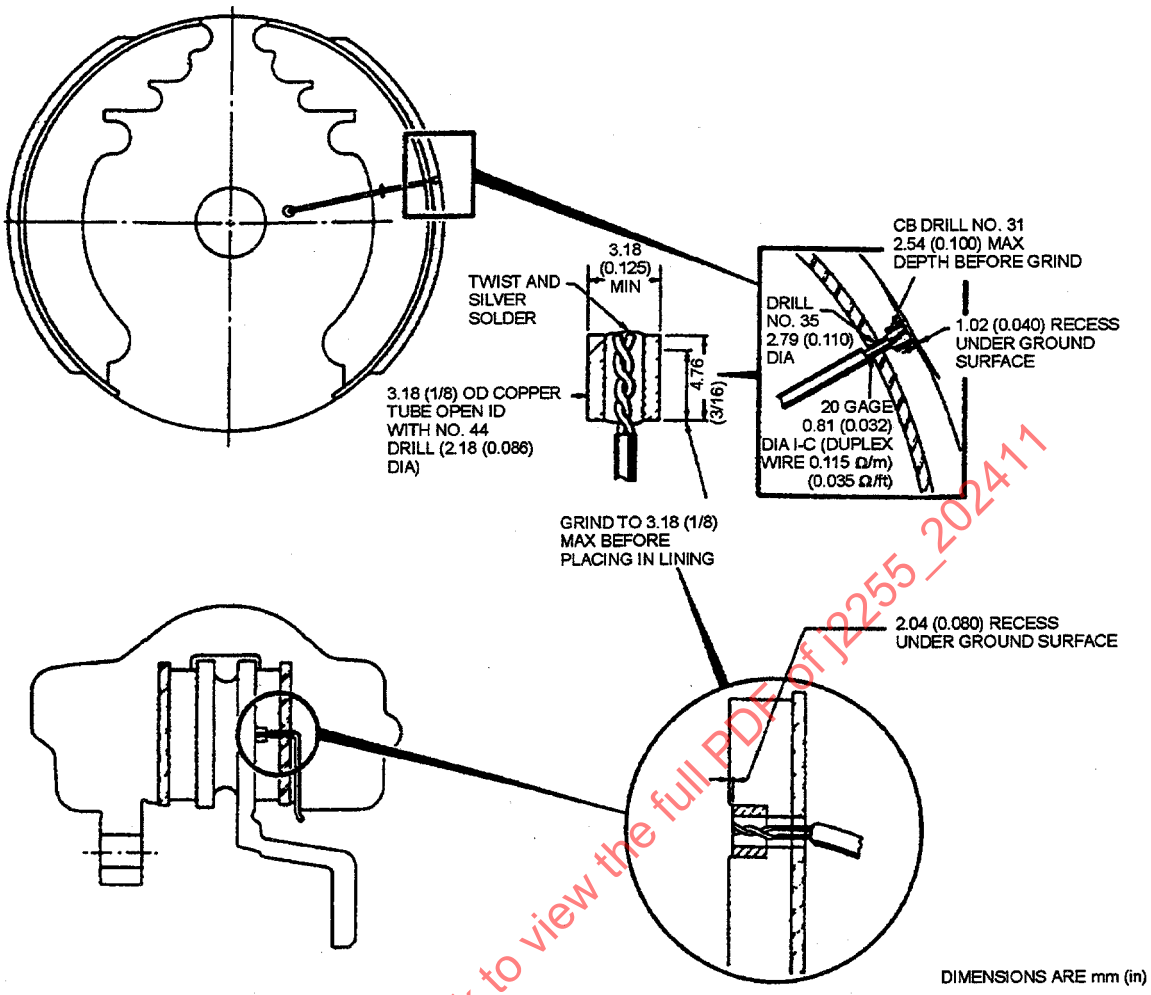

Figure 3 - Typical plug type thermocouple installation

6. TRUCK, TRUCK-TRACTORS, AND BUSES

6.1 Install a pressure transducer at the output of the foot valve and in each reservoir system.

6.2 On towing vehicles attach the 820 cc (50 in^3) reservoir to the control line coupler and a non-vented dummy coupler to the vehicle supply line.

6.3 Position the air control knobs in the cab so that the parking brakes are released and air flows to the control and supply line couplers provided for the trailer.

6.4 Charge the air system to the vehicle manufacturer's specified minimum "cut-out" pressure and make five "full apply" brake applications to exercise the brake system.

6.5 Charge the air system to the vehicle manufacturer's specified minimum "cut-out" pressure and with the vehicle stationary then isolate the air system from the air supply so that the reservoirs are not resupplied with air.

6.6 With the vehicle stationary make three "full apply" brake applications. Hold each brake application for 5 to 15 seconds and record reservoir pressure(s) on the data sheet for each brake application. Fully release the brakes after each brake application.

6.7 Repeat 6.5.

6.8 Run one "full apply" brake application from 56 km/h (35 mph) to a complete stop on a surface per 5.1. Record on the data sheet (Figure 4) the reservoir pressure at the completion of the stop while holding the brakes for 5 to 15 seconds.

6.9 Repeat 6.5 and 6.8 two more times and calculate the average of the three recorded pressures from the completed ABS stops.

7. TRAILERS

7.1 Attach the trailer to an Antilock Brake System (ABS) equipped towing vehicle and load the trailer as specified in 5.8.2. Both the towed and towing vehicle brakes will be applied during the test.

7.2 Install a device to isolate the trailer air system from the supply output of the tractor protection valve of the towing vehicle.

7.3 Install a pressure transducer in the trailer reservoir.

7.4 Trailers equipped to tow another trailer:

7.4.1 Attach the 820 cc (50 in^3) reservoir to the control line coupler and a non-vented dummy coupler to the trailer supply line coupler.

7.5 Lower all lift axles.

7.6 Charge the trailer air system to 827 kPa (120 psi) and with the vehicle stationary make five "full apply" brake applications to exercise the brake system.

7.7 Charge the trailer system to 827 kPa (120 psi) and then isolate the air system from the tractor air supply using the isolation device at the tractor protection valve so that the reservoirs are not resupplied with air.

7.8 Make three "full apply" static brake applications. Hold each brake application for 5 to 15 seconds and record the reservoir pressure(s) on the data sheet for each brake application. Fully release the brakes after each brake application.

7.9 Repeat 7.7.

7.10 Run one "full apply" brake application from 56 km/h (35 mph) to a complete stop on a surface as specified in 5.1. Record on the data sheet (Figure 5) the reservoir pressure(s) at completion of the stop while holding the brakes for 5 to 15 seconds.

7.11 Repeat 7.7 and 7.10 two more times and calculate the average of the three recorded pressures from the completed ABS stops.

CHECK LIST:	**YES**	**NO**
Brakes adjusted to manufacturer's specification?	_____	_____
All air reservoirs drained prior to test start?	_____	_____
Trailer control lines open to 820 cc (50 in^3) reservoir?	_____	_____
Air flow out of trailer supply line coupler blocked?	_____	_____
All auxiliary air operated equipment off?	_____	_____
Air leakage with applied brakes less than 6.9 kPa/min (1 psi/min)?	_____	_____

TEST DATA:

	Air Pressure (kPa) or (psi)		
Brake Application Number:	Reservoir One	Reservoir Two	Reservoir Three
Static Application:			
Application 1	_____	_____	_____
Application 2	_____	_____	_____
Application 3	_____	_____	_____
Average Pressure:	_____	_____	_____
Dynamic Application:			
Initial Cut-Out Pressure:	_____	_____	_____
Time (optional) / Stop 1	_____|_____	_____|_____	_____|_____
Time (optional) / Stop 2	_____|_____	_____|_____	_____|_____
Time (optional) / Stop 3	_____|_____	_____|_____	_____|_____
Time (optional) / Average Stop	_____|_____	_____|_____	_____|_____

COMMENTS: _____

_____

Ambient Temperature:_____ Prepared By:_____

Figure 4 - Truck/tractor/bus data sheet