

**BRAKE SYSTEM ROAD TEST CODE—
PASSENGER CAR—SAE J843b**

SAE Recommended Practice

Report of Brake Committee approved January 1963 and last revised January 1969.

Scope—This SAE Recommended Practice establishes a uniform procedure for the level road test of the brake systems of all classes of passenger cars.

Purpose—The purpose of the practice is to establish brake system capabilities with regard to:

1. Deceleration versus input, as affected by vehicle speed, brake temperature, and usage.
2. Brake system integrity.
3. Stopping ability during emergency or inoperative power assist conditions.
4. Water recovery characteristics.

Section A—Instrumentation—

Line pressure or pedal force gage.

Decelerometer (U-tube or equivalent).

Direct reading temperature instrument.

Speedometer (calibrated).

Odometer (calibrated).

Thermometer—ambient (or ambient sensitive thermocouple).

Stopmeter (fifth wheel, distance only).

Optional Instrumentation—

Pedal travel gage.

Solenoid stop counter.

Stop watch.

Section B—Installation Details—

1. **Friction Material Preparation**—Attach and finish friction material per vehicle manufacturer's specifications.
2. **Thermocouples**—Install the desired type of thermocouples in each brake. Any one of the following installations may be used:
 - (a) Plug type. See Fig. 1.
 - (b) Web-rim junction type, welded or otherwise, in intimate contact with the brake shoe near the web-rim junction.
 - (c) Thermocouple inserted in a hole drilled from the lining edge,

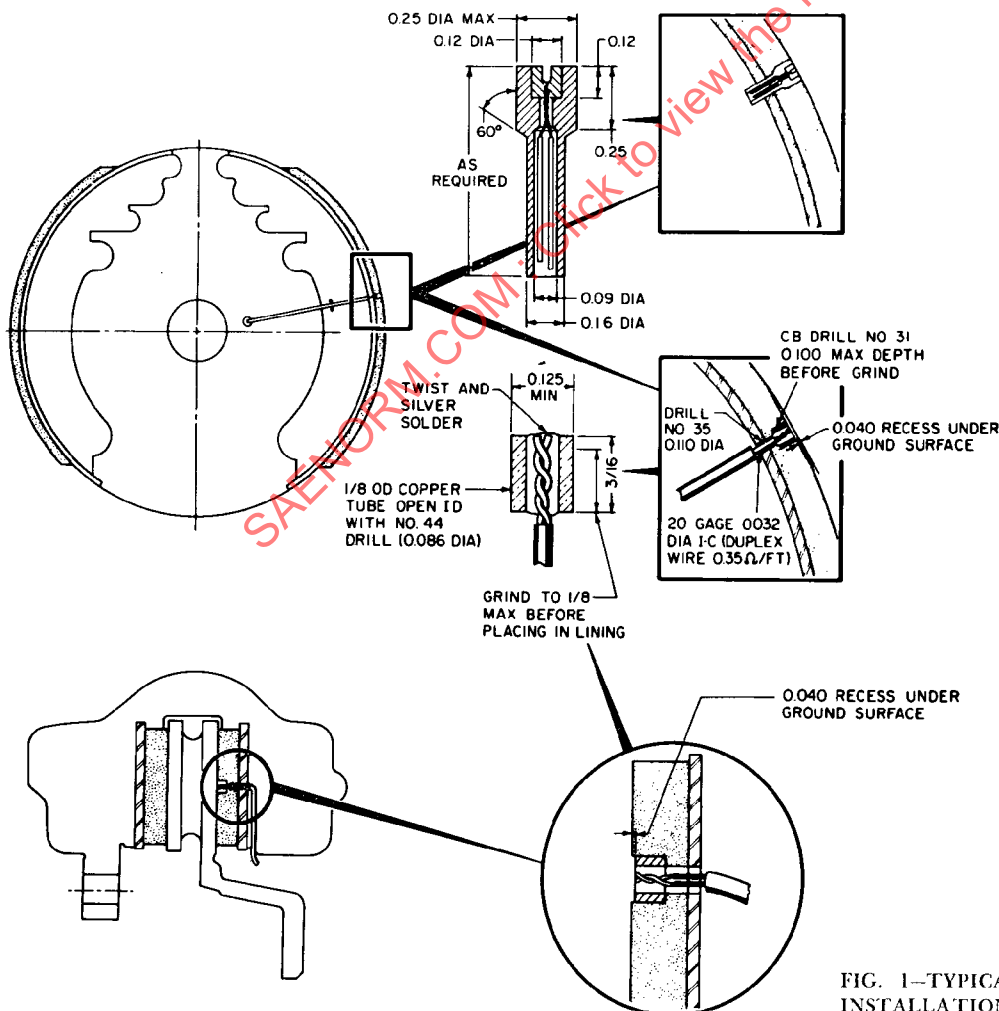


FIG. 1—TYPICAL PLUG TYPE THERMOCOUPLE INSTALLATIONS

approximately one-half the width of the lining in depth and as close to the shoe rim as possible.

All thermocouples to be located in approximate center of the most heavily loaded shoe, one per brake.

3. Brake Drum (or Rotor) and Hub Assembly—New drums (or rotors) recommended for each test. Surface finish, dimensional characteristics, with special emphasis on runout of rubbing surface, to be in accordance with vehicle manufacturer's specifications.

4. Brake Assembly—Brakes to be prepared in accordance with vehicle manufacturer's specification with special attention to required load characteristics on all brake springs. Adjust brakes to manufacturer's specifications.

5. Vehicle Test Weight—Vehicle manufacturer's recommended axle test loading¹ to be maintained throughout full test procedure.

Section C—Test Procedure—

TEST NOTES—(1) Effectiveness, fade and recovery test stops shall be conducted on a substantially level (not to exceed a $\pm 1\%$ grade), dry, smooth, hard-surfaced roadway of Portland cement concrete (or other surface with equivalent coefficient of surface friction) that is free from loose materials. (2) During all phases of this procedure, any unusual performance such as wrap-up or noise characteristics are to be noted and recorded. Note any uncontrollable braking action causing the vehicle to pull or swerve out of a 12 ft wide roadway lane. (3) "Initial brake temperature" defined as 0.2 mile before stop (average temperature of brakes on hottest axle), brakes off. (4) If brakes require warming to prescribed temperature, use burnish procedure and shorten interval if necessary. (5) Because variations in ambient temperature have a significant effect on test results, fade and recovery tests must be conducted within a range of ambient temperature of 40-90 F. (6) Decelerations used in the various fade, recovery, or warmup procedures refer to values at which the decelerometer is held approximately constant during the stop by varying the input pressure. (7) Deceleration and line pressure (pedal force) readings shall not be taken below 5 mph.

1. Preburnish Check—In order to allow for a general check of instrumentation, brakes, and vehicle function, the following stops are to be run: 10 stops, 30-0 mph, 10 fpsps, 1 mile interval, 40 mph cooling speed in normal driving gear.

Record—Maximum line pressure (pedal force).

NOTE: Assuming instrumentation, brakes and vehicle are functioning satisfactorily, proceed immediately with First Effectiveness Test.

2. First (Preburnish) Effectiveness Test—Initial brake temperature, 200 F before each application.

Stop Speed—30 mph and 60 mph (full stops in neutral).

Increments—Curve to be defined to point of incipient skid by adequate number of points.

Record—Deceleration and line pressure (pedal force) and method of brake application (that is, machine or manual). When using manual method, full stops to be defined by maximum line pressure (pedal force) and deceleration. Also note, at the appropriate stop, which wheel or wheels skidded.

3. Burnish—

Stop speed—40-0 mph.

Stop deceleration—12 fpsps (in normal driving gear).

Stop interval—As required to achieve 250 F "initial brake temperature,"² or a maximum of 1 mile. **NOTE:** The 1 mile maximum must be observed even though the initial temperature exceeds 250 F.

Cooling speed—40 mph (moderate acceleration to cooling speed).

Stops required—200.

Optional—Inspect and/or adjust brakes after burnish cycle. Record if either operation is performed.

4. Emergency Brake System Test—This test can be run separately. It need not necessarily be run after Section C, item 3. If run separately, brakes are to be burnished per Section C, item 3.

Initial brake temperature—150 F before each stop.

Procedure—With one-half of system open to the atmosphere, determine the pedal force to cause failure warning system to operate. Determine the pedal force required to provide minimum stopping distance. The maximum pedal force must not exceed 200 lb. Stops are to be made in normal driving gear from 60 mph without leaving a 12 ft lane. Repeat the procedure with only the other half of the system open to the atmosphere.

Record—Pedal force required to actuate failure warning system, maximum pedal force, minimum deceleration, and stopping distance for each failure mode.

5. Inoperative Power System Test—This test can be run separately. It need not necessarily be run after Section C, item 4. If run separately, brakes are to be burnished per Section C, item 3.

Initial brake temperature—150 F.

Procedure—With primary source of power inoperative and its reserve depleted, determine the pedal force required to provide minimum stopping distance. The maximum pedal force must not exceed 200 lb. Stops are to be made in normal driving gear from 60 mph without leaving a 12 ft lane.

Record—Maximum pedal force, minimum deceleration, and stopping distance.

6. Second Effectiveness Test—Repeat item 2, Section C, except add 80 mph stop speed.

7. First Fade and Recovery Test—

(a) BASELINE CHECK STOPS—

Initial brake temperature—150 F before each stop.

Stops required—3.

Stop speed—30-0 mph.

Stop deceleration—10 fpsps (in normal driving gear).

Record—Maximum line pressure (pedal force).

(b) FADE—

Initial brake temperature—150 F before first stop.

Stops required—10.

Stop speed—60-0 mph.

Stop deceleration—15 fpsps (in normal driving gear) or maximum obtainable at 200 lb pedal force (or equivalent line pressure).

Stop interval—0.4 mile.

Cooling speed—60 mph.

Acceleration to cooling speed—Immediate to maximum.

Record—Maximum line pressure (pedal force) and deceleration (if 15 fpsps cannot be held). Initial brake temperature before every stop, all brakes. Ambient air temperature at beginning of run. Total elapsed time from end of the first fade stop to end of the last fade stop—to maintain a check on driver consistency and car performance.

NOTE: Drive 1 mile at 40 mph after last fade stop and make first recovery stop.

(c) RECOVERY—

Stops required—12 minimum.

Stop speed—30-0 mph.

Stop deceleration—10 fpsps (in normal driving gear), or maximum obtainable at 200 lb pedal force (or equivalent line pressure).

Stop interval—1 mile.

Cooling speed—40 mph.

Rate of acceleration to cooling speed—Moderate.

Record—Maximum line pressure (pedal force) and deceleration (if 10 fpsps cannot be held). Initial brake temperatures before every stop, all brakes.

8. First Effectiveness Spot Check—

Initial brake temperature—200 F before each stop.

Stops required—2.

Stop speed—60-0 mph.

Stop deceleration—15 fpsps (in normal driving gear).

Record—Maximum line pressure (pedal force).

9. First Reburnish—Repeat Section C, item 3, except 35 stops required.

10. Second Fade and Recovery Test—Repeat Section C, item 7, except 15 fade stops required.

11. Second Effectiveness Spot Check—Repeat Section C, item 8.

12. Second Reburnish—Repeat Section C, item 9.

13. Final Effectiveness Test—Repeat Section C, item 6.

14. Final Inspection—Disassemble all brakes, inspect and record all pertinent observations.

15. Water Recovery Test—This test can be run separately. It need not necessarily be run after Section C, item 14. If run separately, brakes are to be burnished per Section C, item 3.

(a) BASELINE CHECK STOPS—

Initial brake temperature—150 F before each stop.

Stops required—3.

Stop speed—25-0 mph.

Stop deceleration—8 fpsps (in normal driving gear).

Record—Maximum line pressure (pedal force) for each stop.

(b) WETTING OF BRAKES—

Wetting time—2 minutes minimum.

Wetting procedure—With the brakes fully released, wet all brakes thoroughly by slowly driving through a trough of suitable depth or equivalent method. Start recovery stops not more than 1 minute after wetting brakes. Do not exceed 25 mph prior to recovery stops.

¹Normally curb +600 lb for vehicles of four or more passengers.

²See Test Notes, item 3.

VEHICLE: MAKE _____, MODEL _____, YEAR _____
 ENGINE _____, TRANSMISSION _____, AXLE _____
 WEIGHT _____ LB FRT WT. + _____ LB RR WT. + _____ LB BALLAST* _____ LB TEST WT.
 GENERAL DATA: FRONT-SIZE _____ TYPE _____ CYL DIA _____
 REAR-SIZE _____ TYPE _____ CYL DIA _____
 LINING-FRONT _____ REAR _____
 DRUM (ROTOR) TYPE-FRONT _____ REAR _____
 MASTER CYL DIA _____ PEDAL RATIO _____ POWER BRAKE: YES _____ NO _____ TYPE _____
 TEST INFORMATION: THERMOCOUPLE INSTALLATION METHOD _____
 SPECIAL EQUIPMENT _____
 TESTED BY _____ LOCATION _____ DATE _____

TEST PHASE	TEST RESULTS	TEST PHASE	TEST RESULTS
PREBURNISH CHECK	LB PF	PREBURNISH CHECK	LB PF
EFFECTIVENESS TESTS	1st 2nd 3rd	SECOND FADE AND RECOVERY TEST	
30 MPH AT 20 FPSPS	_____ LB PF	FADE STOPS 1-8	_____ LB PF
60 MPH AT 20 FPSPS	_____ LB PF	RECOVERY STOPS 1-5	_____ FPSPS BY _____ LB
80 MPH AT 20 FPSPS	_____ LB PF	RECOVERY STOPS 6-12	_____ LB PF MAX
EMERGENCY BRAKE TEST	TYPE: POWER MANUAL	STABILITY DURING EFFECTIVENESS TESTS	CONTROLLABLE BRAKING
WARNING SYSTEM ACTUATION	FRT _____ RR _____ LB PF		BELOW 20 FPSPS: YES _____ NO _____
60 MPH STOPPING DISTANCE	FRT _____ FT _____ LB PF	FINAL INSPECTION	
	RR _____ FT _____ LB PF	LINING INTEGRITY	YES _____ NO _____
INOPERATIVE POWER SYSTEM TEST		MECHANICAL INTEGRITY	YES _____ NO _____
60 MPH STOPPING DISTANCE	_____ FT _____ LB PF	HYDRAULIC INTEGRITY	YES _____ NO _____
FIRST FADE AND RECOVERY TEST		WATER RECOVERY TEST	
FADE STOPS 1-4	_____ LB	AVERAGE BASELINE PF	_____ LB PF
RECOVERY STOPS 1-5	_____ FPSPS BY _____ LB	RECOVERY STOPS 4-6	_____ LB PF MAX
RECOVERY STOPS 6-12	_____ LB PF MAX	RECOVERY STOPS 7-14	_____ LB PF MAX
		RECOVERY STOP 15	_____ LB PF FROM BASE

COMMENTS _____
 REPORTED BY _____ DATE _____

FIG. 2—GENERAL DATA AND SUMMARY SHEET

VEHICLE _____
 TESTED BY _____
 DATE _____

SECOND EFFECTIVENESS				FIRST RECOVERY			
200F IBT EACH APPLICATION				30-0 MPH, 10 FPSPS IN GEAR, 1 MILE INTERVAL AT 40 MPH			
30 MPH IN NEUTRAL		80 MPH IN NEUTRAL		30 MPH IN NEUTRAL		80 MPH IN NEUTRAL	
PF-LP	FPSPS	PF-LP	FPSPS	STOP	FRT. IBT	RR. IBT	PF-LP COMMENTS
				1			
				2			
				3			
				4			
				5			
				6			
				7			
				8			
				9			
				10			
				11			
				12			

SKID _____

FIRST BASELINE CHECK			FIRST EFFECTIVENESS SPOTCHECK		
30-0 MPH, 10 FPSPS IN GEAR, 150F IBT			60-0 MPH, 15 FPSPS IN GEAR, 200F IBT		
STOP	PF-LP	COMMENTS	STOP	PF-LP	COMMENTS
1			1		
2			2		
3					

FIRST FADE				FIRST REBURNISH			
60-0 MPH, 15 FPSPS IN GEAR, 0.4 MILE INTERVAL, 150F IBT FIRST STOP				40-0 MPH, 12 FPSPS IN GEAR, 250F IBT EACH STOP BUT 1 MILE MAX INTERVAL			
AMBIENT _____ F		TIME FOR 10 STOPS _____ SEC		STOP		PF-LP COMMENTS	
STOP	FRT. IBT	RR. IBT	PF-LP	COMMENTS	STOP	PF-LP	COMMENTS
1					1		
2					10		
3					25		
4					35		
5							
6							
7							
8							
9							
10							

SECOND BASELINE CHECK		
30-0 MPH, 10 FPSPS IN GEAR, 150F IBT		
STOP	PF-LP	COMMENTS
1		
2		
3		

GENERAL COMMENTS _____

FIG. 4—SECOND EFFECTIVENESS AND FIRST FADE DATA SHEET

VEHICLE _____
 TESTED BY _____
 DATE _____

INPUT CORRELATION		BURNISH	
ENGINE IDLING IN NEUTRAL		40-0 MPH, 12 FPSPS IN GEAR, 250F IBT EACH STOP BUT 1 MILE MAX INTERVAL	
PEDAL FORCE - PF	LINE PRESSURE - LP	STOP	PF-LP
		1	
		20	
		40	
		60	
		80	
		100	
		120	
		140	
		160	
		180	
		200	

PREBURNISH CHECK		EMERGENCY BRAKE SYSTEM	
30-0 MPH, 10 FPSPS IN GEAR, 1 MILE INTERVAL		60-0 MPH IN GEAR, 150F IBT EACH APPLICATION	
STOP	PF-LP	MODE	PF TO ACTUATE WARNING SYSTEM
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

FIRST (PREBURNISH) EFFECTIVENESS			
200F IBT EACH APPLICATION			
30 MPH IN NEUTRAL		60 MPH IN NEUTRAL	
PF-LP	FPSPS	PF-LP	FPSPS

SKID _____

INOPERATIVE POWER SYSTEM		
60-0 MPH IN GEAR, 150F IBT EACH APPLICATION		
PF-LP	FEET	COMMENTS

GENERAL COMMENTS _____

FIG. 3—INITIAL EFFECTIVENESS, EMERGENCY BRAKE, AND INOPERATIVE POWER SYSTEM DATA SHEET

VEHICLE _____
 TESTED BY _____
 DATE _____

SECOND FADE				SECOND EFFECTIVENESS SPOTCHECK			
60-0 MPH, 15 FPSPS IN GEAR, 0.4 MILE INTERVAL, 150F IBT FIRST STOP				60-0 MPH, 15 FPSPS IN GEAR, 200F IBT			
AMBIENT _____ F		TIME FOR 15 STOPS _____ SEC		STOP		PF-LP COMMENTS	
STOP	FRT. IBT	RR. IBT	PF-LP	COMMENTS	STOP	PF-LP	COMMENTS
1					1		
2					2		
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

SECOND REBURNISH			
40-0 MPH, 12 FPSPS IN GEAR, 250F IBT EACH STOP BUT 1 MILE MAX INTERVAL			
STOP		PF-LP COMMENTS	
1			
10			
25			
35			

FINAL EFFECTIVENESS			
200F IBT EACH APPLICATION			
30 MPH IN NEUTRAL		80 MPH IN NEUTRAL	
PF-LP	FPSPS	PF-LP	FPSPS

SKID _____

60 MPH IN NEUTRAL	
PF-LP	FPSPS

SKID _____

FIG. 5—SECOND FADE, RECOVERY AND FINAL EFFECTIVENESS DATA SHEET