

California Environmental Protection Agency



Air Resources Board

Spill-Proof System and Spill-Proof Spout Test Procedure

Test Method 512

**DETERMINATION OF FUEL FLOW RATE FOR
SPILL-PROOF SYSTEMS AND SPILL-PROOF SPOUTS**

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Test Method 512
Determination of Fuel Flow Rate for
Spill-Proof Systems and Spill-Proof Spouts

1 APPLICABILITY

For the purpose of this procedure, the term "ARB" refers to the State of California Air Resources Board, and the term "ARB Executive Officer" refers to the Executive Officer of the ARB or his or her authorized representative or designate. Terms used in this test method are defined in Section 2471, Article 6, Chapter 9, Title 13 of the California Code of Regulations.

This procedure is used to quantify the fuel flow rate of spill-proof systems or portable fuel containers and spill-proof spouts. It is applicable in all cases where a spill-proof system or a spill-proof spout is sold, supplied, offered for sale, or manufactured for use in the State of California.

2 PRINCIPAL AND SUMMARY OF TEST PROCEDURE

Using water in place of gasoline, the portable fuel container is filled to its nominal capacity and inverted for a period of time to test for leaks. Water is then dispensed through the spill-proof spout while the event is timed. The spill-proof system is pre and post weighed to determine the amount of water dispensed and an average flow rate is calculated in gallons per minute.

3 BIASES AND INTERFERENCES

The balance used to determine the amount of water dispensed must be of sufficient capacity to accurately weigh large volume spill-proof systems filled to their nominal capacity with water.

Allowing spill-proof systems to empty during the test procedure can cause errors in the final measurement of the flow rate.

Any leaks from either the spill-proof spout or the portable fuel container can cause errors in the final measurement of the weight of water dispensed.

4 SENSITIVITY, RANGE, AND PRECISION

Range of measurement of water dispensed is approximately 2000 to 26,000 grams; upper range depends upon the volume of the spill-proof system.

5 EQUIPMENT

5.1 A Stopwatch accurate to within 0.2 seconds.

5.2 A high capacity top loading balance capable of a maximum weight measurement of not less than 2,000 grams greater than weight of the largest water filled spill-proof system tested with a minimum readability of 1 gram and a reproducibility of ± 0.2 grams.

6 CALIBRATION PROCEDURE

The high capacity top loading balance shall be calibrated prior to use per the manufacturers specifications.

7 TEST PROCEDURE

- (1) Fill the container of the spill-proof system to its nominal capacity with water and attach the spill-proof spout per manufacturer recommendations. For spill-proof spouts that are not part of a spill-proof system, select the largest portable fuel container specified for use by the spill-proof spout manufacturer for the test procedure. Fill the selected portable fuel container to its nominal capacity with water and attach the spill-proof spout per manufacturer recommendations. This assembly is now considered a spill-proof system.
- (2) Invert the spill-proof system with the spout in a vertical axis position for a period of five minutes to ensure that there are no leaks. If the spill-proof system is observed leaking, place in the upright position and ensure that the spill-proof spout is correctly and firmly attached. Invert the container again for a period of five minutes. If any leakage of water is observed the spill-proof system is not in compliance with the automatic closure requirements of Section 2472, (a), (2), Article 6, Chapter 9, Title 13 of the California Code of Regulations.
- (3) Carefully place the filled spill-proof system on the high capacity balance. Record the pre test weight (*PRE*) on the field data sheet.
- (4) Invert the spill-proof system to a vertical spout axis position over a suitable receptacle. Manually open the spill-proof spout while simultaneously starting the stopwatch. Continue to hold the spill-proof system in the inverted position with the spill-proof spout manually opened. Close the spill-proof spout and simultaneously stop the stopwatch before the container is completely empty leaving approximately one pint of fluid in the container. Record the elapsed time (*t*) on the field data sheet
- (5) Carefully place the spill-proof system on the high capacity balance. Record the post test weight (*POST*) on the field data sheet.
- (6) Repeat this process three times for each spill-proof system tested.

8 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

This section is reserved for future specification.

9 RECORDING DATA

Record data on a form similar to the one shown in Figure 1.

10 CALCULATING RESULTS

The *flow rate* in gallons/minute for each individual test is calculated as follows:

$$FlowRate = \frac{(PRE - POST) * 60}{d * t}$$

Where:

FlowRate	=	The flow rate in gallons/minute
<i>PRE</i>	=	The weight of the filled container in grams
<i>POST</i>	=	The weight of the empty container in grams
<i>d</i>	=	3774 grams/gallon, the density of water at 25 °C
<i>t</i>	=	The elapsed time in seconds

11 REPORTING RESULTS

After calculating the flow rate for each individual test an average of the three tests is calculated to determine the final flow rate in gallons per minute.

12 ALTERNATIVE TEST PROCEDURES

Test procedures, other than specified above, shall only be used if prior written approval is obtained from the ARB Executive Officer. In order to secure the ARB Executive Officer's approval of an alternative test procedure, the applicant is responsible for demonstrating to the ARB Executive Officer's satisfaction that the alternative test procedure is equivalent to this test procedure.

- (1) Such approval shall be granted on a case-by-case basis only.
- (2) Documentation of any such approvals, demonstrations, and approvals shall be maintained by the ARB Executive Officer and shall be made available upon request.

13 REFERENCES

This section is reserved for future specification.

14 FIGURES

Figure 1. Field Data Sheet

**Figure 1
Field Data Sheet**

Spill-Proof System Manufacturer: _____

OR

Spill-Proof Spout Manufacturer: _____ **AND**

Portable Fuel Container Manufacturer: _____

Container Volume: _____

Tested By: _____ Date: _____ Time: _____

TEST NUMBER	PRE - WEIGHT (grams)	POST - WEIGHT (grams)	ELAPSED TIME (seconds)