California Environmental Protection Agency

⬤≣ Air Resources Board

Vapor Recovery Test Procedure

~~PROPOSED~~ *2nd* <u>MODIFIED</u>: TP - 201.2D

Post-Fueling Drips
From Nozzle Spouts

Adopted: _____

Proposed 15-day changes (September 29, 2000) are shown with <u>underline
for additions</u> and ~~strikeout for deletions~~.

Proposed 15-day changes (December 12, 2000) are shown with ***bold italic***
for addition and ~~SMALL CAP STRIKEOUT~~ for deletion.

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TP-201.2D

Post-Fueling Drips from Nozzle Spouts

A set of definitions common to all Certification and Test Procedures is in:

D-200 Definitions ~~for Certification Procedures and Test Procedures~~ **for Vapor Recovery** ~~Systems~~**Procedures**

For the purpose of this procedure, the term "CARB" refers to the California Air Resources Board, and the term "Executive Officer" refers to the CARB Executive Officer, or his or her authorized representative or designate.

1. **PURPOSE AND APPLICABILITY**

    1.1 The purpose of this procedure is to quantify ~~the quantity of~~ liquid gasoline drips from nozzles ~~used during~~ following refueling events. It is applicable, during the certification process, for determining compliance with the performance standard for the maximum allowable number of liquid gasoline drips as defined in the Certification Procedure (CP-201).

2. **PRINCIPLE AND SUMMARY OF TEST PROCEDURE**

    2.1 The vapor recovery nozzles and associated hanging hardware are inspected and verified to be in good working order, as specified in CCR, title 17, section 94006, including the requirement that the nozzle's primary shutoff mechanism is in good working order.

    2.2 The vapor recovery nozzle is used to dispense gasoline into a vehicle fuel tank. Upon activation of the nozzle's primary shutoff mechanism, ten (10) seconds are allowed to elapse prior to removal of the nozzle from the vehicle fillpipe. The nozzle is then inverted and the number of drips of liquid gasoline are quantified for a period of five (5) seconds.

    2.3 Compliance with the performance standard specified in CP-201 shall be determined using the combined average result of the ten test runs for each nozzle tested. A minimum of ten nozzles shall be tested for certification.

3. BIASES AND INTERFERENCES

3.1 Nozzle orientation during refueling can affect the response time of the primary shutoff mechanism. To eliminate this bias, the nozzle shall be inserted into each vehicle fillpipe in the same orientation, as specified in Section 7.

3.2 Nozzles or associated components that have defects pursuant to title 17,CCR, section 94006 may bias the test toward non-compliance. Do not conduct this test during the certification process if the nozzle, or any associated component contains a defect.

3.3 Spitback may bias the results of the test procedure toward noncompliance. During the certification process, spitback occurrences shall be noted on the Field Data Sheet (Form 1). Results attributable to ~~NONCOMPLYING~~ vehicle fillpipes *that do not meet the requirements of title 13, CCR, section 2235* shall not be included.

4. SENSITIVITY, RANGE, AND PRECISION

4.1 The procedure is capable of determining spills as small as one drop per refueling event. ~~The calculation below demonstrates the air quality impact attributable to a single drop of gasoline spilled during each refueling event in California, assuming 14.2 billion gallons per year and an average refueling event of 10 gallons.~~

$$\left(\frac{1\,drop}{10\,gallons}\right)\left(\frac{14.2\times10^{9}\,gallons}{year}\right)\left(\frac{1\,ml}{20\,drops}\right)\left(\frac{1\,gallon}{3{,}785\,ml}\right)\left(\frac{6.28\,lb}{gallon}\right)\left(\frac{1\,ton}{2{,}000\,lb}\right)=\frac{58.9\,tons\,HC}{year}$$

DELETE ABOVE EQUATION

4.2 The ~~Maximum~~ sensitivity of the procedure is 1 drip/refueling event and the precision is $\pm$ 1 drip/refueling event. ~~obtained by measuring the drips of liquid gasoline from 10 vehicle refueling events and calculating the arithmetic average of the number of drops per refueling event. For the purpose of this test procedure, a refueling event shall consist of any refueling episode of at least 4.5 gallons, terminated by activation of the nozzle's primary shutoff mechanism.~~

4.3 For the purpose of the test procedure, a refueling event shall consist of any vehicle refueling event of at least 4.5 gallons, terminated by activation of the nozzle's primary shutoff mechanism.

5. EQUIPMENT

5.1 Field Data Sheet. Use a Field Data Sheet, such as Form 1, to record the number of drips from each acceptable refueling event, as defined in Section 4.3.

   ~~5.1.1 An example of the Field Data Sheet is shown in Form 1.~~

5.2 Stopwatch. Use a stopwatch, equipped with a split-timing function, accurate to within 0.2 seconds to ~~measure~~ determine the dispensing rate. The split function shall be used to determine the 10 second specification in Section 7.6 of the procedure. Two stopwatches may be used instead of using a split-timing function.

6. PRE-TEST PROCEDURES

6.1 Inspect the vapor recovery nozzles and associated hanging hardware and verify that all components are in good working order, as specified in <u>title 17,</u> CCR<u>, section</u> 94006, including the requirement that the nozzle's shutoff mechanism is in good working order.

7. TEST PROCEDURE

7.1 Assign, and record on the Field Data Sheet, a Survey ID # to each vehicle included in the test.

7.2 The tester shall select a vehicle for the test by choosing the next vehicle that appears, for which the refueling event is about to begin.

    7.2.1 The tester should introduce themselves to the customer and ask if the refueling event is to be a fillup. If the answer is no, the tester shall select the next potential test vehicle.

    7.2.2 If the customer acknowledges that they want a fillup, the tester should ask to refuel the vehicle, explaining the purpose and details of the test.

7.3 Properly insert the nozzle <u>spout into the vehicle fillpipe</u>, with the nozzle ~~spout~~ <u>handle</u> pointed ~~upward~~ <u>downward</u> in the 12:00 o'clock orientation for side fill vehicles and as close to <u>a</u> 12:00 o'clock orientation <u>as technically feasible</u> for rear fill vehicles. <u>See Figure 1 for nozzle orientations.</u>

7.4 Begin dispensing with the nozzle trigger in the hand-held, wide open position to achieve the maximum dispensing rate. Start the stopwatch when dispensing begins.

7.5 Upon activation of the nozzle's primary shutoff mechanism, stop the <u>timing for dispensing rate determination and start the</u> stopwatch <u>used to determine the 10 second specification in Section 7.6.</u> ~~and r~~<u>R</u>ecord ~~both~~ the gallons dispensed<u>,</u> ~~and~~ the time required for the refueling event<u>, and note if spitback occurred</u>.

7.6 <u>Using a stopwatch,</u> ~~W~~<u>w</u>ait for ten (10) seconds before removing the nozzle from the vehicle fillpipe.

    7.6.1 After ten seconds, carefully remove the nozzle, keeping the spout pointing downward until the spout tip exits the fillpipe. Immediately tilt the nozzle such that the spout is vertical, pointing upward.

    7.6.2 Pointing the nozzle away from the vehicle and customer, tilt the nozzle downward until the spout is vertical, pointing downward. ***Holding the nozzle as still as possible, c***~~C~~ount the number of drops of liquid gasoline that spill from the nozzle <u>for five seconds</u>, starting with the initial downward tilting through having the nozzle in an inverted position ~~for five seconds~~. Record this quantity on the Field Data Sheet along with the number of gallons dispensed and the refueling time, in seconds<u>. For the purpose of this measurement, a drip shall consist of a maximum volume of 1/15 of a milliliter.</u>

7.7 Conduct ten test runs, pursuant to Sections 7.1 through 7.6, on each of the applicable nozzles installed at the test site.

8. POST-TEST PROCEDURES

8.1 Calculate the arithmetic average of the number of drops of liquid gasoline from each of the refueling events included in the test, on both a per nozzle and total nozzle basis. Record ~~this~~ these average~~s~~ to the nearest tenth of a drop on the Field Data Sheet.

9. CALCULATING RESULTS

9.1 Calculate the dispensing rate for each refueling event as follows:

$$Q_d = \left(\frac{(G_d)(60)}{t_d} \right) \qquad \text{Equation } 9-1$$

Where:

Q_d = Dispensing rate, gallons/minute
G_d = Quantity of gasoline dispensed during the refueling event, gallons
t_d = Time to dispense G_d gallons, seconds
60 = Conversion factor from seconds to minutes

9.2 Calculate the arithmetic average for both each nozzle and all nozzles of the number of drops for each refueling event as follows:

$$N_{drips} = \sum_{i=1}^{n} \left(\frac{D_t}{n} \right) \qquad \text{Equation } 9-2$$

Where:

N_{drips} = Average number of drips for all refueling events, drops/refueling event
D_t = Total of all drops from all refueling events, drops
n = Number of refueling events during test

10. REPORTING RESULTS

10.1 ~~Reporting t~~The results of the quantification of the number of drops per refueling event shall include:

10.1.1 All data shown in the Field Data Sheet.

10.1.2 The average number of drops for each nozzle tested, expressed to the nearest tenth of a drop.

10.1.3 The combined average number of drops for all nozzles tested, expressed to the nearest tenth of a drop.

11.   ALTERNATE PROCEDURES

11.1 This procedure shall be conducted as specified. Modifications to this test procedure shall not be used to determine compliance unless prior written approval has been obtained from the ARB Executive Officer, pursuant to Section 14 of Certification Procedure CP-201.
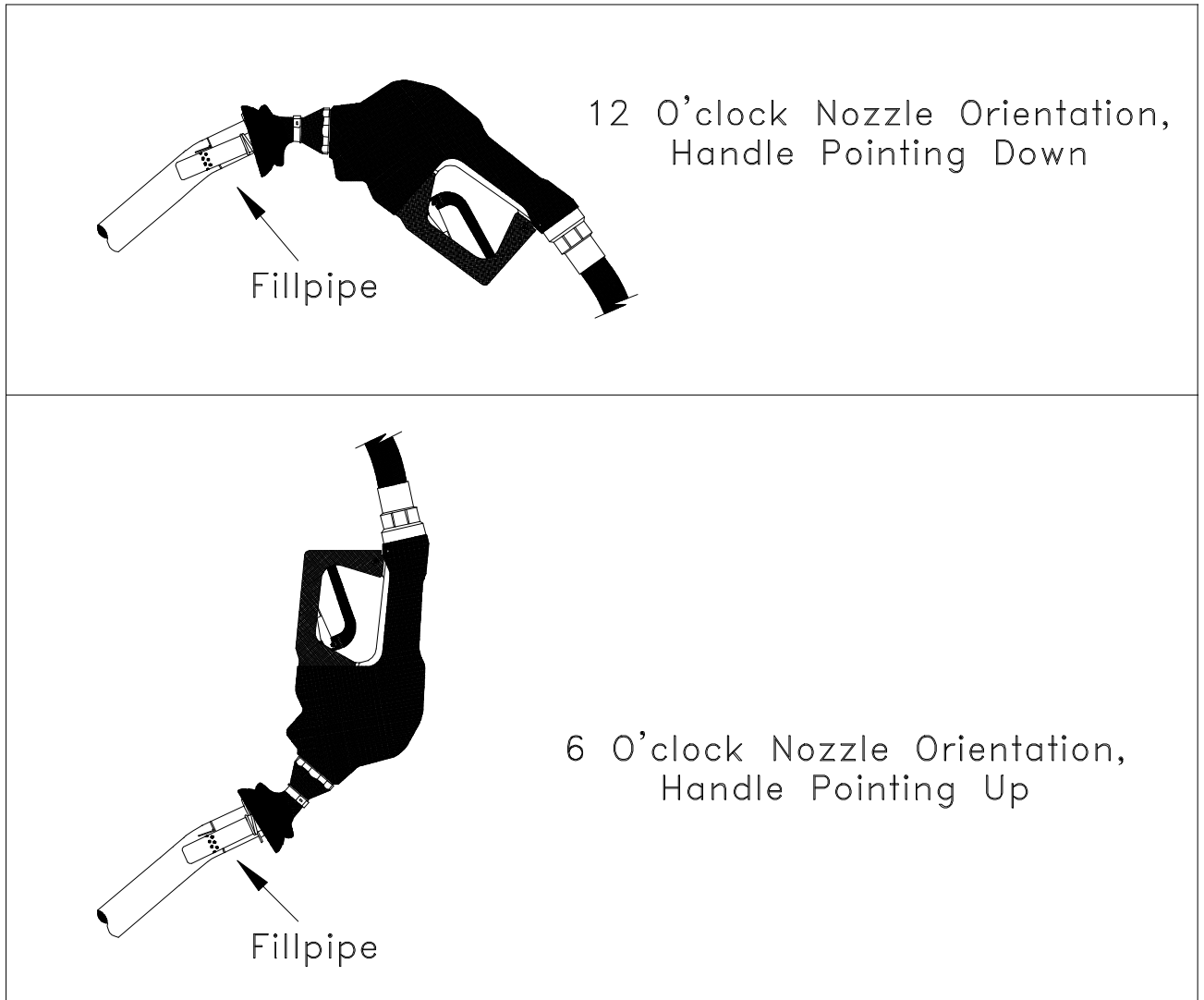
Form 1
Field Data Sheet
POST – FUELING ~~Dripless Nozzle~~ DRIPS

Facility:		Test Date:		Tester(s):	
Address:			Phase II Equipment Type:		

Survey ID #											
Vehicle Information											
Year											
Make											
Model											
Refueling Information											
Nozzle Number											
Gasoline Grade											
Time Start											
Nozzle Position [1 - 12 O'clock]											
Gallons Pumped											
Fueling Time, seconds											
Dispensing Rate, gpm											
Spitback, Yes or No											
NOZZLE DRIP DATA											
# of Post-Fueling Drops											
TOTAL DROPS											

Nozzle Number	Number of Test Runs	Total Number of Post-Fueling Drips	Average Number of Post-Fueling Drips
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
TOTALS			

Figure 1
Nozzle Orientations

12 O'clock Nozzle Orientation, Handle Pointing Down

Fillpipe

6 O'clock Nozzle Orientation, Handle Pointing Up

Fillpipe

INSERT THIS FIGURE