State of California
AIR RESOURCES BOARD

# PROPOSED 15-DAY MODIFICATIONS

## SPECIFICATIONS FOR FILL PIPES AND OPENINGS OF 2015 AND SUBSEQUENT MODEL MOTOR VEHICLE FUEL TANKS

Adopted: March 22, 2012
Amended: [INSERT DATE OF AMENDMENT]

Note: The following text contains staff's suggested modifications to these test procedures as set forth in Appendix B of the Staff Report: Initial Statement of Reasons, released September 4, 2018. The originally proposed amendments are shown in underline to indicate additions and ~~strikeout~~ to indicate deletions. The additional 15-day proposed modifications made available with the 15-day notice are shown in dashed underline to indicate additions and ~~double strikeout~~ to indicate deletions. Staff is proposing modifications to limited portions of the original proposal; for some portions of the original proposal for which no modifications are proposed, the text has been omitted and the omission indicated by "* * * *."

## I. General

A. No new 2015 or later model year gasoline or alcohol fueled passenger car, light-duty truck, medium-duty vehicle, or heavy-duty vehicle may be sold, offered for sale, or registered in California unless such vehicle complies with the following specifications for fill pipes and openings of motor vehicles fuel tanks. The Executive Officer may exempt vehicles for which compliance with the specifications is found to be technologically infeasible, in accordance with ~~Paragraph 9~~ Section XI.

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C. Sections ~~4 through 8~~ IV through XII shall apply to new 2015 and later model year otto-cycle motor vehicles, except motorcycles.

## II. Definitions

* * * *

A. "Restriction device" means a fill pipe device installed by the vehicle manufacturer to prevent insertion by a leaded nozzle spout and to prevent fueling with leaded gasoline, pursuant to regulations of the United States Environmental Protection Agency.

B. "Vapor recovery nozzle", for the purpose of these specifications, means a nozzle, ~~unleaded or leaded~~ as appropriate for fueling vehicles, certified by the state board, pursuant to the latest version of the board's ~~"Certification procedures for Gasoline Vapor Recovery Systems at Service Stations"~~ "CP-201 Certification Procedure for ~~of~~ Vapor Recovery Systems ~~of~~ at Gasoline Dispensing Facilities" established in Section ~~94001~~ 94011 of Title 17, California Code of Regulations~~, at any time between January 1, 1981 and September 14, 1982,~~ together with an appropriate vapor hose. ~~An alternative vapor recovery nozzle means any nozzle certified subsequent to September 14, 1982~~.

C. "Premature nozzle shut-off" means any automatic shut-off of the vapor recovery nozzle before the vehicle fuel tank is filled to either 90 percent of the nominal fuel tank capacity or to within two gallons less than the nominal tank capacity, whichever corresponds to the smaller quantity of gasoline in the fuel tank.

D. "Liquid gasoline loss" means any liquid gasoline that leaves the fill pipe/nozzle interface during dispersing or after nozzle shut-off and includes any liquid

gasoline on the ground, on the vehicle, or that enters the nozzle bellows, nozzle body vapor passage, or vapor hose, but does not include liquid gasoline in the nozzle spout.

E. "Fill pipe head" means upper portion of the fill pipe which would interface with the vapor recovery nozzle during refueling. The following fill pipe characteristics shall be the same among fill pipe heads sharing the same design:
   1. The exterior of the fill pipe from the sealing surface to a plane perpendicular to the fill pipe centerline that is located 12 mm beyond the sealing surface. Fill pipe sealing surface is defined in III.A.a.
   2. The internal locking lip depth from the sealing surface.
   3. The fill pipe outer diameter.
   4. The occurrence of and size of any orifices opening the fill pipe head to atmosphere.

Any changes to portions of the fill pipe not in the areas defined above do not constitute a changed fill pipe head design.

## III. General Design Specifications

The fill pipe and opening of the vehicle fuel tank shall conform to all specifications in the ISO standard "Road vehicles – Filler pipes and openings of motor vehicle fuel tanks – Vapour recovery system" (ISO-13331-1995(E)), as adopted June 1, 1995 and incorporated by reference herein, along with the modifications and additions below. For filler pipes with threaded-type caps, manufacturers may elect to use the alternate filler pipe sealing surface shape specified in the Society for Automotive Engineers (SAE) standard "Fuel Tank Filler Cap and Cap Retainer Threaded" (J1114), as amended August 4, 2005 and incorporated by reference herein. The alternate shape allowance would be used in lieu of Section 3.1 of ISO-13331-1995(E); all other provisions of ISO-13331-1995(E) would need to be met by a manufacturer utilizing the SAE J1114 provision~~, along with the modification below~~. If a manufacturer is changing the fill pipe head design on model year 2024 and subsequent model year vehicles, and is electing to use SAE J1114's alternate filler pipe sealing surface shape, the Alternate Shape 2 in Figure A below applies, along with the modifications in subsection (A) below, in lieu of the Alternate Shape of SAE J1114 as amended August 4, 2005. For the purpose of this section III, the manufacturer's vehicle fleet consists of the vehicles produced and delivered for sale by the manufacturer in California that are subject to this specification.

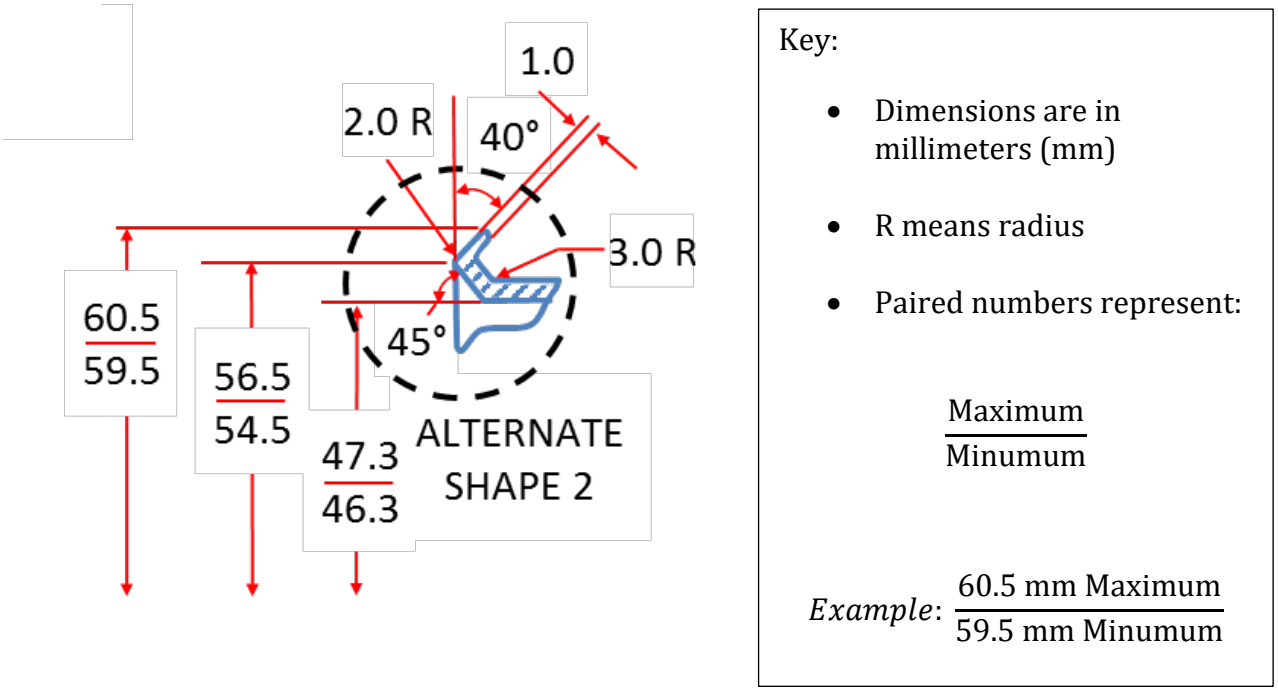



Figure A: Alternate Shape 2, cross-section of a vehicle fill pipe head.

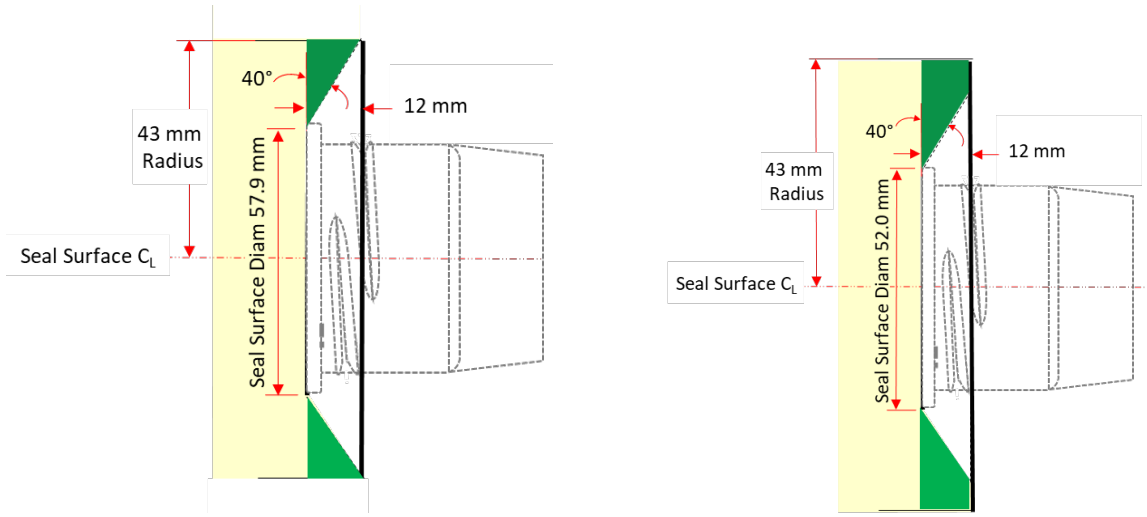
A. Fill pipe sealing surface, modifying or adding to ISO 13331-1995(E) ~~)), as adopted June 1, 1995~~ Section 3.1 as adopted June 1, 1995:

a. "Fill pipe sealing surface" means portion of the fill pipe face which would contact the vapor recovery nozzle boot face. ~~For purposes of this specification, this is the portion of the fill pipe face which would contact the 40 degree tapered zone in Figure A.~~

b. Diameter of the sealing surface of the fill pipe shall have a maximum diameter of ~~57.5 mm~~ 57.9 mm~~, and the convex portion shall have a maximum radius of 6 mm~~.

c. Fill ~~Pipe~~ pipe surfaces outside of the ~~57.5 mm~~ 57.9 mm diameter of the sealing surface are allowable so long as it does not infringe into the 40 degree tapered access zone, which extends to a ~~maximum~~ depth of 12 mm back from the sealing surface of the fill pipe as described in ~~Figure A~~ Figure B~~ access zone below~~.

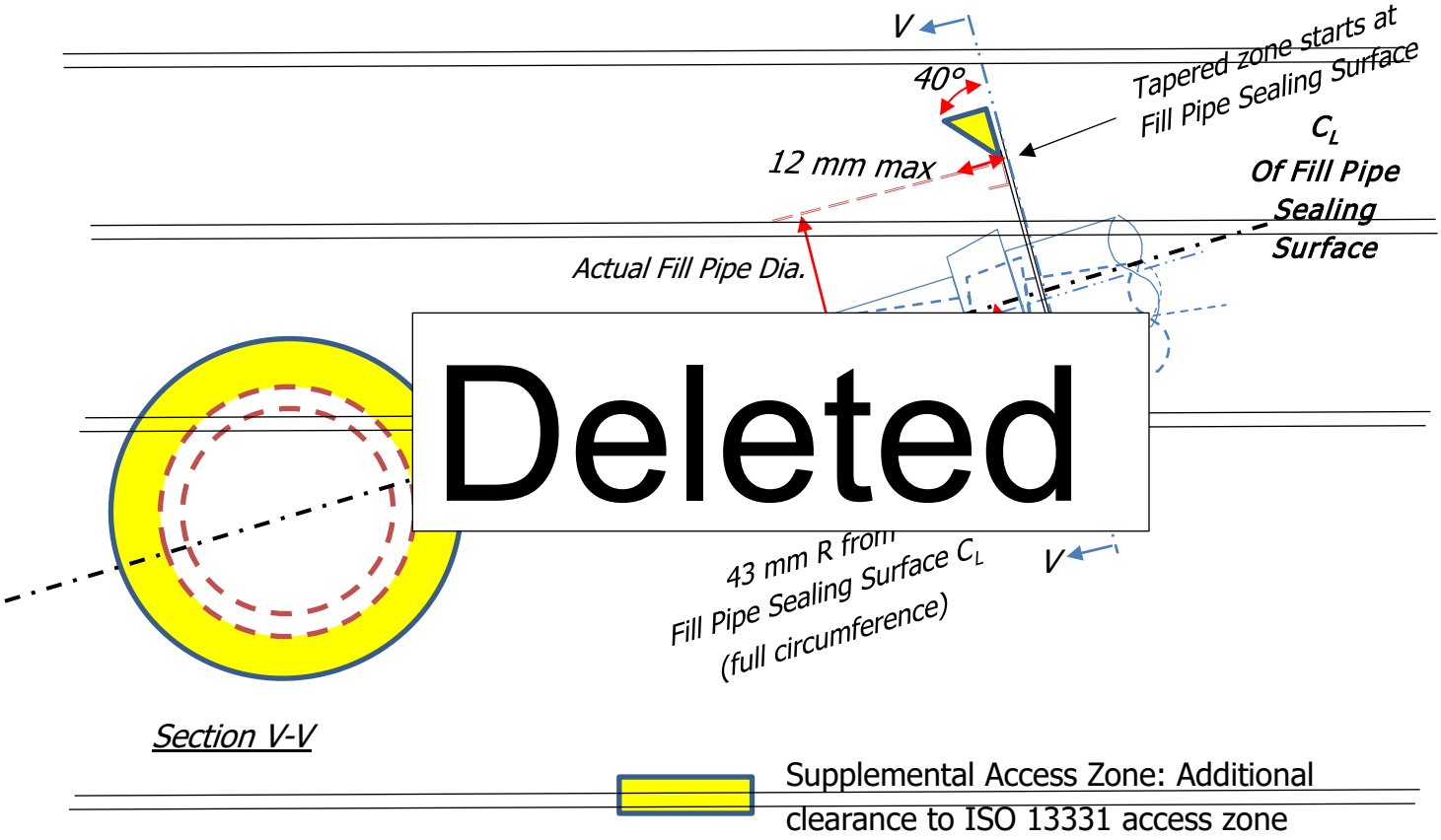
d. These added provisions apply only when a manufacturer is changing the design of their vehicle's fill pipe head for model year 2024 and subsequent vehicle fleets.




Green shaded area: additional access zone

Yellow shaded area: for reference only, represents shape of nozzle boot

Figure B: Additional access zone, showing how the zone shape changes when applied to fill pipes with different sealing surface diameters.




~~Figure A: Supplemental access zone~~

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B. Modify ~~Update~~ internal locking lip depth~~, modifying~~ of ISO 13331-1995(E) Section 3.2 as adopted June 1, 1995:

a. The depth of the lip shall not be less than 4 mm nor more than 11 mm into the filler pipe as measured in the reference plane, from the filler pipe sealing surface.

b. The depth of the locking lip shall be measured down to its deepest edge (edge facing the fuel tank).

c. This allowable depth range of the locking lip shall be maintained throughout at least 100 degrees of the inside circumference of the filler pipe, and extending to at least 35 degrees to either side of the reference plane.

d. This modification ~~update~~ applies only when a manufacturer is changing the design of their vehicle's fill pipe head for model year 2024 and subsequent vehicle fleets.

C. Modification ~~Supplement~~ to access zone, modifying ~~to~~ ISO-13331-1995(E) ~~section~~ Section 3.3:

a. The fill pipe and any other vehicle parts shall not occupy space defined by the additional ~~supplemental~~ access zone shown in ~~Figure A~~ Figure B in green ~~below~~. The additional ~~supplemental~~ access zone is centered on the axis of the fill pipe sealing surface's outer diameter, and applies around the entire perimeter of the fill pipe. The additional access zone shall line up flush with the seal surface as shown in Figure B. The yellow shaded area represents the shape of a nozzle boot and is shown for reference only.

b. This modification replaces the 2.5 mm dimension of the portion of the access zone described in Figure 5, view X of ISO-13331-1995(E).

c. This modification ~~supplement~~ applies only when a manufacturer is changing the design of their vehicle's fill pipe head for model year 2024 and subsequent vehicle fleets.

~~D. Fill pipe outer diameter modification, modifying (SAE) standard "Fuel Tank Filler Cap and Cap Retainer Threaded" (J1114), as amended August 4, 2005.~~

~~a. For the "Alternate Shape", the outermost diameter of the fuel tank cap retainer (the fill pipe) shall be a maximum of 57.9 mm and a minimum of 56.9 mm.~~

~~b. This modification applies only when a manufacturer is changing the design of their vehicle's fill pipe head for model year 2024 and subsequent vehicle fleets.~~

## IV. Fill Rate Specifications

A. The fill pipe on 2015 and subsequent model year vehicles shall accept a fill rate of 10 gallons per minute using the test procedure described in ~~Section 6~~ Section VII.

B. There shall be no premature nozzle shut-off in 90 percent of the test repetitions for any test nozzle using the test procedures described in ~~Section 6~~ Section VII.

## V. Spillage and Spitback Specifications

A. There shall be no more than 1 ~~millimeter~~ milliliter of liquid gasoline loss per test in 90 percent of the tests using the test procedures described in ~~Section 6~~ ~~Section 7~~ Section VII.

B. ~~There shall be no unlatching of the vapor recovery nozzle during dispensing or upon nozzle shut-off using the test procedure described in Section 6.~~ The nozzle shall remain in the normal resting position during dispensing and after nozzle shut-off using the test procedure described in ~~Section 7~~ Section VII.

## VI. Bench Leak Rate Specification

A. Nozzle to Fill Pipe Interface Bench Leak Rate:
   a. Bench Leak Rate: At 500 +/- 25 Pascal vacuum, the maximum allowable leak rate is 2.5 Standard Liters per Minute (SLPM), using the procedure described in ~~Section 8~~ Section VIII.
   b. The Bench Leak Rate s~~S~~hall be implemented based on the phase-in schedule in Section XII.
   c. A separate test shall be performed on each individual fill pipe head configuration.
   d. Manufacturers shall either provide an attestation that vehicle fill pipe meets the ~~proposed requirement~~ Bench Leak Rate when certifying or provide actual test data.

* * * *

## ~~VI.~~VII. Test Procedures: Fill Rate, Spillage, and Spitback

The following test procedures and test conditions shall be used for determining compliance with the Fill Rate, Spillage, and Spitback specifications in ~~Section 4 and 5~~ Sections IV and V.

* * * *

F. Each test shall be conducted as follows:

At the start of the test the fuel tank shall be approximately 10 percent of the nominal tank capacity. The nozzle to be ~~sued~~ used for dispensing gasoline shall be in the normal hands-off-latched position. The fill rate shall be the minimum rate necessary to demonstrate compliance with the applicable fill rate specification set forth in ~~Section 4~~ Section IV. The nozzle shall be allowed to dispense gasoline until automatic nozzle shut-off.

If a premature nozzle shut-off occurs, the nozzle shall be left in the fill pipe in the same position. Dispensing shall be resumed within 10 seconds at the fill rate specified in ~~Section 4~~ Section IV and dispensing shall continue until the fuel tank is filled to within 90 percent of the nominal fuel tank capacity or to within two gallons of the nominal fuel tank capacity, whichever corresponds to the smaller quantity of gasoline in the vehicle fuel tank.

G. A minimum of five tests with each ~~chose~~ chosen nozzle shall be completed to demonstrate compliance with the fill rate and spillage/spitback specifications. If there is any premature nozzle shut-off or instance of liquid gasoline loss greater than 1 ~~millimeter~~ milliliter during the first five ~~test~~ tests with any chosen nozzle, a minimum of ten tests with that nozzle shall be completed to demonstrate compliance with the fill rate and spillage/ spitback specifications.

* * * *

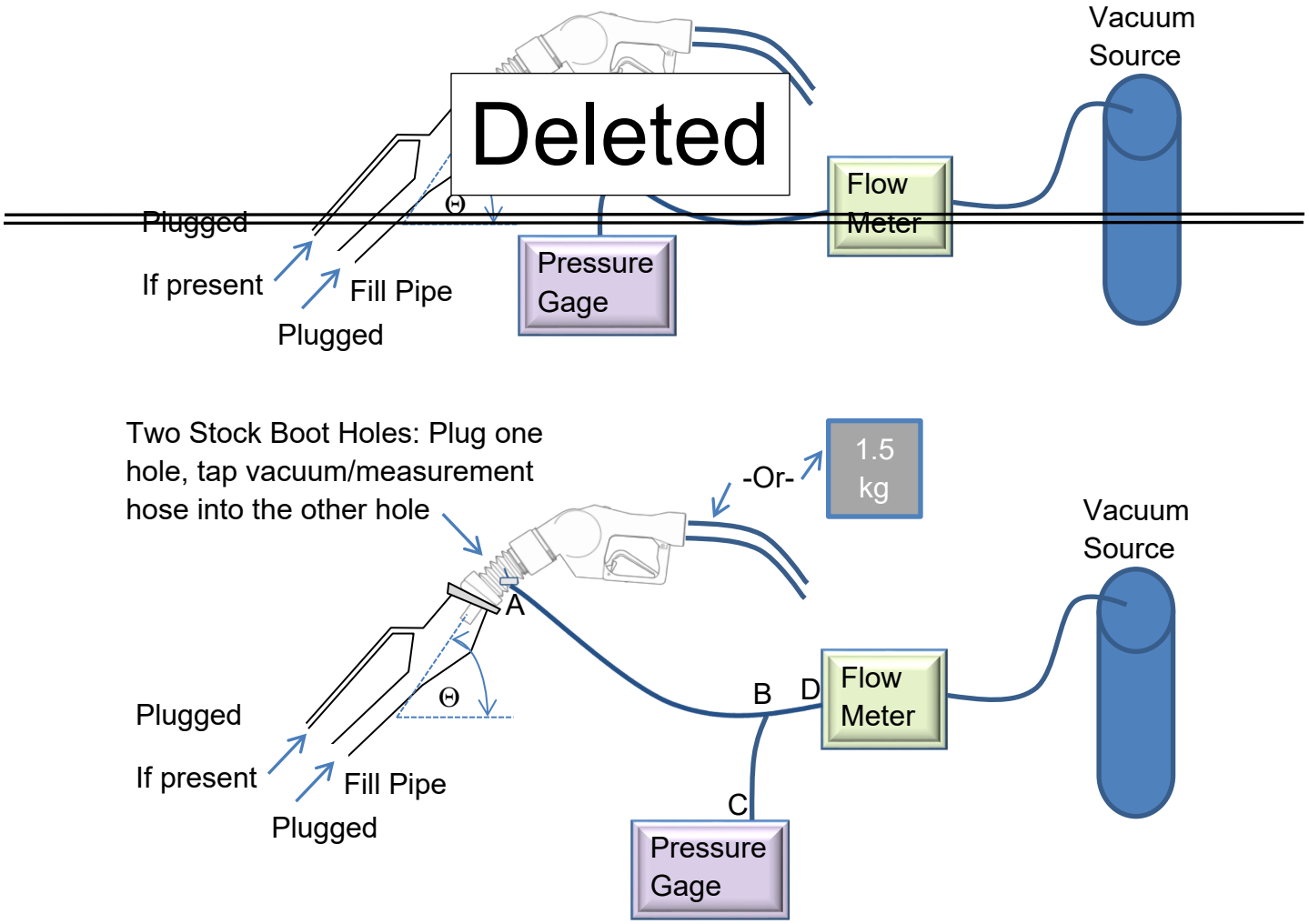
I. For fill pipe/tank configurations with fuel system designs unchanged from a prior model year, and which have been tested using the adopted test procedure or by an equivalent test procedure acceptable to the Executive Officer as specified in ~~Section 6.H~~ Section VII.H, the test results from the prior model year may be used for determining compliance to these specifications.

## VIII. Test Procedure: Bench Leak Rate

A. Secure the test fill pipe into the fill pipe mounting fixture.
   a. Fill pipe should be oriented such that:
      i. Fill pipe opening, at center, is at a height of ~~38 +/- 1~~ 37 +/- 2 inches above the ground.
      ii. Pipe axis angle with respect to horizontal shall be ~~30~~ 32 +/- 2 degrees.

* * * *

B. Interconnect the fill pipe, flow meter, pressure gage, and vacuum source, as shown in ~~Figure B~~ Figure C.
   a. Vacuum and Pressure/Flow measurement ~~can occur at different locations in this apparatus, so long as it is representative of what is occurring~~ hose shall be routed inside the assist vapor recovery nozzle's (assist nozzle[1]) boot.




~~Figure B~~Figure C: Set-up of Testing Equipment

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E. ~~The two pre-existing holes in the boot of the nozzle shall either be plugged or the hole(s) can be used for routing the vacuum source into the nozzle.~~ One of the two pre-existing holes in the boot of the assist nozzle shall be used for routing the hose that connects the vacuum source, pressure gage, and flow meter into the nozzle, and the other hole shall be plugged.

F. The hose dimensions shall be as indicated in Table 1.

Table 1: Hose dimensions for bench leak test

| Location (between points in Figure C) | Hose Length (inches) | Hose Inner Diameter (inches) |
|---|---|---|
| A-B | 128 +/-2 | 3/16 to 1/4 |
| B-C | 40 +/-2 | 3/16 to 1/4 |
| B-D | 16 +/-2 | 3/16 to 1/4 |

G. Latch an assist ~~type vapor recovery~~ nozzle into the fill pipe using a natural motion as you would when filling up your own car at a gas station.
H. Hose should form a “U” shape, and be within 6-12 inches from the ground at its lowest point. As an alternative to the hose, attach a 1.5 kg weight to the nozzle, at the end where a hose would normally connect to.
I. Adjust the vacuum source until a vacuum level is stabilized to vary no more than 500 +/- 50 Pascal over a two minute period during which no adjustments are made.
    a. Record the flow rate at a vacuum of 500 +/- 25 Pascal.
J. The above ~~measurement~~ procedure shall be repeated with five more ~~fill pipes~~ iterations with the same fill pipe head design.
K. The average of the six flow rate measurements shall meet the specification as indicated in ~~Section 6~~ Section VI.

[1] For specifications for assist vapor recovery nozzles, see the most recent version of CARB Executive Order VR-202, incorporated by reference herein.

**~~VII.~~IX. Specifications to Reduce Damage to Vapor Recovery Nozzles**

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**~~VIII.~~X. Fill Pipe Assembly and Restriction Device Durability and Other Specifications**

A. The manufacturer of each motor vehicle shall warrant to the ultimate purchaser and each subsequent purchaser that he vehicle is: (1) designed, built, and equipped so as to conform, at the time of sale, with the specifications in ~~Sections 4, 5, 7, 8.B, and 8.C~~ Sections IV, V, IX, X.B, and X.C herein, and (2) free from defects in materials and workmanship which cause the fill pipe assembly, including restriction device, to fail to conform to the specifications in ~~Sections 4, 5, 7, 8.B, and 8.C~~ Sections IV, V, IX, X.B, and X.C herein for the useful life of the vehicle as defined in Section 2035 of Title 13, California Code of Regulations. The provision of Sections 2037 (d) – (k), 2038, 2039, 2040, and 2041 of Title 13, California Code of Regulations, shall be applicable to the warranty. The fill pipe assembly, including restriction device, shall be subject to vehicle emissions related defects report and vehicle or engine recall procedures in Title 13, Chapter 3, Subchapter 2, Article 2, California Code of Regulations.

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## ~~IX.~~XI. Exemption of Vehicles

A. A manufacturer may apply for an exemption from the fill pipe and fuel tank opening specifications in ~~paragraphs 3 through 810~~ Sections III through X for any of its vehicles by applying in writing to the Executive Officer. Application should be submitted at least 60 days prior to the manufacturer's date for final design commitment. The application shall set forth:

1. the specific models for which the exemption is sought;

2. for each such model all facts which demonstrate that compliance with the specifications is technologically infeasible; and

3. evidence showing what efforts have been and will be made by the manufacturer to overcome technological infeasibility, and what the state-of-art technology and problems consist of.

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## XII. Phase-in schedule

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B. For each model year, a manufacturer shall certify, at a minimum, the specified percentage of its vehicle fleet to these standards according to the implementation schedule set forth below. For the purpose of this section XII, the manufacturer's vehicle fleet consists of the ~~vehicles produced and delivered for sale by the manufacturer in California that are subject to this specification~~ manufacturer's projected California sales volume of vehicles that are subject to this specification.

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