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August 30, 2016

FIRST-CLASS MAIL
ELECTRONIC SUBMITTAL

Matthew Holmes
Air Resources Engineer, Testing and Certification Section
c/o Clerk of the Board, Air Resources Board
1001 I Street
Sacramento, CA 95814

Re: Proposed Amendments to The Portable Fuel Containers Regulation

Dear Mr. Holmes:

We are writing on behalf of our client The Portable Fuel Container Manufacturers Association (PFCMA) to comment on the amendments the ARB is proposing to its Portable Fuel Container Regulations as published on August 15, 2016, including attachments 1, 2, 3 and 4 to that notice.

The PFCMA appreciates your having accepted many of our previously suggested amendments. We still believe, however, that 2 more amendments are necessary.

First, the requirement to send 14 cans to the ARB prior to testing is overly burdensome, and will cause unnecessary significant and avoidable delays in the manufacturer's attempt to bring certified products into the marketplace.

Secondly, the PFCMA believes that an additional, alternative test method, as attached hereto, using a "FID" test procedure should be incorporated into these regulations and adopted by the ARB. Such a test method will prove to be more accurate and reliable than the current test methods contained in CP-501, TP 501 and TP 502.

We would be happy to discuss our suggestions further with you at your convenience.

Sincerely,

James Mattesich

Enclosures

SAC 442772848v1

SGS-TSG Portable Fuel Container Certification Alternate Procedure (EPA & ARB Certification)

1. INTRODUCTION

1.1 This document specifies a test procedure which combines the certification testing requirements from ARB TP-501, ARB TP-502 and 40 CFR Part 59.653. Independent approval from CARB and EPA is required to use this test program for certification.

2 PURPOSE

2.1 The goal of this document is to create a single test procedure which will achieve ARB and EPA portable fuel container evaporative emissions certification compliance.

3 FOREWORD

3.1 This test procedure applies to any PFC manufacturer.

4 PROCEDURES REFERENCED

4.1 USEPA 40 CFR part 59.653

4.2 ARB TP-501 and ARB TP-502

5 RESOURCES REQUIRED

5.1 A ventilated, temperature-conditioned enclosure capable of controlling the internal air temperature from 18.3°C to 40.6°C with a tolerance of 1.1°C. The enclosure shall be capable of producing a variable temperature profile as specified in Table 9-1.

5.2 Sealed Housing Evaporative Determination (SHED) is used to measure diurnal emissions. This method subjects PFC’s to a preprogrammed temperature profile while maintaining a constant pressure and continuously sampling for hydrocarbons with a Flame Ionization Detector (FID). The volume of a SHED enclosure can be accurately determined. The mass of total hydrocarbons that emanates from a PFC over the test period is calculated using the ideal gas equation.

5.3 One or more scales with a capable maximum mass measurement of not less than 120% of the mass of the filled container for which it is being used.

For mass measurements more than 6,200 grams, the minimum sensitivity of the scale must be 0.1-grams; for mass measurements less than or equal to 6,200-grams, the minimum sensitivity must be 0.01-grams.

5.4 NIST-traceable mass standards which will be used to verify scale measurements. The interval for scale verification will not be greater than three (3) months.

5.5 A barometric pressure instrument capable of measuring atmospheric pressure at the location of the scale to within ± 70 Pa

5.6 A relative humidity measurement instrument capable of measuring the relative humidity at the location of the scale with a sensitivity of ± 2% RH.

6 EQUIPMENT

6.1 The equipment/instrumentation necessary to perform evaporative emission testing for PFC's is the same instrumentation used for passenger cars and light duty vehicles, and is described in 40 CFR 86.107-96. The ARB will consider data generated with SHEDs as valid if approved as an alternative test procedure.

6.2 Diurnal Evaporative Emission Measurement Enclosure

References to methanol in this test procedure can be disregarded.

6.3 The diurnal evaporative emissions measurement enclosure shall be equipped with an internal blower or blowers coupled with an air temperature management system (typically air to water heat exchangers and associated programmable temperature controls) to provide for air mixing and temperature control.

6.4 The blower(s) shall provide a nominal total flow rate of 0.8 ± 0.2 ft3 /min per ft3 of the nominal enclosure volume, Vn.

6.5 The inlets and outlets of the air circulation blower(s) shall be configured to provide a well-dispersed air circulation pattern that produces effective internal mixing and avoids significant temperature or hydrocarbon and alcohol stratification.

6.6 The discharge and intake air diffusers in the enclosure shall be configured and adjusted to eliminate localized high air velocities which could produce non-representative heat transfer rates between the engine fuel tank(s) and the air in the enclosure.

6.7 The air circulation blower(s), plus any additional blowers if required, shall maintain a homogeneous mixture of air within the enclosure. The enclosure temperature shall be taken with thermocouples located 3 feet above the floor at the approximate mid-length of each side wall of the enclosure and within 3 to 12 inches of each side wall.

6.8 The temperature conditioning system shall be capable of controlling the internal enclosure air temperature to follow the prescribed temperature versus time cycle as specified in 40 CFR §86.133-90 as modified by paragraph III.D.10 (diurnal breathing loss test) of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" within an instantaneous tolerance of ± 3.0o F and an average tolerance of ± 2.0o F as measured by side wall thermocouples.

6.9 The control system shall be tuned to provide a smooth temperature pattern, which has a minimum of overshoot, hunting, and instability about the desired long term temperature profile.

6.10 The enclosure shall be of sufficient size to contain the test equipment with personnel access space. It shall use materials on its interior surfaces, which do not adsorb or desorb hydrocarbons, or alcohols (if the enclosure is used for alcohol-fueled vehicles).

6.11 The enclosure shall be insulated to enable the test temperature profile to be achieved with a heating/cooling system, which has minimum surface temperatures in the enclosure no less than 25.0o F below the minimum diurnal temperature specification.

6.12 The enclosure shall be equipped with a pressure transducer with an accuracy and precision of ± 0.1 inches H_2O. The enclosure shall be constructed with a minimum number of seams and joints, which provide potential leakage paths. Particular attention shall be given to sealing and gasketing of such seams and joints to prevent leakage.

6.13 The enclosure shall be equipped with features, which provide for the effective enclosure volume to expand and contract in response to both the temperature changes of the air mass in the enclosure, and any fluctuations in the ambient barometric pressure during the duration of the test. Either a variable volume enclosure or a fixed volume enclosure may be used for diurnal emission testing.

6.14 A variable volume enclosure shall have the capability of latching or otherwise constraining the enclosed volume to a known, fixed value, Vn.

6.15 The Vn shall be determined by measuring all pertinent dimensions of the enclosure in its latched configuration, including internal fixtures, based on a temperature of 84o F, to an accuracy of ± 1/8 inch (0.5 cm) and calculating the net Vn to the nearest 1 ft3 . In addition, Vn shall be measured based on a temperature of 65o F and 105o F.

6.16 The latching system shall provide a fixed volume with an accuracy and repeatability of 0.005xVn. Two potential means of providing the volume accommodation capabilities are; a moveable ceiling which is joined to the enclosure walls with a flexure, or a flexible bag or bags of Tedlar or other suitable materials, which are installed in the enclosure and provided with flowpaths which communicate with the ambient air outside the enclosure. By moving air into and out of the bag(s), the contained volume can be adjusted dynamically. The total enclosure volume accommodation shall be sufficient to balance the volume changes produced by the difference between the extreme enclosure temperatures and the ambient laboratory temperature with the addition of a superimposed barometric pressure change of 0.8 in. Hg.

6.17 A minimum total volume accommodation range of ± 0.07xVn shall be used. The action of the enclosure volume accommodation system shall limit the differential between the enclosure internal pressure and the external ambient barometric pressure to a maximum value of ± 2.0 inches H2O.

6.18 The fixed volume enclosure shall be constructed with rigid panels that maintain a fixed enclosure volume, which shall be referred to as Vn. Vn shall be determined by measuring all pertinent dimensions of the enclosure including internal fixtures to an accuracy of ± 1/8 inch (0.5 cm) and calculating the net Vn to the nearest 1 ft3 .

6.19 The enclosure shall be equipped with an outlet flow stream that withdraws air at a low, constant rate and provides makeup air as needed, or by reversing the flow of air into and out of the enclosure in response to rising or falling temperatures. If inlet air is added continuously throughout the test, it must be filtered with activated carbon to provide a relatively constant hydrocarbon and alcohol level.

6.20 Any method of volume accommodation shall maintain the differential between the enclosure internal pressure and the barometric pressure to a maximum value of ±2.0inches of water. The equipment shall be capable of measuring the mass of hydrocarbon, and alcohol (if the enclosure is used for alcohol-fueled equipment) in the inlet and outlet flow streams with a resolution of 0.01 gram. A bag sampling system may be used to collect a proportional sample of the air withdrawn from and admitted to the enclosure.

6.21 Alternatively, the inlet and outlet flow streams may be continuously analyzed using an online Flame Ionization Detector (FID) analyzer and integrated with the flow measurements to provide a continuous record of the mass hydrocarbon and alcohol removal. An online computer system or strip chart recorder shall be used to record the following parameters during the diurnal evaporative emissions test sequence:-

- Enclosure internal air temperature
- Diurnal ambient air temperature specified profile as defined in 40 CFR §86.133-90 as modified in paragraph III.D.10 of the “California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles” (diurnal breathing loss test).
- Enclosure internal pressure
- Enclosure temperature control system surface temperature(s)
- FID output voltage recording the following parameters for each sample analysis
- zero gas and span gas adjustments
- zero gas reading
- enclosure sample reading
- zero gas and span gas readings

6.22 The data recording system shall have a time resolution of 30 seconds and shall provide a permanent record in magnetic, electronic or paper media of the above parameters for the duration of the test.

6.23 Other equipment configurations may be used if approved in advance by the Executive Officer. The Executive Officer shall approve alternative equipment configurations if the manufacturer demonstrates that the equipment will yield test results equivalent to those resulting from use of the specified equipment.

6.24 Calibrations of the SHED

6.25 Evaporative emission enclosure calibrations are specified in 40 CFR §86117-90. Methanol measurements may be omitted when methanol-fueled engines will not be tested in the evaporative enclosure. Amend 40 CFR §86.117-90 to include an additional subsection 1.1, to read: The diurnal evaporative emission measurement enclosure calibration consists of the following parts: initial and periodic determination of enclosure background emissions, initial determination of enclosure volume, and periodic hydrocarbon (HC) and methanol retention check and calibration. Calibration for HC and methanol may be conducted in the same test run or in sequential test runs.

6.26 The initial and periodic determination of enclosure background emissions shall be conducted according to the procedures specified in §86.117-90(a)(1) through (a)(6).

6.27 The enclosure shall be maintained at a nominal temperature of 105.0oF throughout the four-hour period. Variable volume enclosures may be operated either in the latched volume configuration, or with the variable volume feature active. Fixed volume enclosures shall be operated with inlet and outlet flow streams closed.

6.28 The allowable enclosure background emissions of HC and/or methanol as calculated according to 40 CFR §86.117-90(a)(7) shall not be greater than 0.05 grams in 4 hours. The enclosure may be sealed and the mixing fan operated for a period of up to 12 hours before the initial HC concentration reading (CHCi) and the initial methanol concentration reading (CCH3OHi) is taken and the four-hour background measurement period begins.

6.29 The initial determination of enclosure internal volume shall be performed according to the procedures specified in paragraph I.A.1.3 of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles." If the enclosure will be used for hot soak determination, the determination of enclosure internal volume shall also be performed based on 105oF.

6.30 The HC and methanol measurement and retention checks shall evaluate the accuracy of enclosure HC and methanol mass measurements and the ability of the enclosure to retain trapped HC and methanol.

6.31 The check shall be conducted over a 24-hour period with all of the normally functioning subsystems of the enclosure active.

6.32 A known mass of propane and/or methanol shall be injected into the enclosure and an initial enclosure mass measurement(s) shall be made.

6.33 The enclosure shall be subjected to the temperature cycling specified in paragraph III.D.10.1.7 of the "California Evaporative Emission Standards and Test Procedures 7 for 2001 and Subsequent Model Motor Vehicles" (revising 40 CFR §86.133-90(l) for a 24-hour period.

6.34 The temperature cycle shall begin at 105F (hour 11) and continue according to the schedule until a full 24-hour cycle is completed.

6.35 A final enclosure mass measurement(s) shall be made. The following procedure shall be performed prior to the introduction of the enclosure into service and following any modifications or repairs to the enclosure that may impact the integrity of this enclosure; otherwise, the following procedure shall be performed on a monthly basis. (If six consecutive monthly retention checks are successfully completed without corrective action, the following procedure may be determined quarterly thereafter as long as no corrective action is required.)

6.36 (A) Zero and span the HC analyzer.

6.37 (B) Purge the enclosure with atmospheric air until a stable enclosure HC level is attained.

6.38 (C) Turn on the enclosure air mixing and temperature control system and adjust it for an initial temperature of 105.0o F and a programmed temperature profile covering one diurnal cycle over a 24 hour period according to the profile specified in paragraph III.D.10.1.7. Of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles" (revising 40 CFR §86.133-90).Close the enclosure door. On variable volume enclosures, latch the enclosure to the enclosure volume measured at 105o F. On fixed volume enclosures, close the outlet and inlet flow streams.

6.39 (D) When the enclosure temperature stabilizes at 105.0o F ± 3.0oF seal the enclosure; measure the enclosure background HC concentration (CHCe1) and/or background methanol concentration (CCH3OH1) and the temperature (T1), and pressure (P1) in the enclosure.

6.40 (E) Inject into the enclosure a known quantity of propane between 2 to 6 grams and a known quantity of methanol in gaseous form between 2 to 6 grams. For evaporative emission enclosures that will be used for testing equipment subject to the standards shown in Table 2-1, use a known amount of propane or gaseous methanol between 0.5 to 1.0 grams. The injection method shall use a critical flow orifice to meter the propane and/or methanol at a measured temperature and pressure for a measured time period. Techniques that provide an accuracy and precision of ± 0.5 percent of the injected mass are also acceptable. Allow the enclosure internal HC and/or methanol concentration to mix and stabilize for up to 300 seconds. Measure the enclosure HC concentration (CHCe2) and/or the enclosure methanol concentration (CCH3OH2). For fixed volume enclosures, measure the temperature (T2) and pressure in the enclosure (P2). On variable volume enclosures, unlatch the enclosure. On fixed volume enclosures, open the outlet and inlet flow streams. Start the temperature cycling function of the enclosure air mixing and temperature control system. These steps shall be completed within 900 seconds of sealing the enclosure.

6.41 (F) For fixed volume enclosures, calculate the initial recovered HC mass (MHCe1) according to the following formula:

6.42 MHCe1 = (3.05 x V x 10-4 x [P2 (CHCe2 - rCCH3OH2)/T2 - P1 (CHCe1 - rCCH3OH1)/T1])

Where:

V is the enclosure volume at 105oF (ft3)

P1 is the enclosure initial pressure (inches Hg absolute)

P2 is the enclosure final pressure (inches Hg absolute) CHCen is the enclosure HC concentration at event n (ppm C)

CCH3OHn is the enclosure methanol concentration calculated according to 40 CFR §86.117-90 (d)(2)(iii) at event n (ppm C)

r is the FID response factor to methanol T1 is the enclosure initial temperature (oR)

T2 is the enclosure final temperature (oR)

For variable volume enclosures, calculate the initial recovered HC mass and initial recovered methanol mass according to the equations used above except that P2 and T2 shall equal P1 and T1.

6.43 Calculate the initial recovered methanol mass (MCH3OH1) according to 40 CFR §86.117-96(d)(1), as amended March 24, 1993

6.44 If the recovered HC mass agrees with the injected mass within 2.0 percent and/or the recovered methanol mass agrees with the injected mass within 6.0 percent, continue the test for the 24 hour temperature cycling period. If the recovered mass differs from the injected mass by greater than the acceptable percentage(s) for HC and/or methanol, repeat the enclosure concentration measurement in step (E) and recalculate the initial recovered HC mass (MHCe1) and/or methanol mass (MCH3OH1). If the recovered mass based on the latest concentration measurement agrees within the acceptable percentage(s) of the injected mass, continue the test for the 24-hour temperature cycling period and substitute this second enclosure concentration measurement for CHCe2 and/or CCH3OH2 in all subsequent calculations.

6.45 In order to be a valid calibration, the final measurement ofCHCe2 and CCH3OH2 shall be completed within the 900-second time limit outlined above. If the discrepancy persists, the test shall be terminated and the cause of the difference determined, followed by the correction of the problems(s) and the restart of the test

6.46 (G) At the completion of the 24-hour temperature cycling period, measure the final enclosure HC concentration (CHCe3) and/or the final enclosure methanol concentration (CCH3OH3).

6.47 For fixed-volume enclosures, measure the final pressure (P3) and final temperature (T3) in the enclosure or fixed volume enclosures, calculate the final recovered HC mass (MHCe2) as follows:

MHCe2 = [3.05 x V x 10-4 x(P3 (CHCe3 - rCCH3OH3)/T3 - P1 (CHCe1 - rCCH3OH1)/T1)] + MHC,out - MHC, in

Where:

- V is the enclosure volume at 105oF (ft3)
- P1 is the enclosure initial pressure (inches Hg absolute)
- P3 is the enclosure final pressure (inches Hg absolute)
- CHCe3 is the enclosure HC concentration at the end of the 24-hour
- temperature cycling period (ppm C)
- CCH3OH3 is the enclosure methanol concentration at the end of the 24-hour temperature cycling period, calculated according to 40 CFR §86.117-909 (d)(2)(iii) (ppm C)
- r is the FID response factor to methanol
- T1 is the enclosure initial temperature (oR)
- T3 is the enclosure final temperature (oR)
- MHC,out is mass of HC exiting the enclosure, (grams)
- MHC,in is mass of HC entering the enclosure, (grams)

For variable volume enclosures, calculate the final recovered HC mass and final recovered methanol mass according to the equations used above except that P3 and T3 shall equal P1 and T1, and MHC, out and MH, in shall equal zero.
Calculate the final recovered methanol mass (MCH3OH2) according to 40 CFR §86.117-96(d)(1), as amended March 24, 1993.

6.48 (H) If the calculated final recovered HC mass for the enclosures is not within 3 percent of the initial enclosure mass, or if the calculated final recovered methanol mass for the enclosures is not within 6 percent of the initial enclosure mass, then All devices reporting a numerical measurement must be traceable, in an unbroken chain, to a known national standard such as NIST. The instruments shall be calibrated by an independent accredited calibration facility and scheduled calibration will be determined the accredited laboratory performing this alternate test procedure.

7 FACILITIES

7.1 This procedure must be conducted at SGS Testing Services Group, in Lapeer, Michigan or at an Independent ISO 17025-2005 Accredited Laboratory which possesses the required test facilities and associated resources.

8 CERTIFICATION FUEL

8.1 The specification for gasoline to be used for testing is given in USEPA 40 CFR 1065.710. Use the grade of gasoline specified for general testing. Blend this grade of gasoline with reagent grade ethanol in a volumetric ratio of 90.0 percent gasoline to 10.0 percent ethanol. You may use ethanol that is less pure if you can demonstrate that it will not affect your ability to demonstrate compliance with the applicable emission standards

8.2 Indolene + 10% Ethanol is an acceptable test fuel per ARB and EPA. Gage Products, a fuels supplier, identifies this fuel as “CN-40889”. The RVP of this fuel should exceed 9.5-PSI

9 GENERAL TESTING PROVISIONS

9.1 The sample set is comprised of a total of seven (7), production intent PFC systems (includes all attachments). Six (6) PFC systems will be used for testing with the last as a reference container.

9.2 The PFC manufacturer shall show good engineering judgment to determine the “worst performing” (i.e. evaporative emissions) product size.

9.3 You must test the portable fuel container as described in your application, with the applicable spout attached except as otherwise noted. Tighten fittings in a manner representative of how they would be tightened by a typical user.

9.4 Accuracy and precision of all temperature measurements must be ±2.2 °C or better.

9.5 Incorrectly installed spouts can bias the reported results.

10 ALTERNATE METHODS

10.1 Any Alternate Test Methods MUST be approved by the USEPA and California Air Resources Board authorized personnel.

11 METAL/OTHER PORTABLE FUEL CONTAINERS

11.1 For metal containers, you may demonstrate for certification that your portable fuel containers comply with the evaporative emission standards without performing the pre-soak or container durability cycles (i.e., the pressure cycling, UV exposure, and slosh testing).

11.2 For other containers, you may demonstrate compliance without performing the durability cycles specified in this section only if ARB and EPA approve it after presenting data that clearly demonstrates that the cycle or cycles do not negatively impact the permeation rate of the materials used in the containers

12 SYSTEM PREPARATION

12.1 Fill the portable fuel container to its rated capacity with *certification fuel* and attach the spout per manufacturer's instructions. This assembly is now considered a "PFC system".

13 INITIAL LEAK CHECK

13.1 Invert the PFC system with the spout pointing down in a vertical axial position for a period of five (5) minutes. Any leak from any point in the PFC system during this five minute period constitutes a failure. Record the outcome on the data sheet.

If the PFC system is observed to be leaking, place the PFC system in the upright position and ensure that the spout is correctly and firmly attached. Invert the container again for a period of five (5) minutes and check for leaks. Record the outcome on the data sheet.

14 INITIAL SPOUT ACTUATION

The initial spout actuation can be performed at a temperature of +43°C ±5°C. This time can be considered as part of the 70-day soak period.

14.1 Verify that the PFC systems contain certification fuel filled to the noted nominal capacity and that the spout is installed per the manufacturer's instructions. Record the amount of fuel verified and the temperature of the environment at which the spouts are installed.

14.2 Check the leak tightness of the PFC systems by raising the ambient temperature at least 14°C (25°F) for a minimum of two hours. This should slightly expand the systems. If any of the containers do not show signs of expansion, there may be a leak.

For any container that does not show signs of expansion, allow the container and fuel to return to the temperature at which the spout was installed. Remove and install the spout per the manufacturer's instructions, and record the temperature at which the spout is installed. Place the container in an environment that is at least 14°C (25°F) warmer than the temperature at which the spout was installed for a minimum of two hours.

14.3 After removing the PFC system from the elevated temperature environment submerge it in a water bath large enough to submerge the entire container to a depth of at least six (6) inches. Tilt the container back and forth while submerged to dislodge any air from external cavities. Wait at least 30-seconds. Any bubbles coming from the container denotes a leak.

No repairs may be performed unless documentation from the manufacturer or independent laboratory performing the test is provided. Leaks, repairs or adjustments shall be listed on the data sheet. For PFC systems with leaks that cannot be repaired without the use of tools, sealant, etc., those containers and spouts shall be removed from testing and the failure documented on the data sheet.

14.4 Remove the PFC system from the water bath and dry off all excess water from the exterior surfaces.

14.5 Actuate the spout, by fully opening and closing without dispending fuel, to relieve pressure. Take care to point the spout away from the user.

14.6 Slowly invert the PFC system and keep it inverted for at least five (5) seconds to ensure that the spout and mechanisms become saturated with fuel. Any fuel leaking from any part of the PFC systems will denote a leak and shall be reported on the data sheet as a failure.

14.7 Once completed, place the container on a flat horizontal surface in the upright position.

14.8 With the PFC system in the upright position, actuate the spout by fully opening and closing without dispensing fuel. The spout shall return to the closed position without the aid of the operator (e.g. operator pushing or pulling the spout closed).

14.9 Repeat for a total of ten (10) actuations. If at any point the spout fails to return to the closed position, the container fails the test.

14.10 Repeat the steps in 14.6, 14.7, 14.8 and 14.9.

14.11 After twenty (20) actuations are completed, remove and replace the spout to simulate filling the container.

14.12 Repeat the steps in 14.6, 14.7, 14.8, 14.9, 14.10 and 14.11 no more than once per day, nine more times until two hundred spout actuations and ten (10) spout replacements are completed in a minimum ten (10) day period.

14.13 Record the dates and number of spout actuations and replacements completed on the data sheet.

15 DURABILITY/EVAPORATIVE EMISSIONS PRECONDITIONING

You may complete the pressure/vacuum, UV and slosh in any order unless it is determined that omission of one or more of these durability tests will not affect the emissions from your container may

The time required to perform the following durability tests may count as part of the 70-day preconditioning fuel soak as long as the temperature remains within +43°C ±5°C and the container maintains a certification fuel volume of at least 50% of nominal capacity.

During the durability tests, certification fuel may be added or replaced as needed to maintain the required liquid level.

The estimated duration of the durability/evaporative emissions preconditioning test is 73-days. This satisfies the 70-day elevated temperature soak requirement for ARB and EPA.

15.1 Pressure cycling. Perform a pressure test by sealing the container and cycling it between + 13.8 and −1.7 kPa (+ 2.0 and −0.5 psig) for 10,000 cycles at a rate of 60 seconds per cycle. For this test, the spout may be removed and the pressure applied through the opening where the spout attaches. The purpose of this test is to represent environmental wall stresses caused by pressure changes and other factors (such as vibration or thermal expansion). If your container cannot be tested using the pressure cycles specified by this paragraph, you may ask to use special test procedures.

15.2 UV exposure. Perform a sunlight-exposure test by exposing the container to an ultraviolet light of at least 24 W/m2 (0.40 W-hr/m2/min) on the container surface for at least 450 hours. Alternatively, the container may be exposed to direct natural sunlight for an equivalent period of time, as long as you ensure that the container is exposed to at least 450 daylight hours.

15.3 Slosh testing. Perform a slosh test by filling the portable fuel container to 40 percent of its capacity with the certification fuel and rocking it at a rate of 15 cycles per minute until you reach one million total cycles. Use an angle deviation of + 15° to −15° from level

16 POST-DURABILITY/EVAPORATIVE EMISSION PRECONDITIONING SPOUT ACTUATION

16.1 After 70-days of elevated temperature soak, conduct the following spout actuation:

16.1.1 Slowly invert the PFC system and keep it inverted for at least five (5) seconds to ensure that the spout and mechanisms become saturated with fuel. Any fuel leaking from any part of the PFC systems will denote a leak and shall be reported on the data sheet as a failure.

16.1.2 Once completed, place the container on a flat horizontal surface in the upright position.

16.1.3 With the PFC system in the upright position, actuate the spout by fully opening and closing without dispensing fuel. The spout shall return to the closed position without the aid of the operator (e.g. operator pushing or pulling the spout closed).

16.1.4 Repeat for a total of ten (10) actuations. If at any point the spout fails to return to the closed position, the container fails the test.

16.1.5 Repeat the steps in 16.1.1, 16.1.2, 16.1.1.3 and 16.1.4.

16.1.6 After twenty (20) actuations are completed, remove and replace the spout to simulate filling the container.

16.1.7 Repeat the steps in 16.1.1, 16.1.2, 16.1.1.3 and 16.1.4, no more than once per day, nine more times until two hundred spout actuations and ten (10) spout replacements are completed in a minimum ten (10) day period.

16.1.8 Record the dates and number of spout actuations and replacements completed on the data sheet.

17 DIURNAL TEST VIA SHED METHOD

17.1 At the conclusion of the post-durability/evaporative emissions preconditioning soak, drain the PFC systems of the certification fuel and immediately refill to 50% of nominal capacity. Be careful not to spill any fuel onto the container. Record the volume of fuel dispensed into each container on the data sheet.

17.2 Install the spout assembly that will be used in the production containers. Torque the closure to the manufacturer's design intent. All manual closures such as caps must be left off the container and spout during testing.

17.3 For the six (6) PFC systems under test, perform the following leak check:

17.3.1 Check the leak tightness of the PFC systems by raising the ambient temperature at least 14°C (25°F) for a minimum of two hours. This should slightly expand the systems. If any of the containers do not show signs of expansion, there may be a leak.

For any container that does not show signs of expansion, allow the container and fuel to return to the temperature at which the spout was installed. Remove and install the spout per the manufacturer's instructions, and record the temperature at which the spout is installed. Place the container in an environment that is at least 14°C (25°F) warmer than the temperature at which the spout was installed for a minimum of two hours.

17.3.2 After removing the PFC system from the elevated temperature environment submerge it in a water bath large enough to submerge the entire container to a depth of at least six (6) inches. Tilt the container back and forth while submerged to dislodge any air from external cavities. Wait at least 30-seconds. Any bubbles coming from the container denotes a leak.

17.4 Remove the PFC systems from the water bath and dry off all excess water from the exterior surfaces.

17.5 Stabilize the fuel temperature within the portable fuel container at 18.3°C ± 1.1°C for a minimum of 6 hours. Vent the container at this point to relieve any positive or negative pressure that may have developed during stabilization.

17.6 After the18c stabilization, purge the SHED to reduce the hydrocarbon concentration to background levels (< 10 ppmC). Cool the enclosure to attain a wall temperature of 65oF.

17.7 Once stabilized, place each PFC system in to the SHED (Sealed Housing Evaporative Determination) and ensure the environment within the SHED is at 18.3°C ± 1.1°C

17.8 If the temperature setpoint and hydrocarbon background are within acceptable levels, begin a continuous 72-hour CARB diurnal temperature profile (24-hr CARB Temperature diurnal can be found in Table 9-1) with FID measurements.

18 CALCULATING RESULTS

18.1 The calculation of the mass of the diurnal evaporative emissions is as specified in Part III of the "California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles."

19 POST-DIURNAL PFC SYSTEM INTEGRITY TEST

The post-test integrity tests detailed below must be performed on the containers that have completed the diurnal test.

19.1 Drain the fuel that was contained in the PFC systems.

19.2 Automatic Closure Test

19.2.1 Prefill the test fixture (figure 2) with water as shown in the following equations:

- Pre-Fill Volume = Volume of the Test Fixture – (0.25*Capacity of PFC)
  For PFC's ≤ 5-gallons

- Pre-Fill Volume = 0
  For PFC's > 5-gallons

19.2.2 Following the manufacturer's instructions, carefully insert the spout into the opening on top of the test fixture and dispense water until the tip of the spout is immersed in water.

19.2.3 Remove the spout from the test fixture and allow the spout to close.

19.2.4 Gently tap the spout against the opening of the test fixture to remove any water that may adhere to the exterior surface of the spout. The spout must return to the closed position without the operator pushing or pulling the spout closed.

19.2.5 Verify that the spout remains closed and sealed by observing the spout for any water leakage while still in the inverted position for 10-seconds.

19.2.6 Return the PFC system to the normal upright position and check for leaks and liquid retention while repositioning and for 10-seconds after repositioning. If at any point the spout fails to return to the closed position, the container fails the test. Record observations on the data sheet.

19.2.7 Empty the test fixture (if necessary) and repeat 18.2.1 to 18.2.6 two more times in sequence without refilling the PFC system.

19.3 Pressurized Leak Test

19.3.1 Using a compressed air source, as detailed in figure 3, slowly pressurize the empty PFC system to 34.5-kPa (5.0-PSIG). The introduction of the pressure can be through the container wall or by actuating the spout while the compressed air source is turned on.

19.3.2 After reaching the specified pressure, verify that the container is sealed. Pay special attention to the areas of pressure introduction.

19.3.3 Using a sufficient ballast, submerge the pressurized PFC system upright in a water bath to a depth of at least six (6) inches. Observe the PFC system for leaks for a period of five (5) minutes. Leaks are determined through the evidence of any bubbles coming from the PFC system. Any leak constitutes a failure. Record observations on the data sheet.

20 Post-Test PFC System Disposition

20.1 The tested PFC systems will be stored until certification has been granted.

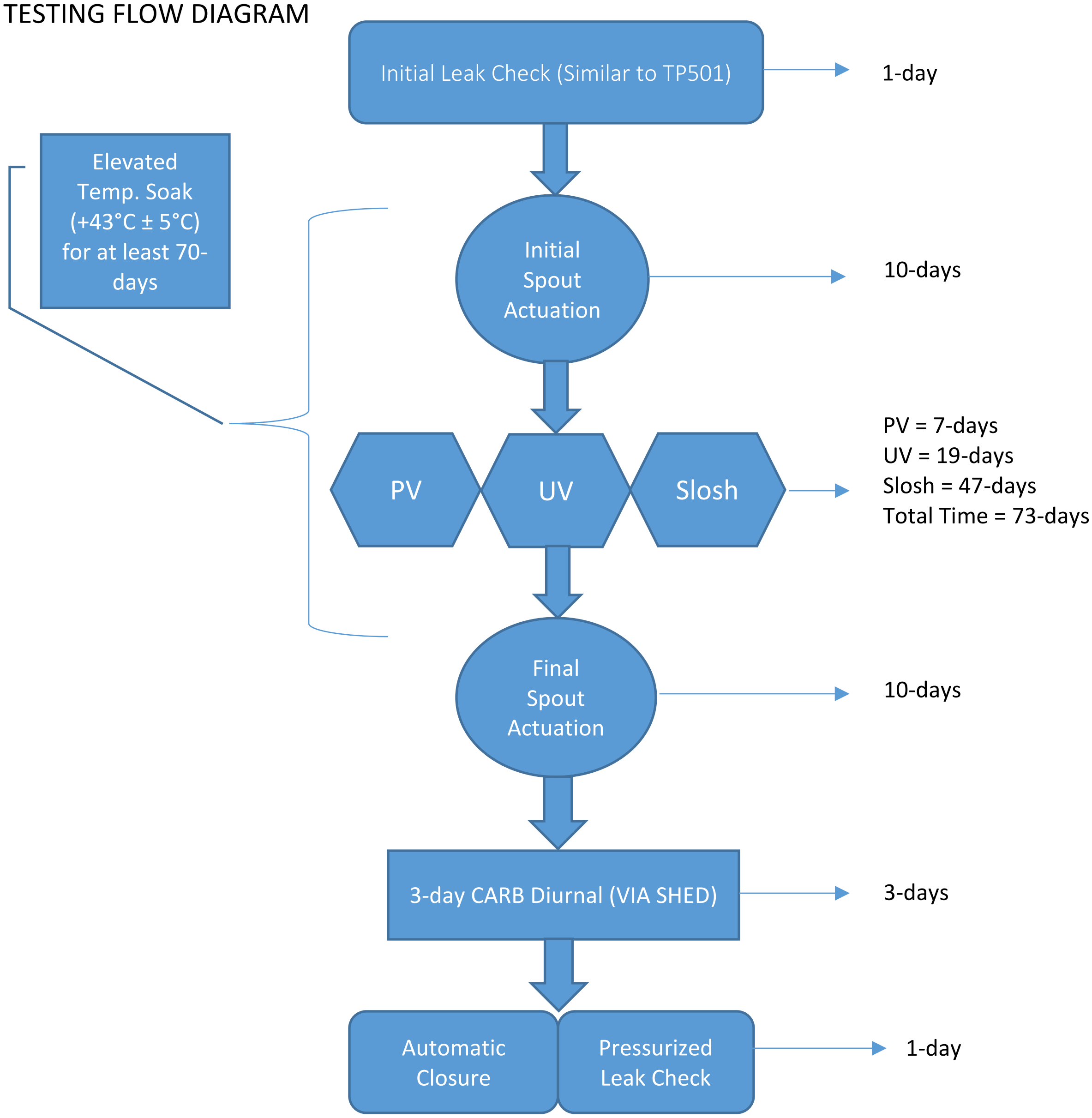
21 REPORTING RESULTS

21.1 Reference the Data Sheet (to be created by the accredited testing laboratory that is performing the test)

22 RELEASE AND REVISIONS

REVISION	DATE	DESCRIPTION	EPA APPROVAL	CARB APPROVAL
A	April 2016	RELEASE		
B	August 2016	Added SHED testing		
C				

TESTING FLOW DIAGRAM

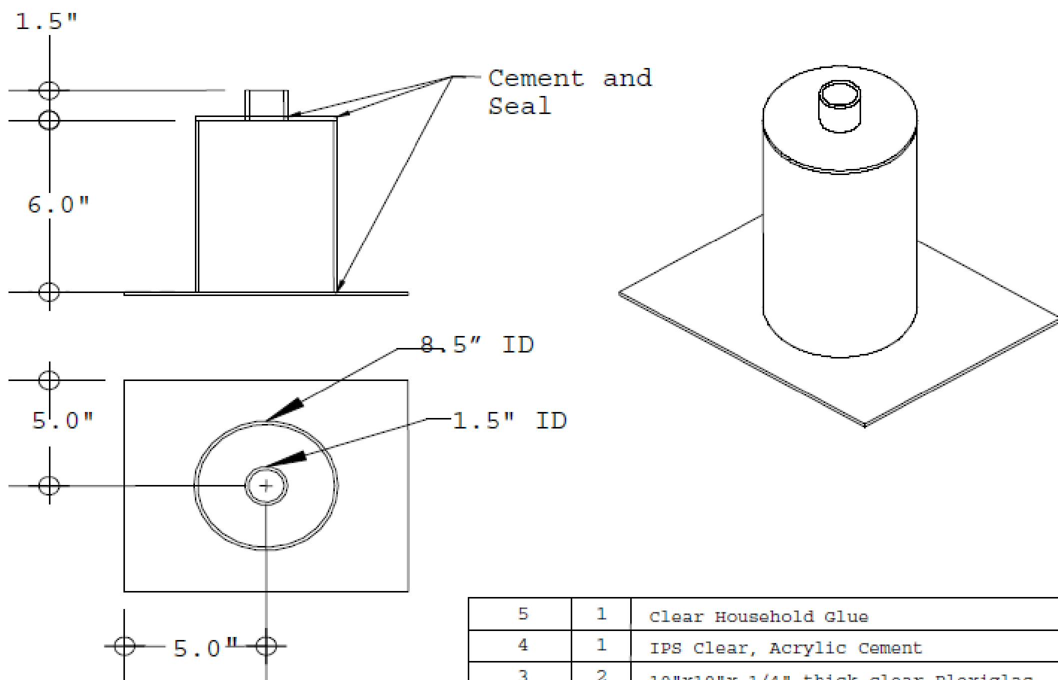


Total Test Time = 98-days (add 2% for inefficiencies) = 103-days

Table 9-1 Diurnal Temperature Profile

Hour	0	1	2	3	4	5	6	7	8	9	10	11	12
(°F)	65	66.5	72.7	80.2	86.2	90.7	94.6	98.1	101.1	103.5	104.9	105.1	104.2
Hour	13	14	15	16	17	18	19	20	21	22	23	24	--
(°F)	101.1	95.4	88.9	84.4	80.8	77.7	75.4	72.0	70.0	68.2	66.5	65	--

Figure 2. Test Fixture



PART #	QTY	DESCRIPTION
5	1	Clear Household Glue
4	1	IPS Clear, Acrylic Cement
3	2	10"x10"x 1/4" thick clear Plexiglas
2	1	1 1/2" OD x 1/4" thickness x 1 1/2" tubing
1	1	8.5" ID 1/4" thickness x 6.0" tubing

Figure 3. Pressurized Leak Check Assembly