METHOD 310

Determination of Volatile Organic Compounds (VOC) in Consumer Products and Reactive Organic Compounds (ROC) in Aerosol Coating Products

(Including Appendix A)

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METHOD 310

DETERMINATION OF VOLATILE ORGANIC COMPOUNDS (VOC) IN CONSUMER PRODUCTS AND REACTIVE ORGANIC COMPOUNDS (ROC) IN AEROSOL COATING PRODUCTS

(Including Appendix A)

1 APPLICABILITY

1.1 CARB Method 310 (Method 310) applies to the determination of each of the following:

(1) Volatile organic compound (VOC) content of a consumer product, under Title 17, California Code of Regulations (CCR), (Consumer Products Regulations), Article 1, sections 94500-94506.5 and Article 2, sections 94507-94517;

(2) LVP-VOC as that term is defined in section 94508;

(3) Volatile components of a product that do not meet the definition of a VOC or are exempted, under sections 94501, 94503, 94508, or 94510;

(4) Specific components that are prohibited under sections 94509, 94522; and

(5) Reactive organic compound (ROC) content, under Article 2, section 94509; and Article 3, sections 94520-94528, for the purposes of calculating product-weighted maximum incremental reactivity (PWMIR).

1.2 Method 310 does not apply to the determination of the composition or concentration of fragrance components in products.

1.3 Definitions:

1.3.1 Chemical "compound" means a molecule of definite chemical formula and isomeric structure.

1.3.2 Chemical "mixture" means a substance comprised of two or more chemical compounds.

1.3.3 "Content" means the weight of a compound or a mixture in a product expressed as a percentage of the product weight (exclusive of the container or packaging).

2 REFERENCES

2.1 Reference Methods

Method 310 incorporates by reference the following ASTM International (ASTM), National Institute for Occupational Safety and Health (NIOSH), and United States Environmental Protection Agency (US EPA) analytical test methods:

2.1.1 ASTM D86-01, Standard Test Method for Distillation of Petroleum Products at Atmospheric Pressure (August 10, 2001).

2.1.2 ASTM D523-08, Standard Test Method for Specular Gloss (June 1, 2008).

2.1.3 ASTM D850-00, Standard Test Method for Distillation of Industrial Aromatic Hydrocarbons and Related Materials (December 10, 2000).

2.1.4 ASTM D859-00, Standard Test Method for Silica in Water (June 10, 2000).

2.1.5 ASTM D1078-01, Standard Test Method for Distillation Range of Volatile Organic Liquids (June 10, 2001).

2.1.6 ASTM D1426-98, Standard Test Methods for Ammonia Nitrogen in Water (December 10, 1998).

2.1.7 ASTM D1613-06, Standard Test Method for Acidity in Volatile Solvents and Chemical Intermediates Used in Paint, Varnish, Lacquer, and Related Products (April 1, 2006).

2.1.8 ASTM D2369-01, Standard Test Method for Volatile Content of Coatings (January 10, 2001).

2.1.9 ASTM D2879-97, Standard Test Method for Vapor Pressure-Temperature Relationship and Initial Decomposition Temperature of Liquids by Isoteniscope (April 10, 1997).

2.1.10 ASTM D2887-01, Standard Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography (May 10, 2001).

2.1.11 ASTM D3063-94, Standard Test Method for Pressure in Glass Aerosol Bottles (November 15, 1994), with the modifications found in Appendix A to this Method 310.

2.1.12 ASTM D3064-97, Standard Terminology Relating to Aerosol Products (September 10, 1997).

2.1.13 ASTM D3074-94, Standard Test Methods for Pressure in Metal Aerosol Containers (November 15, 1994), with the modifications found in Appendix A to this Method 310.

2.1.14 ASTM D3257-06, Standard Test Methods for Aromatics in Mineral Spirits by Gas Chromatography (April 1, 2006).

2.1.15 ASTM D3606-07, Standard Test Method for Determination of Benzene and Toluene in Finished Motor and Aviation Gasoline by Gas Chromatography (November 1, 2007).

2.1.16 ASTM D3792-99, Standard Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph (May 10, 1999).

2.1.17 ASTM D4017-96a, Standard Test Method for Water in Paints and Paint Materials by the Karl Fisher Method (July 10, 1996).

2.1.18 ASTM D4057-12, Standard Practice for Manual Sampling of Petroleum and Petroleum Products (December 1, 2012).

2.1.19 ASTM D4177-16e1, Standard Practice for Automotive Sampling of Petroleum and Petroleum Products (October 1, 2016).

2.1.20 ASTM D4626-95(2015), Standard Practice for Calculation of Gas Chromatographic Response Factors (April 1, 2015).

2.1.21 ASTM D5381-93(2014), Standard Guide for X-Ray Fluorescence (XRF) Spectroscopy of Pigments and Extenders (July 1, 2014).

2.1.22 ASTM D5443-14, Standard Test Method for Paraffin, Naphthene, and Aromatic Hydrocarbon Type Analysis in Petroleum Distillates Through 200°C by Multi-Dimensional Gas Chromatography (June 15, 2014).

2.1.23 ASTM D5580-15, Standard Test Method for Determination of Benzene, Toluene, Ethylbenzene, p/m-Xylene, o-Xylene, C9 and Heavier Aromatics, and Total Aromatics in Finished Gasoline by Gas Chromatography (December 1, 2015).

2.1.24 ASTM D6730-01(2016), Standard Test Method for Determination of Individual Components in Spark Ignition Engine Fuels by 100-Metre Capillary (with Precolumn) High-Resolution Gas Chromatography (April 1, 2016).

2.1.25 ASTM E203-01, Standard Test Method for Water Using Volumetric Karl Fisher Titration (October 1, 2001).

2.1.26 ASTM E1719-97, Standard Test Method for Vapor Pressure of Liquids by Ebulliometry (March 10, 1997).

2.1.27 ASTM E1782-08, Standard Test Method for Determining Vapor Pressure by Thermal Analysis (March 1, 2008).

2.1.28 NIOSH Methods 1300, Ketones I, NIOSH Manual of Analytical Methods, Fourth Edition (August 15, 1994).

2.1.29 NIOSH Methods 1400, Alcohols I, NIOSH Manual of Analytical Methods, Fourth Edition (August 15, 1994).

2.1.30 NIOSH: Methods 1401, Alcohols II, NIOSH Manual of Analytical Methods, Fourth Edition (August 15, 1994).

2.1.31 NIOSH: Methods 1402, Alcohols III, NIOSH Manual of Analytical Methods, Fourth Edition (August 15, 1994).

2.1.32 NIOSH: Methods 1403, Alcohols IV, NIOSH Manual of Analytical Methods, Fourth Edition (March 15, 2003).

2.1.33 US EPA Method 18, Measurement of Gaseous Organic Compound Emissions by Gas Chromatography, Title 40 CFR Part 60, Appendix A (July 1, 1996).

2.1.34 US EPA Method 24, Determination of Volatile Matter Content, Water Content, Density, Volume Solids, and Weight Solids of Surface Coatings, Title 40 Code of Federal Regulations (CFR) Part 60, Appendix A (July 1, 1996).

2.1.35 US EPA Method 24A, Determination of Volatile Matter Content and Density of Printing Inks and Related Coatings, Title 40 CFR Part 60, Appendix A (July 1, 1994).

2.1.36 US EPA Method 300.7, Dissolved Sodium, Ammonium, Potassium, Magnesium, and Calcium in Wet Deposition by Chemically Suppressed Ion Chromatography, EPA Report # 600/4-86-024 (March 1, 1986).

2.1.37 US EPA Method 625, Base/Neutrals and Acids, Title 40 CFR 136 Appendix A, Method for Organic Chemical Analysis of Municipal and Industrial Wastewater (July 1, 2007).

2.1.38 US EPA Method 8240B, Revision 2, September 1994, Final Update IIA to the Third Edition of the Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), EPA publication SW-846.

2.1.39 US EPA Method 8260B, Revision 2, December 1996, Final Update III to the Third Edition of the Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), EPA publication SW-846.

2.1.40 US EPA Method 8270D, Revision 4, January 1998, Final Update IV to the Third Edition of the Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, Semivolatile Organic Compounds by Gas Chromatography / Mass Spectroscopy (GC/MS), EPA publication SW-846.

3 TESTING TO DETERMINE VOC

3.1 The Executive Officer may select a product for analysis under Method 310. After selection of the product, the Executive Officer shall maintain chain of custody for that product throughout the analytical process, by ensuring that the product is kept in a secure location.[1]

3.2 Initial Testing of Aerosol Products

If the sample is an aerosol product, the aerosol propellant shall be separated from the non-propellant portion of the product using ASTM D3074-94 (as modified in Appendix A for metal aerosol container) or ASTM D3063-94 (as modified in Appendix A for glass aerosol container). The propellant portion is analyzed using US EPA Method 18. The remaining non-propellant portion of the product shall be analyzed as specified in section 3.3.

3.3 Initial Testing of Non-Aerosol Products and the Non-Propellant Portion of Aerosol Products

The non-aerosol product or non-propellant portion of an aerosol product shall be analyzed to determine the total volatile content present in the sample, and to determine the presence of any components that are exempt, prohibited, or volatile but do not meet the definition of a VOC in the Consumer Products Regulations. This analysis shall be conducted by performing the following tests, as applicable:

3.3.1 Total volatile content determination, using one or more of the following: US EPA Method 24, US EPA Method 24A, ASTM D2369-01;

3.3.2 Water content determination, by either using ASTM D4017-96a (including ASTM E203-01), or ASTM D3792-99, or by averaging results from both ASTM D4017-96a (including ASTM E203-01) and ASTM D3792-99;

3.3.3 Ammonium content determination, using either ASTM D1426-98 or US EPA Method 300.7;

3.3.4 Ketone~~s~~ and/or alcohol content determination, using one or more of the following: NIOSH Method 1300, NIOSH Method 1400, NIOSH Method 1401, NIOSH Method 1402, NIOSH Method 1403;

[1] Alternative test methods may be used, as provided in section 8 of Method 310.

3.3.5 Exempt and/or prohibited content determination, if present, using one or more of the following: US EPA Method 18, US EPA Method 8240B, US EPA Method 8260B, ASTM D859-00, NIOSH Method 1400, NIOSH Method 1401, NIOSH Method 1402, NIOSH Method 1403, ASTM D5443-14, ASTM D5580-15. Effective January 1, 2015, for non-aerosol "Multi-purpose Solvent" and "Paint Thinner" products sold, supplied, offered for sale, or manufactured for sale in the South Coast Air Quality Management District (SCAQMD), analysis of exempt and prohibited compounds shall include analysis for methyl esters with 17 or more carbon atoms, if present;

3.3.6 LVP-VOC determination. If LVP-VOC status is claimed or analysis indicates the presence of an LVP-VOC component and the percent VOC is not in compliance, the Executive Officer may request formulation data as specified in section 3.4.2;

3.3.7 VOC content determination for products with low level VOC (<5%), using one or more of the following: US EPA Method 18, US EPA Method 8240B, US EPA Method 8260B, ASTM D859-00, NIOSH Method 1400, NIOSH Method 1401, NIOSH Method 1402, NIOSH Method 1403; and

3.3.8 Hydrocarbon content determination, using one or more of the following: US EPA Method 625, US EPA Method 8270D, ASTM D5443-14, ASTM D3257-06, ASTM D3606-07, ASTM D5580-15, ASTM D6730-01(2016), ASTM D4057-12, ASTM D4177-16e1, ASTM D4626-95(2015).

3.4 Initial Determination of VOC Content

If the Executive Officer makes a VOC content determination, they shall do so pursuant to sections 3.2 and 3.3. Only those components with concentrations equal to or greater than 0.1 percent by weight shall be reported.

3.4.1 Using the appropriate equation specified in section 4.0, the Executive Officer shall make an initial determination of whether the product meets the applicable VOC standards specified in the Consumer Products Regulations, under sections 94502 and 94509. If initial results show that the product does not meet the applicable VOC standards, the Executive Officer may perform additional testing to confirm the initial results.

3.4.2 If the results obtained under section 3.4.1 show that the product does not meet the applicable VOC standards, the Executive Officer may request the responsible party supply product formulation data to confirm compliance with the applicable VOC standard. The responsible party shall supply the requested information within 25 working days of the request. Information submitted to the Executive Officer may be claimed as confidential. The Executive Officer shall handle confidential information in accordance with Title 17, CCR, sections 91000 to 91022. Failure to respond to an Executive Officer request for this information is a violation.

3.4.3 If the Executive Officer determines, based on testing, information they may receive from the responsible party, and any other applicable evidence, that the product does not comply with the applicable VOC standard, the Executive Officer will take appropriate enforcement action.

3.5 Determination of the LVP-VOC status of compounds and mixtures. This section does not apply to antiperspirants and deodorants or aerosol coating products. Effective January 1, 2015, this section also does not apply to non-aerosol "Multi-purpose Solvent" and "Paint Thinner" products sold, supplied, offered for sale, or manufactured for sale in the South Coast Air Quality Management District. There is no LVP-VOC exemption for these products.

3.5.1 Formulation data. If the vapor pressure or boiling point, or both, are unknown, the following ASTM methods, which are incorporated by reference herein, may be used to determine the LVP-VOC status of compounds and mixtures:

3.5.1.1 Testing to determine vapor pressure may be performed using one of the following ASTM methods: ASTM D2879-97 (April 10, 1997), ASTM E1719-97 (March 10, 1997), or ASTM E1782-08 (March 1, 2008).

3.5.1.2 Testing to determine boiling point may be performed using one of the following ASTM methods: ASTM D86-01 (August 10, 2001), ASTM D850-00 (December 10, 2000), ASTMD1078- 01 (June 10, 2001), or ASTM D2887-01 (May 10, 2001).

3.5.2 LVP-VOC status of "compounds" or "mixtures." The Executive Officer may test a sample of the LVP-VOC used in the product formulation to determine the boiling point for a compound or for a mixture. If the boiling point exceeds 216°C, the compound or mixture is an LVP-VOC. If the boiling point is less than 216°C, then the weight percent of the mixture which boils above 216°C is an LVP-VOC. The Executive Officer shall use the nearest 1 percent distillation cut that is greater than 216°C as determined under 3.5.1.2 to determine the percentage of the mixture qualifying as an LVP-VOC.

3.6 Final Determination of VOC Content

If a product's compliance status is not satisfactorily resolved under sections 3.4 and 3.5, the Executive Officer may conduct further analyses and testing as necessary based on the Executive Officer's scientific judgment to verify the formulation data.

3.6.1 If the Executive Officer is unable to verify the accuracy of the supplied formulation data, then the Executive Officer may ask the responsible party to supply additional information to explain the discrepancy.

3.6.2 If there exists a discrepancy that cannot be resolved between the results of Method 310 and the supplied formulation data, then the results of Method 310 shall take precedence over the supplied formulation data. The results of Method 310 shall then determine if the product is in compliance with the applicable VOC standards, and may be used to establish a violation of CARB regulations.

4 CALCULATION OF VOC CONTENT

4.1 Article 1. Antiperspirants and Deodorants

This section specifies the equations that shall be used to calculate the Medium Volatility Organic Compound (MVOC) and High Volatility Organic Compound (HVOC), of consumer products under section 94500, which shall be reported as percent by weight.

4.1.1 Aerosol Products

4.1.1.1 The following equations shall be used to calculate the HVOC of aerosol products, which shall be reported as percent by weight:

$$\% \text{ HVOC} = \left[\sum_{i=1}^{h}\left(\frac{HV}{WL + WP}\right)_i\right] \times 100$$

Where:

HV = weight of HVOC compound (g), in product.

WL = weight in grams (g) of a non-aerosol sample or the non-propellant portion of an aerosol sample, excluding container and packaging.

WP = weight (g) of propellant.

h = number of HVOC compounds identified.

4.1.1.2 The following equations shall be used to calculate the MVOC of aerosol products, which shall be reported as percent by weight:

$$\% \text{ MVOC} = \left[\sum_{i=1}^{m}\left(\frac{MV}{WL + WP}\right)_i\right] \times 100$$

Where:

MV = weight of MVOC compound (g), in product.

m = number of MVOC compounds identified.

4.1.2 Non-Aerosol Products

4.1.2.1 The following equations shall be used to calculate the HVOC of non- aerosol products, which shall be reported as percent by weight:

$$\% \text{ HVOC} = \left[\sum_{i=1}^{h} \left(\frac{HV}{WL}\right)_i\right] \text{x } 100$$

4.1.2.2 The following equations shall be used to calculate the MVOC of non- aerosol products, which shall be reported as percent by weight:

$$\% \text{ MVOC} = \left[\sum_{i=1}^{m} \left(\frac{MV}{WL}\right)_i\right] \text{x } 100$$

4.2 Article 2. Consumer Products

This section specifies the equations that shall be used to calculate the VOC content of a product.

4.2.1 Aerosol Products

4.2.1.1 For aerosol products, except those containing LVP-VOC, the percent VOC content shall be calculated using the following equation:

$$\% \text{ VOC} = \left[\frac{WL\ (\ TV - A - H - EL\ ) + (WP - EP)}{WL + WP}\right]$$

Where:

WL = weight (g) of a non-aerosol sample or the non-propellant portion of an aerosol sample, excluding container and packaging.

TV = weight fraction of total volatile content in a non-aerosol sample or in the non-propellant portion of an aerosol sample.

A = weight fraction of ammonia (as $NH^{\pm}$) in a non-aerosol sample or in the non-propellant portion of an aerosol sample.

H = weight fraction of water in a non-aerosol sample or in the non-propellant portion of an aerosol sample.

EL = weight fraction of exempt compound(s) in a non-aerosol sample or in the non-propellant portion of an aerosol sample.

WP = weight (g) of propellant.

EP = weight (g) of exempt compound(s) in propellant

4.2.1.2 For aerosol products containing LVP-VOC, the percent VOC content shall be calculated using the following equation:

$$\%VOC = \left[\frac{WL\,[\,(1 - H) \times (\,1 - LVP\,) - EL\,] + (WP - EP)}{WL + WP} \right] \times 100$$

Where:

LVP = weight fraction of LVP-VOC compounds and/or mixtures in the non-propellant, non-aqueous portion.

1 – H = weight fraction of the non-propellant portion that does not contain water

1 – LVP = weight fraction of the non-propellant, non-aqueous portion that is volatile.

Volatile compounds, such as ammonia, that do not meet the definition of a VOC in the Consumer Products Regulations will not count toward the total percent VOC content of a product.

4.2.2 Non-Aerosol Products

4.2.2.1 For non-aerosol products, that do not contain LVP- VOC, the percent VOC content shall be calculated using the following equation:

$$\%\ VOC = (TV - A - H - EL) \times 100$$

4.2.2.2 For non-aerosol products containing LVP-VOC, the percent VOC content shall be calculated using the following equation:

$$\%\ VOC = [(1 - H) \times (1 - LVP) - EL] \times 100$$

4.2.3 For consumer products with VOC embedded within a delivery substrate, such as Fabric Softener – Single Use Dryer Product, VOC shall be calculated as total weight (g) VOC per use.

4.2.3.1 For those products, that do not contain LVP-VOC:

$$\text{VOC per use (g)} = (TV - A - H - EL) \times TW$$

Where:

TW = total weight (g) of VOC and delivery substrate per use, excluding container and packaging.

4.2.3.2 For those products containing LVP-VOC:

$$\text{VOC per use (g)} = [(1 - H) \times (1 - LVP) - EL] \times TW$$

4.2.4 Effective January 1, 2015, for non-aerosol "Multi-purpose Solvent" and "Paint Thinner" products sold, supplied, offered for sale, or manufactured for sale for use in the SCAQMD, grams of VOC per liter of material (g/L) shall be calculated using the following equation:

$$^{g}/_{L}\ \text{VOC} = \frac{WM \times (TV - H - EL)}{VM}$$

Where:

WM = weight of the material in grams.

VM = volume of the material in liters.

EL = weight fraction of exempt compounds including the weight fraction of methyl esters with 17 or more carbon atoms in the total volatile material.

4.2.5 Consumer products subject to low VOC limits ($\leq$ 5.0%) may have their VOC content characterized by a low-level direct determination.

4.2.5.1 For aerosol products the percent VOC content may be calculated using the following equation:

$$\%\ \text{VOC} = \left[\frac{WL\left(\sum_{i=1}^{n} V_i\right) + (WP - EP)}{(WL + WP)}\right] \times 100$$

Where:

V = weight fraction of VOC in the non-propellant portion.

n = number of VOC(s) in the non-propellant portion.

4.2.5.2 For non-aerosol products the percent VOC content may be calculated using the following equation:

$$\% \text{ VOC} = \left(\sum_{i=1}^{n} V_i \right) \times 100$$

5 TESTING TO DETERMINE ROC

5.1 The Executive Officer may select a product for analysis under this Method 310. After selection of the product, the Executive Officer shall maintain chain of custody for that product throughout the analytical process, by ensuring that the product is kept in a secure location.[2]

5.2 Initial Testing of Aerosol Products

If the sample is an aerosol product, the aerosol propellant shall be separated from the non-propellant portion of the product using ASTM D3074-94 (as modified in Appendix A for metal aerosol container) or ASTM D3063-94 (as modified in Appendix A for glass aerosol container). The propellant portion is analyzed for ROC(s) and other compound(s) by using US EPA Method 18. The remaining non-propellant portion of the product shall be analyzed as specified in section 5.3.

5.3 Initial Testing of Non-Aerosol Products or the Non-Propellant Portion of Aerosol Products

The non-aerosol product or non-propellant portion of the aerosol product shall be analyzed to determine the ROC(s) content present in the sample, including the presence of any prohibited compound(s). This analysis shall be conducted by performing the following tests, as applicable:

5.3.1 Total volatile content determination, using one or more of the following: US EPA Method 24, US EPA Method 24A, ASTM D2369-01;

5.3.2 Water content determination, by either using ASTM D4017-96a (including ASTM E203-01), or ASTM D3792-99, or by averaging results from both ASTM D4017-96a (including ASTM E203-01) and ASTM D3792-99;

5.3.3 Ammonium content determination, using either ASTM D1426-98 or US EPA Method 300.7;

[2] Alternative test methods may be used, as provided in section 8 of Method 310.

5.3.4 Ketones and/or alcohol content determination, using one or more of the following: NIOSH Method 1300, NIOSH Method 1400, NIOSH Method 1401, NIOSH Method 1402, NIOSH Method 1403;

5.3.5 Prohibited content determination, if present, using one or more of the following: US EPA Method 18, US EPA Method 8240B, US EPA Method 8260B, ASTM D859-00, NIOSH Methods 1400, NIOSH Method 1401, NIOSH Method 1402, NIOSH Method 1403, ASTM D5443-14, ASTM D5880-15; and

5.3.6 Hydrocarbon content determination using one or more of the following: ASTM D6730-01(2016), ASTM D4057-12, ASTM D4177-16e1, ASTM D4626-95(2015), ASTM D5443-14, ASTM D5880-15.

5.4 Initial Determination of ROC Content

If the Executive Officer makes a ROC content determination, they shall do so pursuant to sections 5.2 and 5.3. Only those components with concentrations equal to or greater than 0.1 percent by weight shall be reported.

Using the equation specified in section 6, the Executive Officer shall make an initial determination of whether the product meets the applicable requirements specified in the Consumer Products Regulations, under sections 94509 and 94522. If initial results show that the product does not meet the applicable requirements, the Executive Officer may perform additional testing to confirm the initial results.

5.4.1 Using the equation specified in section 6, the Executive Officer shall make an initial determination of whether the product meets the applicable requirements specified in the Consumer Products Regulations, under sections 94509 and 94522. If initial results show that the product does not meet the applicable requirements, the Executive Officer may perform additional testing to confirm the initial results.

5.4.2 If the results obtained under section 5.4.1 show that the product does not meet the applicable limits set forth in the CARB regulations, the Executive Officer may ask the responsible party to supply the product formulation data specified in section 94526 to confirm compliance with the applicable reactivity limit. The responsible party shall supply the requested information within 25 working days of the request. Information submitted to the Executive Officer may be claimed as confidential. The Executive Officer shall handle confidential information in accordance with Title 17, CCR, sections 91000 to 91022. Failure to respond to an Executive Officer request for this information is a violation.

5.4.3 If the Executive Officer determines, based on testing, information they may receive from the responsible party, and any other applicable evidence, that the product does not comply with the applicable Reactivity Limit, the Executive Officer may take appropriate enforcement action.

5.5 Final Determination of ROC Content

If a product's status is not satisfactorily resolved under section 5.1 - 5.4, the Executive Officer may conduct additional analyses and testing as necessary based on the Executive Officer's scientific judgment to verify the formulation data.

5.5.1 If the Executive Officer is unable to verify the accuracy of the supplied formulation data, then the Executive Officer may ask the responsible party to supply additional information to explain the discrepancy.

5.5.2 If there exists a discrepancy that cannot be resolved between the results of Method 310 and the formulation data or additional information supplied by the responsible party, then the results of Method 310 shall take precedence over the supplied formulation data or additional information. The results of Method 310 shall then determine if the product is in compliance with the applicable requirements, and may be used to establish a violation of CARB regulations.

6 CALCULATION OF PWMIR USING ROC CONTENT

This section specifies the equation that shall be used to calculate the PWMIR

$$PWMIR = \left[\sum_{i=1}^{r}\left(\frac{RW}{WL + WP}\right)_i \times MIR_i\right]$$

Where:

RW = weight of ROC compound and/or hydrocarbon solvent (g) in product.

r = number of ROC compounds and hydrocarbon solvents identified.

MIR = maximum incremental reactivity (MIR) value, as stated in Title 17, CCR, sections 94700 and 94701.

WL = weight (g) of a non-aerosol sample or the non-propellant portion of an aerosol sample, excluding container and packaging.

WP = weight (g) of propellant.

7 METHOD PRECISION AND ACCURACY

7.1 The precision of Method 310 for determining VOC content was evaluated using seven representative products with known VOC contents ranging from 6.2 to 81.2 percent VOC by weight. Each sample was divided into six portions, and each portion was separately analyzed to determine the VOC content. Based on the results of this analysis, the 95 percent confidence interval for Method 310 is 3.0 percent by weight.

7.2 For determining the percent by weight of the individual ingredients in aerosol coating products, the precision and accuracy of the determination for each ingredient is governed by the precision and accuracy of the test method used to ascertain the percent by weight of each ingredient.

8 ALTERNATIVE TEST METHODS

Alternative test methods which are shown to accurately determine the concentration of VOC or components may be used upon written approval of the Executive Officer, as described in the Consumer Products Regulations, sections 94506, 94515, and 94526, respectively.

Method 310 - Appendix A

PROPELLANT COLLECTION PROCEDURES

1 APPLICATION

These procedures modify ASTM D3074-94 and D3063-94. These procedures shall be used to collect the propellant for the analysis and density measurement for metal aerosol containers and glass aerosol containers, respectively, where required by Method 310. These modified procedures use the same aerosol standard terminology as listed in ASTM D3064-97.

2 LIMITATIONS

Nitrogen analysis: Nitrogen may be used as a component of the propellant system. Ambient air is 78 percent nitrogen and may be present as a contaminant in the system prior to sample collection. This risk of nitrogen contamination shall be eliminated by sweeping out any connecting lines prior to attaching the propellant collection bag. This procedure can eliminate or reduce nitrogen contamination to less than 0.1 percent by weight of the sample, and therefore, the analysis of the propellant gas will be unaffected.

3 EQUIPMENT AND SUPPLIES

3.1 Propellant Collection System: See Figure 1 (metal containers) and Figure 3 (glass containers).

3.2 Propellant Collection Bags equipped with slip valve and septum.

3.3 Density Measurement

3.3.1 250 mL gas dilution bulb, or

3.3.2 Density/Specific gravity meter meeting the following minimum specifications:

3.3.2.1 Measurement Range: 0 – 3 +/- 0.00001 g/cm3

3.3.2.2 Measurement Temperature Range: 4°C ~ 70°C.

3.4 Balance, capable of accurately weighing to 0.1 mg

3.5 Sample Venting Platform. See Figure 2 (metal containers) and Figure 4 (glass containers).

3.6 Platform Shaker, equivalent to Thermolyne M49125

3.7 Cork Rings, 80 x 32 mm

4 PROCEDURE

4.1 Propellant Collection for Metal Aerosol Containers. This process shall be followed in the same order as outlined below.

4.1.1 Close valves on the Propellant Collection System on the product being tested (see Figure 1).

4.1.2 Remove the actuator from the valve on the aerosol can and weigh the can to the nearest 0.01 g.

4.1.3 Place the aerosol can in an inverted position onto the Sample Venting Platform, stabilized by cork rings.

4.1.4 Slowly raise the hydraulic jack until it pierces the can.

4.1.5 Vent the can until the propellant is seen flowing from output 1 (see Figure 1). Collect the propellant from output 1 in the propellant collection bag. Density shall be determined from this same propellant collection bag, as necessary.

4.1.6 After the propellant is collected, close and remove the propellant collection bag and vent the remainder of the propellant.

4.1.7 After the flow ceases from the can, it is removed from the assembly and allowed to vent overnight on a platform shaker, to vent the remainder of the propellant.

4.1.8 Weigh the can again to the nearest 0.01 g and record the weight loss. The can may now be opened for analysis of the non-propellant portion of the sample.

4.2 Propellant Collection for Glass Aerosol Containers. This process shall be followed in the same order as outlined below.

4.2.1 Remove the actuator from the valve of the aerosol glass container and weigh the container, which includes the valve assembly, to the nearest 0.01 g.

4.2.2 With the container in an inverted position, place the valve onto the tapered adaptor.

4.2.3 Pressurize the air cylinder to actuate the sample container valve onto the tapered adaptor.

4.2.4 Open the sample valve and collect propellant sample into the propellant collection bag. Density shall be determined from this same propellant collection bag, as necessary.

4.2.5 After the propellant is collected, close and remove the propellant collection bag and vent the remainder of the propellant.

4.2.6 Continue to vent the container on the platform assembly until no pressure registers on the sample gauge and there in no visible propellant flowing from the sampling tube.

4.2.7 Remove the container from the platform.

4.2.8 Punch a small hole into the container valve assembly.

4.2.9 Place the container on a platform shaker to vent the remainder of the propellant.

4.2.10 Weigh the container and valve assembly to the nearest 0.01 g and record the weight loss. The non-propellant portion of the sample is ready to be analyzed.

FIGURE 1
PROPELLANT COLLECTION SYSTEM METAL AEROSOL CONTAINER

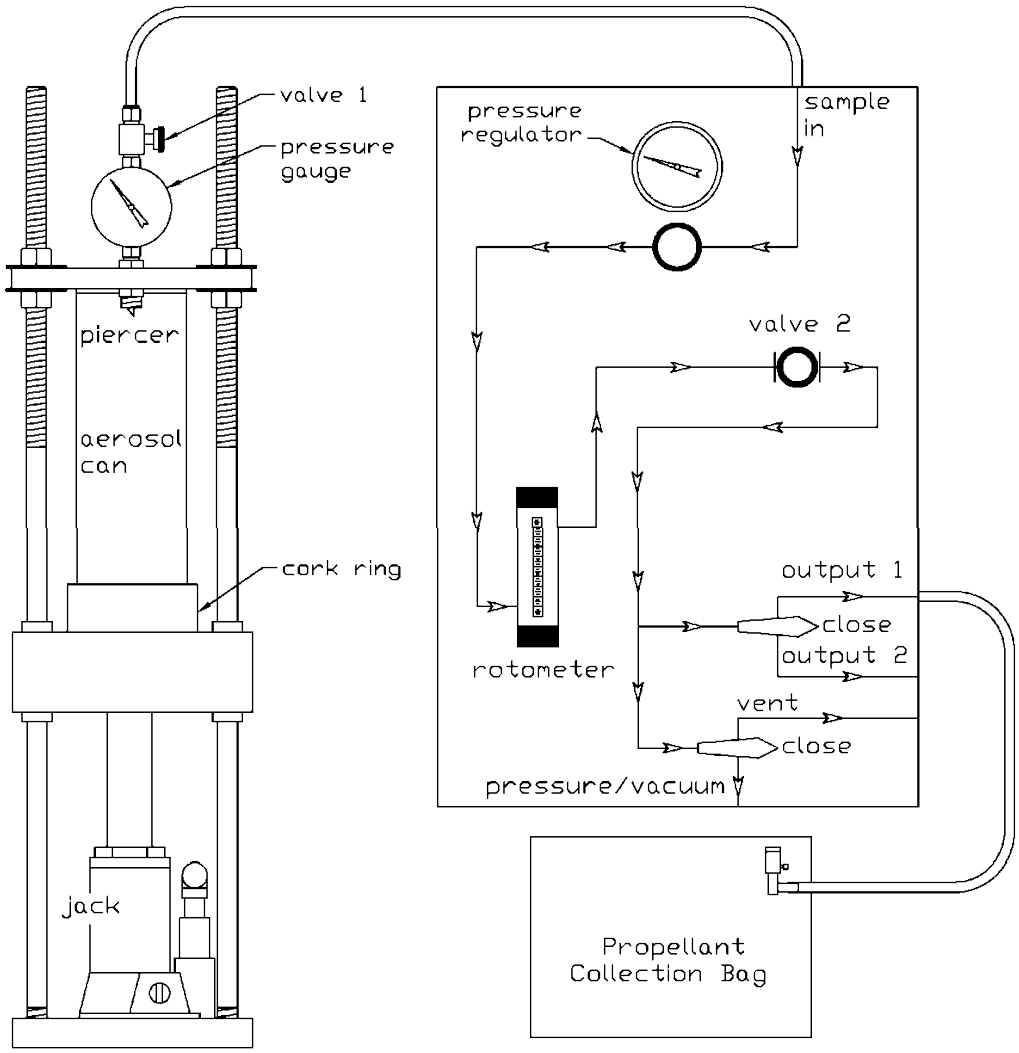
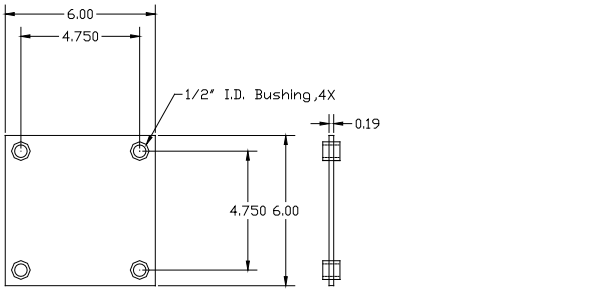
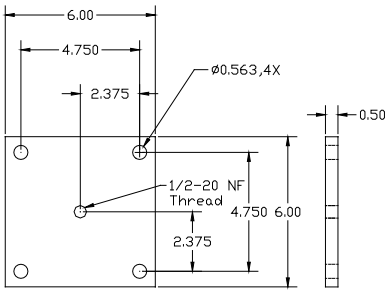


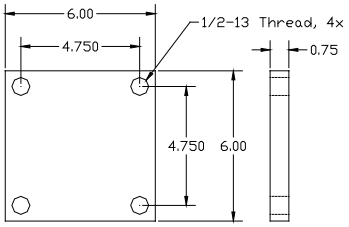
FIGURE 2
SAMPLE VENTING PLATFORM
METAL AEROSOL CONTAINER



Steel Jack Plate

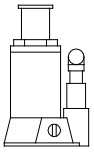


Aluminum Piercing Plate

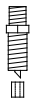


Base Plate

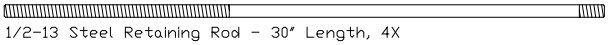
1/2" Nut, 8X 1/2" Washer, 8X



Note: Extend Jack to maximum length (to prevent damage from heat), then tack weld to steel jack plate.



Manual Hydraulic Jack (2 Ton) Piercer and Viton Gasket



1/2-13 Steel Retaining Rod - 30" Length, 4X

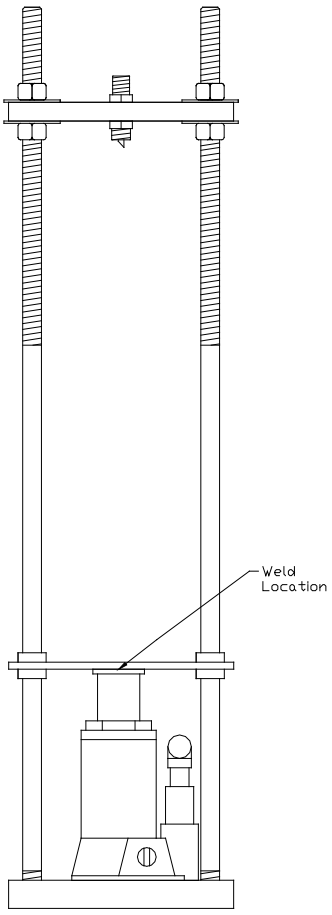


FIGURE 3
PROPELLANT COLLECTION SYSTEM GLASS AEROSOL CONTAINER

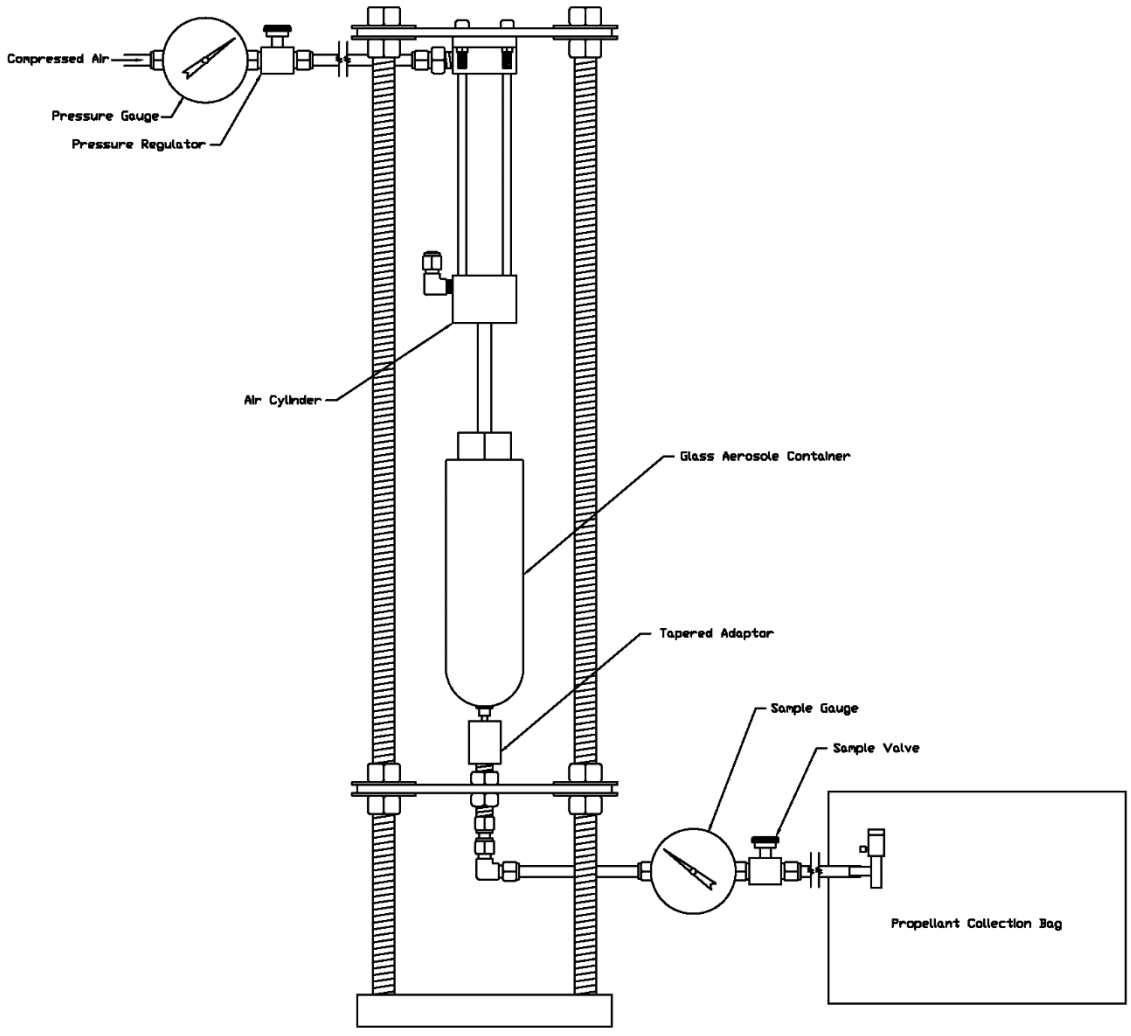
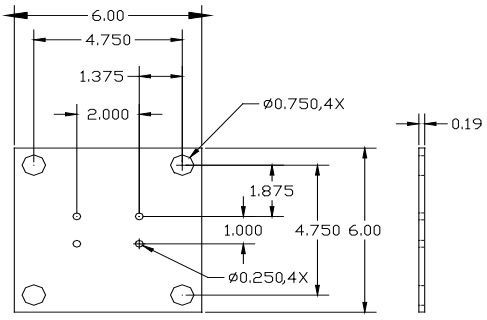
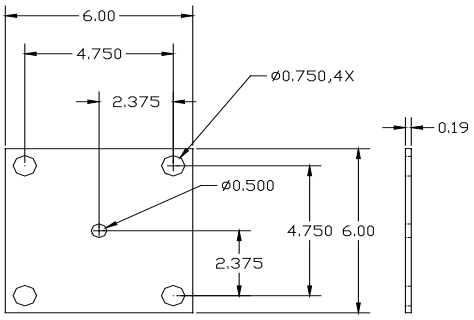


FIGURE 4
SAMPLE VENTING PLATFORM

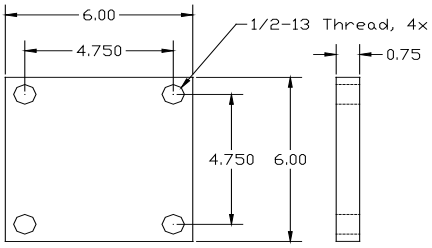
GLASS AEROSOL CONTAINER



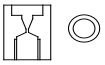
Air Cylinder Mounting Plate



Tapered Adapter Mounting Plate



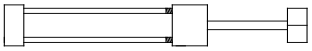
Base Plate



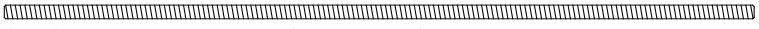
Tapered Adaptor and □-Ring

1/2" Nut, 8X 1/2" Washer, 8X

Air Cylinder Rear Flange Mounting Plate



Air Cylinder, nonrotating drop-in tie rod, 1-1/8" bore, 4" stroke



1/2-13 Threaded Rod - 24" Length, 4X