

Twelve

Petroleum Products

*Training for the
Weights and Measures Official*

TRAINING FOR THE WEIGHTS AND MEASURES OFFICIAL

CURRICULUM

MODULE 12 - PETROLEUM PRODUCTS

- Module 1 - Introduction to Weights and Measures**
- Module 2 - Laws and Regulations**
- Module 3 - Enforcement Procedures**
- Module 4 - Legal Action**
- Module 5 - Legal Metrology**
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- Module 14 - Service Agencies and Agents**



Acknowledgment

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It is impossible to list the names of the many people who contributed to the development of this course. However, gratitude is extended to the following groups whose dedication and commitment made this training module a reality.

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Module Twelve

Petroleum Products

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Introduction

Welcome to “Petroleum Products”. This is the twelfth module in the series “Training for the Weights and Measures Official”. It will introduce you to the distribution and sales of petroleum and automotive products, weights and measures responsibilities related to the inspections of locations, petroleum advertising laws, petroleum and automotive product labeling laws, sampling of petroleum and automotive products, end product testing, and complaint investigations. The laws and regulations governing petroleum and automotive products are found in the California Business and Professions Code, Division 5, Chapters 14, 14.5 and 15 and the California Code of Regulations, Title 4, Division 9, Chapter 6.

At the end of each segment in this module you will find a series of self-evaluation questions to test your knowledge. Although you are not required to complete the self-evaluation, we encourage you to take a few minutes to read the questions before moving on to the next segment. Answers are provided at the end of the module. If you are unsure of a response, reread the training material and it will give you the information you need.

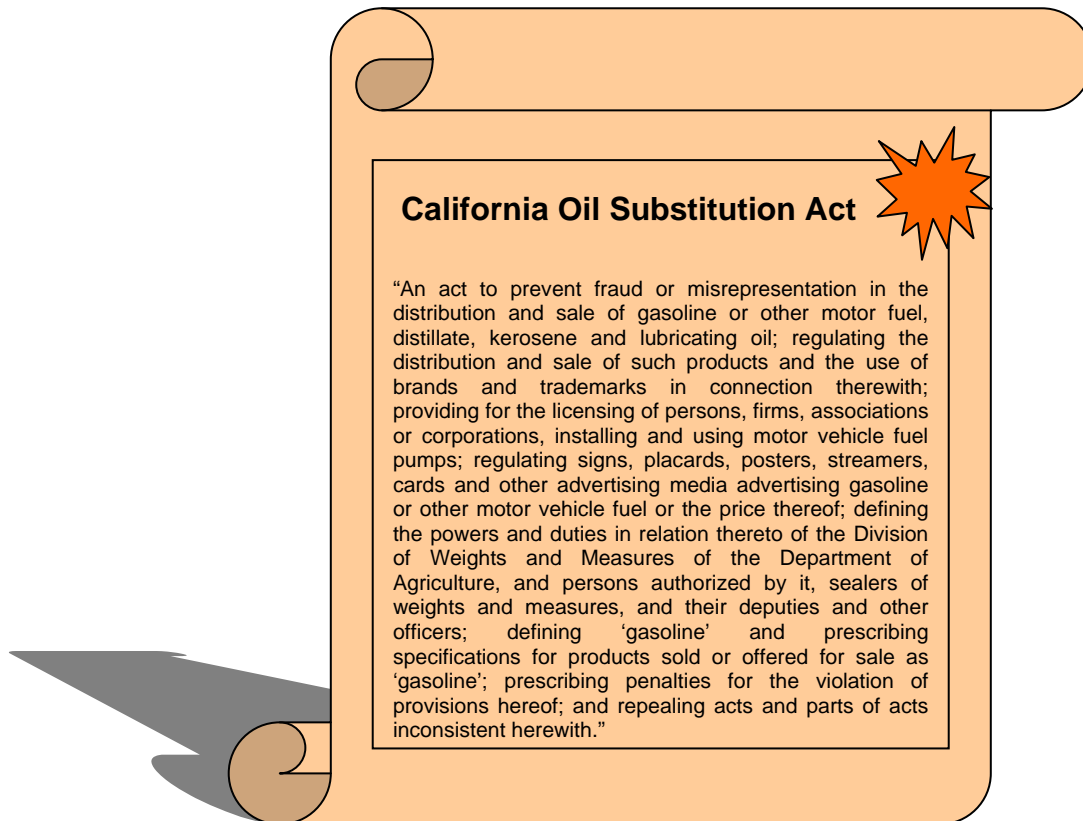
Module Objectives

When you have completed this module you will be able to understand and apply:

- The applicable governing laws and regulations from the Business and Professions Code and the California Code of Regulations.
- The basic petroleum and automotive products labeling requirements.
- The basic overview of conducting an inspection at a location manufacturing, distributing, storing, selling or offering for sale petroleum and automotive products.
- The basic overview of sampling petroleum and automotive products.
- The different types of petroleum product advertising signs and the information required to be on them.
- The basic overview of end product testing and how to investigate a complaint.

History

On June 5, 1931, California Governor James Ralph signed a new law passed by the legislature entitled the “California Oil Substitution Act”.



The California Oil Substitution Act was amended on August 27, 1937, to include several new “important provisions”:

- Gasoline price posting was mandated and prohibited sales at prices other than posted.
- Required advertising signs showing the price of gasoline or motor oil to specify the brand name or state “No Brand”.
- Prohibited misleading advertising signs for gasoline.
- Required labeling of pumps, storage tanks, and fill pipes with the product name and brand name.
- Made violations of the Act misdemeanors punishable by a \$500 fine and six months in jail.

Petroleum Products Advertising Laws

All motor fuel advertising (price) signs must include:

- ◆ The total price per gallon or liter including all taxes.
- ◆ The trademark or brand of the motor fuel.
- ◆ The word “gasoline” or the name of any other motor fuel (product).
- ◆ The grade designation of the motor fuel.



The minimum size of price numerals in any price sign is six (6) inches in height. The size requirements for the brand, product, and grade are based on the size of the price numerals.

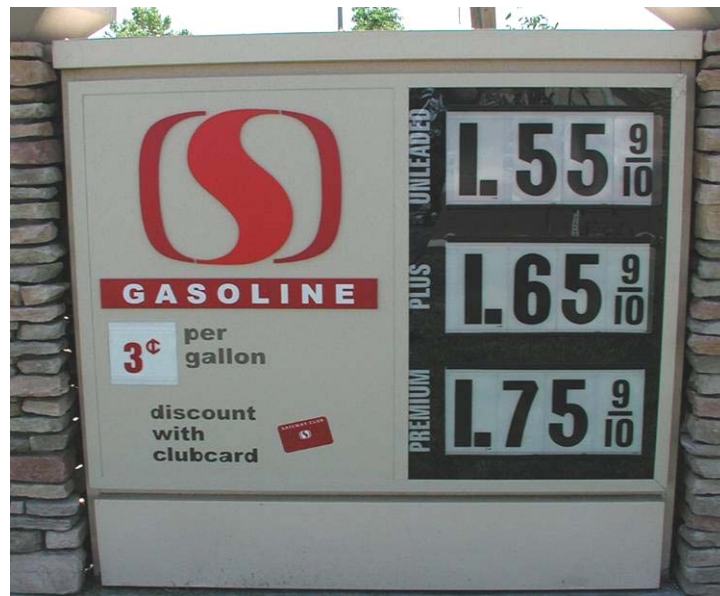
- ◆ Brand is not less than one third (1/3) the size of the price numerals.
- ◆ Product is not less than one third (1/3) the size of the price numerals, but need not be larger than four (4) inches.
- ◆ Grade is not less than one sixth (1/6) the size of the price numerals, but need not be larger than four (4) inches.

Be advised that petroleum advertising laws also apply to off-site motor fuel advertising signs located along highways, freeways, etc.

It is unlawful to display an advertising medium that advertises a discount or reduction in price for motor fuel, unless the advertising medium contains all the following:

- ◆ The price per gallon or liter from which the discount or price reduction is to be taken.
- ◆ The amount of the discount or price reduction in cents per gallon or liter.
- ◆ The conditions of the discount or price reduction.

Additional requirements can be found in Section 13532(b) of the Business and Professions Code.

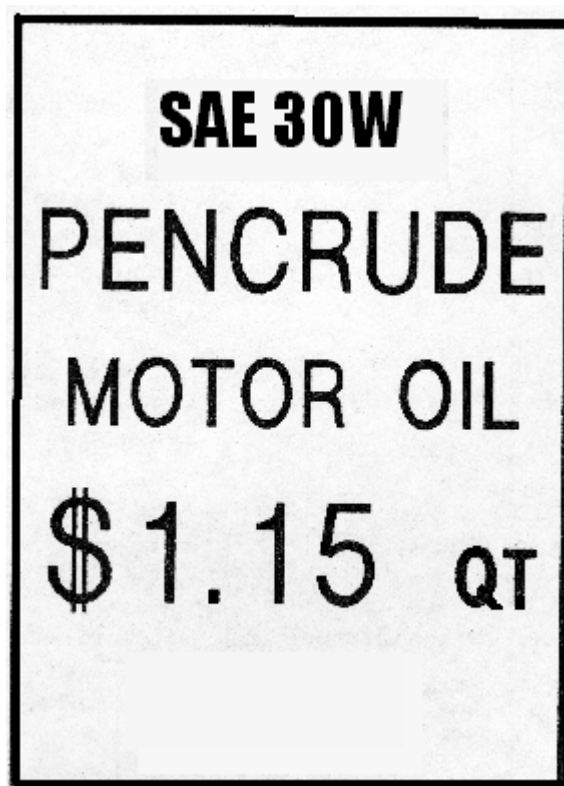


When the lower price of a motor fuel is advertised, the higher price and condition of sale must be advertised. There would have to be at least one advertising medium showing both the higher and lower prices and condition of sale for any grade of motor fuel sold at different prices.

When the mandatory price sign has been displayed and is in compliance with Chapter 14 of the Business and Professions Code, additional (supplemental) advertising may be posted. Supplemental advertising must meet the same size requirements of the mandatory price sign found in Section 13532 of the Business and Professions Code.

A person is allowed to advertise products (milk, cigarettes) and services (tune-up, car wash) on price signs, but cannot advertise the price for those products or services.

Motor oil advertising signs, which advertise a price, must conspicuously identify the brand, product and grade. The price numerals on a price sign advertising motor oil may be of any convenient size. The grade designation (SAE/API) must be shown.





SELF-EVALUATION QUESTIONS

1. Why are motor fuel retailers (service stations) required to advertise prices of motor fuel?
2. What information is required on a mandatory price sign for motor fuel?
3. What additional information can be on a price sign? What cannot?
4. What are the size requirements for price numerals, brand, product, and grade on price signs?

The Need for Labeling Laws

Label compliance inspections are an integral part of the Petroleum Products Program. Labeling laws and regulations are in place to ensure that the information provided on the container sufficiently informs the consumer of what product best meets their particular needs.

Vehicle manufacturers continually modify their equipment design specifications. This requires the manufacturers of products used in their vehicles to do the same. This process is ever changing, and we, as regulators, must assure the accuracy of their product labels. All prepackaged items must conform to the Federal Fair Packaging and Labeling Act. Certain petroleum product containers must also conform to additional labeling requirements.

Label inspections can be done alone or in conjunction with routine marketplace inspections for quality or investigation of a complaint.

We regulate the labels that are required to be on the following prepackaged products: motor oil and gear oil, engine coolant, automatic transmission fluid, brake fluid, kerosene, diesel, and gasoline.

We also regulate the labeling of bulk containers and dispensers where petroleum and automotive products are stored for sale. Pursuant to Business and Professions Code Section 13480, containers, receptacles, pumps, dispensers, and the inlet ends of fill pipes to underground storage tanks of petroleum products, that are kept or stored for sale, shall have attached a sign or label plainly visible consisting of the name of the product, the brand, trademark, or trade name of the product, and, in case of engine fuel and kerosene, the grade or brand name designation.

When the product is motor oil or gear oil, there must be conspicuously marked on each label, the proper Society of Automotive Engineers (SAE), and American Petroleum Institute (API) service classifications. When the product is automatic transmission fluid, it must conform to California law, and the same applies to engine coolant. However, brake fluid must conform to the National Highway Traffic Safety Administration, United States Department of Transportation specifications.



The SAE and the API are organizations devoted to the development of standards promoting the latest technological advances in the petroleum industry.

These standards are used to identify quality products. Specifically, the SAE is your one-stop resource for technical information and expertise used in everything to do with the operation of self-propelled vehicles used on land, sea, in the air or space. The API on the other hand, provides a forum for all segments of the oil industry to pursue public policy objectives and advance the interests of their industry.

Motor Oil

For example, oil labeled with an SAE 5W30 grade classification, identifies multigrade oil possessing specific viscosity requirements for both low temperature starting, and normal engine operating temperatures. The “W” means the oil meets specifications for viscosity at 0°F and is suitable for winter use. Oil labeled with an SAE 40 grade classification, without the W, describes single grade oil with properties that protect under typical engine operating temperatures.

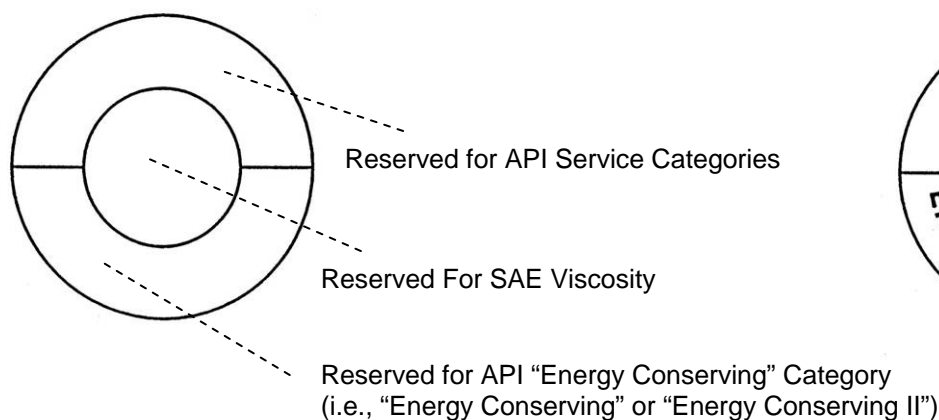
Historically, the API classifications met requirements for certain year model cars, and this practice continues today.

Obsolete and Current Motor Oil Categories for Gasoline Engines		
API Category	Year Model Cars	Application
SA	Pre (1931)	Additive-free 100% mineral oil.
SB	Pre (1964)	Minimal level of performance additives; contained no detergents.
SC	(1964 to 1967)	Additive treatment to control sludge, rust, corrosion and wear.
SD	(1968 to 1971)	Additive treatment to provide PCV cleanliness and protection for short trip, stop and go driving.
SE	(1972 to 1979)	Additive treatment to correlate with long distance, high speed, summer driving, which included trailer towing. Also new emission control requirements.
SF	(1980 to 1988)	Additive treatment reflected consumer worries of engine wear due to new higher speed, small displacement engines, and extended maintenance intervals.
SG	(1987 to 1993)	Higher levels of dispersant kept harmful particles in suspension enabling easier removal of these contaminants.
SH	(1993 to 1997)	Phosphorus limited to protect emission control systems.
SJ	(1997 to Present)	Provides protection from high temperature deposits, volatility and foaming which causes short catalyst life.

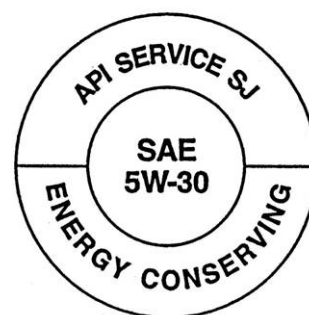
Motor Oil - Today the API licenses two types of registered marks identified as the API Service Symbol (“donut”) and the API Certification Mark (“starburst”). These “Quality Marks” – help consumers identify quality **engine oils** for their gasoline and diesel-powered vehicles.

API’s Engine Oil Licensing and Certification System is a voluntary licensing and certification program that authorizes engine oil marketers who meet specified requirements to use the **API Marks** on their containers. This program is a cooperative effort between the oil industry, vehicle and engine manufacturers and technical societies such as SAE, API and the American Society for Testing and Materials (ASTM).

EXPLANATION



EXAMPLE



The API Service symbol “donut” is divided into three parts:

- The top half describes the oil’s performance level by the API designation.
- The center identifies the oil’s viscosity (such as an SAE 10W30).
- The bottom half tells whether the oil has demonstrated energy – conserving properties (as demonstrated in standard test engines).



API Certification Mark

The API certification mark “starburst” is designed to identify engine oils recommended for a specific application (such as gasoline service, fuel flexible or light duty diesel). Oil may be licensed by the API to display the “starburst” only if the oil satisfies the most current performance requirements of the International Lubricant

Standardization and Approval Committee minimum performance standards. The certification mark remains the same for a given application even if a new engine oil performance standard is developed. However, new **annual** licenses are issued only for oils that meet the most recent standards. Some products marked with the API certification “starburst” may not have the API service category included due to standards not being set by SAE.

Labeling Requirements for Prepackaged Products

Motor Oil - BPC 13480, 13482/CCR 4150

- Product name, brand name, or trademark or trade name
 - If the oil is intended for motorcycle use, the words “motorcycle oil” are acceptable for the product name.
- Viscosity grade classification and SAE
 - Viscosity grade is the SAE number associated with the viscosity of an oil (i.e., SAE 10W40).
- API/SAE service classification
 - Conspicuously marked on each label (*API designation; i.e., SF for gasoline, CF for diesel engines define the performance of an oil in a particular engine*).

Prepackaged Motor Oil Label



- Statement of use for gasoline engines
 - Plainly visible on one gallon or less and must include the following:
 - (1) For non-obsolete oils - a general description of the automobile years or condition of service for the engine oil as described in SAE J183. (Obsolete API classifications denote oils that cannot be evaluated because the tests and equipment used to evaluate their performance in an engine are no longer available.)
 - (2) For obsolete oil's API service classification the following statement **must** appear on each container – with the blank areas filled in with the appropriate API classification and applicable model years of intended use.

“CAUTION – THIS OIL IS RATED API _____. IT IS NOT SUITABLE FOR USE IN MOST GASOLINE-POWERED AUTOMOTIVE ENGINES BUILT AFTER _____. USE IN MODERN ENGINES MAY CAUSE UNSATISFACTORY ENGINE PERFORMANCE OR EQUIPMENT HARM.”

Refer to the latest version of SAE J183 for the **above** cautionary statement language required for **all** obsolete categories.

Two-Cycle Engine - BPC 13408/CCR 4151

- Product name, brand name or trademark or trade name
 - If the oil is intended for motorcycle use, the words “motorcycle oil” are acceptable for the product name.
- Viscosity grade classification and SAE, API/SAE service classification
 - Not required.
- Statement of use for gasoline engines
 - Not required (J183 is not related to 2-cycle engines).

Gear Oil - BPC 13480

- Product name, brand name, or trademark or trade name, viscosity grade classification and API/SAE service classification.
- Statement of use for gasoline engines
 - Conspicuously marked on each container.

Engine Coolant (Concentrated Product) - BPC 13711/CCR 4160

- Product name, brand name, or trademark or trade name.
- Engine coolant or antifreeze
 - Must appear on the principal display panel.

- Principal Ingredient
 - (Allows the lab to know what type of tests to perform.)
- Intended application.
- Name and place of business (of manufacturer, packer, seller, or distributor).
- Accurate statement of quantity (in terms of liquid measure).
- Chart
 - Showing appropriate amounts of coolant and water in terms of liquid measure, to provide freeze protection, to at least 30 degrees below zero.
- Boiling point statement
 - Showing the boiling point of 50% mix by volume of coolant and water in degrees Fahrenheit.
- If principal ingredient is propylene glycol
 - Statement stating not to use an ethylene glycol hydrometer for propylene glycol coolants.
- Lot or batch number
 - Must appear on the label identifying the lot and date of packaging.
- The applicable ASTM standard designation that the product meets.



Prediluted Engine Coolant (Ready to Use) - BPC 13711/CCR 4160

- Product name, brand name, or trademark or trade name.
- Prediluted engine coolant or prediluted antifreeze
 - Must appear on the principal display panel.
- Principle ingredient.
- Intended application.
- Name and place of business (of manufacturer, packer, seller, or distributor).
- Accurate statement of quantity (in terms of liquid measure).
- Freeze protection
 - Showing the freezing point in degrees Fahrenheit.
- Boiling point statement
 - Showing the boiling point in degrees Fahrenheit.
- “DO NOT ADD WATER” (printed on the label).
- If principle ingredient is propylene glycol
 - Statement stating not to use an ethylene glycol hydrometer for propylene glycol coolants.
- Lot or batch number
 - Must appear on the label identifying the lot and date of packaging.
- The applicable ASTM standard designation that the product meets.

Recycled Engine Coolant - CCR 4160/4161

Same as above.

Automatic Transmission Fluid - BPC 13711

- Product name, brand, or the trademark or trade name.
- Name and place of business (of manufacturer, packer, seller, or distributor).
- Automatic transmission fluid (product name).
- Duty type classification.
- Accurate statement of quantity (in terms of liquid measure).

Brake Fluid - BPC 13711, 13712/CCR 4112

- Product name, grade name (i.e., DOT number), or brand name.
- Accurate statement of quantity (in terms of liquid measure).
- Label must conform to the requirements of the National Highway Traffic Safety Administration, United States Department of Transportation (DOT).
- A brake fluid receptacle or dispensing device including “bleeders”, pressurized containers, or any container used to fill a brake system, are exempt from the above container labeling requirements, except they must have on the container the words “DOT _____ Motor Vehicle Brake Fluid” with the appropriate identification number filled in.

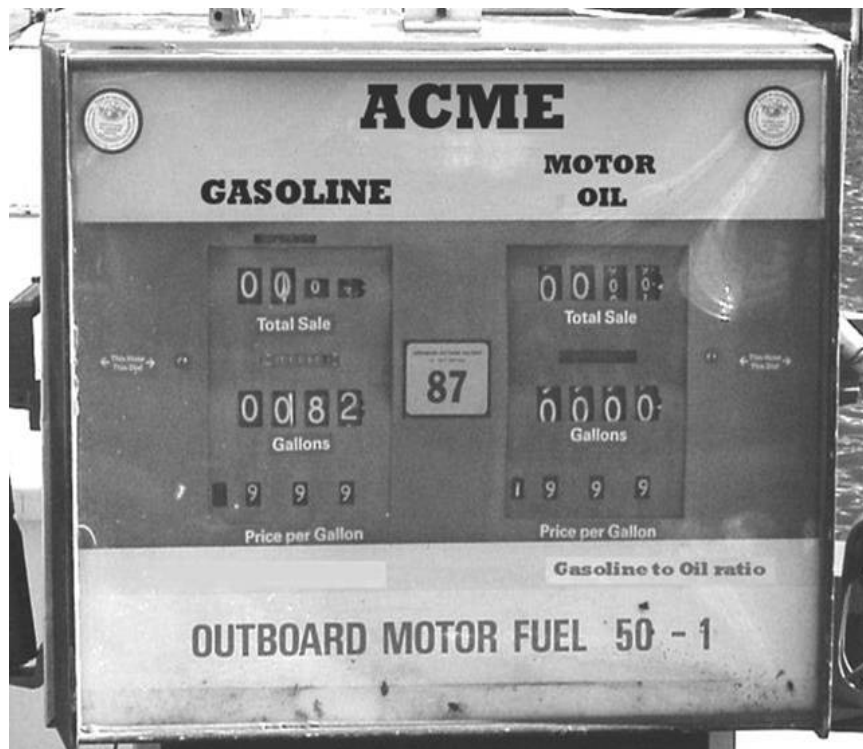
Labeling Requirements for Bulk Products

Automotive Spark-Ignition Engine Fuel (Gasoline, Diesel, Kerosene, Fuel Oil) - BPC 13480/CCR 3473

- For retail dispensers and containers of more than one gallon capacity:
 - Product name, brand name, or trademark or trade name, grade, price.
- For retail dispensers:
 - Octane (for gasoline only).
 - Must comply with Federal Register 306.1 (*aviation fuel is exempt from required octane posting*).
 - Each sign or label shall be placed in a conspicuous place (*if service of motor fuel can be made from more than one side of a dispenser, signs and labels must be on two sides*).

Outboard Motor Fuel – [BPC 13480, 13473]

In addition to the minimum labeling requirements of Section 13480 and 13473, where the motor fuel is a mixture of gasoline and oil there shall also be conspicuously displayed on the dispensing device a sign or label stating the ratio of gasoline and motor oil.



Oils - BPC 13480

- Product name, brand name, or trademark or trade name.
- Viscosity grade classification preceded by the letters SAE.
(SAE requirements do not apply to oil used for aviation purposes.)



Hand Measures - BPC 13484

Small hand measures used for delivery of petroleum products and filled in the presence of the customer, need not be labeled if the container or pump the products are drawn from are properly labeled.

Storage Tanks - BPC 13480/13483

- Product name, brand name, or trademark or trade name, grade
 - On an underground storage tank, the label shall be affixed to the inlet end of the fill pipe. The letters on this label may be of any convenient size but shall be plainly visible while such tank is being filled.
 - Where the product is oil, the sign or label shall also show the viscosity grade classification and shall be preceded by the letters "SAE".



Petroleum Products Without Brand - BPC 13481

- Where any petroleum product is offered for sale, but not under any brand, trademark or trade name, the words "**No Brand**" shall be used.
- The label shall be in Gothic type letters in red with white background.



SELF-EVALUATION QUESTIONS

1. What two service classifications must be marked on all motor oil and gear oil containers?
2. What does the API certification mark “starburst” signify?
3. Name an API motor oil classification that is considered obsolete?
4. What must be on an obsolete API motor oil label?
5. Is an automatic transmission fluid mislabeled if it does not have a duty type classification on the label?
6. Brake fluid labels must conform to what Federal requirements?
7. Is a label or sign showing the minimum octane number or antiknock rating required to be on a gasoline dispenser?
8. What information is required to be on the label attached to an underground storage tank of gasoline that is being sold to the public?

Inspections of Service Stations, Retail Outlets, and Wholesale Locations and Sampling of Product

Introduction

Weights and measures inspectors must be familiar with and knowledgeable of the laws and regulations as they apply to the petroleum industry. When a weights and measures inspector enters a petroleum products sales location, they should identify themselves to the owner or manager and state the nature of their business. The following procedure outline should be used as a guide when conducting an inspection at:

Service Station

1. Obtain the business name, address, and name of the owner/operator.
2. Check location and content of all price advertising signs. **BPC 13531/13532**
 - a. Check visibility of signs from adjacent street(s).
 - b. Check price numerals, brand or trademark, product, and grade.
 - c. Check conditions of sale, if any.
3. Check labeling on all petroleum product dispensers. **BPC 13474/13480**
 - a. Check price indicators on dispensers for agreement with price signs.
 - b. Check brand or trademark, product, and grade.
 - c. Check octane label.
4. Check fuel storage labeling. **BPC 13480(a)**
 - a. Check tag or label for brand or trademark, product, and grade.
 - b. Check to see that the tag or label information agrees with advertising signs and fuel dispensers.
5. Check additional required signs. **BPC 13651/13660**
 - a. Check for “provision of air, water and pressure gauge”.
 - b. Check for “refueling services to disabled drivers”.
6. Observe and make notes of any opened and filled containers of automotive products (i.e., motor oil, ATF, and engine coolant), such as quart cans, labeled with various brand names. Consult with the State petroleum investigator on the advisability of making undercover purchases at that location.

7. If the inspector has reason to believe a product is contaminated or is suspect, a sample should be taken and submitted to their respective Division of Measurement Standards Petroleum Laboratory (Anaheim, Sacramento). BPC 13592 and 13730 gives you the authority to take samples.
8. Any corrective action taken by the inspector should be based on the existing law. All necessary evidence such as photographs, drawings, samples, and statements should be obtained for any court action. Depending on judicial requirements in a particular court, it may be necessary to issue a Notice of Violation before the filing agency will accept a complaint. In any case, enforcement action taken should be handled in accordance with the guidelines established in the citation section.

Retail Outlet or Wholesale Locations

1. Obtain the business name, address, and name of the owner/operator.
2. Check location for packaged and bulk products. ***BPC 13480/13482/13711/13712***
 - a. Check labeling for proper content.
 - b. Check brand or trademark, product, and grade.
 - c. Verify size requirements, if any.
 - d. Make a note of quantity on hand.
3. If the inspector has reason to believe a product is contaminated or is suspect, a sample should be taken and submitted to their respective Division of Measurement Standards Petroleum Laboratory (Anaheim, Sacramento).

Any corrective action taken by the inspector should be based on the existing law. All necessary evidence such as photographs, drawings, samples, and statements should be obtained for any court action.

These inspection procedures can ultimately improve compliance throughout the State. The uniformity by both state and county officials in using the Petroleum Products Audit Report form lends simplicity in recording information.

Sampling Procedures

In general, these instructions apply to all products within the scope of the petroleum laboratory testing and analysis activities. Minor variations in handling occur in types of products to be sampled.

Extreme care and good judgement are necessary to ensure samples obtained are a true representation of the product being sold. When sampling from a multiple product single hose delivery system, the proper purging procedure should be followed to ensure that the sample is not contaminated with a different grade of product from a previous delivery.

As most petroleum vapors are toxic and flammable, avoid breathing them or igniting them from an open flame or a spark produced by static electricity. Follow all safety precautions specific to the material being sampled.

It is necessary to protect all volatile samples of petroleum and petroleum products from evaporation.

- Transfer the product from the sampling apparatus (i.e., sample thief, plastic sample tube, etc.) to the sample container immediately.
- Keep the container closed except when material is transferred. Never completely fill a sample container; always allow adequate room for expansion.
- The container should be filled 80 to 85 percent of the container capacity.
- To prevent the loss of liquid and vapors during transport, **SCREW THE CAPS OF CONTAINERS DOWN TIGHTLY** and **CHECK FOR LEAKAGE**.

Complete the appropriate Petroleum Products Sample Tag and seal the containers immediately after the sample has been obtained.

TAKING OF SAMPLES

1. Use a sample container, that is clean, dry, and free from visible contamination.
2. Size of sample:
 - (a) Gasoline - One-half gallon
 - (b) Motor oils - One quart
 - (c) Brake fluids:
 - Factory-sealed container - 12 fluid ounces
 - In-use container - 8 fluid ounces
 - (d) Gear oils/lubes - One quart
 - (e) Diesel fuel - One-half gallon
 - (f) Kerosene - One-half gallon
 - (g) Automatic transmission fluids – One quart
 - (h) Antifreeze, coolant, pre-diluted coolant, recycled coolant - One quart (use only glass bottle provided by the State Petroleum Laboratory)
3. Complete and attach the appropriate sample tag for identification.
4. Submit only samples taken by authorized personnel.
5. Pay for sample if a request is made.
6. **DO NOT TAKE A SAMPLE FROM PRIVATE STORAGE, VEHICLE FUEL TANKS, ETC.** Neither the County nor the Division can attest to such sample as being truly representative of the product that has been sold.

Samples can be taken overtly or covertly, as follows:

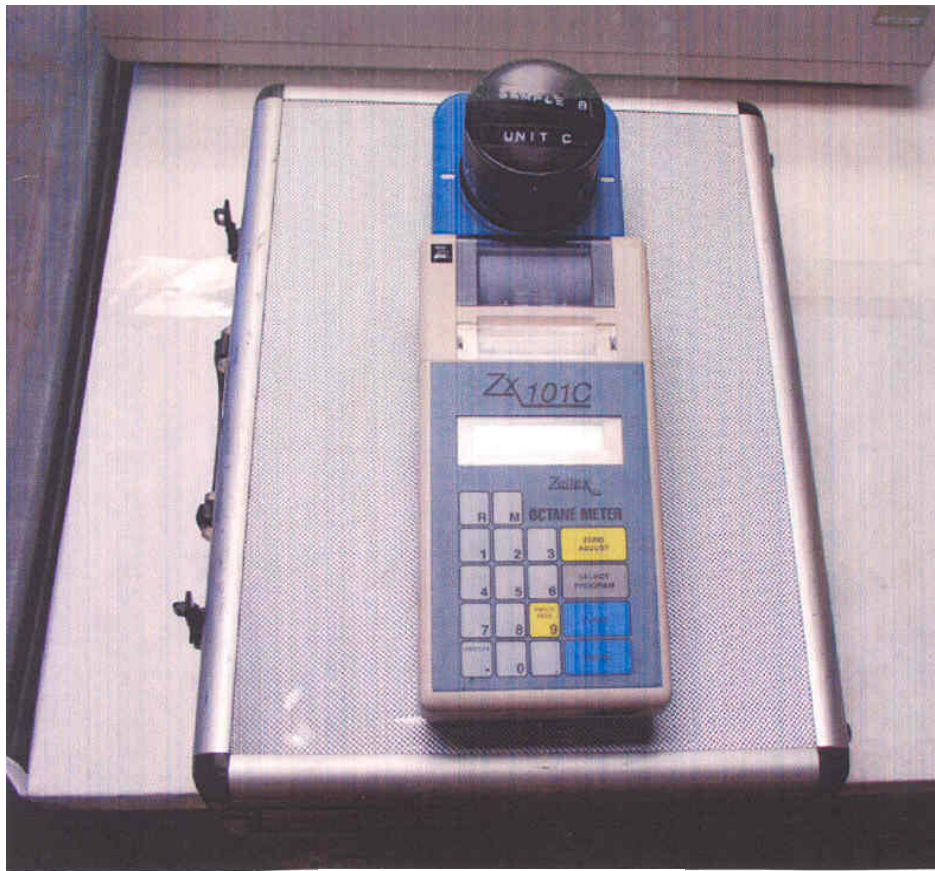
- Using a bulk tank thief, dipping container(s) into a product, dispensing directly into sample cans or bottles using the delivery equipment on site, or using a sample cap adaptor that attaches to the product outlet on a bulk delivery truck.
- To maintain a chain of possession for legal purposes, each time the possession of a sample is transferred from one person to another, an entry **shall be made** on the sample tag. The entries must be **legible and complete**.

Timeliness of Samples

A sample that fails to arrive at the laboratory within 2 days for analysis is usually of little value in preventing low octane, low flash diesel or contaminated motor fuel from being sold to the public. This is primarily due to the fast turnover of dealers' inventories in today's market.

Field Screening Test

The Zeltec® unit is a device used by the Division of Measurement Standards, and some counties, to determine the octane rating of gasoline and is utilized in the field as a screening test. The results obtained from this device should not be used as the basis for a court action; the most accurate sample results are still obtained through laboratory testing.



Zeltec Octane Analyzer



SELF-EVALUATION QUESTIONS

1. When meeting and greeting the station or store owner or manager what three items should you obtain?
2. At a service station the brand or trademark, product, and grade, must be consistent and labeled on what three locations?
3. When performing an inspection at a service station two additional signs must be checked according to Business and Professions Code Sections 13651/13660, what are they?
4. What Business and Professions Code section gives any authorized weights and measures person the empowerment to inspect and take samples?
5. When taking an engine coolant sample, what size and type of container is needed?
6. When should product delivery lines be flushed when taking samples and why?
7. What should an inspector do if he or she suspects a product is contaminated?
8. A sample has little to no value if not tested and analyzed within how many days?
9. What form should be used uniformly by both state investigators and county inspectors when completing an inspection?

Laboratory Tests and Equipment

Laboratory Test Result Checklist

GASOLINE		
<u>Product Test</u>	<u>Effect of Failure</u>	<u>Reference Code</u>
Octane	Can cause performance loss and in severe situations damage to the engine.	<i>BPC 13440(d)/ 13480(c)</i>
Vapor Pressure	If high, can lead to vapor lock and excessive evaporative emission losses.	<i>BPC 13440(a)/ 13440(c) CCR 4140, 2258 ASTM D4814</i>
Vapor-Liquid Ratio	If liquid level is low, vapor lock (i.e., fuel boiling in lines, fuel pumps or carburetors) can occur.	<i>BPC 13440(a) CCR 4140 and ASTM D 4814</i>
Water and Sediment	May lead to fuel system plugging, corrosion and engine stalling.	<i>BPC 13440(a) CCR 4140 ASTM D 4814</i>
Distillation	Possible knocking and may create excessive deposits due to diesel or other contamination.	<i>BPC 13440(a) CCR 4140 and ASTM D 4814</i>
Sulfur Content	Can increase exhaust emissions, engine deposits and engine wear.	<i>BPC 13440(a) CCR 4140 ASTM D 4814</i>
Oxygenate	Lack of oxygenates with increased (carbon monoxide) emissions.	<i>BPC 13440(b)/ 13480(d)</i>

DIESEL FUEL		
<u>Product Test</u>	<u>Effect of Failure</u>	<u>Reference Code</u>
Flash Point	Low flash point can impact safe handling and storage of fuel. Flash point is not directly related to engine performance.	<i>BPC 13450(a) CCR 4143 ASTM D 975</i>
Sulfur Content	High sulfur content may increase exhaust emissions, engine deposits and engine wear.	<i>BPC 13450(a) CCR 4143/2281 ASTM D 975</i>
Cetane Number	A low cetane rating can impact ignition quality and cause combustion roughness.	<i>BPC 13450(a) CCR 4143 ASTM D 975</i>
Water Content and Sediment	Can lead to corrosion, filter plugging and biological growths.	<i>BPC 13450(a) CCR 4143 ASTM D 975</i>
Distillation	Engine performance and fuel economy are related to a fuel's boiling range. The 90% recovered point may be used to indicate a diesel fuel's grade number (i.e., #1 or #2).	<i>BPC 13450(a) CCR 4143 ASTM D 975</i>

MOTOR OIL		
<u>Product Test</u>	<u>Effect of Failure</u>	<u>Reference Code</u>
Viscosity (Cold Cranking Simulator)	High viscosity's can reduce oil flow to the oil pump and the entire engine during cold weather starts.	<i>BPC 13480(b) SAE J300</i>
Viscosity (Kinematic)	If too thin, the oil may not provide protection against engine wear, blowby, and oil consumption. If too thick, the oil can reduce fuel economy and increase oil pressure.	<i>BPC 13480(b) SAE J300</i>
Neutralization Number (SA Oil Only)	High acidity from strong acids may cause excessive engine wear.	<i>BPC 13460(d)</i>

AUTOMATIC TRANSMISSION FLUID		
<u>Product Test</u>	<u>Effect of Failure</u>	<u>Reference Code</u>
Viscosity (Kinematic)	Low viscosity may cause transmission wear and poor performance.	<i>BPC 13710(b)</i> Auto manufacturer's recommended requirements
Viscosity (Brookfield)	High viscosity may inhibit proper shifting and operation at cold temperature.	<i>BPC 13710(b)</i> Auto manufacturer's recommended requirements

GEAR OIL		
<u>Product Test</u>	<u>Effect of Failure</u>	<u>Reference Code</u>
Viscosity (Kinematic)	Low viscosity may increase wear in manual transmissions and differentials. May also provide less protection during high temperature operation.	<i>BPC 13480(b)</i> <i>SAE J306</i>
Viscosity (Brookfield)	High viscosity can cause increased friction and reduced fuel economy in cold conditions.	<i>BPC 13480(b)</i> <i>SAE J306</i>

BRAKE FLUID		
<u>Product Test</u>	<u>Effect of Failure</u>	<u>Reference Code</u>
Boiling Point	A reduced boiling point can be caused by the absorption of water. Low boiling point fluids can lead to failure of braking systems.	<i>BPC 13710(c)</i> <i>DOT MVSS #1 16</i>

ENGINE COOLANT		
<u>Product Test</u>	<u>Effect of Failure</u>	<u>Reference Code</u>
Freeze Point	This indicates the temperature at which ice crystals will start to form. Ice can exert extreme pressures within the engine, which may result in serious engine damage.	<i>BPC 13710(a) CCR 4162, 4163, 4164</i>
Boiling Point	This indicates the temperature at which the coolant will boil at atmospheric pressure. Low boiling point coolants reduce heat transfer and can lead to engine overheating.	<i>BPC 13710(a) CCR 4162, 4163, 4164</i>
Reserve Alkalinity	This indicates the capacity of the coolant to neutralize acids that may form in the cooling system. Acidic coolants may be corrosive to the cooling system. This test is not a good judge of corrosion protection for certain organic corrosion inhibitor packages.	<i>BPC 13710(a) CCR 4165</i>

KEROSENE		
<u>Product Test</u>	<u>Effect of Failure</u>	<u>Reference Code</u>
Flash Point	Low flash point can impact upon the safe handling and storage of the product.	<i>BPC 13450(b) CCR 4141 ASTM D 3699</i>
Sulfur Content	The sulfur content is the only difference between 1-K and 2-K kerosene. Non-fluid connected burner appliances require lower sulfur levels because of sulfur dioxide emissions.	<i>BPC 13450(b) CCR 4141 ASTM D 3699</i>
Distillation	Indicates the volatility of the fuel for proper vaporization and could impact the burning quality of the fuel.	<i>BPC 13450(b) CCR 4141 ASTM D 3699</i>

Laboratory Equipment

Octane Engines

Two test methods were first developed in the 1930's to measure the octane of gasoline. These two standard test methods are currently utilized worldwide today. They are the Research Method and the Motor Method. Both methods require the use of an octane engine and measure the gasoline's tendency to knock or ping in an engine, but under different operating conditions. The Research Method measures the gasoline's antiknock tendencies under mild operating conditions, such as cruising down the highway. The Motor Method measures the gasoline's antiknock tendencies under severe operating conditions, such as rapid acceleration. Automobile manufacturers design their engines to run with a specified minimum octane fuel. Using octane fuel of a lesser octane level can cause engine damage. Using a fuel with a higher octane level than recommended does not increase the power of the engine. In the United States, the average of the research octane number and the motor octane number $(R+M)/2$, is the number you see on the black and yellow octane rating labels posted on the fuel dispensers. Outside of the United States the posting requirements on the pump may vary, and you may see only the research octane number posted, which is the higher number of the two.

These testing procedures and posting requirements are the result of regulations adopted by the Federal government in the 1970's, when government regulators and industry representatives could not reach a consensus on the most accurate octane test method.



Automatic Distillation Apparatus

The distillation test is used to measure the volatility of the fuel across its entire boiling range. As the fuel is boiled, the vapors are collected and condensed back into liquid. The temperatures are recorded in relationship to the volume of condensed liquid recovered. The test can determine if the fuel is contaminated, its cold start characteristics, its hot start characteristics, resistance to vapor lock, and fuel economy.



Automatic Flash Point Tester



The flash point is the temperature that diesel fuel must be heated to in order to produce an ignitable mixture of vapor and air above the liquid when exposed to an open flame. The temperature at which diesel fuel will flash or ignite is an important safety factor in handling the fuel.

Automatic Kinematic Viscometer

This device is used to measure the viscosity or the ability of an oil to flow at high temperatures and thereby provide protection against friction.



Automatic Cold Cranking Simulator



This test is used to simulate how well an oil will lubricate during low temperature cranking of an engine.

Brookfield Viscosity Cold Temperature Air Bath

This is the cold box used to cool down test samples, in preparation for the Brookfield Viscosity measurement.



Digital Brookfield Viscometer



This test is used to measure the viscosity or the ability of an automatic transmission fluid or gear oil to flow at low temperatures and provide protection against friction.

Freeze Point Test Apparatus

This test is used to measure at what temperature a 50/50 mixture of engine coolant (antifreeze) and water will freeze. The requirement is at least -34°F .





SELF-EVALUATION QUESTIONS

1. What effect can water and sediment in gasoline have on a vehicle?
2. What is the significance of a low flash point?
3. What type of damage can occur in a vehicle where the boiling point of engine coolant is below ASTM specifications?
4. What is the purpose of conducting a kinematic viscosity test on engine oil?
5. What methods are used to determine the octane number for gasoline?

Complaint Investigation and End Product Testing

Undercover Purchases

Most of the information needed for undercover purchases is the same as an open announced inspection. It is important to attempt to obtain as much information as possible. The significant difference between an open inspection and an undercover inspection or purchase, is the amount of time spent in the station. When conducting an undercover inspection or purchase, the inspector must be prepared to observe and take notes quickly and accurately, because another opportunity may not arise to obtain the information.

Consumer Complaint

Here are a few simple tips when taking information regarding a complaint:

1. The most important information is the location of the suspect station, repair shop, store, etc. Without this information you don't have a location to visit to handle the complaint. Many consumers do not like to leave their name. If you scare them away by asking that first you will be unable to investigate what could be a great complaint.
2. Assign the complaint a number.
3. Find out what exactly happened and when. Allow the caller to give you as much information as possible before you start asking questions.
4. It is important to get basic information relative to the complaint, such as the "Who, What, Where, When, and How". Take good notes on the complaint form. After all this information is obtained and you feel there are no other questions you could ask, complete the information identifying the complainant.
5. Ask for the complainant's name, address, and phone number.
6. Record the date and time of the call.

Place your name on the form so whoever picks up the complaint will know who took the complaint.

Investigating the Complaint

Once a complaint has been assigned, read it.

1. Decide whether this inspection complaint should be handled open or undercover.
2. Be sure you are equipped with everything needed for the inspection.
3. Follow the procedures for open or undercover inspections. Be thorough and take complete notes.
4. At the conclusion of the investigation, and all results are in, contact the complainant to notify them of your findings.
5. In the event that questions might arise later, record the method of inspection you took and your findings in some type of complaint log so that everyone has access.

End Product Testing

End product testing involves the sampling of a product at its point of sale or where it is kept or exposed for sale and later verifying its quantity and quality.

Originally, the Petroleum Products Program mainly monitored the sales of bulk motor oil, diesel and gasoline. The testing for quality of brake fluid, gear oil, automatic transmission fluid and kerosene was added at a later date.

During the early 1960's through the early 1990's the program had a number of cars equipped with motor oil by-pass devices that allowed the motor oil purchased to by-pass the engine and go directly into a sample can. This type of equipment was discontinued for several reasons. The old glass oil bottles were no longer used and most motor oil sold was from sealed plastic containers. Additionally, with smaller front wheel drive vehicles and the amount of equipment under the hood, it became harder to design, install and hide oil by-pass equipment. Petroleum Program vehicles are equipped with gasoline sample tanks that allow gasoline sample purchases to be tested for quality as well as quantity.



Concealed tank mounted in Division of Measurement Standards vehicle used in undercover purchases



SELF-EVALUATION QUESTIONS

1. What is the most important information that is needed on a complaint form?
2. What are the four basic “W’s” to be answered relative to a complaint?
3. What should you do at the conclusion of your investigation?
4. Why was the practice of using motor oil by-pass devices discontinued?
5. What is the purpose of end product testing?



GLOSSARY

A LISTING OF TERMINOLOGY AND ACRONYMS MOST COMMONLY USED BY WEIGHTS AND MEASURES OFFICIALS.

API – American Petroleum Institute.

ASTM – American Society for Testing and Materials.

Boiling Point – The temperature at which a liquid begins to bubble, changing it from a liquid state to a gaseous state as heat is applied.

Cetane Number – The number assigned to compression ignition (diesel) engine fuel that designates how quickly the fuel will ignite when an air/fuel mixture is compressed. Cetane number is related to the time it takes the fuel to ignite after it is injected into the chamber.

Distillation – Determines the level of fuel contamination causing possible hard engine starting, pinging and deposit build up.

DOT – Department of Transportation.

Flashpoint – The temperature at which air and fuel will produce an ignitable mixture when exposed to an open flame. This is not related to fuel performance, but rather to safety while handling.

Neutralization Number – Measures the oil's acidity or alkalinity. API SA oils are required to be neutral – not acid or basic.

Octane/Octane Number – Is the number that represents the antiknock (ping) quality of a gasoline, typically the higher the number the less likely the fuel will ping.

Oxygenate – A gasoline compound that contains both oxygen and hydrogen. It typically will increase the octane of the gasoline.

SAE – Society of Automotive Engineers.

Sulfur Content – A naturally occurring compound found in the crude oil that is distilled to make gasoline.

Vapor Liquid Ratio – A measuring of the vapor fuel mixture. High vapors cause vaporization inside the fuel lines rather than inside the engine.



GLOSSARY

A LISTING OF TERMINOLOGY AND ACRONYMS MOST COMMONLY USED BY WEIGHTS AND MEASURES OFFICIALS.

Vapor Pressure – The measure of a gasoline’s tendency to vaporize.

Viscosity:

Brookfield – A direct measurement of the viscosity (thickness) of a petroleum product. This is usually used for measuring the viscosity of automatic transmission fluid, and gear oil at low temperature. The unit of measurement is the centipoise (cP).

Cold Cranking Simulator – Measures oil’s ability to permit engine cranking during cold start conditions.

Kinematic – A measurement of the viscosity (thickness) of a petroleum product. This is usually used for measuring the viscosity of motor oil, automatic transmission fluid, gear oil, diesel fuel, and kerosene at 40°C or 100°C. The unit of measurement is the centistoke (cSt).

Water/Sediment – Detrimental contaminants of gasoline.



BIBLIOGRAPHY AND REFERENCES

Annual Book of ASTM Standards, Volume 05.01, 05.02, 05.03, 05.04, 05.05, and 15.05

California Business and Professions Code, Division 5, Chapters 14, 14.5 and 15

California Code of Regulations, Title 4, Chapter 9 (California Field Reference Manual)

California Oil Substitution Act, Provisions, Statutes of 1931 Chapter 609, as amended by Statutes of 1937, Chapter 574

Petroleum Products Program Manual, January 2003

SAE Handbook, Volume 1, 2, and 3

United States Department of Transportation: Code of Federal Regulations, Oct. 2000, Title 49, Volume 5, Sec. 571.116 Standard No. 116: Motor Vehicle Brake Fluid



SELF-EVALUATION ANSWERS

Segment 1

1. California Business and Professions Code requires every service station to display the prices of the three major grades of motor vehicle fuel for sale. [BPC 13531]
2. The brand name, the grade, the word gasoline, and the full selling price for each grade, including all taxes. [BPC 13532]
3. Items and services that are offered for sale may be on the price sign; however, prices for these items or services can not be on the price sign. [BPC 13534]
4. The brand name height shall be one-third the size of price numerals. [BPC 13532]
 - The word “gasoline” or other “motor fuel” not less than 1/3 the size of the price numerals – need not be more than four inches in height.
 - The grade size shall not be less than one-sixth the size of the price numerals – need not be more than four inches in height.
 - The price figures shall be all of the same size and color and at least six inches in height. Fractions may be used if equal in size to one numeral.

Segment 2

1. The SAE API service classification “donut” and the API certification mark “starbust”. [BPC 13480, 13482/CCR 4150]
2. It signifies which type of engine a particular engine oil should be used in. [BPC 13482]
3. SA and SB, formulated for pre 1964 vehicle engines. [SAE J183]
4. The following cautionary statement: “Caution – This oil is rated API _____. It is not suitable for use in most gasoline – powered automotive engines built after _____. Use in modern engines may cause unsatisfactory engine performance or equipment harm. [BPC 13482/SAE J183]
5. Yes. [BPC 13711(c)(1)]
6. To the requirements of the National Highway Traffic Safety Administration, United States Department of Transportation (DOT). [CCR 4100]
7. Yes. [BPC 13403]
8. Name of product, brand, trademark, or trade name of the product and in the case of engine fuel and kerosene, the grade or brand name designation. [BPC 13480(a)]



SELF-EVALUATION ANSWERS

Segment 3

1. Business name, address and name of the owner/operator. [Program Procedure]
2. Price sign. [BPC 13532]
Gasoline pumps. [BPC 13480]
Underground storage tanks. [BPC 13480]
3. Provision for air, water and pressure gauge. [BPC 13651]
Refueling services to disabled drivers. [BPC 13660]
4. BPC Sections 13591, 13592 and 13730.
5. One quart glass bottle. [Laboratory Policy]
6. When sampling from a multiple product single hose delivery system. To prevent contamination with a different grade of product from a previous delivery. [Program Manual]
7. Samples of the product shall be taken and submitted to the Division of Measurement Standards Petroleum Laboratory. [Program Policy]
8. Two days. [Program Policy]
9. Petroleum Products Audit Report form. [Program Policy]

Segment 4

1. May lead to fuel system plugging, corrosion, and engine stalling. [BPC 13440(a)/CCR 4140]
2. Low flash point can impact safe handling and storage of fuel. [BPC 13450(a)/CCR 4143]
3. Over heating may cause engine damage. [BPC 13710(a)/CCR 4162-4164]
4. To measure the viscosity or the ability of an oil to flow at high temperature and thereby provide protection against friction. [BPC 13480(b)]
5. Research method and motor method. [BPC 13403]

Segment 5

1. The location of the suspect station, repair shop, store, etc. [Program Procedure]
2. Who, What, Where, When. [Program Procedure]
3. Contact the complainant to notify them of your findings. [Program Procedure]
4. Old glass bottles no longer used – sealed plastic containers mostly used now.
Smaller front wheel drive cars, make it harder to install and hide the oil recovery equipment. [Program Procedure]
5. To verify the quantity and quality of a petroleum or automotive product and to verify that services are being offered and delivered as required by law. [BPC 13651, 13660/Program Procedure]



We would appreciate your taking a few moments to complete our training evaluation feedback form. We welcome your comments and any suggestions you might have regarding Training Module 12. You may E-mail your response to us at DMS@cdfa.ca.gov or mail to Division of Measurement Standards at 6790 Florin Perkins Road, Suite 100, Sacramento CA 95828-1812.

1. Did this module fulfill your expectations?
2. What did you like/dislike about this module?
3. What areas would you like to see improved?
4. What specific changes, if any, would you recommend?
5. How could this module be better organized to make it easier to follow and learn from?
6. Was this module too basic or too advanced for someone with an entry level background in weights and measures?
7. Additional comments or suggestions.