

Bulk Oil Testing, Handling, and Storage Guidelines

API RECOMMENDED PRACTICE 1525
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Manufacturing, Distribution and Marketing Department

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FOREWORD

This standard was developed to guide the management of certain operations in a manner that protects the environment and the safety of workers and the public. This standard is intended for petroleum terminal and tank facilities associated with the storage and distribution of petroleum lubricants. This standard may be used as a resource and management guide by those responsible for such facilities and by those working on their behalf. This standard is a compilation of industry knowledge, information, and management practices for all relevant aspects of bulk lubricant handling aggregated into an overview document comprising best practices. It is intended to be consistent with, but is not a substitute for, any applicable local, state, or federal regulations.

Some provisions in this standard, as indicated by the use of the word *shall*, are mandatory and have to be followed to meet the intent of this standard. Some provisions are recommended, as denoted by the word *should*, but are not mandatory. These provisions will need to be considered based on site-specific factors. Still other provisions are optional, as denoted by the word *may*. Typically, these will be given where a range of good options exists.

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Bulk Oil Testing, Handling, and Storage Guidelines

1 Scope

The purpose of these guidelines is to provide recommended equipment and procedures for the proper handling of incoming and outgoing shipments of lubricants to prevent contamination and spillage, and to protect product quality. The guidelines cover receipt, storage, and shipment of finished lubricants in bulk, drum, or pail. A log detailing incoming and outgoing shipments is recommended.

This recommended practice provides general guidance on the proper handling of bulk oil. Application of all or part of the guidelines should be determined on a case-by-case basis.

2 Governmental Requirements and Reviews

Reviews should be conducted periodically to help ensure that the facility meets applicable federal, state, or local requirements. These reviews should include, but are not limited to the following:

- a. Spill Prevention Control and Countermeasure (SPCC) plans, 40 *Code of Federal Regulations* (CFR) 112 and other Environmental Protection Agency (EPA) requirements.
- b. Occupational Safety and Health Act (OSHA) requirements.
- c. Tank or vessel inspection records, registration, or files.
- d. Discharge or remediation permits.
- e. Air and water permits.
- f. Oil Pollution Act of 1990 (OPA 90) regulations and contingency plans.
- g. State and local emergency plans.
- h. 49 *Code of Federal Regulations* 195—Department of Transportation (DOT) Transportation of Hazardous Liquid by Pipeline regulations.
- i. Superfund Amendments and Reauthorization Act (SARA) Title III requirements.
- j. United States Coast Guard (USCG) requirements, 33 *Code of Federal Regulations* 154.
- k. Local or state Fire Marshall permits.

3 Definitions

3.1 For the purposes of this recommended practice, the following definitions apply:

3.1.1 may: indicates provisions that are optional and, consequently, are at the discretion of the designer or operator.

3.1.2 must: indicates important legal or safety considerations.

3.1.3 shall: indicates provisions that are mandatory to meet this API standard.

3.1.4 should: indicates provisions that are recommended but not mandatory. Implementation of these provisions will be made based on consideration of the following, as appropriate: (a) risk/benefit analysis, (b) company standards, (c) company experience, and (d) company philosophy.

3.1.5 underground tank: a buried container that has a capacity of more than 110 gallons (416 liters) and is used to store petroleum, additives, or other products for later use.

4 Facility and Equipment Standards

The following are recommendations for the tankage, lines, and testing equipment, and are intended to complement the general operating guidelines.

4.1 STORAGE TANKS

4.1.1 Tanks may be either above or below ground. Tanks should meet all federal, state, and local codes and requirements. Underground tank integrity testing should be done annually, and records of such testing should be maintained.

4.1.2 All tanks should be clearly marked with the product name, as well as any other information required by federal, state, and local laws.

4.1.3 All tanks, except cone-bottom tanks, should have a water draw-off at the lowest possible point within the tank.

4.1.4 All tanks should be designed to allow for sampling of the contents. A sample obtained through a pump or line is acceptable, provided adequate flushing procedures are used.

4.1.5 When changing tank service from one product type to another, the tank should be emptied completely and cleaned first. It is not necessary to clean between shipments that have the same grade and performance level.

4.1.6 The facility should be capable of storing line flushings. Disposal of line flushings should be in accordance with federal, state, and local laws.

4.1.7 Tanks should be designed so that their contents can be volumetrically measured/gauged in some manner.

4.1.8 All tanks should be designed so that the temperature of their contents can be monitored. Heating, if required to facilitate handling, should be carefully controlled to prevent product degradation.

4.2 LINES, PUMPS, METERS, AND HOSES

4.2.1 All lines should be clearly identified with the product name near the valve closest to the tank discharge or receiving point.

4.2.2 It is preferred that each product have separate lines, pumps, and meters.

4.2.3 In situations where a totally dedicated system for each product is not feasible, it may be acceptable to use limited common lines and a common pump/meter within each of the product groups. Common lines and pumps/meters should not be used for products in different groups (hydraulic oils, motor oils, gear oils, ATF).

4.2.4 Lines should have isolated valves close to the pump (manifold) and should be equipped with appropriate pressure-relief controls.

4.2.5 Schedule 40 carbon steel or stainless steel are the preferred materials for all lines carrying lube oils. Galvanized and PVC pipe are not recommended for lubricants. Most PVC pipe is manufactured for water service and is incompatible with hydrocarbons, especially low-viscosity products and synthetics.

4.2.6 All lines and hoses at bulk loading racks should be designed to drain-dry, and/or procedures should provide for line flushing using pigs, inert gas, or air if it is safe to do so.

4.2.7 All scales and meters should be routinely and regularly calibrated and should comply with city, county, state, federal, and other applicable regulations. Records of calibration should be maintained.

4.2.8 Loading and filling lines should contain a strainer of 60-mesh or finer, to protect the pump. Small micron-size screens may be required to meet cleanliness requirements.

4.2.9 To maintain good housekeeping, drip pans should be used where the hoses are coupled.

4.2.10 All hoses used within the facility should be dedicated to a specific product group and identified to reflect that service.

4.2.11 A schematic drawing of the bulk plant facilities indicating tank sizes, products, lines, pumps, and other pertinent information is recommended.

4.3 PRODUCT TESTING EQUIPMENT

For facilities handling bulk lubricants, the following equipment should be available to perform basic product tests:

- a. Clean, dry, and clear glass or plastic bottles that can be used when making visual comparisons to reference samples for color, water, and contamination.
- b. A handheld device to measure product viscosity grade. (This is used for viscosity grade identification only. This is not a measure of accurate viscosity.)
- c. A soldering iron to run crackle tests for water contamination.
- d. An explosion-proof droplight to inspect 55-gallon drums for internal cleanliness.

e. A sample thief to secure representative samples from storage tanks or other containers.

f. Any additional laboratory equipment that may be necessary to complete ASTM tests on products that are blended on site.

4.4 PERSONAL SAFETY EQUIPMENT

Safety equipment is recommended to protect employees. Appropriate safety equipment may include the following:

- a. Hardhat.
- b. Protective eyewear.
- c. Fire extinguisher.
- d. Solvent-impervious gloves.
- e. Long-sleeved clothing and/or coveralls.
- f. Safety belts.
- g. Personnel should follow a written safety program that includes appropriate governmental regulations and recommended company safety policies.

4.5 TRAINING RECORDS

Records should be maintained to document training provided to employees who handle loading or packaging of lubricants.

5 Sampling and Testing

General sampling and testing guidelines are located in Appendixes B and C.

6 Storage

6.1 GENERAL

6.1.1 All bulk oil products should be stored in dedicated tanks.

6.1.2 Clearly mark tanks as to contents, disclosing product name, and viscosity.

6.1.3 Beginning and ending balances should be recorded.

6.1.4 Tanks should be designed so that samples may be taken.

6.1.5 Tanks should be designed so that the temperature of the contents can be monitored.

6.2 COMMINGLING

6.2.1 Products from different companies should not be commingled, even if the product is similar.

Note: Under some circumstances, mixing different oils with different additive systems may cause adverse reactions. Additionally, there may be commercial or contractual restrictions that prohibit commingling different products from different companies. Therefore, as a general rule, oils should not be mixed, unless full disclosure is made to all parties involved.

6.2.2 Tanks should be drained and flushed between similar products from different companies.

6.2.3 Tanks should be drained and flushed between different grades of the same product.

6.2.4 Tanks should be cleaned between different products or product groups.

7 Unloading Procedures

7.1 BEFORE UNLOADING TRUCKS

7.1.1 Properly position the truck for unloading; secure the brakes, and chock the tires.

7.1.2 Carefully check delivery documents to verify the products and quantities to be unloaded. If multiple products are included in separate compartments, take special care to avoid possible cross-contamination. A Bulk Receiving/Batch Log (see Appendix A) should be maintained for each product received.

7.1.3 Obtain a sample, per sampling instructions (see Appendix B). Complete the identification label, attach it to the sample bottle, and submit the sample to the laboratory.

7.1.4 Gauge the receiving tank to verify that there is enough room for the product to be unloaded. The quantity of the product to be unloaded should not exceed safe tank height, which is considered to be 90 percent of tank capacity.

7.1.5 Upon release by the laboratory, or verification that the shipment conforms to acceptance criteria, connect the ground strap to the trailer and prepare to unload the truck.

7.1.6 All unloading should be performed in accordance with applicable safety procedures and governmental regulations.

7.1.7 Inspect hoses for integrity and the absence of contaminants. Faulty hoses should not be used. Hoses used for unloading other products, or hoses that are dirty, should be flushed prior to use.

7.1.8 Before unloading, lines and valves must be set to direct the product to the proper tank. Piping systems with common lines, pumps, or manifolds should be flushed to displace any prior product (see Table 1).

Note: All trucks/trailers have emergency or hydraulic valves that must be opened before unloading can begin. Operator must ensure the dome hatch is not obstructed, which could cause the trailer to implode.

7.2 DURING UNLOADING

7.2.1 Once pumping has begun, inspect the system for possible leaks. If any leaks are noted, the unloading should be discontinued while the leak is repaired. Drip pans should be used to collect or contain any spillage.

7.2.2 During pumping, observe the pressure level on the pump discharge. An unusually low or high pressure may indicate that the pump suction is obstructed, or that the dome cover or valves are improperly open. Also, check the receiving tank to verify that the product from the trailer has been directed to the correct tank. If any anomalies are noted, all pumping operations should be shut down until the matter is understood and resolved.

7.3 AFTER UNLOADING

7.3.1 Once the trailer is empty, close the bottom valve, pump the suction valve, and turn off the pump. When possible, particularly when receiving lines to storage tanks are not product specific, blowing receiving lines with inert gas and/or ball will clear product from lines into receiving tank. Then, close all remaining valves, beginning at the receiving tank and ending at the pump discharge.

7.3.2 Bleed any pressure from the lines before disconnecting the suction hose. Connections should be released slowly to avoid possible discharge due to pressure buildup. Hoses should be capped/plugged before they are returned to storage areas.

7.3.3 Cap the trailer outlet valve, disconnect the ground strap, return the drip pan, and remove the wheel chocks. Release the truck.

7.3.4 Record receiving tank volumes (gauge readings) on the Bulk Receiving/Batch Log (see Appendix A).

8 Loading Procedures

8.1 GENERAL

8.1.1 Truck operators should be DOT qualified per all federal, state, and local regulations.

Table 1—Recommended Flushing Volumes for Common Systems

Oil Product Group	Recommended Flushing Volume (percent).
Motor Oils	100 percent of common (pump and line) volume when changing grades within a product family (example: HD SAE 30 to HD SAE 15W-40). 200 percent of common volume when changing from PCMO to HD or vice versa.
Hydraulic Oils	100 percent of common volume when changing from one grade to another within this group.
Gear Oils	100 percent of common volume when changing grades within a product family (example: SAE 85W-140 to SAE 80W-90).
ATF	300 percent when following any dyed product, or until no red tint can be seen.
Turbine Oils	100 percent of common volume when changing from one grade to another.

