API RP 3000

Classifying and Loading of Crude Oil into Rail Tank Cars

Draft 06/27/2014

1 Scope

This document provides guidance on the material characterization, transport classification, and quantity measurement of petroleum crude oil, using both laboratory and field testing techniques, for the loading of rail tank cars.

This document also provides guidance on the documentation of measurement results.

This document identifies the criteria for determining the frequency that the crude oil should be sampled and tested.

This document applies only to petroleum crude oil classified as Hazard Class 3 flammable liquids under the U.S. Code of Federal Regulations (CFR) at the time of publication.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API *Manual of Petroleum Measurement* Standards *(MPMS)*

Chapter 3.1A, *Manual Gauging of Petroleum and Petroleum Products*

Chapter 3.1B, *Level Measurement of Liquid Hydrocarbons in Stationary Tanks by Automatic Tank Gauging*

Chapter 3.2, *Standard Practice for Gauging Petroleum and Petroleum Products in Tank Cars*

Chapter 5 (all parts), *Metering*

Chapter 7, *Temperature Measurement*

Chapter 8.1-2013, *Standard Practice for Manual Sampling of Petroleum and Petroleum Products*

Chapter 8.2, *Standard Practice for Automatic Sampling of Liquid Petroleum and Petroleum Products*

Chapter 9.1, *Standard Test Method for Density, Relative Density, or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method*

Chapter 9.3, *Standard Test Method for Density, Relative Density, and API Gravity of Crude Petroleum and Liquid Petroleum Products by Thermohydrometer Method*

Chapter 11.1-2004 (including Addendum 1-2007), *Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils*

Chapter 11.5 (all parts), *Density/Weight/Volume Intraconversion*

Chapter 12.1.1, *Calculation of Static Petroleum Quantities—Upright Cylindrical Tanks and Marine Vessels*

ASTM

D4057-12 *Standard Practice for Manual Sampling of Petroleum and Petroleum Products*

D7900 *Standard Test Method for Determination of Light Hydrocarbons in Stabilized Crude Oils by Gas Chromatography*

Association of American Railroads (AAR)[1]

Pamphlet 34, *Recommended Methods for the Safe Loading and Unloading of Non-Pressure (General Service) and Pressure Tank Cars*

AAR Scale Handbook

[1] Association of American Railroads, 425 3rd Street, SW, Washington, DC 20024

GPA 2103 *Method for the Analysis of Natural Gas Condensate Mixtures Containing Nitrogen and Carbon Dioxide by Gas Chromatography*

NIST

Handbook 44, *Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices*

U.S. Code of Federal Regulations (CFR)

49 CFR Subchapter C, *Hazardous Material Regulations (HMR)*

Part 171, *General Information, Regulations, and Definitions*

Part 172, *Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, Training Requirements, and Security Plans*

Part 173, *Shippers—General Requirements for Shipments and Packagings*

Part 174, *Carriage by Rail*

Canadian *Transportation of Dangerous Goods Regulations (TDGR)*

SOR/2012-245 (Amendment 11)

3 Terms and Definitions

For the purposes of this document, the following definitions apply.

3.1
bill of lading
BOL
A document between the offeror of a particular good and the carrier detailing the type, quantity and destination of the good being carried. The BOL also serves as a receipt of shipment when the good is delivered to the predetermined destination. This document has to accompany the shipped goods, no matter the form of transportation, and has to be signed by an authorized representative from the carrier, offeror and consignee.

Note to entry: The rail tank car BOL is typically an electronic file (electronic data interface – EDI).

3.2
capacity table
tank car capacity table
calibration table
Table showing the capacities or volumes in a tank for various liquid levels measured from the rail tank car's reference gauge point.

Note to entry: The same capacity table may be assigned to many similar, but not identical, rail tank cars. The table may be based on either innage or outage gauges and may indicate either liquid or vapor space gallons. These are referred to as outage/liquid, outage/vapor, innage/liquid or innage/vapor tables. Rail tank car manufacturers have traditionally located the reference gauge point at the top inside of the car's shell at the shell-full point; the top of the manway closest to the center point of the car is specified by API *MPMS* Ch. 3.2.

[Source: API MPMS Ch. 12.1.2 [3]]

3.3
carrier
A person who transports passengers or property in commerce by rail [tank] car.

[Source: 49 CFR 171.8 modified]

3.4
combustible liquid
Classification for a crude oil which has a flash point greater than 60 °C (140 °F) to 93 °C (200 °F), and offered for transportation in bulk.

3.5
consignee
The person or place shown on a shipping document, package marking, or other media as the location to which a carrier is directed to transport a hazardous material.

[Source: 49 CFR 171.8]

3.6
crude oil
A mixture of hydrocarbons that exists in liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities.

[Source: 16 CFR 317.2 and EIA Energy Glossary]

3.7
dead crude oil
stabilized crude oil
A term usually employed for crude oils that, when exposed to normal atmospheric pressure at room temperature, will not result in actual boiling of the sample.

Note to entry: For the purposes of this document the terms “stabilized” and “dead” are synonymous, and the terms “non-stabilized”, “un-stabilized”, and “live” are synonymous.

[Source: ASTM D6377 [14]]

3.8
division
Subset of a hazard class (under the U.S. HMR) indicating a particular kind of hazard within that class.

Note to entry: For example, Class 2 has three divisions: 2.1 flammable gas; 2.2 compressed gas; and 2.3 toxic gas.

3.9
gauge
The measure of the liquid level in a tank, vertically from the [rail] tank car’s reference gauge point.

[Source: API MPMS Ch. 12.1.2 [3] modified]

3.10
gauging
A process of measuring the height of a liquid in a container.

[Source API MPMS Ch.12.1.2]

3.11
hazard class
The category of hazard assigned to a hazardous material under the definitional criteria of part 173 of the HMR and the provisions of the 49 CFR hazmat table.

Note to entry: A material may meet the defining criteria for more than one hazard class but is assigned to only one hazard class.

[Source: 49 CFR 171.8]

3.12
hazardous materials (HM)
dangerous goods (DG)
Materials determined by the U.S. Secretary of Transportation to pose an unreasonable risk to health, safety, and property when transported in commerce.

[Source: 49 CFR 171.8]

Note to entry: The U.S. refers to these materials as "hazardous materials" while other United Nations (UN) members refer to them as "dangerous goods".

3.13
hazmat employee
1) An individual who:
   (i) is employed on a full time, part time, or temporary basis by a hazmat employer; or
   (ii) is self-employed (including an owner-operator of a motor vehicle, vessel, or aircraft) transporting hazardous material in commerce; and
   (iii) who during the course of such full time, part time, or temporary employment, or such self employment, directly affects hazardous material transportation safety as [defined] by regulation; and
2) includes an individual, employed on a full time, part time, or temporary basis by a hazmat employer, or self employed, who during the course of employment:
   (i) loads, unloads, or handles hazardous materials;
   (ii) designs, manufactures, fabricates, inspects, marks, maintains, reconditions, repairs, or tests a package, container or packaging component that is represented, marked, certified, or sold as qualified for use in transporting hazardous material in commerce.
   (iii) prepares hazardous materials for transportation;
   (iv) is responsible for safety of transporting hazardous materials;
   (v) operates a vehicle used to transport hazardous materials, certified, or sold as qualified for use in transporting hazardous material in commerce.

Note to entry: This is a U.S. term. Different terms may be used outside of the USA.

[Source: 49 CFR Chapter 51 modified]

3.14
heel
on-board quantity (OBQ)
remaining (quantity) on-board (ROB)
The material remaining in a rail tank car, prior to loading and after the crude oil is unloaded.

Note to entry: ROB and OBQ may include any combination of water, oil, oil residue, oil/ water emulsions, and sediment.

[Source: API MPMS Ch. 17.1 modified]

3.15
innage
Level of liquid in a tank measured from the datum plate or tank bottom to the surface of the liquid.

[Source: API MPMS Ch. 3.1A]

3.16
light weight
[tare]
LT WT
The number on the sides of a [rail] tank car near its ends indicating the empty weight of the car.

[Source: API MPMS Ch. 12.1.2 modified]

3.17
[flammable] liquid
a liquid having a flash point of not more than 60 °C (140 °F), or any material in a liquid phase with a flash point at or above 37.8 °C (100 °F) that is intentionally heated and offered for transportation or transported at or above its flash point in a bulk packaging, with the following exceptions:

1) Any liquid meeting one of the definitions [of a flammable gas].
2) Any mixture having one or more components with a flash point of 60 °C (140 °F) or higher, that make up at least 99 % of the total volume of the mixture, if the mixture is not offered for transportation or transported at or above its flash point.
3) Any liquid with a flash point greater than 35 °C (95 °F) that does not sustain combustion according to ASTM D4206 [11] or the procedure in appendix H to Part 173 of the HMR.
4) Any liquid with a flash point greater than 35 °C (95 °F) and with a fire point greater than 100 °C (212 °F) according to ISO 2592.
5) Any liquid with a flash point greater than 35 °C (95 °F) which is in a water-miscible solution with a water content of more than 90 % by mass.

Note to entry: Liquid in this context refers to flammable liquid Class 3 as defined in the HMR.

[Source: 49 CFR 173.120]

3.18
[weight] load limit
LD LMT
The number on the sides of a rail tank car near its ends indicating the maximum legal weight of its contents.

Note to entry: The maximum gross rail load of the rail tank car is the sum of the load limit and light weight (tare).

[Source: API MPMS Ch. 12.1.2 modified]

3.19
manway
A cylindrical opening on the top of a [rail] tank car, with a manway cover, for [personnel] access to the interior of the car.

[Source: API MPMS Ch. 12.1.2 modified]

3.20
[crude oil] outage
ullage
The amount by which a packaging falls short of being liquid full, usually expressed in percent by volume.

[Source: 49 CFR 171.8]

3.21
Packing Group (PG)
A grouping according to the degree of danger presented by [some] hazardous materials [dangerous goods].

Note to entry: PG I indicates great danger, PG II medium danger, and PG III minor danger.

[Source: 49 CFR 171.8]

3.22
portable electronic gauging device
PEGD
An electronic sensing device suspended on a measuring tape, and a housing with readouts.

[Source: API MPMS Ch. 3.1A]

3.23
relative density
specific gravity
The ratio of the mass of a given volume of liquid at a specific temperature to the mass of an equal volume of pure water at the same or different temperature. Both reference temperatures shall be explicitly stated.

[Source: API MPMS Ch. 9.1]

3.24
safety data sheet (SDS)
material safety data sheet (MSDS)
Written or printed material concerning a hazardous chemical that is prepared in accordance with the following:

Chemical manufacturers and importers shall obtain or develop a safety data sheet for each hazardous chemical they produce or import. Employers shall have a safety data sheet in the workplace for each hazardous chemical which they use.

[Source: 29 CFR 1910.1200]

3.25
standard reference conditions
The standard reference conditions of pressure and temperature for use in measurements on crude petroleum and its products is 101.325 kPa (absolute) and 15.556 °C (60 °F), with the exception of liquid hydrocarbons having a vapor pressure greater than atmospheric at 15.556 °C (60 °F), in which case the standard pressure shall be equilibrium vapor pressure at 15.556 °C (60 °F).

Note to entry: 101.325 kPa = 1.01325 bar = 1 013.25 mbar = 1 atm.

[Source: ISO 5024:1999 modified]

3.26
standard temperature
The temperature at which a product is traded by volume, normally 60 °F in the U.S., and either 15 °C or 20 °C elsewhere.

[Source: API MPMS Ch. 12.1.2]

3.27
subsidiary hazard
As defined in the transport regulations of the U.S., Canada and the international regulations for air and sea transport, a hazard of a material other than the primary hazard.

3.28
tank car capacity
stenciled capacity
tank car volume
The number on the ends of a [rail] tank car indicating its shell-full capacity.

Note to entry: This is the amount of water in gallons and liters that the car can contain at 15.56 °C (60 °F).

[Source: API MPMS Ch. 12.1.2 modified]

3.29
vapor space
The volume above the liquid surface.

[Source: API MPMS Ch. 12.1.2]

3.30
waybill
Document issued and used by a carrier providing details and instructions relating to the shipment of a consignment of goods. Typically it will show the names of the consignor and consignee, the point of origin of the consignment, its destination, and route.

Note to entry: A waybill in itself does not contain all the information required by law in a shipping paper.

4 Roles and Responsibilities

4.1 General

For the purposes of this document, it has been chosen to use the term “offeror” as defined below. However, in common usage, the term “offeror” is often used interchangeably with other terms such as “shipper”, “consignor” and “one who offers”. Users of this document should be aware of and comply with regulatory requirements of their local jurisdiction when preparing crude oil for shipment.

4.2 Offeror

An offeror is:

1) Any person who does either or both of the following:
   i. Performs, or is responsible for performing, any pre-transportation function required for transportation of the hazardous material in commerce.
   ii. Tenders or makes the hazardous material available to a carrier for transportation in commerce.
2) A carrier is not an offeror when it performs a pre-transportation function required as a condition of acceptance of a hazardous material for transportation in commerce (e.g., reviewing shipping papers, examining packages to ensure that they are in conformance with the HMR, or preparing shipping documentation for its own use) or when it transfers a hazardous material to another carrier for continued transportation in commerce without performing a pre-transportation function.

4.3 Pre-transportation functions

Offerors perform any of the 14 “Pre-transportation functions” specified below. Pre-transportation function means a function that is required to assure the safe transportation of a hazardous material in commerce, including—

1) Determining the hazard class (3.11) of a hazardous material (3.12).
2) Selecting a hazardous materials packaging.
3) Filling a hazardous materials packaging, including a bulk packaging.
4) Securing a closure on a filled or partially filled hazardous materials package or container or on a package or container containing a residue of a hazardous material.
5) Marking a package to indicate that it contains a hazardous material.
6) Labeling a package to indicate that it contains a hazardous material.

7) Preparing a shipping paper.
8) Providing and maintaining emergency response information.
9) Reviewing a shipping paper to verify compliance with the HMR or international equivalents.
10) For each person importing a hazardous material into the United States, providing the shipper with timely and complete information as to the HMR requirements that will apply to the transportation of the material within the United States.
11) Certifying that a hazardous material is in proper condition for transportation in conformance with the requirements of the HMR.
12) Loading, blocking, and bracing a hazardous materials package in a freight container or transport vehicle.
13) Segregating a hazardous materials package in a freight container or transport vehicle from incompatible cargo.
14) Selecting, providing, or affixing placards for a freight container or transport vehicle to indicate that it contains a hazardous material.

4.4 Consignor

In Canada, the consignor (expéditeur) is defined a person who

a) is named in a shipping document as the consignor;
b) imports or who will import dangerous goods into Canada; or
c) if paragraphs (a) and (b) do not apply, has possession of dangerous goods immediately before they are in transport.

NOTE A person may be both a consignor and a carrier of the same consignment, for example, a manufacturer who also transports the dangerous goods he or she produces.

4.5 Function-specific Responsibilities

Employees performing activities utilizing transport classifications and proper shipping descriptions shall be trained commensurate to their job responsibilities. The following functions require use of classification information:

1) Identification of transport hazard classes (1-9) per applicable regulatory code. This can include hazardous waste (40 CFR) and noting differences in other regulatory agencies such as Transport Canada.
2) Determining primary hazard class (3.11), subsidiary hazards (3.27) (or risks), and the assignment of Packing Group (3.21).
3) Selection of proper shipping name, UN (or NA- North American) number, hazard class (category of risk), subsidiary risks, Packing Group (degree of risk).
4) Creating proper shipping description (PSD) options in EDI (information technology) systems per carrier specifications.
5) Determination of packaging instructions and packaging selection.
6) Preparing and packaging small quantities of hazardous materials, i.e., samples for transport to laboratories.
7) Inspection and placement of marks/labels/placards when offering for transport.
8) Supervision of [rail] tank cars at load, unload, and storage incidental to transport.
9) Securement and proper closure procedures of tank cars.
10) Transmitting EDI information to carriers (e.g., for waybills, shipping papers, bills of lading (BOLs)).
11) Providing and coordination of emergency response.
12) Certifying shipping papers (via EDI electronic signature).

13) Offering placards to truck drivers.

14) Development of training programs for the above regulated activities.

15) Enforcing, surveying, or inspecting for compliance with applicable regulations.

16) Supervision of new employees performing any of the above activities.

See Annex C for a summary of roles, responsibilities and training requirements of hazmat employees (3.14).

5 Classifying Crude Oil for Transportation by Rail

5.1 Identification of the Physical and Chemical Properties of Crude Oil

5.1.1 General

The identification of physical and chemical characteristics of crude oil (3.6) is conducted for the purpose of determining the proper hazardous material classification and the assignment of Packing Group (3.21) of the crude oil and subsequent selection of package. See Table 1.

Identifying the physical and chemical properties of crude oil shipped by rail is required by government regulations. Each package used for the shipment of hazardous materials shall be designed, constructed, maintained, filled, its contents so limited, and closed, so that under conditions normally incident to transportation there will be no identifiable (without the use of instruments) release of hazardous materials to the environment, and that the effectiveness of the package will not be substantially reduced.

5.1.2 Reasons for Classification

Classification of a hazardous material (3.12) is the first step in preparing a consignment of dangerous goods for transport. Classification is the determination of basic shipping information. Basic information includes:

- UN ID number
- Proper shipping name (technical chemical name)
- Primary hazard class
- Subsidiary hazard class/risk(s)
- Packing Group
- Other special designations or notations.

Misclassification of a hazardous material could lead to use of an unauthorized rail tank car that may lack the required safety enhancements necessary to safely transport the crude oil, as well as insufficient development of safety and security plans and the communication of inaccurate information to emergency responders.

5.1.3 Determination of Classification

Any person who offers crude oil for transportation in commerce shall ensure that the crude oil has been tested and classified in accordance with government regulations prior to being offered into transport by rail.

When determining the hazard class of crude oil, a determination shall be made that the crude oil does not meet the definition of a flammable gas prior to being classified as a Class 3 flammable liquid (3.17). Some crude oils may not be classified as a hazardous material – see 5.1.5.

Within the USA, a flammable gas is defined in 49 CFR 173.115 as any material which is a gas at 20 °C (68 °F) or less and 101.3 kPa (14.7 psia) of pressure (a material which has a boiling point of 20 °C (68 °F) or less at 101.3 kPa (14.7 psia)) which—

1. Is ignitable at 101.3 kPa (14.7 psia) when in a mixture of 13 % or less by volume with air; or
2. Has a flammable range at 101.3 kPa (14.7 psia) with air of at least 12 % regardless of the lower limit. Except for aerosols, the limits specified in [these paragraphs] shall be determined at 101.3 kPa (14.7 psia) of pressure and a temperature of 20 °C (68 °F) in accordance with the ASTM E681-85, *Standard Test Method for Concentration Limits of Flammability of Chemicals* or other equivalent method approved by the [PHMSA] Associate Administrator.

Within Canada, a flammable gas is defined in TDGR s. 2.13 as a substance that at 50 °C has a vapor pressure greater than 300 kPa or that is completely gaseous at 20 °C at an absolute pressure of 101.3 kPa and that is

a) compressed (other than in solution) so that when it is packaged under pressure for transport it remains entirely gaseous at 20 °C;
b) liquefied so that when it is packaged for transport it is partially liquid at 20 °C;
c) refrigerated so that when it is packaged for transport it is made partially liquid because of its low temperature;
d) in solution so that when it is packaged for transport it is dissolved in a solvent.

5.1.4 Assignment of Packing Group (PG)

Once crude oil is classified as a flammable liquid (Class 3) (3.17) and prior to being offered for transportation by rail in rail tank cars, the flash point and initial boiling point shall be determined to establish the PG (3.21). See 5.6 for sampling and testing frequency. See Table 1 for the criteria for assignment of PG for a Class 3 flammable liquid.

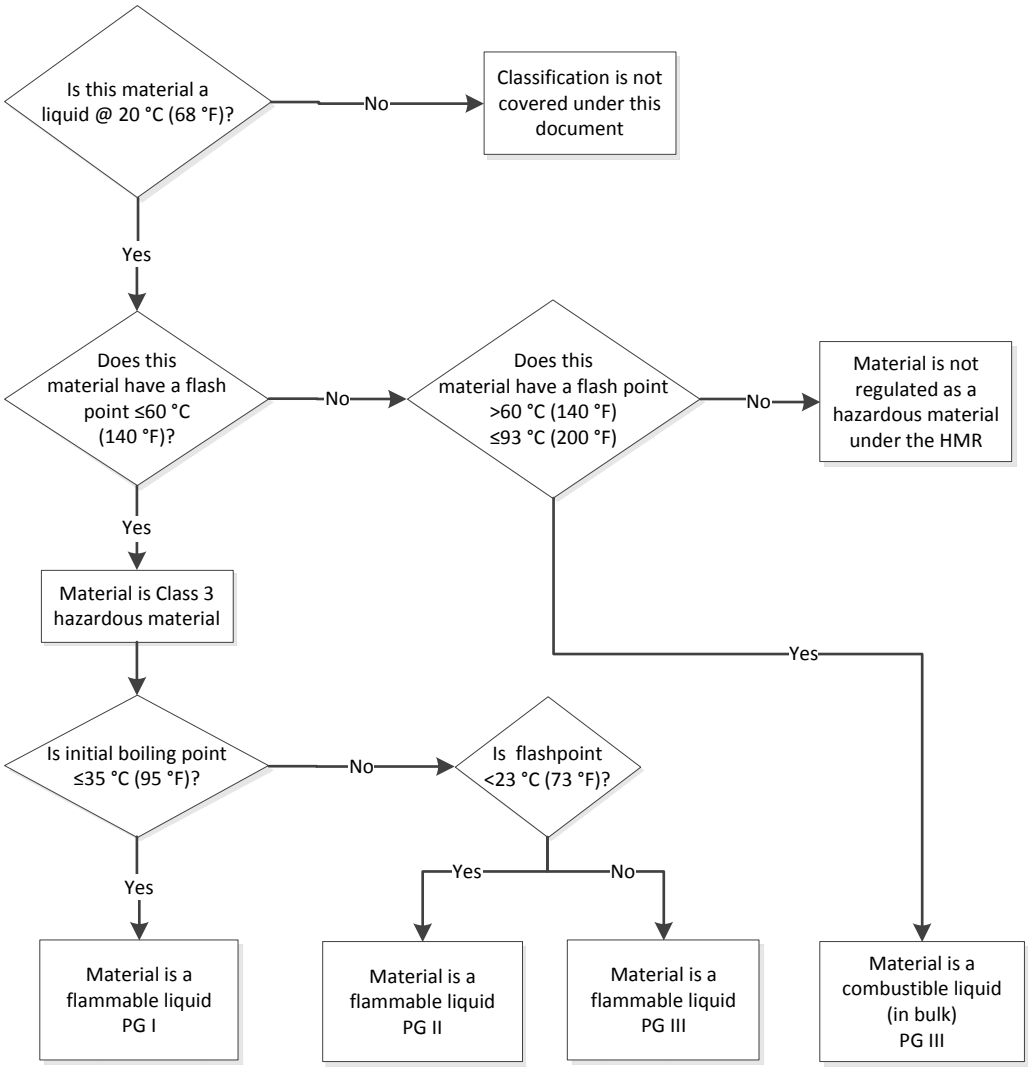
Table 1—Criteria for Assignment of PG for a Class 3 Flammable Liquid[1)]

Packing Group	Flash point (closed-cup)	Initial boiling point (IBP)
I (Great Danger)	Not applicable	≤35 °C (95 °F)
II (Medium Danger)	<23 °C (73 °F)	>35 °C (95 °F)
III (Minor Danger)	≥23 °C, ≤60 °C(≥73 °F, ≤140 °F)	>35 °C (95 °F)

[1)] This table is for informational purposes only and does not provide legal advice on compliance with regulations.

See Figure 1 for a schematic of PG assignment. This schematic is for informational purposes only and does not provide legal advice on compliance with regulations.

Figure 1—Crude Oil for Transport by Rail Tank Car – Packing Group Assignment



5.1.5 Crude Oil Classified as Non-Hazardous

If the material is determined to be non-hazardous per government regulations, e.g. certain Californian crudes that do not meet the criteria for hazard classes 1-9, periodic sampling and testing (see 5.6) shall be performed to ensure that the non-hazardous classification remains valid.

5.1.6 Potential Effect of Heel on Assignment of Packing Group

The assignment of the PG of rail tank cars containing a heel (3.14) should be the same as the assignment of the last contained product, unless the heel is sampled and tested.

A heel can affect the assignment of PG. If multiple crude oils having different packing groups are mixed together, a sampling and testing program (e.g. see Annex A) shall be in place to determine the effect of the heel on the assignment of PG prior to loading of crude oil onto rail tank cars.

5.1.7 Mixing Crude Oils of Differing Packing Groups

When rail tank cars are loaded from sources of different PG, the rail tank car shall be assigned the PG with the greatest level of potential danger as given in Table 1 unless testing dictates otherwise.

5.2 Hydrogen Sulfide (H_2S) Risk and Additional Marking Requirements

Some crude oils contain sulfur compounds which can, through temperature change, agitation, composition etc. evolve hydrogen sulfide (H_2S), a toxic gas. This gas can collect in the vapor space (3.29) of the rail tank car and present an inhalation hazard to handlers or, in certain circumstances, to emergency responders.

Petroleum crude oils transported in bulk have a potential to evolve lethal levels of H_2S in head space vapors, and rail tank cars shall include a marking, label, tag, or sign to warn of the toxic inhalation hazard.

5.3 Corrosivity Risk

Under this document, petroleum crude oil is not considered a Class 8 (Corrosive) material. However, certain components found in crude oil (e.g. H_2S) in combination with water can form acids which can result in corrosive action in rail tank cars. Continuing rail tank car qualification is mandated by government regulation.

5.4 Selection of Proper Shipping Name (PSN) and Associated UN ID Number

The PSN shall be selected using the following hierarchy:

1) Specific technical name, e.g. ethanol.
2) Generic use name, e.g. gasoline, resin solution, petroleum crude oil.
3) Generic chemical family name, e.g. alcohols not otherwise specified (n.o.s.) or petroleum distillates n.o.s., petroleum products.
4) General hazard class name, e.g. flammable liquid n.o.s., flammable liquid toxic n.o.s.

Following the above PSN hierarchy, petroleum crude oil offered for rail transportation should be given the proper shipping name, Petroleum Crude Oil, with the associated UN ID Number 1267.

If bitumen is blended or processed with a diluent and is to be used as a refinery feedstock, the PSN can be UN1993, otherwise it can be assigned UN1267.

5.5 Documentation of Transportation Requirements

5.5.1 General Information on Shipping Paper/Document

Shipping paper means a shipping order, bill of lading (3.1), manifest or other shipping document serving a similar purpose and prepared in accordance with government regulations. For rail, the shipping paper can be electronic. The shipping paper also requires an offeror's certification signature which may also be electronic.

The in-bound waybill (3.30) should be reviewed to determine the Packing Group (3.21) of the last known product. If the product to be loaded is less dangerous (a higher Packing Group or non-hazardous) then a determination should be made as to the impact on the PG of the material to be loaded.

Further information on the shipping paper can be found in Annex D.

Users should consult the regulations in their applicable jurisdiction regarding additional information that may be required on the shipping paper.

5.5.2 EDI (Electronic Data Interchange): Shipping Paper and Waybill Information

Persons offering hazardous materials (3.12) for transportation in bulk rail tank cars shall describe their consignments as prescribed by the HMR. Individual rail carriers (3.3) can have specific procedures and protocols for acceptance and carriage of hazardous materials. The EDI provides all the information needed to produce shipping papers, bill of ladings (BOL) (3.1), and waybills (3.30) to carriers and emergency responders. EDI, waybill (3.30), shipping paper, and BOL can be used interchangeably. Each will include classification information. The shipping paper is the regulated document. These documents shall be available in printed format to both offeror/consignor and carrier (3.3) when requested.

Shipping papers shall be legible, not include any unauthorized codes or abbreviations, and shall not contain any information inconsistent with the description of the hazardous material. Additional information shall be placed after the basic shipping description.

5.6 Sampling and Testing

5.6.1 General

Petroleum crude oils shall be analyzed to determine the physical and chemical characteristics of a particular composition prior to it being offered as a product for commerce. Evaluation of the physical and chemical properties with particular consideration given to those known hazardous constituents is critical to proper classification. Once the classification category is established, the appropriate package for loading and transportation is determined. It may be necessary to perform additional, or more frequent, testing to obtain more representative tests results.

Do not use SDSs (3.24) as the sole source of information for the assignment of Packing Group.

5.6.2 Sampling and Testing Program

A documented sampling and testing program shall be implemented and maintained. See Annex A for an example of a sampling and testing program.

In addition to testing for assignment of PG, an ongoing sampling and testing program shall include:

- Representative samples obtained in accordance with API MPMS Ch. 8.1 or API MPMS Ch. 8.2;
- Verification that the crude oil is a stabilized crude oil (3.7). Indications of un-stabilized crude oil are visible bubbling, foaming, and actual boiling.

5.6.3 Initial Testing for Assignment of Packing Group

Prior to being offered and transported by rail, the offeror shall obtain in accordance with API MPMS Ch. 8.1 or API MPMS Ch. 8.2 samples of the petroleum crude oil to be offered, and shall test for flash point and initial boiling point for the assignment of PG. Test methods listed in Table 2 are provided for the purpose of determining flash point, and those listed in Table 3 are provided for determining initial boiling point. Comments are given to offer guidance in the areas of test method applicability, practicability and sample(s) size. It should not be inferred by its placement in the tables that one test is more preferable than another.

Table 2—Flash Point Test Methods for the Assignment of PG

Test Method	Applicable Range[2]	Result Type	Units	Comments
ASTM D56[1] [5]	<93 °C (200 °F)	Numeric	°C or °F	For PG assignment purposes using 23 °C (73 °F), a pass/fail using D56 can be applied. Applicable to homogeneous, single-phase liquids having a viscosity less than 5.5 cSt @ 40 °C (104 °F) that do not form a film while under test. A large sample size is utilized in this test method.
ASTM D3278[1] [9]	0 °C (32 °F) to 110 °C (230 °F)	Numeric	°C or °F	For PG assignment purposes, pass/fail at 23 °C (73 °F) suffices. Applicable to homogeneous, single-phase liquids having a viscosity less 5.5 cSt @ 40 °C (104 °F) that do not form a film while under test. This test method is more conducive to laboratory safety due to the small sample size.
ASTM D3828[1] [10]	−30 °C to 300 °C	Pass/Fail, Numeric	°C	For PG assignment purposes, pass/fail at 23 °C (73 °F) suffices. Applicable to homogeneous, single-phase liquids having a viscosity less 5.5 cSt @ 40 °C (104 °F) that do not form a film while under test. This test method is more conducive to laboratory safety due to the small sample size.

Test Method	Applicable Range[2]	Result Type	Units	Comments
ASTM D93 [7] (ISO 2719) [23] [1]	>40 °C to 70 °C	Numeric	°C or °F	Applicable to distillate fuels, residual fuels, biodiesel and those materials that tend to form a surface film under test conditions where a stirrer is not used. A large sample size is utilized in this test method.
ISO 13736 [29] (IP 170) [1]	−30 °C to 75 °C	Numeric	°C	For PG assignment purposes, pass/fail at 23 °C (73 °F) suffices. A large sample size utilized in this test method.
ISO 3680[1] [26]	−30 °C to 300 °C	Pass/Fail	°C	This test method is more conducive to laboratory safety due to the small sample size.
ISO 3679[1] [25]	−30 °C to 300 °C	Numeric	°C	For PG assignment purposes, pass/fail at 23 °C (73 °F) suffices. This test method is more conducive to laboratory safety due to the small sample size.
ISO 1516[1] [21]	−30 °C to 110 °C	Pass/Fail	°C	A large sample size is utilized in this test method.
ISO 1523[1] [22]	−30 °C to 110 °C	Numeric	°C	For PG assignment purposes, pass/fail at 23 °C (73 °F) suffices. A large sample size is utilized in this test method.

[1] Test Methods listed in the HMR and the TDGR. This table is for informational purposes only and does not provide legal advice on compliance with regulations.

NOTE The use of alternative test methods to those listed in the HMR can be approved by U.S. DOT.

[2] Applicable temperature ranges are as of the date of publication of this document.

Table 3—Initial Boiling Point Test Methods for the Assignment of PG

Test Method	Applicable Range[2]	Result Type	Units	Comments
ASTM D86[1] [5]	0 °C to >250 °C	Numeric	°C	For purposes of PG assignment using 35 °C (95 °F), a pass/fail using D86 can be applied. However, this test method may not be the most accurate test method in measuring the IBP for crude oil with light components (i.e. methane to butanes).
ASTM D1078[1] [8]	30 °C to 300 °C	Numeric	°C	Applicable for PG assignment purposes. This test method is not commonly used for wide boiling material, more for narrow range chemicals.
ISO 3405[1] [23]	IBP=0 °C, FBP < 400 °C	Numeric	°C	For purposes of PG assignment using 35 °C (95 °F), a pass/fail using D86 can be applied. However, this test method may not be the most accurate test method in measuring the IBP for crude oil with light components (i.e. methane to butanes).
ISO 3924[1] [27]	>55 °C (131 F)	Numeric	°C	Not applicable for IBP of less than 55 °C (131 °F).

Test Method	Applicable Range[2]	Result Type	Units	Comments
ISO 4626[1] [28]	−30 °C to 100 °C	Numeric	°C	Applicable for PG assignment purposes. This test method is not commonly used for wide boiling material, more for narrow range chemicals.
ASTM D7900	Methane to n-nonane	Numeric	°C or °F	See below.
GPA 2103	Methane to hexane	Numeric	Volume %	Currently GPA 2103 reports volume percent which should be converted to weight percent for IBP calculation.

[1] Test Methods listed in the HMR and the TDGR. This table is for informational purposes only and does not provide legal advice on compliance with the regulations.

NOTE The use of alternative test methods to those listed in the HMR can be approved by U.S. DOT.

[2] Applicable temperature ranges are as of the date of publication of this document.

For crude oil packing group assignment for rail transportation purposes, crude oil samples shall be obtained in accordance with 5.6.4.1.2, and tested using ASTM D7900[2] to determine the boiling range distribution through n-nonane with the following qualifiers:

a) The initial boiling point (IBP) (as defined in ASTM D7169 [15]) is the temperature at which 0.5 weight percent is eluted when determining the boiling range distribution.

b) To determine vapor pressure (at 100 °F and a V/L ratio of 4:1), crude oil samples shall be tested using ASTM D6377.

c) If the vapor pressure, as determined in accordance with ASTM D6377 (at 100 °F and a V/L ratio of 4:1), of the crude oil is outside of the scope of ASTM D7900, i.e. is greater than 82.7 kPa (12 psi), one of the following techniques may be used:

   i. GPA 2103 with a weight percent conversion. GPA 2103 is intended for component quantification from methane to hexane. A 0.5 weight percent recovery point or IBP can be calculated as prescribed in ASTM D7900.

   ii. Modifications of ASTM D7900 to include sample introduction techniques utilizing GPA 2103 and experimental or theoretical response factors in the manner of an external standard method.

In either configuration of c) i or c) ii, the precision and bias statements of ASTM D7900 and GPA 2103 do not apply.

5.6.4 Ongoing Sampling Program for Packing Group Determination

5.6.4.1 Representative Sampling Considerations

5.6.4.1.1 General

The objective of choosing the sample source/location and method is to ensure the sample obtained is representative of the crude oil being loaded into rail tank cars (guidance provided in Annex A).

Refer to API MPMS Ch. 8.1 for guidance on static sampling methods, and API MPMS Ch. 8.2 for dynamic sampling methods. Procedures should be in place to ensure no additional or different crude type that could affect the package selection be introduced downstream of the sample point. Representative samples should be obtained as close as practical to the rail tank car loading point.

[2] At the time of balloting of API RP 3000, ASTM D7900 is not listed in the HMR. Subsequent to the ballot, if approved for inclusion in RP 3000, there is the intention to approach U.S. DOT to request approval of ASTM D7900 as an alternative test method under the HMR, and this footnote will be removed.

5.6.4.1.2 Sample Container for PG Assignment

For crude oil packing group assignment for rail transportation purposes, to minimize loss of volatile low molecular weight components, crude oil samples shall be obtained using the closed container (pressurized cylinder) method as specified in API MPMS Chapter 8.1-2013/ASTM D4057-12, unless the party responsible for assigning the PG demonstrates that a closed container is not necessary (e.g. a history of test data that demonstrates the absence of volatile low molecular weight components).

5.6.5 Frequency of Ongoing Testing for Assignment of Packing Group

Tests shall be performed with sufficient frequency to ensure the assignment of the PG has not changed. The criteria for determining the tests to be used and the frequency of testing in the testing program should be determined by the offeror. The frequency of testing should consider the following factors:

- Historical consistency of the physical and chemical characteristics of the petroleum crude oil to be loaded.
- Stability of the petroleum crude oil to be loaded.
- Single source vs. multiple source(s).
- Pipeline specifications changes (tariff rules and regulations).
- Type of rail tank car loading facility (i.e., transload).
- New crude production or changes in crude oil production characteristics.
- Variability of truck or pipeline receipts.

6 Determining the Loading Target Quantity (LTQ)

6.1 General

The loading target quantity (LTQ) is a quantity established by the loading terminal personnel, prior to commencement of loading, intended to ensure compliance with regulatory quantity requirements for weight and outage (3.20).

Personnel involved in the process of determining and implementing the LTQ shall be trained in the use of measurement equipment, systems and calculations used for the determination of loaded quantities. Since there are many measurement processes and scenarios unique to each facility, facility procedures shall be documented and utilized.

6.2 Determining Volumetric or Weight Loading Target Quantity (LTQ)

6.2.1 Volumetric Limitation

The total calculated volume (TCV), based on the reference temperature (3.23) given in Table 4, to be loaded into the rail tank car shall not exceed a volume equivalent to an ullage (outage (3.20)) of 1 % at the relevant reference temperature of the rail tank car shell full capacity.

Table 4—Reference Temperature Requirement Table[1)]

Type of Rail Tank Car Insulation/Coating	Reference Temperature
Non-insulated tank	46 °C (115 °F)
Insulated tank	41 °C (105 °F)
Thermal protection system, incorporating a metal jacket that provides an overall thermal conductance at 15.5 °C (60 °F) of no more than 10.22 kilojoules per hour per square meter per degree Celsius (0.5 Btu per hour/per square foot/ per degree F) temperature differential	43 °C (110 °F)

[1)] This table does not provide advice on legal compliance with regulations. The current regulations in the local jurisdiction of users of this document shall take precedence and be followed.

In addition, liquids shall not completely fill a receptacle at a temperature of 55 °C (131 °F) or less. However, hazardous materials may not be loaded into the dome of a rail tank car. Therefore, the LTQ should use whichever requirement is more limiting. Also see 6.3.3.

6.2.2 Weight Limitation

The maximum weight of product to be loaded into the rail tank car shall not exceed the load limit (3.18) of the rail tank car, or as required by the railroad on the intended rail route to the off-load facility. The load limit shall be obtained from the manufacturers' shell capacity table (3.2), also known as a gauge table. The load limit on the manufacturer's table should match the load limit (LD LMT) stenciled on the rail tank car.

6.2.3 Determining if Volume or Weight is to be used for the LTQ

Prior to loading, the offering facility shall perform the necessary calculations to determine if volume or weight will be used in establishing the LTQ. For example, colder temperatures may result in achieving maximum allowable weight during loading regardless of outage. Conversely, warmer temperatures may result in achieving maximum volume with a target minimum outage and not achieving maximum allowable weight. The more restrictive, lower quantity shall be used to establish the LTQ.

6.3 Calculating the Loading Target Quantity (LTQ)

6.3.1 Rail Tank Car Shell Capacity Table (Gauge Table)

The offering facility shall obtain the rail tank car capacity table (3.2) applicable to the unique tank rail car number and record the shell-full capacity. Either the innage (3.15) or outage (3.20) capacity table may be used, but care should be taken to make sure the correct table is used for determining the LTQ. Use of the incorrect capacity table is a common cause of calculation error. Load limit (3.18) and light weights (3.16) are stenciled on the side of the rail tank car, and may be available from an electronic equipment database.

6.3.2 Rail Tank Car Heel (On Board Quantity (OBQ) Before Loading and Remaining On Board (ROB) after off-loading)

6.3.2.1 General

The purpose of determining the heel (3.14) is to obtain a quantity that will be used as one of the inputs in calculating the LTQ. Depending upon the quantity determination method used, the LTQ could be miscalculated or misstated if the heel were not properly accounted for. In order to avoid overfill conditions, the actual heel quantity or potential uncertainty in the heel quantity shall be incorporated in calculating the LTQ.

6.3.2.2 Heel Determination

A heel quantity shall be determined, or a visual inspection carried out to establish that there is no measurable heel.

Open manway cover (3.19): A physical gauge (3.9) measurement should be obtained from the rail tank car gauge reference point.

Closed manway cover (3.19): One of the following options should be used to measure and record the heel quantity:

1) For rail tank cars equipped with closed or restricted gauging connections installed on the rail tank car gauge reference point, utilize a portable electronic gauging device (PEGD) (3.22).
2) For rail tank cars equipped with closed or restricted gauging connections not installed on the rail tank car gauge reference point, utilize a PEGD (3.22). The offering facility shall take into account the deviation between observed reference height and the reference gauge height; the difference shall be assumed to be the heel. For example, if the PEGD touchpoint is 1 in. short of reference gauge height, the heel will be deemed to be a minimum of 1 in.
3) For rail tank cars not equipped with closed or restricted gauging connections and a gauging device installed on a location other than the rail tank car gauge reference point, a measurement of the heel can be made through the manual vent line or vent valve, using a PEGD (3.22), manual gauge tape or

graduated gauge rod. The offering facility shall take into account the deviation between observed reference height and the reference gauge height; the difference shall be assumed to be the heel.

4) Rail tank car weigh scales.

6.3.2.3 Heel Density and Temperature for LTQ

If the heel exceeds 1,100 gallons, or 8,000 lbs. (approximately 12 in. depth at the gauge reference point)[3], the heel density should be used in the calculation of LTQ. Otherwise, the density of the heel may be presumed to be the same as the density of either the crude oil to be loaded or the last offload (if known), or given a conservative value such as the value of water.

The temperature of the heel can be presumed ambient unless the heel volume exceeds 7 % of the rail tank car capacity[4]. When the heel volume is 7 % or less, use of presumed ambient heel temperatures will result in less than a 0.25 % variance in the LTQ. When heel volume exceeds 7 %, the offering facility should utilize a measured temperature in calculating the LTQ.

If state or federal regulations prohibit the venting of vapors and therefore do not permit opening the manway (3.19) cover or using the vent stack for measurement and sampling, rail tank car weigh scales or closed sampling and gauging equipment should be used. Otherwise, the rail tank cars may require a fitting for closed system gauging equipment to be used.

6.3.2.4 Clingage and Residue

Many crude oils have high viscosities and high paraffin content which can result in crude oil adhering to the sidewalls or ends of the rail tank car (clingage). An estimate of clingage quantity should be used in determining the LTQ. It is recommended that a process be considered to minimize an excessive residual buildup of clingage. Weigh scales, by design, will provide quantities that are inclusive of clingage that are otherwise not capable of being measured through manual gauging (3.10).

6.3.2.5 ROB heel

The unloading facility should ensure that the rail tank car has been emptied to the maximum extent practicable.

If regulations allow, the unloading facility should verify that the rail tank car is empty by conducting a physical check (e.g. a visual check) or physical gauge (3.9) measurement or using a weigh scale.

6.3.3 Temperature

Crude oil expands and contracts based on changes in temperature. For example, the volume can change by 0.4 % to 0.6 % per 10 °F change depending upon the density. Volume corrections shall be carried out in accordance with API MPMS Ch. 11.1-2004 or API MPMS Ch. 11.5, as appropriate.

Because the temperature of the crude oil at time of loading, and the possible temperature increase during transit, are essential in understanding the potential for a rail tank car overfill, accurate and representative temperature measurement and related calculations are essential to establishing the LTQ.

For initial LTQ purposes, the temperature of the crude oil prior to loading shall be estimated from either the temperature of the storage tank, truck(s), or pipeline from which the crude oil is supplied. When loading, the temperature value used in the initial LTQ should be verified within the first few minutes of loading when the temperature has stabilized and any adjustment made to the final LTQ.

There are cases where the planned maximum unloading temperature is above the reference temperature (see Table 4). In these cases the consignee (3.5) should notify the loading facility to use the planned maximum unloading temperature for calculating the LTQ.

6.3.4 Sampling and LTQ Density

6.3.4.1 Sampling Points Based on Loading Scenarios

As all possible scenarios cannot be anticipated, common loading scenarios are outlined below.

[3] 12 in. corresponds to less than 0.5 % of a variance in the LTQ.
[4] The value of 7 % is obtained from the Residue Test as defined in 19 U.S.C. 1321.

a) Single Source

All the crude oil loaded into a rail tank car comes from one source, such as a storage tank or pipeline, with capacity equal to or greater volume than the capacity of the rail tank car. A composite sample shall be obtained in accordance with API MPMS Ch. 8.1 or API MPMS Ch. 8.2.

NOTE Alternatively, an on-line densitometer can be used in place of sampling and testing to obtain the density for the LTQ calculation.

b) Multiple Sources

In instances where crude oil is loaded into a rail tank car from more than one source such as multiple trucks and/or storage tanks, representative samples from each source should be utilized to determine the densities for the LTQ calculation. If densities are obtained from truck run tickets, periodic testing should be performed for verification purposes.

See also 5.6.4.1.1.

6.3.4.2 Density

The LTQ calculation system or process will require density as an input variable. The density shall be determined based on representative samples or an on-line densitometer. Representative sampling is described in API MPMS Ch. 8.1 and API MPMS Ch. 8.2. Ensure that the obtained density has been converted to standard reference conditions (3.25) in accordance with API MPMS Ch. 9.1 or API MPMS Ch. 9.3.

If a truck run ticket density is used for LTQ calculation, the offering facility should have a process in place to periodically verify the density. The verification may take the form of testing samples from loading lines or trucks.

Regardless of where the sample used for density is obtained, no additional product should be introduced downstream of this point that can alter the density for LTQ calculations.

6.3.4.3 Testing

Multiple test methods exist for measuring density. Methods for determining density include API MPMS Ch. 9.1, API MPMS Ch. 9.3 or ASTM D5002 [12]. Application of the test method for density requires a dead crude oil (3.7) or field stabilization of the crude oil prior to sampling and testing. Indications of un-stabilized crude oil are visible bubbling, foaming, and actual boiling. The lack of hydrometer stabilization, if performed using API MPMS Ch. 9.1, can be another indication of sample instability.

NOTE Use of density test methods on un-stabilized/live crudes can yield erroneous results due to loss of light components.

6.3.4.4 LTQ Calculation Example

See Annex B for an example of calculating LTQ.

6.4 Measurement Equipment and Processes

6.4.1 General

Measurement systems used during the loading of rail tank cars should be consistent with API MPMS standards or other applicable standards.

Measurement equipment or processes exhibit measurement uncertainty. These measurement uncertainties include rail tank car capacity tables (3.2), gauging equipment, temperature and density measuring equipment, metering and proving equipment and processes, and weigh scales.

6.4.2 Metering Systems

Metering systems can be used to determine the total quantity (volume, weight, or both) being loaded. Metering systems generally include a flow meter (either volumetric or mass), appropriate temperature and pressure instruments for compensation to standard reference conditions (3.25), a flow computer to collect the instrument signals, perform the necessary calculations, and produce a final run ticket or quantity report. The meters and accessory equipment require periodic proving, calibration, or verification to ensure they are in good working order. The frequency and tolerances are set by the manufacturer, equipment owner or contract terms. Specific

guidance for tolerances is also provided within the applicable API standard. Refer to API MPMS Ch. 5 and API MPMS Ch. 7.

It is recommended that flow meters be located as near as practical to the rail tank car being loaded to avoid a potential concern regarding line fullness or line integrity.

Line fullness is referring to the concept that pipelines could contain air or vapor, when assumed to be filled with liquid, and the metered quantity might not represent the loaded quantity. If the meter cannot be located in close proximity, it is recommended the operator implement procedures to increase the surety of line fullness.

Line integrity is related to the possibility of common manifold valves or relief devices could be leaking. Therefore, line integrity will ensure the product reaches its intended destination.

6.4.3 Storage Tank Gauging

6.4.3.1 General

Storage tank gauging is another method for determining total quantity (volume, weight or both) being loaded into rail tank cars. Tank gauging shall be carried out in accordance with API MPMS Ch. 3.1A or Ch. 3.1B.

Gauging systems for a storage tank can be manual or automatic, and will include a tank capacity table, level gauge, temperature measurement, and calculation of quantity per API MPMS Ch. 12.1.1. The measurement equipment will require periodic calibration or verification to ensure they are in good working order.

API MPMS Ch. 3.1A and API MPMS Ch. 3.1B describe gauging and temperature measurement equipment used in both open and closed measurement systems. Specific instruction is provided for level gauging. General instruction is provided for temperature and sampling.

6.4.4 Rail Tank Car Gauging

6.4.4.1 General

Rail tank car gauging is another method for determining total quantity (volume, weight or both) being loaded. Refer to API MPMS Ch. 3.2 as the primary reference that describes the equipment and procedures for the liquid level method of measurement for rail tank cars.

Gauging systems for a rail tank car can be manual or automatic, and will include a rail tank car capacity table (3.2), level gauge, temperature measurement, and calculation of quantity. The measurement equipment requires periodic calibration or verification to ensure they are in good working order.

API MPMS Ch. 3.2 describes gauging and temperature measurement equipment used in both open and closed measurement systems. Specific instruction is provided for rail tank car gauging. General instruction is provided for temperature and sampling.

6.4.5 Weigh Scales

Static (stationary) or weigh-in-motion (dynamic) weigh scales (railway track scales) are acceptable methods for quantity determination of crude oil. If an operator considers weigh scales as an option, they shall refer to the latest editions of AAR Scale Handbook, NIST Handbook 44, or an equivalent standards body, for certification, calibration, specification of location, maintenance, operation, and testing requirements.

If transloading from trucks, the net weight of the individual trucks, as measured by truck scales, may be used to determine total rail tank car weight (see NIST Handbook 44).

6.5 Other Operational Considerations

6.5.1 Process Safety Factors

Since the LTQ methodology calculates an exact quantity by volume and weight to precisely meet regulatory requirements, whereas actual loading processes have a certain amount of variability, it is recommended that the loading facility establish process safety factors for volume and weight and incorporate them in the LTQ calculation. The volume safety factor or weight safety factor that is used in the LTQ calculation should be selected using loading facility judgment based on the accuracy and variability of their process for loading of the rail tank car.

6.5.2 Overfill Prevention

An offering facility shall have an overfill prevention system or procedure in place as a secondary safety system. It is not to be used as the primary LTQ control. An overfill prevention system can be either automatic or manual.

An automatic system is alarmed, typically visual and audible, for rail tank car loading operations and is activated without operator intervention. When an automatic protective action or alarm condition is received, the LTQ should be confirmed as not exceeded.

A manual alarm system requires operator action when an alarm is received, in accordance with terminal operating procedures. The alarm set points should be set to allow sufficient time for operations personnel time to react and prevent any potential overfill or release. In determining protection levels to allow human reaction times, the pump rates from truck and tanks and maximum human reaction timeframes should be used.

If an alarm overfill prevention system is not available, an operator should be physically present with an unobstructed view or with a measurement capability to ensure that a rail tank car is not overfilled.

In the event that a rail tank car is overfilled, appropriate personnel should be notified in accordance with terminal operating procedures and steps should be taken to remove excess product from the rail tank car.

6.5.3 Preparing a Rail Tank Car for Loading

AAR Pamphlet 34 provides the recommended best industry practices and can be used when developing operational procedures for preparing a rail tank car for loading. The offering facility shall secure and protect the track, and each rail tank car shall be secured, inspected, and placed in a safe condition prior to the commencement of loading operations. Applicable regulations should be regularly reviewed for updates of operational procedures.

6.5.4 Preparing a Loaded Rail Tank Car for Shipment

Prior to release to the carrier (3.3) for transportation, all tank rail cars shall be inspected and secured according to regulations. As part of this process, a tamper resistant seal should be installed or affirmed in place on the manway (3.19) cover, top fittings protection lid, and bottom operated valve handle. Additional seals may be affixed in accordance with the terminal operating procedures. Regulatory requirements, and recommendations from AAR Pamphlet 34, should be considered when developing procedures for securing a rail tank car.

See Annex D for information concerning shipping paper.

6.5.5 Verification

The shipper shall periodically review procedures and verify that all requirements as prescribed in Section 6 of this document are implemented.

7 Record retention

At a minimum, document retention requirements of records, shipping papers, etc. prescribed in 49 CFR, or other regulatory rules or standards shall be met.

Any party that provides a shipping paper shall retain a copy of the shipping paper, or an electronic image of the shipping paper. This document shall be accessible at, or through the party's principal place of business. The shipping paper shall be available, upon request, to an authorized official of any Federal, State, or local government agency at reasonable times and locations.

Each shipping paper copy shall include the date of acceptance by the originating carrier (3.3). For crude oil shipped by rail, the date on the bill of lading (3.1) or the shipment waybill (3.30) may be used in place of the date of acceptance by the originating carrier.

For the shipment of crude oil by rail, each offeror shall retain the shipping paper(s) and documentation of quantity and quality, including results of sampling and testing for the classification and characterization of crude oil, for two years after the crude oil is accepted by the originating carrier.

Each offeror should periodically review and verify adherence to document retention policies and requirements of this document.

Annex A
(informative)
Sampling and Testing Program Example[5]

The crude oil testing program should take into account both initial and ongoing testing. Testing of crude should include all tests necessary to ensure the proper characterization for the purpose of determining the proper packing group (3.21) and package.

Testing should be conducted prior to offering the crude oil for rail transportation. An ongoing testing program should periodically test parameters when there is reason to believe, or where historical data indicates, the characterization of the crude may change the assignment of Packing Group. The program should identify if the Packing Group has changed, and if it has, a re-evaluation of the transportation requirements shall be conducted. Sample frequency should be adjusted based on the variability of test results.

The number of samples obtained should take into consideration how the crude oil is loaded and the number of rail tank cars to be loaded. The trains may be as large as unit trains (trains containing a single commodity originating at a single origin and terminating at a single destination), or as small as a single manifest rail tank car.

When loading from a single storage tank (assuming that the crude oil is mixed), one sample per unit train may be sufficient as the same product is being loaded into all rail tank cars. This sample could be taken directly from the tank, provided there is no means to introduce a new product into a rail tank car from another source. The same principle applies when loading the volume of smaller tanks into fewer rail tank cars. In summary, if the storage tank volume exceeds the rail tank car volume, then only one sample may be taken.

If a unit train is being filled by more than one tank, then samples from each storage tank should be taken. These samples may be obtained at the tank outlet as long as no means is available to introduce a new material.

If the characteristics of the crude oil vary, each rail tank car may be sampled since the rail tank car may be filled by as many as 3-4 trucks. In these cases, the crude type is generally classified as the same due to being produced from the same geographical/geological field. However, the origin of the crude oil may be from several different independent sources or geographic locations. Therefore, the testing program may include taking samples of either the rail tank car or taking samples from multiple trucks offloading product. If trucks are the basis of testing, the most conservative result should be used for classification and packing group determination.

Testing at unloading is generally not required. If testing at the rail tank car unloading point is desired, caution should be exercised to ensure the rail tank car has not stratified during transport.

[5] The example given above is merely for illustration purposes only. Each company should develop its own approach. It is not to be considered exclusive or exhaustive in nature. API makes no warranties, express or implied for reliance on or any omissions from the information contained in this document.

Annex B
(informative)
Example for Calculating LTQ

The following example is merely for illustration purposes only. It is not to be considered exclusive or exhaustive in nature. API makes no warranties, express or implied for reliance on or any omissions from the information contained in this document. This example is for non-heated light crude oil, loaded into a non-insulated rail tank car. Some considerations in this example are for other types of rail tank cars, e.g. insulated and heated rail tank cars. This example is included as a guide for developing a tool for operators to use. Individual facilities should determine the input values needed from operations and develop input screens needed for the calculations.

LTQ for Loading Light Cold Crude Oil into Non-insulated Rail Tank Car

Segment 1 – Rail Tank Car Specifics and Process Safety Factors

All of the values in Segment 1 are input values with the exception of the reference temperature for Shell Full Temperature (SFT), Statutory Outage and Regulatory Mandated Values.

Input: Rail Tank Car Name and Number (Reporting Marks): TASX 41093

Source: Rail tank car stenciling and/or nameplate

Volume

Input: CAPY (Tank Volume Capacity): 31,770 gal (756.43 BBL)

Source: Rail tank car capacity data sheet or gauge table information for the shell-full (zero-outage) level

Input: Volume Safety Factor (VSF): 105 gal (2.5 BBL) as an example only

Source: Loading facility judgment based on the accuracy of their process for loading the rail tank car

Weight

Input: Maximum Gross Weight (GWR or Gross Weight on Rail): 286,000 lb.

Source: Rail tank car capability or rail carrier route restriction, whichever is lower

Input: LT WT (Light Weight or Tare Weight): 74,700 lb.

Source: Rail tank car capacity data sheet or gauge table information

Input: LD LMT (Load Limit): GWR – LT WT = 286,000 lb. – 74,700 lb. = 211,300 lb.

Weight Safety Factor (WSF): 500 lb. (226.80 kg) as an example only

Source: Loading facility judgment based on the accuracy of their process for loading the rail tank car

Regulatory

Input: Tank Type: Non-insulated.

Source: User should be able to use a drop-down box or needs to type into the cell the following rail tank car type: insulated, jacketed, or non-insulated

Reference Temperature: 115 °F

Source: Based on Tank Type (insulated 105 °F, jacketed 110 °F, non-insulated 115 °F) (see Table 4)

Regulatory Outage: 1 %

Source: Regulatory requirement, based on the Reference Temperature

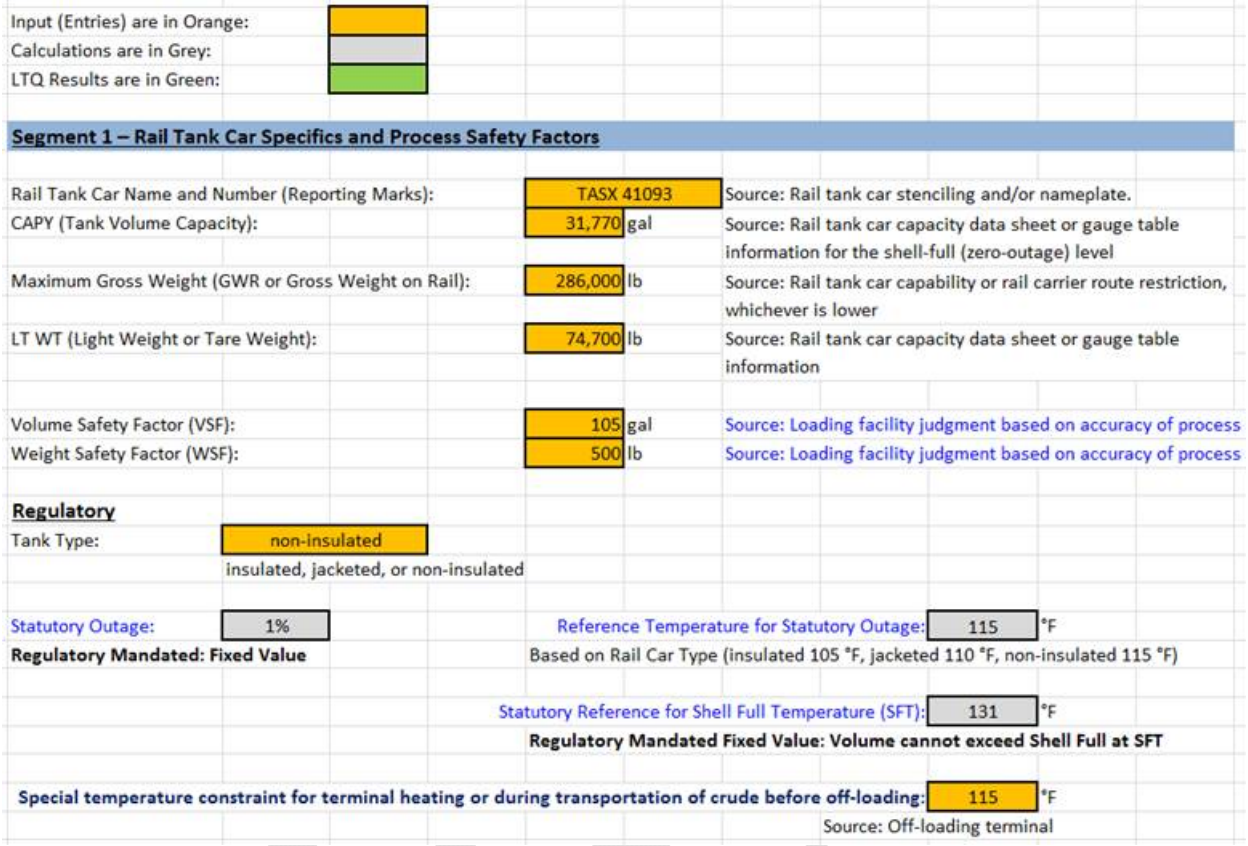
Completely Full Temperature (CFT): 131 °F, and may not load into the dome

Source: Regulatory requirement, based on completely filling a rail tank car

Input: Special temperature constraint for terminal heating crude before off-loading: 115 °F.

Source: Off-loading terminal (see Section 6.3.3)

Figure B.1—Segment 1 Example



Input (Entries) are in Orange:
Calculations are in Grey:
LTQ Results are in Green:

Segment 1 – Rail Tank Car Specifics and Process Safety Factors

Rail Tank Car Name and Number (Reporting Marks):	TASX 41093		Source: Rail tank car stenciling and/or nameplate.
CAPY (Tank Volume Capacity):	31,770	gal	Source: Rail tank car capacity data sheet or gauge table information for the shell-full (zero-outage) level
Maximum Gross Weight (GWR or Gross Weight on Rail):	286,000	lb	Source: Rail tank car capability or rail carrier route restriction, whichever is lower
LT WT (Light Weight or Tare Weight):	74,700	lb	Source: Rail tank car capacity data sheet or gauge table information
Volume Safety Factor (VSF):	105	gal	Source: Loading facility judgment based on accuracy of process
Weight Safety Factor (WSF):	500	lb	Source: Loading facility judgment based on accuracy of process

Regulatory

Tank Type: non-insulated
insulated, jacketed, or non-insulated

Statutory Outage: 1%
Regulatory Mandated: Fixed Value

Reference Temperature for Statutory Outage: 115 °F
Based on Rail Car Type (insulated 105 °F, jacketed 110 °F, non-insulated 115 °F)

Statutory Reference for Shell Full Temperature (SFT): 131 °F
Regulatory Mandated Fixed Value: Volume cannot exceed Shell Full at SFT

Special temperature constraint for terminal heating or during transportation of crude before off-loading: 115 °F
Source: Off-loading terminal

Segment 2 – Heel Volume and Weight

Input: Heel Depth: 4.00 in.

Source: As measured, verified, or potential highest case

Input: Heel Temperature: 15 °F

Source: As measured, or presume equal to ambient temperature

Input: Heel API gravity at 60: 40° API

Source: As measured, from prior load data, from historical verification, or potential heaviest case (such as water at 10° API, 1.000 Specific Gravity, 8.3283 lb./gal, or 997.94 kg/m^3

Reference: GPA 2145-09 [20]

Input: Measured Heel Volume (GOV): 108 gal (2,571 BBL) as an example only

Source: Rail tank car capacity data sheet or gauge table information, based on Heel Depth

Input: Clingage Only Volume (COV): 0 gal (0 BBL) as an example only

Source: If possible to verify, estimated from a method such as visual observation or weigh scales

Figure B.2—Segment 2 Example

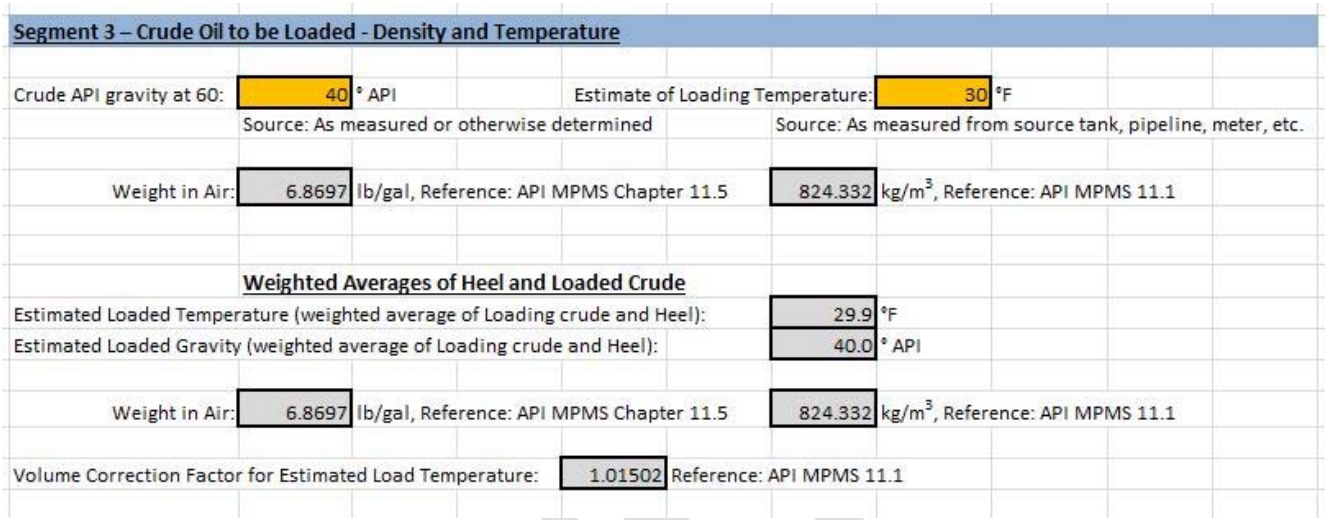
Segment 2 – Heel Volume and Weight				
Heel Depth:	4.00	in.	10.16	cm
	Source: As measured, verified, or potential highest case			
Heel Temperature:	15	°F		
	Source: As measured, or presume equal to ambient temperature			
Heel API gravity at 60:	40	° API		
	Source: As measured, from prior load data, from historical verification, or potential heaviest case (such as water at 10° API, 1.000 Specific Gravity, 8.3372 lb./gal, or 999.102 kg/m3 Reference GPA 2145-09)			
Weight in Air:	6.8697	lb/gal, Reference: API MPMS Chapter 11.5	824.332	kg/m³, Reference: API MPMS 11.1
Volume Correction Factor for Heel	1.02243	Reference: API MPMS 11.1		
Measured Heel Volume (GOV):	108	gal	Source: Rail tank car capacity data sheet or gauge table information, based on Heel Depth	
Additional Clingage Volume:	0	gal	Source: If possible to verify, estimated from a method such as visual observation or weigh scales	
Total Heel Volume (GSV):	110	gal	Measured Heel Volume + Additional Clingage Volume, corrected to Standard Temperature	
Heel Weight: Total Heel Volume × Heel lb/g	759	lb		
Equivalent Volume for 1% of Capacity	318	gal		
Initial Volume Load Limit: CAPY - 1% Outage Vol - VSF =	31,347	gal		
Initial Load Limits Reduced by Heel:	31,237	gal		

Segment 3 – Crude Oil Density and Temperature

Input: API gravity at 60 (Standard Density for Crude Oil to be Loaded): 40° API
Source: As measured or from inbound shipment data

Input: Pre-fill Temperature (PFT): 30 °F
Source: As measured from source

Figure B.3—Segment 3 Example



Segment 3 – Crude Oil to be Loaded - Density and Temperature				
Crude API gravity at 60:	40	° API	Estimate of Loading Temperature: 30 °F	
	Source: As measured or otherwise determined		Source: As measured from source tank, pipeline, meter, etc.	
Weight in Air:	6.8697	lb/gal, Reference: API MPMS Chapter 11.5	824.332	kg/m^3, Reference: API MPMS 11.1
Weighted Averages of Heel and Loaded Crude				
Estimated Loaded Temperature (weighted average of Loading crude and Heel):			29.9	°F
Estimated Loaded Gravity (weighted average of Loading crude and Heel):			40.0	° API
Weight in Air:	6.8697	lb/gal, Reference: API MPMS Chapter 11.5	824.332	kg/m^3, Reference: API MPMS 11.1
Volume Correction Factor for Estimated Load Temperature:	1.01502	Reference: API MPMS 11.1		

Segment 4 – Volume Limit

Figure B.4A—Segment 4A Example

Segment 4 – Volume Limit

Statutory Outage Reference Temperature Check		Gallons	BBL	lbs	°F	Values at 60°F API	kg/m³	lb/gal	VCF
CAPY (Tank Volume Capacity) at Statutory Reference Temperature:	A	31,770	756.43	212,176	115.0	40.0	824.332	6.8697	0.97218
1% of Capacity at Statutory Reference Temperature:	B=A x 1%	318	7.56	2,122	115.0	40.0	824.332	6.8697	0.97218
Volume Safety Factor (VSF) at Reference Temperature:	C	108	2.57	721	115.0	40.0	824.332	6.8697	0.97218
Total Volume at Statutory Reference Temperature:	D=A-B-C	31,344	746.29	209,333	115.0	40.0	824.332	6.8697	0.97218
Net VCF for Difference Between Reference Temperature and Loaded Temperature	E								0.95780
Total Volume at Loaded Temperature:	F=D x E	30,021	714.80	209,333	29.9	40.0	824.332	6.8697	1.01502
Existing Heel Volume at Loaded Temperature	G	109	2.59	759	29.9	40.0	824.332	6.8697	1.01502
LTQ Volume at Loaded	H=F-G	29,913	712.21	208,575	29.9	40.0	824.332	6.8697	1.01502

Statutory Reference for Shell Full Temperature (SFT) Check		Gallons	BBL	lbs	°F	Values at 60°F API	kg/m³	lb/gal	VCF
Volume Load Limit at Statutory Reference Temperature for Shell Full:	I	31,770	756.43	210,394	131.0	40.0	824.332	6.8697	0.96401
Volume Safety Factor (VSF) at Reference Temperature:	J	109	2.59	721	131.0	40.0	824.332	6.8697	0.96401
Existing Heel Volume at Reference Temperature	K	115	2.73	759	131.0	40.0	824.332	6.8697	0.96401
Total Volume at Statutory Reference Temperature:	L=I-J-K	31,547	751.11	208,914	131.0	40.0	824.332	6.8697	0.96401
Net VCF for Difference Between Reference Temperature and Loaded Temperature	M								0.94975
LTQ Volume at Loaded	N=L x M	29,961	713.36	208,914	29.9	40.0	824.332	6.8697	1.01502

Figure B.4B—Segment 4B Example

Statutory Reference for Shell Full Temperature (SFT) Check						Values at 60°F			
		Gallons	BBL	lbs	°F	API	kg/m³	lb/gal	VCF
Volume Load Limit at Statutory Reference Temperature for Shell Full:	I	31,770	756.43	210,394	131.0	40.0	824.332	6.8697	0.96401
Volume Safety Factor (VSF) at Reference Temperature:	J	109	2.59	721	131.0	40.0	824.332	6.8697	0.96401
Existing Heel Volume at Reference Temperature	K	115	2.73	759	131.0	40.0	824.332	6.8697	0.96401
Total Volume at Statutory Reference Temperature:	L=I-J-K	31,547	751.11	208,914	131.0	40.0	824.332	6.8697	0.96401
Net VCF for Difference Between Reference Temperature and Loaded Temperature	M								0.94975
LTQ Volume at Loaded	N=L x M	29,961	713.36	208,914	29.9	40.0	824.332	6.8697	1.01502

Volume only Check When Loading "Hot" Crude						Values at 60°F			
		Gallons	BBL	lbs	°F	API	kg/m³	lb/gal	VCF
Volume Limit at Loaded Temperature for Shell Full:	O	31,770	756.43	221,526	29.9	40.0	824.332	6.8697	1.01502
Volume Safety Factor (VSF) at Loaded Temperature:	P	103	2.46	721	29.9	40.0	824.332	6.8697	1.01502
Existing Heel Volume at Loaded Temperature	Q	109	2.59	759	29.9	40.0	824.332	6.8697	1.01502
LTQ Volume at Loaded	R=O-P-Q	31,558	751.38	220,046	29.9	40.0	824.332	6.8697	1.01502

Volume or Weight Restriction When Heating Crude Before Offload						Values at 60°F			
		Gallons	BBL	lbs	°F	API	kg/m³	lb/gal	VCF
Volume Limit at Loaded	O	31,770	756.43	212,176	115.0	40.0	824.332	6.8697	0.97218
Volume Safety Factor (VSF) at	P	108	2.57	721	115.0	40.0	824.332	6.8697	0.97218
Existing Heel Volume at Loaded	Q	114	2.70	759	115.0	40.0	824.332	6.8697	0.97218
LTQ Quantity at Unloaded Temp:	R=O-P-Q	31,548	751.15	210,697	115.0	40.0	824.332	6.8697	0.97218

SUMMARY	Gallons	BBL	lbs	
LTQ Volume at Loaded	29,913	712.21	208,575	Statutory Outage Reference Temperature
LTQ Volume at Loaded	29,961	713.36	208,914	Statutory Reference for Shell Full Temperature (SFT)
LTQ Volume at Loaded	31,558	751.38	220,046	Volume only Check When Loading "Hot" Crude
LTQ Quantity at Unloaded Temp:	31,548	751.15	210,697	Volume Restriction When Heating Crude Before Offload
Limiting LTQ for Volume	29,913	712.21	208,575	

Segment 5 – Weight Limit

Figure B.5—Segment 5 Example

Segment 5 – Weight Limit			
	lbs		
Weight Load Limit: GWR - LT WT - WSF - Heel Weight =	210,041		
LTQ Quantity at Unloaded Temp:	210,697	Weight Restriction When Heating Crude Before Offload	
Limiting LTQ from Volume Section	208,575		
Smallest lb value governs:	208,575	Limited by Statutory Volume Outage	

Segment 6 – Loading Target Quantity (LTQ)

Figure B.6—Segment 6 Example

Segment 6 – Loading Target Quantity (LTQ)

					Values at 60°F			
	Gallons	BBL	lbs	°F	API	kg/m^3	lb/gal	VCF
LTQ at 60°F:	30,362	722.90	208,575	60.0	40.0	824.332	6.8697	1.00000
LTQ Volume at Loaded Temp.:	**29,913**	**712.21**	**208,575**	**29.9**	**40.0**	824.332	6.8697	1.01502
LTQ Volume at Average Loading Temp.:	29,913	712.22	208,575	30.0	40.0	824.332	6.8697	1.01499

Critical Output for Operators

Annex C
(informative)
Summary of Roles, Responsibilities and Training Requirements of Hazmat Employees

Table C.1 gives a summary of roles, responsibilities and training requirements of hazmat employees (3.13). This table is for information purposes only and does not provide legal advice on compliance with regulations.

Table C.1—Roles, responsibilities and training requirements of hazmat employees

Hazardous Material— Rail Tank Car Function	Responsibilities: Training Requirements
Classification: preparing proper shipping descriptions	All Classification requirements: - Identification of hazard classes, precedence of classes, and proper shipping name - Assignment of Packing Group - Structure of the proper shipping description and special notations - Nature of dangerous goods (physical, chemical, toxicological properties) - Hazardous substances - Marine pollutants - Use of the applicable regulatory list of hazardous materials/dangerous goods - Emergency response guidance
Selecting/preparing rail tank cars for offering	Hazard classes - Packaging selection - Type of rail tank car - Required markings - Segregation requirements - Placarding - First aid/safety measures - Safe handling procedures
Marking, labels/placarding	Hazard classes Marking/placarding requirements - Primary and subsidiary risks - Marine pollutants - Test/date stencil marks
Unload/load rail tank cars	Thorough working knowledge of the HMR shipping papers: - Hazard classes - Marks/labels/placards - Stowage - Segregation - Securement - Emergency response guidance - First aid - Safe handling procedures - Right to know/OSHA/SDS training Knowledge and training in AAR Pamphlet 34 procedures

Hazardous Material— Rail Tank Car Function	Responsibilities: Training Requirements
Preparation of EDI for dispatch to carrier (waybill, BOLs)	Documentation requirements - Consignor and consignee address/contact information - Proper shipping description (UN ID, PSN, hazard class(es), PG, special notations as required) - Quantity with units - Container type and count - Certification section with name and title of signatory, time, place - 24/7 emergency contact information with contract number as applicable - International requirements (e.g. emergency response assistance plan (ERAP))
Offering for transport	Thorough working knowledge of the HMR (including classification, marks/placards, documentation, securement, etc.)
Accepting for transport	Thorough working knowledge of the HMR (including classification, marks/placards, documentation, securement, etc.)
Handling/securing for transport	Thorough working knowledge of the HMR - Hazard classes - Marking/placarding requirements - First aid - Safe handling procedures - Right to know/OSHA/SDS training - International regulatory requirements, e.g., ERAP for Transport Canada
Carriage (acceptance of rail tank cars for transport)	Thorough working knowledge of the HMR - Documentation (EDI, waybills, BOL, shipping papers) - Proper shipping descriptions including hazard classes - Marks/labels/placards - Stowage/segregation requirements - Emergency response - First aid/safety
Enforce, survey, inspect for compliance with applicable rules and regulations	Thorough working knowledge of the HMR, operational and safety procedures.

Annex D
(informative)
Shipping Paper

D.1 General

Users should consult the regulations in their applicable jurisdiction regarding additional information that may be required on the shipping paper.

Examples of proper shipping descriptions are shown in Figure D.1. They are presented in sets of five codes, representing U.S. DOT and TC (Transport Canada). To simplify, all Packing Groups are represented in the appropriate entry. These are the "codes" selected at consignment by dispatchers to go along with a consignment or unit train of rail tank cars. The codes are pre-loaded into IT shipping systems.

NOTE Selecting the wrong code can put the wrong shipping description on the EDI waybill and/or shipping papers.

Figure D.1 is an example for illustration purposes only. It is not to be considered exclusive or exhaustive in nature. API makes no warranties, express or implied for reliance on or any omissions from the information contained in this document.

Figure D.1—Example Proper Shipping Descriptions for IT Waybill Systems

U.S. DOT or Transport Canada (TC)	Waybill System Code	Proper Shipping Descriptions
		CLASSIFICATIONS: EXAMPLE PROPER SHIPPING DESCRIPTIONS FOR TYPICAL PETROLEUM CRUDE OILS, ALL PACKING GROUPS
DOT	**1028R - DOTM**	**UN1267, PETROLEUM CRUDE OIL, 3, I, II, OR III; OPTIONAL DISCLOSURE: UN1267, PETROLEUM CRUDE OIL, 3, I, MARINE POLLUTANT**
TC	**1028R - TCM**	**UN1267, PETROLEUM CRUDE OIL, 3, PG I, II, OR III, MARINE POLLUTANT (*WHEN TRANSPORTED VIA WATER)***
		PETROLEUM CRUDE OILS: ALL PACKING GROUPS WITH A POTENTIAL TO ACCUMULATE LETHAL LEVELS OF H_2S IN HEAD SPACE VAPORS
DOT	**1028P - DOTM**	**UN1267, PETROLEUM CRUDE OIL, 3, I, II, OR III (POTENTIAL HYDROGEN SULFIDE INHALATION HAZARD); OPTIONAL DISCLOSURE: UN1267, PETROLEUM CRUDE OIL, 3, I, II, OR III, MARINE POLLUTANT (POTENTIAL HYDROGEN SULFIDE INHALATION HAZARD)**
TC	**1028P - TCM**	**UN1267, PETROLEUM CRUDE OIL, 3, PG I, II, OR III, MARINE POLLUTANT (*WHEN TRANSPORTED VIA WATER*), (POTENTIAL HYDROGEN SULFIDE INHALATION HAZARD)**

U.S. DOT or Transport Canada (TC)	Waybill System Code	Proper Shipping Descriptions
		INTERNATIONAL CLASSIFCATION FOR UN3494: PETROLEUM CRUDE OILS MEETING THE CRITERIA AS A TOXIC DIVISION 6.1 SUBSIDIARY RISK
		NOTE: ANYTHING MEETING THE CRITERIA OF A 6.1 TOXIC SHOULD NOT BE SHIPPED IN BULK. VARIATIONS OF THESE COULD BE USED FOR SAMPLES (NON-BULK):
DOT	**1028T - DOTM**	**UN3494, PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC, 3 (6.1), PG I, II, OR III (WARNING - HYDROGEN SULFIDE INHALATION HAZARD) SEE 49 CFR 172.327 AND 172.102, SPECIAL PROVISION 357**
TC	**1028T - TCM**	**UN3494, PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC, 3 (6.1), PG I, II, OR III, MARINE POLLUTANT (WHEN TRANSPORTED VIA WATER) (WARNING - HYDROGEN SULPHIDE INHALATION HAZARD)**
		TYPICAL FLAMMABLE LIQUID OF PETROLEUM CRUDE OILS, TRANSMIX: ALL PGs:
DOT	**1028W - DOTM**	**UN1993, FLAMMABLE LIQUID, N.O.S. (PETROLEUM CRUDE OIL, TRANSMIX), 3, I, II, OR III; OPTIONAL DISCLOSURE: UN1993, FLAMMABLE LIQUID, N.O.S. (PETROLEUM CRUDE OIL, TRANSMIX), 3, I, II, OR III, MARINE POLLUTANT (PETROLEUM CRUDE OIL, TRANSMIX)**
TC	**1028W - TCM**	**UN1993, FLAMMABLE LIQUID, N.O.S. (PETROLEUM CRUDE OIL, TRANSMIX), 3, I, II, OR III, MARINE POLLUTANT (PETROLEUM CRUDE OIL, TRANSMIX) (*WHEN TRANSPORTED VIA WATER*)**
		HIGH FLASH PETROLEUM CRUDE OIL (FP PM CC > 60 DEG C) GHS AQTOXIC EHS/MARINE POLLUTANT (ACUTE 1, CHRONIC 1, 2)
DOT	**1028X - DOTM**	**NOT REGULATED FOR TRANSPORTATION UNDER 49 CFR; OPTIONAL DISCLOSURE: UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (PETROLEUM CRUDE OIL), 9, III, MARINE POLLUTANT (PETROLEUM CRUDE OIL)**
TC	**1028X - TCM**	**UN3082, ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (PETROLEUM CRUDE OIL), 9, III, MARINE POLLUTANT (PETROLEUM CRUDE OIL)**

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