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Section 4.40. Vehicle Tanks Used as Measures

A. Application

A.1. General. – This code applies to vehicle tanks when these are used as commercial measures.

A.2. Exceptions. – This code does not apply to the following devices:

- (a) Devices used solely for dispensing a product in connection with operations in which the amount dispensed does not affect customer charges.
- (b) Meters mounted on vehicle tanks (for which see Section 3.31. Code for Vehicle-Tank Meters).

A.3. Additional Code Requirements. – In addition to the requirements of this code, Vehicle Tanks Used as Measures shall meet the requirements of Section 1.10. General Code.

S. Specifications

S.1. Design of Compartments.

S.1.1. Compartment Distortion. – The shell and bulkheads of a vehicle tank shall be so constructed that under any condition of liquid lading they will not become distorted sufficiently to cause a change in the capacity of any compartment (as determined by volumetric test) equal to more than 0.25 L per 750 L (0.5 pt per 200 gal), or fraction thereof, of the nominal compartment capacity, or to more than 0.5 L (1 pt), whichever is greater. (This specification prescribes a limit on permissible distortion only, and is not to be construed as setting up a secondary tolerance on compartment capacities to be added to the values given in tolerance paragraph T.2. Tolerance Values.)

S.1.2. Venting. – During filling operations, effective venting of a compartment shall be provided to permit air to escape from all spaces designed to be filled with liquid and to permit the influx of air to the compartment during the discharge of liquid therefrom. Venting shall prevent any formation of air pockets.

S.1.3. Completeness of Delivery. – A tank shall be so constructed that, when it is standing on a level surface, complete delivery can be made from any compartment through its delivery faucet or valve whether other compartments are full or empty, and whether or not the delivery is through a manifold.

S.1.4. Fill or Inspection Opening. – The fill or inspection opening of a compartment shall be of such size and location that it can readily be determined by visual inspection that the compartment has been properly filled or completely emptied and shall be so positioned with respect to the ends of the compartment that the indicator may be positioned as required. In no case shall the opening, if circular, have a diameter of less than 20 cm (7⁵/₈ in), or, if other than circular, have an effective area of less than 290 cm² (45 in²).

S.1.5. Dome Flange and Baffle Plates. – Any dome flange extending into a compartment shall be provided with sufficient perforations or openings flush with the compartment shell to prevent any trapping of air. All baffle plates in a compartment shall be so cut away at top and bottom, and elsewhere as necessary, as to facilitate loading and unloading.

S.1.6. Compartment and Piping Capacities and Emergency Valve. – If a compartment is equipped with an emergency (or safety) valve, this shall be positioned at the lowest point of outlet from the compartment, and the compartment capacity or capacities shall be construed as excluding the capacity of the piping leading therefrom. However, the capacity of the piping leading from such a compartment shall be separately determined and reported and may be separately marked as specified in S.4. Marking of Compartments.

S.1.6.1. On Vehicle Tanks Equipped for Bottom Loading. – On equipment designed for bottom loading, the compartment capacity shall include the piping of a compartment to the valve located on the upstream side of the manifold and immediately adjacent thereto or, if not manifolded, to the outlet valve, provided that on or immediately adjacent to the marking as specified in S.4. Marking of Compartments the following words or a statement of similar meaning shall be affixed: “Warning: Emergency valves must be opened before checking measurement.”

S.1.7. Expansion Space. – When a compartment is filled to the level of the highest indicator in the compartment, there shall remain an expansion space of at least 0.75 % of the nominal compartment capacity as defined by that indicator.

S.2. Design of Compartment Indicators.

S.2.1. General. – An indicator shall be so designed that it will distinctly and unmistakably define a capacity point of its compartment when liquid is in contact with the lowest portion of the indicator.

S.2.2. Number of Indicators. – In no case shall a compartment be provided with more than five indicators.
(Amended 1972)

S.2.3. Identification of Multiple Indicators. – If a compartment is provided with multiple indicators, each such indicator shall be conspicuously marked with an identifying letter or number.

S.2.4. Location. – An indicator shall be located:

- (a) midway between the sides of its compartment;
- (b) as nearly as practicable midway between the ends of its compartment, and in no case offset by more than 10 % of the compartment space or 15 cm (6 in), whichever is less;
(Amended 1972)
- (c) so that it does not extend into, nor more than 15 cm (6 in) from that section of the compartment defined by a vertical projection of the fill opening;
(Amended 1974)
- (d) at a depth, measuring from the top of the dome opening, not lower than 46 cm (18 in) for fill openings of less than 38 cm (15 in) in diameter, or, if other than circular, an effective area of less than 1130 cm² (175 in²), and not lower than 61 cm (24 in) for larger fill openings; and
- (e) to provide a clearance of not less than 5 cm (2 in) between indicators.

S.2.5. Permanence. – Any indicator that is not intended to remain adjustable and all brackets or supports shall be securely welded in position.

S.2.6. Adjustable Indicators. – Adequate provision shall be made for conveniently affixing a security seal or seals:

- (a) to any indicator intended to remain adjustable, so that no adjustment of the indicator can be made without mutilating or destroying the seal; and
- (b) to any removable part to which an indicator may be attached, so that the part cannot be removed without mutilating or destroying the seal.

S.2.7. Sensitiveness. – The position of any indicator in its compartment shall be such that at the level of the indicator a change of 1.0 mm (0.04 in) in the height of the liquid surface will represent a volume change of not more than the value of the tolerance for the nominal compartment capacity as defined by that indicator.

S.3. Design of Compartment Discharge Manifold. – When two or more compartments discharge through a common manifold or other single outlet, effective means shall be provided to ensure that:

- (a) liquid can flow through the delivery line leading from only one compartment at one time and that flow of liquid from one compartment to any other is automatically prevented; or
- (b) all compartments will discharge simultaneously.

If the discharge valves from two or more compartments are automatically controlled so that they can only be operated together, thus effectively connecting these compartments to one another, such compartments shall, for purposes of this paragraph, be construed to be one compartment.

S.4. Marking of Compartments.

S.4.1. Compartment Identification. – Each compartment of a multiple-compartment tank shall be conspicuously identified by a letter or number marked on the dome or immediately below the fill opening. Such letters or numbers shall be in regular sequence from front to rear, and the delivery faucets or valves shall be marked to correspond with their respective compartments.

S.4.2. Compartment Capacity, Single Indicator. – A compartment provided with a single indicator shall be clearly, permanently, and conspicuously marked with a statement of its capacity as defined by its indicator.

S.4.3. Compartment Capacity, Multiple Indicators. – A compartment provided with two or more indicators shall be clearly, permanently, and conspicuously marked with a statement identifying:

- (a) each indicator by a letter or number; and
- (b) immediately adjacent to each letter or number, the capacity of the compartment as defined by the particular indicator.

N. Notes

N.1. Test Liquid. – Water or light fuel oil shall be used as the test liquid for a vehicle-tank compartment.

N.2. Evaporation and Volume Change. – Care shall be exercised to reduce to a minimum, evaporation losses and volume changes resulting from changes in temperature of the test liquid.

N.3. To Deliver. – A vehicle-tank compartment shall be gauged “to deliver.” If the compartment is gauged by measuring the test liquid into the tank, the inside tank walls shall first be thoroughly wetted.

N.4. Gauging of Compartments. – When a compartment is gauged to determine the proper position for an indicator or to determine what a capacity marking should be, whether on a new vehicle tank or following repairs or modifications that might affect compartment capacities, tolerances are not applicable, and the indicator shall be set and the compartment capacity shall be marked as accurately as practicable.

N.5. Adjustment and Remarkings. – When a compartment is found upon test to have an error in excess of the applicable tolerance, the capacity of the compartment shall be adjusted to agree with its marked capacity, or its marked capacity shall be changed to agree with its capacity as determined by the test.

T. Tolerances

T.1. Application.

T.1.1. To Excess and to Deficiency. – The tolerances hereinafter prescribed shall be applied to errors in excess and in deficiency.

T.2. Tolerance Values. – Maintenance and acceptance tolerances shall be as shown in Table 1. Maintenance and Acceptance Tolerances on Vehicle-Tank Compartments.

Table 1. Maintenance and Acceptance Tolerances on Vehicle-Tank Compartments		
Nominal Capacity of Compartment	Maintenance and Acceptance Tolerances	
Gallons	Expressed in Quarts	Expressed in Gallons
200 or less	2	0.5
201 to 400, inclusive	3	0.75
401 to 600, inclusive	4	1.0
601 to 800, inclusive	5	1.25
801 to 1000, inclusive	6	1.50
over 1000	Add 1 quart per 200 gallons or fraction thereof	Add 0.25 gallon per 200 gallons or fraction thereof

UR. User Requirements

UR.1. Conditions of Use.

UR.1.1. Filling. – A vehicle shall stand upon a level surface during the filling of a compartment.

UR.1.2. Delivering. – During a delivery, a vehicle shall be so positioned as to assure complete emptying of a compartment. Each compartment shall be used for an individual delivery only; that is, an individual delivery shall consist of the entire contents of a compartment or compartments.

(Amended 1976)