

**OFFICIAL MEXICAN STANDARD
NOM-028-SCT2/1994
"SPECIAL PROVISIONS FOR
HAZARDOUS MATERIALS AND WASTES
OF CLASS 3 FLAMMABLE LIQUIDS
TRANSPORTED."**

1. PURPOSE.

The purpose of this Official Mexican Standard is to set forth the special provisions for assigning the container and packaging risk group of the hazardous substances and wastes of Class 3 Flammable Liquids transported.

2. APPLICABILITY.

This Official Mexican Standard applies compulsorily to the shippers, carriers and consignees of hazardous substances, materials and wastes of Class 3 Flammable Liquids, and for determining the type of package and packaging for their transport.

3. REFERENCES

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| NOM-002-SCT2/1994. | LIST OF THE MOST COMMONLY TRANSPORTED HAZARDOUS SUBSTANCES AND MATERIALS. |
| NOM-003-SCT2/1994. | LABELLING REQUIREMENTS FOR PACKAGES AND PACKAGINGS INTENDED FOR THE LAND TRANSPORT OF HAZARDOUS SUBSTANCES, MATERIALS AND WASTES. |
| NOM-004-SCT2/1994 | SYSTEM OF IDENTIFICATION OF UNITS INTENDED FOR THE LAND TRANSPORT OF HAZARDOUS MATERIALS AND WASTES. |
| NOM-024-SCT2/1994 | SPECIFICATIONS FOR THE CONSTRUCTION AND RECONSTRUCTION, AS WELL AS THE METHODS FOR TESTING THE PACKAGES AND PACKAGINGS OF HAZARDOUS SUBSTANCES, MATERIALS AND WASTES. |

4. DEFINITIONS

Flammable liquid: Liquids, or mixtures thereof, that may contain dissolved solid substances in solution or suspension (e.g., paints, varnishes, lacquers, etc., provided that these are not substances included in other classes owing to their hazardous characteristics)

and that give off flammable vapors at temperatures no greater than 60.5EC in closed cup or no greater than 65.6EC in open cup, when tested in accordance with the recognized methods itemized in Section 5.9 of this Standard

Nevertheless, for purposes of these recommendations, those liquids with a flash point higher than 35EC and which do not sustain combustion, need not be considered as flammable liquids. Liquids intended to be transported at temperatures equal to or lower than their flash point, are in any case considered as flammable liquids. Also considered as flammable liquids are those substances transported or intended for transport at elevated temperatures in the liquid state and which give off a flammable vapor at the maximum transport temperature or at a lower temperature.

5. GENERAL PROVISIONS

5.1 This class only includes substances whose flash point does not exceed 60.5EC in closed-cup or 65.6EC in open-cup, or substances which, when transported under high temperatures, give off flammable vapors at or below the maximum temperature under which they will be transported. Nevertheless, it should be noted that the flash point of a flammable liquid may change if said liquid contains impurities. The substances expressly included in this class must be considered as chemically pure.

5.2 In practice, however, the substances or materials transported under the name of said substances are frequently commercial products that contain other substances or impurities. Therefore, it may happen that liquids excluded from the list (because their flash point in the pure state is higher than 60.5EC in closed-cup, or higher than 65.6EC in open-cup) are offered for transportation as commercial products whose flash point would be equal to or lower than these limits. Moreover, some liquids that would be, in the pure state, classified under package and packaging Group III might actually fall under package and packaging Group II as commercial products owing to the fact that they contain other substances or impurities.

5.3 For the above reasons, the List of Most Commonly Transported Hazardous Substances and Materials, NOM-002-SCT2/1994, is for indicative purposes only and must be used with caution. In case of doubt, the flash point or boiling point must be

verified experimentally, or other necessary tests conducted, if the data are not immediately available. Each substance, mixture or solution must be classified based on the general criterion of the Standard (e.g., flash point test, determination of the minimum boiling point, viscosity test, segregation test, combustibility test[]). Analytical methods based on the confirmed data are also acceptable.

- 5.4 Liquids are considered non-combustible for purposes of this standard (e.g., their combustion is not sustained under the established testing conditions), if they have already passed the combustibility test in accordance with paragraph 6.4, if their flash point under ISO 2592:1973 is greater than 100EC or, in the case of aqueous solutions, if they have a water contents greater than 90% by mass.
- 5.5 Table 1 must be used for classifying in a package and packaging group those liquids that exhibit any risk owing to their flammability.

Table 1: Classification in groups based on flammability

Package/Packaging Group	Flash point (closed-cup)	Initial boiling point
I		# 35EC
II	< 23EC	> 35EC
III	\$ 23EC, # 60.5EC	> 35EC

- 5.6 The viscous substances that have a flash point lower than 23EC must be assigned to package and packaging Group III in accordance with Item 5.
- 8.7 In the case of liquids that exhibit one or several additional risks, it is necessary, in order to classify them correctly, to use Table I on the order of preponderance of risk characteristics in Official Mexican Standard NOM-002-SCT2/1994. The package and packaging group for the substance shall be the one corresponding to the most serious risk.

- 5.8 Substances classified as flammable liquids because they are transported at high temperatures are included in package and packaging Group III.
- 5.9 The most commonly used methods for determining the flash point of Class 3 Flammable Liquids are the following:
- a) Standard Method DIN 51755 (flash points below 65EC)
 - b) Standard Method DIN 51758 (flash point between 65EC and 165EC)
 - c) Standard method DIN 53213 (for varnishes, lacquers and similar viscous liquids with a flash point lower than 65EC)
 - d) Method ASTM D 56-87
 - e) Method ASTM D 3278-89
 - f) Method ASTM D 93-90
 - g) Method ISO 1523:1983 for paints and varnishes.

6. DETERMINATION OF THE PACKAGE AND PACKAGING GROUP IN WHICH FLAMMABLE VISCOUS SUBSTANCES WITH A FLASH POINT LOWER THAN 23EC MUST BE INCLUDED.

- 6.1 The group to be assigned to paints, varnishes, enamels, lacquers, adhesives, polishes and other Class 3 flammable viscous substances with a flash point lower than 23EC, is determined based on:
- a) The viscosity, expressed as flowtime, in seconds;
 - b) The flash point in closed-cup; and
 - c) The solvent separation test.
- 6.2 Flammable viscous liquids such as paints, varnishes, enamels, lacquers, adhesives and polishers with a flash point lower than 23EC shall be considered in package and packaging Group III whenever they meet each and all of the following requirements:

- a) The separated solvent layer amounts to less than 3% in the solvent separation test;
- b) The mixture does not contain more */missing phrase/* substances of Group I or of Group II of Division 6.1 or of Class 8, nor more than 5% of substances of Group I of Class 3, with secondary risks of Division 6.1 or Class 8; and
- c) The viscosity and flash point are in accordance with the following table:

Flowtime in seconds	Diameter of beaker in millimeters	Flash point in EC
20 < t # 60	4	Above 17
60 < t # 100	4	Above 10
20 < t # 32	6	Above 5
32 < t # 44	6	Above -1
44 < t # 100	6	Above -5
100 < t	6	-5 or below

- d) The capacity of the receptacle used is greater than 30 liters.

6.3 The testing methods are the following:

- a) **Viscosity test:** The flowtime in seconds is determined at 23EC using an ISO (International Standard Organization) standard cup with a 4 mm beaker (ISO 2431:1984). Where the flowtime exceeds 100 seconds, a second test must be carried out using a standard ISO cup with a 6 mm diameter beaker.
- b) **Flash point:** The flash point in closed-cup is determined in accordance with ISO Method 1523:1983 for paints and varnishes. If the flash point is sufficiently low for water to be used in the bath receptacle, the test method shall be changed as follows:
 - b.1) Ethylene glycol shall be used in the bath receptacle or in any other available similar receptacle.
 - b.2) If necessary, a cooler may be used to lower the sample and apparatus temperature to less than what is required by the method of determination

of the assumption flash point. In order to obtain lower temperatures, the sample and equipment must be cooled by slowly adding solid carbon dioxide to the ethylene glycol, and by likewise cooling the sample in another ethylene glycol receptacle.

- b.3) To ensure that the flash points are reliable, it is important not to exceed the recommended sample temperature increase rate. Based on the volume of the bath and the amount of ethylene glycol that it contains, it may be necessary to partially insulate the bath, so that the temperature increase is sufficiently slow.

- c) **Solvent Separation Test:** This test is conducted at 23EC in a 100 ml tester fitted with a stopper, having a total height of approximately 25 cm and a uniform internal diameter of approximately 3 cm over the calibrated part. The paint is stirred to obtain a uniform consistency, and is poured in the tester up to the 100 ml mark; the stopper is inserted, and the tester is left undisturbed for 24 hours. Then, the height of the upper separated layer is measured, and the percentage of height of this layer as compared with the total sample height is calculated.

6.4 Testing Method for Combustibility

- 6.4.1 The method describes a procedure for determining whether a substance, when heated under testing conditions and exposed to a flame, sustains its combustion.

- 6.4.2 Method principle: A metal piece with a concave hollowed-out area (test cavity) is heated at a specific temperature. A specific volume of the substance to be tested is placed in the cavity, and its capacity to sustain combustion is observed after approaching and withdrawing the flame under specific conditions.

6.4.3 Apparatus: The combustibility tester consists of a block made of aluminum alloy or any other metal that is corrosion-resistant and has a high thermal conductivity. The block has a concave cavity and a perforation for inserting a thermometer[;] a small gas beaker is assembled in a rotating piece and is secured onto the block. The handle and the gas receptacle are connected to the beaker at a convenient angle, as is shown by Figure 1, which also shows its basic dimensions. The following equipment is also required:

- a) A calibrator to verify that the height from the center of the gas beaker above the top part of the test cavity is 2.2 mm as indicated in Figure 1;
- b) A mercury thermometer for horizontal use, with a sensitivity of no less than 1 mm/EC or any other equally sensitive device that permits readings taken at intervals of 0.5EC. When placing the thermometer in the apparatus, the bulb should be wrapped in a temperature-conducting thermoplastic compound;
- c) A gas burner with a temperature regulating device. Use may be made of any other apparatus with adequate temperature control facilities for heating the metal block;
- d) A time clock or any other suitable timing device;
- e) A syringe with a 2 ml. capacity with ± 0.1 ml accuracy, and
- f) As a source of fuel, butane gas.

6.4.4 Sample: The sample must be representative of the substance to be tested, and must be kept in a hermetic receptacle before the test to prevent any possible loss of constituents owing to the volatility of the compounds[;] the sample must receive whatever minimum treatment will ensure its homogeneity. After each sample portion has been drawn, the sample vessel must be immediately and hermetically closed so as to ensure that none of the volatile components will leak from the receptacle; if this does occur, it will be necessary to draw a new sample.

6.4.5 Procedure: The determination must be made in triplicate. Caution: Do not carry out tests in small and confined areas (such as desk drawers, etc.) owing to the danger of explosion.

- a) In order to be able to observe the behavior of the inflammation, flame, etc., it is important that the apparatus be placed in an area completely free of drafts and in the absence of any strong lights.
- b) Place the metal block above the gas burner, or heat it by any other method, until the desired temperature has been reached, as indicated by the thermometer placed in the metal block, and keep the temperature constant with a tolerance of ± 1 EC. The test temperatures are 60.5EC and 75EC [see paragraph h.)] The temperature must be adjusted to the barometric pressure differences from the standard atmospheric pressure (101.3 kPa), by increasing the temperature if said pressure is greater or decreasing it if the pressure is lower, at the rate of 1EC for each 4 kPa of difference. Make sure that the top edge of the metal block is in a perfectly horizontal position. Use the calibrator to verify that the beaker is 2.2 mm above the cavity edge before starting the test.
- c) Ignite the gas beaker far from the test position (in the "OFF" position, withdrawn from the test cavity)[;] adjust the size of the flame to between 8 and 9 mm high and approximately 5 mm wide.
- d) Using the syringe, draw at least 2 ml from the sample vessel; quickly transfer this $2 \text{ ml} \pm 0.1 \text{ ml}$ sample portion to the combustibility tester cavity and immediately start the chronometer.
- e) After a heating period of 60 seconds, by which time it is considered that the sample portion will have reached its equilibrium temperature, and if the sample portion has not ignited, approach the flame above the liquid, keep it in this position for 15 seconds then withdraw the flame, all the while observing the sample portion. The test flame must remain ignited throughout the test.

- f) For each test, observe and note:
 - f.1) Whether there is inflammation and sustained combustion or smoldering, or neither, of the sample portion before the test flame is placed in the test position.
 - f.2) Whether the sample portion ignites very soon after the test flame, and if so, how long the combustion was sustained after the flame was extinguished.
- g) If the observations cannot be interpreted as sustained combustion in accordance with paragraph 6.4.6, repeat the full procedure with new sample portions, but with a heating time of 30 seconds.
- h) If the observations cannot be interpreted as sustained combustion in accordance with paragraph 6.4.6, at a test temperature of 60.5EC, repeat the full procedure with new sample portions, but at a test temperature of 75EC.

6.4.6 Interpreting of the observations: The substance must be classified as "SUSTAINS COMBUSTION" OR "DOES NOT SUSTAIN COMBUSTION". If it sustains combustion, it must be reported as such for the heating times if any of the sample portions behaves as follows:

- a) If the sample portion ignites and sustains its combustion before the flame is accelerated, [sic] and
- b) If the sample portion ignites when the flame is approached for 15 seconds and combustion is sustained for over 15 seconds after the flame is withdrawn.

Intermittent flames must not be interpreted as "SUSTAINS COMBUSTION". Normally, after 15 seconds, it is clear whether combustion has ceased or continues[;] should there persist any doubt, one must assume that the substance sustains combustion.

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