OFFICIAL MEXICAN STANDARD

NOM-046-SCT2/1998

“CHARACTERISTICS AND SPECIFICATIONS FOR THE CONSTRUCTION AND RECONSTRUCTION OF MULTIMODAL TANK CONTAINERS DESTINED TO TRANSPORT OF NON REFRIGERATED PRESSURE LIQUEFIABLE GASES”

SECRETARIA DE COMUNICACIONES Y TRANSPORTES

INDEX

1. OBJECTIVE

This Mexican Official Standard (NOM) has as an objective to establish characteristics and specifications for the contruction and recontruction of multimodal tank containers destined to the transport of non refrigerated pressure liquefied gases, as well as to approval, certification and marking of them along with provisions related to their transportation with the purpose of protecting the ways of transportation and safety of their users.

2. FIELD OF APPLICATION

This MOS (NOM) is obligatory for all manufacturers of these tanks, for those responsible of autorized shops dedicated to their reconstruction and carriers involved in their handling.

Specifications contained herein are not applicable to tank carriers, railroad tanks, non metal containers or IBC's or containers destined to transport of cases with capacity not exceeding 1,000 liters (1.0 m3) or for those designed to withstand a maximum allowable working pressure (MAWP) bellow 7.13 kg/cm^2 (101.3 lb/in^2) (7 bars) or above 40.76 kg/cm2 (578.8 lb/in^2) (40 bars)

3. REFERENCES

For a correct application of this Standard it is necessary to consult the following Official Mexican Standards:

NOM-002-SCT2/1994	**LIST OF SUBSTANCES AND DANGEROUS MATERIALS MORE FREQUENTLY TRANSPORTED.**
NOM-003-SCT2/1994	**LABELING CHARACTERISTICS FOR PACKAGINGS DESTINED TO THE TRANSPORT OF DANGEROUS MATERIALS AND RESIDUES.**
NOM-004-SCT2/1994	**IDENTIFICATION SYSTEM OF UNITS DESTINED TO THE LAND TRANSPORT OF DANGEROUS MATERIALS AND RESIDUES**

NOM-020-SCT2/1995	**GENERAL REQUIREMENTS FOR THE DESIGN AND CONSTRUCTION OF AUTO TANKS DESTINED TO THE TRANSPORT OF DANGEROUS MATERIALS AND**

	RESIDUES OF SPECIFICATIONS SCT 306, SCT 307, AND SCT 312.
NOM-023-SCT2/1994	**TECHNICAL INFORMATION TO BE INCLUDED IN THE METAL PLATE ATTACHED TO AUTOTANKS, INTERMEDIATE BULK CONTAINERS (IBC) AND VESSELS WITH CAPACITY LARGER THAN 450 LITERS TRANSPORTING DANGEROUS MATERIALS, SUBSTANCES AND WASTE.**
NOM-030-SCT2/1994	**SPECIFICATIONS AND CHARACTERISTICS FOR THE CONSTRUCTION AND RECONSTRUCTION OF TANK CONTAINERS DESTINED TO THE MULTIMODAL TRANSPORT OF REFRIGERATED LIQUEFIED GASES.**
NOM-051-ECOL/93	**STANDARD ESTABLISHING CHARACTERISTICS OF DANGEROUS RESIDUES, A LIST OF THEM AND THE LIMITS THAT MAKES A RESIDUE DANGEROUS DUE TO ITS TOXICITY TO THE ENVIRONMENT.**

4. DEFINITIONS

To the effect of applicable provision to tank containers destined to the transport of non refrigerated pressured gases of class 2, we will base upon definitions stated on NOM-030-SCT2-1994, along with the following:

Maximum Allowable Working Pressure (MAWP) is understood as the maximum manometric pressure allowed measured at the top section of the tank while tank is in operating position. It will not be less than the vapor pressure, or the preferenced designed temperature, of any product that may be loaded and transported and at any pressure that may be used during the filling or unloading.

Discharge pressure.- It means the highest pressure wich reaches within the shell when being emptied by pressure.

Design reference temperature.- it means the temperature in which the vapour pressure is determined by the contents for the effect of calculation of the maximum allowable working pressure (MAWP). This value, for the various types of tank is as follows:

a) Tanks with a maximum diameter of 1.5 meters = 65°C

b) Tanks with larger diameter 1.5 m:

I) with no insulation or protective cover from the sun = 60°C

II) with sun protective cover : 55°C

III) with insulation; 50°C (this value depending on the quality of insulation)

Mild Steel.- A steel with a guaranteed minimum tensile strength of 37 decanewtons/mm^2 (da N/mm^2) and a guaranteed minimum percentage elongation of 27%

Low carbon steel.- Means a steel with a tensile strength between 380 and 515 MPa (55-75 Kis) and a minimum elongation percentage of 27%

Elongation = Elastic limit or fluency

5. SPECIFICATIONS AND CHARACTERISTICS

5.1 Relative to design and construction of tank container intended for the transport of non refrigerated pressure liquefiable gases.

5.1.1 Shells for tank containers should be made of a steel suitable for shaping. For welded shells only a material whose weldability has been fully demostrated should be used. If contruction process or materials used demand it, tank containers should subjected to suitable thermal treatment after welding operations. Welding should be performed and offer full safey . Tank containers materials should be adequate for the environment in which they can be transported, for instance, by sea. Aluminium should not be utilized as a construction material except for those destined to land transport or in those cases in which its use is expressly autorized for maritime transport as stated on Table 1 of this Standard.

If its utilization is authorized, aluminium should have an insulation to prevent significant loss of phisical properties when it is subjected to a heat load of 2.6 $gcal/cm^2.sec$ (34,500 british thermical units by square foot hour) which are equivalent to the units of heat load for 30 minutes; insulation should remain effective at all temperatures up to 650°C and should be jacketed with a material with a melting point of not less than 650°C. Steel should be resistant to withstand tensile fracture and fusible corrosion under traction stress at temperatures between –30°C and design reference temperature.

5.1.2 Tank containers, fittings and pipe work should be contructed of materials wich are:

a) Practically inalterable by the substance carried, or

b) Properly neutralized by chemical reaction with that substance.

5.1.3 Gaskets, where used, should be made of materials not subject to attack by the contents of the tank.

5.1.4 Precaution should be taken to avoid damage by galvanic action due to juxtaposition of dissimilar metals.

5.1.5 Tank containers including any devices, accesories and covers that may be in contact with contents, must be manufactured with materials that cannot be affected or damaged by contents nor produce a dangerous reaction with them.

5.1.6 Tank containers should be designed and fabricated with supports to provide a secure base during transport and with suitable lifting and tie-down attachments

5.1.7 Tanks, their attachments and their service and structural equipment should be designed to withstand, whithout loss of contents, at least the internal pressure due to the contents, and the static and dynamic stresses in normal handling and transport.

5.1.8 Tank containers should be designed to withstand without permanent deformation an minimum external pressure of 0.4076 kg/cm^2 (6.00 lb/in^2) (.04 bar) above the internal pressure. Tanks to be subject to a pre loading or after unloading, significative vacuum should be designed to withstand a minimum external pressure of 0.917 kg/cm2 (12.8 lb/in2) (0.9 bar) and should be tested at that pressure.

5.1.9 Minimum dynamic loads, besides static loads to be absorbed should be based in the values of 2 gn vertically downwards, 2gn lengthwise and 1 gn across, applied towards the center of gravity of the tank

5.1.10 Tank container should be transported only on vehicles whose fastening are capable, when carry the maximum permissible loading, of absorbing the forces specified in 5.1.9.

5.1.11 Tank containers intended to contain certain gases listed on Table 1, should be provided with additional protection, wich may be in the form of an increase in the thickness of the shell or a higher test pressure. It will be detemined in the ligth of the dangers inherent to the substance to the transported.

5.1.12 Thermal insulation system should comply with the following requisits:

5.1.12.1. If tank containers used for transport of gases is equipped with thermical insulation, this should consist of:

a) A cover extending to no less of the third of the upper shell and not more of one half of the upper surface of the tank should have an air gap from the tank approximately 4cm.; or

b) A full cover of sufficient thickness made of insulating materials protected in such manner that the cover cannot get humid nor eroded in normal transport conditions.

The protective cover if closed hermetically to gases must be provided with a device that avoids dangerous pressure accumulation in the insulating cover in case of tank leakeage, its elements or accesories.

5.1.12.2 Thermal insulation should be designed in a manner that will not obstruct access to accesories or unloading devices.

5.1.12.1 Depending on material utilized on tank construction or methods of fabrication a thermal treatment may be required after welding or an effort reduction treatment after conformation of tank.

5.2 Relative to Cross-Section

5.2.1 Tank containers should have a circular cross-section.

5.2.2 Tank containers destined to multimodal transport should be designed and build in a way to whistand a test pressure equivalent to at least 1.3 times the MAWP. Attention is drawn to the minimum shell thickness requirements for these tanks specified on paragraph 5.3.

5.2.3 In choosing the material and determining wall thickness, the maximum and minimum filling or working temperature should be taken into account, having regard to the risk of brittle fracture.

5.2.4 At the test pressure the stress σ at the most severely stressed point of the tank-container shell should conform to the material-dependent limitations prescribed below:

a) For metals and alloys exhibiting a clearly defined yield point or characterized by a guaranteed conventional yield stress Re (generally 0.2% permanent elongation; in the case of austenitic steels, 1% permanent elongation), the stress should no exceed the lowest of these values: 0.75 Re or 0.50 Rm

b) In the case of steel, the elongation at fracture, in %, should not be less than 1.000/Rm, where Rm is in decanewtons/mm^2 with an absolute minimum of 20%; in the case of aluminium the elongation at fracture in percentage should not be less than 1.000/6Rm; where Rm is decanewtons/mm^2, with an absolute minimum of 12%.

5.2.5 It should be noted that the specimens used to determine the elongation at fracture should be taken transversely to the direction of rolling and be so secure that:

$$Lo = 5d,$$
or
$$Lo = 5.65\sqrt{A}$$

Where :

Lo = Legth of the specimen before the test;
d = Diameter

A = Surface of the transversal section of the specimen

5.3 Relative to the minimum shell thickness of tank.

5.3.1 Tank containers should be built in a accordance to regulations for pressure containers

5.3.2 The cylindrical portion of the shells and ends of tanks not more than 1.8 meters (6 feet) in diameter should be not less than 5 mm. (6/16 inch) thick if of carbon stell or equivalent thickness if of other metal. In tanks more than 1.8 meters (6 feet) in diameter they should be not less than 6mm. (1/4 inch) thick if of mild steel or equivalent thickness if of other metal. The cylindrical portions and ends of all tanks should be not less than 4 mm (5/32 inch) thick regardless of the materials of construction.

5.3.3 In the case of metal other than a mild steel of a guaranteed minimum tensile strength of 37 decanewtons/mm2 and guaranteed minimum percentage elongation of 27 equivalent to that prescribed in 5.3.2 should be determined by using the following equation:

$$E1 = \frac{10\ e_0,}{\sqrt[3]{Rm_1 \times A_1}}$$

Where :

e_1 = The required equivalent thickness of the metal to be used
e_0 = Minimum thickness for mild steel specified in 5.3.2
Rm_1= Guaranteed minimum tensile strength of the metal to be used
a_1 = Guaranted minimum elongation (as a percentage) of the metal to be used on fracture uder tensile stress (see 5.3.2)

5.3.3.1 In no case should the wall thickness be less than prescribed in 5.3.2

5.3.4 There should be no sudden change of plate thickness at the head of attachment to the cylindrical portion of the shell and in no case should the plate thickness at the knuckle be less prescribed in 5.2.4

5.4 Relative to components

5.4.1 Components (values, accesories, fittings, safety devices, gauging, devices, etc.) should be so arranged as to be protected against the risk of being wrenched off or damaged during transport and handling. If the connection between the frame and the tank shell allows relative movement as between the sub-assemblies, the equipment should be so fastened to permit such movement with risk of damage to working parts. Equipment protection should offer a degree of safety comparable with that of the tank shell.

5.4.2 All orifices in the shell more that 1.5 mm in diameter except those for safety valves, inspection opening or closed bleed holes should be provided with three mutually independent shut-off devices in series, the first being an internal stop valve, flow restriction valve or equivalent device.

5.4.2.1 A flow-restricting valve should be so fitted that its seating is inside the or inside a welded flange or, if fitted externally mounting should be designed so that in the event of impact its effectiveness should be maintained.

5.4.2.2 Flow-restricting valves should be selected and fitted so as close automatically when rated flow specified by the manufacturer is reached. Connections and accesories leading to or from such a valve should have the capacity for a flow greater than the rated flow of the flow-restrictinig valve.

5.4.3 In the case of filling and discharge openings the first shut-off device should be an internal stop valve and the second should be a stop valve placed in an accesible position on each and/or filling pipe.

5.4.4 In the case of filling and discharge openings of tanks intended for the transport of flammable and/or toxic gases the internal stop value should be an instant closing safety device, which closes automatically in the event of unintended movent of the tank or fire engulfment. It should also be possible to opperate this device by remote control.

5.4.5 The shells of tank container intended for the transport of liquefied gases may be equipped, in addition to filling, discharge and gas pressure equalizing orifices, with openings in which gauges, thermometers and manometers can be fitted.

Connections for such instruments should be made by suitable welded nozzles or pockets and not be screwed connections through the shell.

5.4.6 A tank-container should be provided with an opening large enough to enable the container to be inspected internally.

5.4.7 External fittings should be grouped together.

5.4.8 All connections should be clearly marked to indicate the function of each.

5.4.9 Stop valves with screwed spindles should close by clockwise rotation.

5.4.10 All piping should be of suitable material. Welded pipe joints should be used. Non malleable metals should be used in the construction of valves or accesories. The bursting strength of all piping and pipe fittings should be at least four times the strength at the maximum allowable working pressure of the tank and at least four times the strength at the pressure to which it may be subject in service by the action of a pump or other device (except pressure-relief valves) the action of wich may be subject portions of the piping to pressures greater than the tank maximum allowable working pressure. Suitable provisions should be made in every case to prevent damage to piping to thermal expansion and contraction, jarring and vibration

5.4.11 Tank containers intended for the transport of flammable gases should be capable of being electrically grounded.

5.4.12 For certain gases indicated in Table 1 shell openings for any purpose below the liquid level are not allowed.

5.5 RELATIVE TO PRESSURE RELIEF DEVICES.

5.5.1 Tank-containers should be provided with one or more spring-loaded pressure-relief devices. Frangible discs not in series with a spring-loaded pressure-relief device are not permitted. The valves should open automatically at a pressure not less than the maximum allowable working pressure and should be completely open at a pressure of no less of 110% and no more than 138% at MAWP. These valves should, after discharge, close at a pressure not lower than 10% below the the pressure at which discharge starts and should remain closed at all lower pressures. The pressure-relief valves should be of a type that will resist dynamic stresses including liquid surge.

5.5.2 Pressure-relief devices should be designed to prevent the entry of foreign matter, the leakage of gas and the development of any dangerous excess pressure.

5.5.3 Tank shells for the transport of certain gases listed in Table 1 should have a

pressure-relief device approved within the corresponding standard. Unless a tank in dedicated service is fitted with an approved relief valve constructed of materials compatible with the load, such device should comprise a frangible disc preceding a spring-loaded valve. The space between the frangible disc and the valve should be provided with a pressure gauge or a suitable tell-tale indicator. This arrangement permits the detection of disc rupture, pinholing, or leakage which could cause a malfunction of the pressure-relief device. In this instance, the frangible disc should rupture at the start-to-discharge pressure of the relief valve.

5.5.4 The safety device should operate only in conditions of excessive rise in temperature, as the tank will not be subject during transport to undue fluctuations of pressure due to handling procedures.

5.5.5 The combined delivery capacity of the relief devices should be sufficient that, in the event of total fire engulfment, the pressure (including accumulation) inside the shell does not exceed 1.1 times the maximum allowable working pressure. Spring-loaded relief devices should be used to achieve the full relief capacity prescribed.

5.5.6 To determine the total required capacity of the relief devices, which may be regarded as being the sum of the individual capacities of the several devices, one of the following equivalent formulae may be used:

(a) $$Q = 5.62 \times 10^{6} \left(\frac{FA}{LC} \sqrt[.82]{V \frac{ZT}{M}} \right)$$

where:

Q = Minimum required rate of discharge (in M /h), of air at standard conditions: 15.6°C and 1 atm;

A = Total external surface area of tank shell in sq. m.
L = Latent heat of vaporization in cal/g;
Z = Compressibility factor for the vapor in g, m, K units;
T = Absolute temperature in Kelvin (°C + 273) at relieving conditions;
M = Molecular weight of vapour in g;
C = A constant depending on ratio of specific heats of vapour ; see 5.5.7
F = Insulation factor; use 1 for uninsulated tanks, and

$$\left(\frac{8U\,(650 - t)}{93.5 \times 10^{6}} \right)$$

for insulated tanks, where t is the temperature in °C of the vapour or gas in the tank as the device is venting;

U = Thermal conductivity of the insulation at 311 K in gcalories/h.sq.m.°K. This should be a function of the thickness of the insulation.

(b) $$Q = 37.98 \times 10^{6} \left(\frac{FA}{LC} \sqrt{\frac{ZT}{M}} \right)$$

Where:

Q = Minimum required rate of discharge in cubic feet of air per hour at 60°F and 14.7 lb/sq.in.abs.
A = Total external surface area of tank shell (in sq. ft.)
L = Latent heat of vaporization in BTU/lb;
Z = Compressibility factor for the vapour in lb,ft,°F units
T = Absolute temperature in degrees Rankin (°F+460) at relieving conditions;
M = Molecular weight of vapour in lb units;
C = A constant depending on ratio of specific heats heats of vapour; see 5.5.7 (hours and °F)
F = Insulation factor; use 1 for uninsulated tanks and

$$\left(8U \frac{(1{,}200 - t)}{34{,}500} \right)$$

for insulated tanks, where t is the temperature in °F of the vapour or gas in the tank as the device is venting;

U = Thermal conductivity of the thickness of the insulation at 100 F in BTU/h. sq.ft.°F. This should be a function of the insulation.

5.5.7 "C" is a constant derived from the followin equation: as a function of the ratio of specific heats:

$$k = \frac{Cp}{Cv}$$ (if factor is unknown, let C = 315)

k	C	k	C	k	C
1.00	315	1.26	343	1.52	366
1.02	318	1.28	345	1.54	368
1.04	320	1.30	347	1.56	369
1.06	322	1.32	349	1.57	371
1.07	324	1.34	351	1.60	372
1.10	327	1.35	352	1.61	374
1.11	329	1.38	354	1.64	376
1.14	331	1.39	356	1.65	377
1.15	333	1.42	358	1.68	379
1.18	335	1.43	359	1.69	380
1.19	337	1.46	361	2.00	400
1.22	339	1.47	363	2.20	412
1.24	341	1.50	364		

5.8 Every pressure relief device should be plainly and permanently marked with the pressure or temperature at which it is set to discharge and the rated free-air delivery of the device at 15°C and one bar. Capacity marked on valves should be as rated at a pressure not greater than 110% of the set pressure.

5.5.9 Connections to pressure-relief devices should be of sufficient size to enable the required discharge to pass unrestricted to the safety device. No stop-valve should be installed between the tank shell and the pressure- relief devices except where duplicate equivalent devices are provided for maintenance and the stop-valves serving the devices actually in use are locked open or the stop-valves are interlocked so that at least one of the duplicate devices is always in use. Vents from the pressure-relief devices,where used,should deliver the relieved vapour or liquid to the atmosphere in conditions of minimum back-pressure on the relieving device.

5.5.10 Pressure-relief valve inlets should be sited on top of the tank in a position as near the longitudinal and transverse center of the tank as possible. All pressure-relief device inlets should be situated in the vapor space of the tanks and the devices so arranged as to ensure that the escaping vapor is discharged unrestrictedly and in such a manner that it cannot impinge upon the tank shell. Protective devices which deflect the flow of vapor are permissible provided the required valve capacity is not reduced.

5.5.11 Arrangements should be made to prevent access to the valves by unauthorized persons and to protect the valves from damage caused by the tank overturning.

5.6 RELATIVE TO GAUGING DEVICES

5.6.1 Glass level-gauges, or gauges made of other easily destructively material, which are in direct communication with the contents of the tank should not be used.

5.7 RELATIVE TO TANK SUPPORT, FRAMEWORKS AND LIFTING ATTACHMENTS

5.7.1 Tank containers should be designed and fabricated with a support structure to provide a secure base during transport. Skids, frameworks, cradles or other similar devices are acceptable. Relative to this design characteristic it should also be taken in consideration loads indicated on 5.1.9 regarding minimum dynamic loads.

5.7.1.1Under each of these loads, the safety factors to be observed should be as follows:

(a) For metals having a clearly defined yield point, a safety factor of 1.5 in relation to the determined yield stress; or

(b) For metals with no clearly defined yield point, a safety factor of 1.5 in relation to the guaranteed 0.2% proof stress

5.7.2 The combined stresses caused by tank mountings (cradles, frameworks, etc.) and the tank lifting and tie-down attachments should not cause excessive stress in any portion of the tank shell. Permanent lifting and tie-down attachments should be fitted to all tanks. Preferably they should be fitted to tank supports but may be secured to

reinforcing plates located on the shell at the points of support.

5.7.3 In the design of supports and frameworks due regard should be paid to the effects of environmental corrosion, and in calculations for all structural members not constructed of corrosion-resistant materials a minimum corrosion allowance determined by the competent authority should be provided.

5.7.4 Tank container frameworks intended to be lifted or secured by their corner casting should be subjected to internationally accepted special tests, for example, the ISO system. The use of such tank-container frameworks within an integrated system is generally encouraged.

5. TESTS.

6.1 The entities approved by the Secretariat as competent authorities should issue, in respect of every new design of tank container, a certificate attesting that the tank-container and its attachments surveyed by that authority are suitable for the purpose for which they are intended and meet the construction and equipment requirements stated on this chapter and where appropiate, the special requirements for the gases in Table 1. Such certificate should show the commodities or group of commodities allowed to be transported in the tank-container. The prtotype test results, the gases for whose transport the tank-container is approved and an approval number should be specified in a test report. If the tank-containers are manufactured without change in structural design this approval should be deemed to be a design approval The approval number should consist of the distinguishing mark or sign of the Country or State in whose territory the approval was granted.

6.2 Design approval should be given in respect of at least one tank of each design and each size, it being, however, understood that a set of tests made on a tank of one size may serve for the approval of smaller tanks made of a material of the same kind and thickness by the same fabrication technique and with identical supports and equivalent closures and other appurtenances.

6.3 The shell and items of equipment of each tank-container should be inspected and tested, either together or separately, first before being put into service (initial inspection and test) and thereafter at not more than five-year intervals (periodic inspection and test)

6.4 The initial inspection and test should include a check of the design characteristics, an internal and external examination and a hydraulic pressure test. If the shell and equipment have been pressure-tested separately, they should together be subjected after assembly to a leakage test. All welds in the shell should be tested in the initial

test by radiographic, ultrasonic or another suitable non-destructive method. This does not apply to the metal sheathing of an insulation.

6.5 The periodic inspections and tests should include an internal and external examination and, as a general rule, a pressure test. Sheathing, thermal insulation and the like should be removed only to the extent required for reliable appraisal of the condition of the tank-container.

6.6 The initial and periodic pressure tests should be carried out, by an expert approved by the competent authority, at the test pressure indicated on the data plate of the tank container, except in cases where periodic tests at lower test pressures are authorized.

6.7 While under pressure the tank should be inspected for leakage, corrosion, dents, or other conditions which indicate weaknesses that might render the tank unsafe in transport and, if any evidence of such unsafe condition is discovered, the tank should not be placed in or returned to service untilit has been repaired and the test, repeated, has been passed.

6.8 Before tank-containers are put into service, and thereafter at intervals midway between the inspections and tests provided for by 6.3, the following tests and inspections should be performed:

a) a leakproofness test, where required;

b) a test of satisfactory operation of all service equipment; and

c) an internal and external inspection of the tanks and their fittings with due regard to the gases transported.

6.8.1 However, the internal inspection may be excempted by the competent authority concerned in the case of tanks intended for the transport of one substance.

6.9 When a tank-container, other than its shell, is damaged it should be so repaired as to comply with these specifications. When the shell is damaged, it should be repaired and retested in conformity with next paragraph.

6.10 In all cases where cutting, burning or welding operations on the shell of a tank-container have been effected, that work should be to the approval of the competent authority and a hydrostatic test to at least the original test pressure should be carried out.

7 MARKING AND CERTIFICATION.

7.1 Marking.

7.1.1 Every tank-container should be fitted with a rust-proof metal plate permanently attached to the shell in a place readily accesible for inspection according to NOM-023- SCT2/1994.These data may be engraved directly on the walls of the shell itself if the walls are sufficiently thick so that the strength of the shell is not impaired.

7.1.2 The tank-container must indicate the substance or dangerous residue that is being transported according to NOM- 002-SCT2/1994 (as well as the mean maximum temperature of load if other than 50°C); name of of owner and name of the manufacturer.

7.2 Certification.

7.2.1 Cetifyng agencies approved by competent authority should issue certificates in which test results are stated regarding tank-containers being certified.

7.2.2 This document should contain the following data:

a) Code to which tank is designed

b) Manufacturer's name or mark

b) Year of manufacture

c) Tank material
Design pressure in Kg/sq.cm. (Lb/sq.in.)

e) Original test pressure in Kg/sq.cm. (lb/sq.in.)

f) Month, year and test pressure of most recent periodic test

_____month_____year_____Kg./sq.cm. (lb/sq.in.)

g) Date of last visual inspection.

h) Stamp and signature of who carried out the most recent test.

i) Name of gases for which container has been approved.

7.7.3 This document should be safely kept until a new test or inspection is effected, as the last inspection or test results will be considered in force.

8. RESOLUTIONS RELATIVE TO TRANSPORT.

8.1 Tank-containers in poor condition should not be used for transport:

8.1.1 In a not totally filled condition liable to produce an unacceptable hydraulic force;

8.1.2 That are leaking;

8.1.3 That are damaged to such an extent that the integrity of the tank or its lifting or securing arrangements may be affected; and

8.1.4 The service equipment has not been examined and/or considered to be in good working order.

8.2 Empty tank-containers not cleaned and not gas-free should comply with the same requirements as tanks filled with the previous substance.

8.3 During transport, tank-containers should be adequately protected agains lateral and longitudinal impact and against overturning. If the shells and the service equipment are so constructed as to withstand impact or overturning they need not be protected in this way. Examples of protection of of shells against collision:

a) Protection against lateral impact may consist, for example, of longitudinal bars protecting the shells on both sides at the level of the median line;

b) Protection of tank containers against overturning may consist, for example, of reinforcement rings or bars fixed across the frame;

c) Protection against rear impact may consist of a bumper or frame;

d) External fittings should be designed or protected so as to preclude the

release of contents upon impact or overturning of the tank upon the fittings.

8.4 Certain gases are chemically unstable. They are to be accepted for transport only if the necessary steps have been taken to prevent their dangerous decomposition, transformation or polymerization during transport. To this end, care should in particular be taken to ensure that tanks do not contain any substances liable to promote these reactions.

8.5 The maximum mass of liquefied gas per liter of tank capacity (kg/l) should not exceed the density of liquefied gas at 50°C multiplied by 0.95. Furthermore, the tank should not be liquid-full at 60°C.

8.5.1 During filling, the temperature of the liquefied gas should fall within the limits of the metallurgic design temperature.

8.5.2 Tanks should not be filled above their maximum permissible gross weight.

9. BIBLIOGRAPHY

Recommendations on the Transport of Dangerous Goods, United Nations, Ninth revised edition, New York and Geneva,1995.

10. HARMONIZATION WITH INTERNATIONAL STANDARDS.

This Mexican Official Standard coincides with the Recommendations on the Transport of Dangerous Goods of the United Nations, Chapter 12; 1995.

11. COMPLIANCE.

Based upon dispositions within the Land Transport of Dangerous goods and Residues Act, This Mexican Official Standard is obligatory.

12. SANCTIONS

Non compliance of Dispositions contained in this Mexican Official Standard, will be sanctioned in accordance to what is stated in the Land Transport of Dangerous Goods and Residues Act as well as well as other judicial acts that may apply.

12. ENFORCEMENT.

The Secretariat of Communications and Transport through the competent General Directorates is the responsible and competent authority to enforce compliance of this Mexican Official Standard.

13. DATE OF EFFECT.

This Mexican Official Standard wll be in effect 90 days after its publication in Mexican Official Gazzete. M‚Àxico, D.F., September 18, 1998.

THE UNDERSECRETARY OF TRANSPORT AND
CHAIRMAN OF THE NATIONAL STANDARIZATION
CONSULTIVE COMMITTEE OF LAND TRANSPORT

DR. AARON DICHTER POLTOLAREK

NOTES FOR TABLE 1.

Table is divided in 9 columns

Column 1: Indicates United Nations number asigned to the dangerous substance.

Column 2: Indicates the official designation for thesubstance.

Column 3: Indicates assigned Division for the substance.

Column 4: Indicates secondary risks asigned to the substance.

Column 5: Indicates the Maximum Allowed Working Pressure (MAWP) based on each of the four different types of containers: "small"; "bare"; "sun-shielded"; "insulated", or makes refference to the definition of MAWP established on this Standard.

Column 6: Indicates that openings below liquid level are either "allowed" or "not allowed".

Column 7: Indicates the pressure-relief requirements that may be "normal" (see paragraph 5.5.1) or requires special attention to paragraph 5.5.3.

Column 8: Indicates filling requirements for containers, indicated in Kg/liter or with reference to paragraph 8.5.

Column 9: Indicates special requirements for specific dangerous substance in particular.

TABLE 1 : LIST OF SUBSTANCES OF CLASS 2, NON REFIGERATED PRESSURE-LIQUEFIABLE GASES, TRANSPORTED IN TANK-CONTAINERS

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1015	AMONIA, ANHYDROUS, LIQUIFIED	2.3	8	29.0 25.7 22.0 19.7	ALLOWED	5.5.3	0.53	
1005	AMMONIA, SOLUTION WITH MORE THAN 50 % AMMONIA	2.3	8	SEE DEFINITION OF MAWP IN THIS STANDARD	ALLOWED	5.5.3	SEE 8.5	
1009	BROMOTRIFLUORO-METHANE (R13B1)	2.2		38.0 34.0 30.0 27.5	ALLOWED	NORMAL	1.13	
1010	BUTADIENES, INHIBITED	2.1		7.5 7.0 7.0 7.0	ALLOWED	NORMAL		
1011	BUTANE	2.1		7.0 7.0 7.0 7.0	ALLOWED	NORMAL		

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1011	BUTANE MIXTURES	2.1		SEE DEFINITION OF MAWP IN THIS STANDARD	ALLOWED	NORMAL	SEE 8.5	
1012	BUTYLENE	2.1		8.0 7.0 7.0 7.0	ALLOWED	NORMAL	0.53	
1017	CHOLORINE	2.3	5.1 8	19.0 17.0 15.0 13.5	NOT ALLOWED	5.5.3	1.25	THE CALCULATED WALL THICKNESS SHOULD BE INCRESED BY 3 MM. WALL THICKNESS SHOULD BE VERIFIED ULTRASONICALLY AT INTERVALS MIDWAY BETWEEN PERIODIC HYDRAULIC TESTS.
1018	CHORIDIFLOURO-METHANE (R22)	2.2		26.0 24.0 21.0 19.0	ALLOWED	NORMAL	1.03	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1020	CHLOROPENTAFLUOR-METHANE (R115)	2.2		23.0 20.0 18.0 16.0	ALLOWED	NORMAL	1.06	
1021	1-CHLORO-1,2,2,2-TETRA-FLOUOROETHANE (R124)	2.2		10.3 9.8 7.9 7.0	ALLOWED	NORMAL	1.20	
1027	CYCLOPROPANE, LIQUIEFIED	2.1		18.0 16.0 14.5 13.0	ALLOWED	NORMAL	0.53	
1028	DICHLORODIFLUORO-METHANE (R21	2.2		16.0 15.0 13.0 11.5	ALLOWED	NORMAL	1.15	
1029	DICHLOROFLUORO-METHANE (R21)	2.2		7.0 7.0 7.0 7.0	ALLOWED	NORMAL	1.23	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1030	1,1-DIFLUORETHANE (R152A)	2.1		16.0 14.0 12.4 11.0	ALLOWED	NORMAL	.79	
1032	DIMETHYLAMINE, ANHYDROUS	2.1		7.0 7.0 7.0 7.0	ALLOWED	NORMAL	.59	
1033	DIMETHYL ETHER	2.1		15.5 13.8 12.0 10.6	ALLOWED	NORMAL	.58	
1036	ETHYLAMINE	2.1		7.0 7.0 7.0 7.0	ALLOWED	NORMAL	.61	
1037	ETHYL CHLORIDE	2.1		7.0 7.0 7.0 7.0	ALLOWED	NORMAL	0.8	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1040	ETHILENE OXIDE WITH NITROGEN UP TO A TOTAL PRESSURE OF 1Mpa (10 BAR) AT 50 °C	2.3	2.1	- - - 10.0	NOT ALLOWED	5.5.3	0.78	THIS SUBSTANCE SHPOULD ONLY BE CARRIED IN INSULATED TANKS UNDER A NITROGEN BLANKET
1041	ETHILENE OXIDE AND CARBON DIOXIDE MIXTURE WITH MORE THAN 9 % BUT NOR MORE THAN 87% ETHYLENE OXIDE	2.1		SEE DEFINITION OF MAWP IN THIS STANDARD	ALLOWED	NORMAL	SEE 8.5	
1055	OSOBUTILENE	2.1		8.1 7.0 7.0 7.0	ALLOWED	NORMAL	0.52	
1061	METHYLAMINE, ANHYDROUS	2.1		10.6 9.8 7.8 7.0	ALLOWED	NORMAL	0.58	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1062	METHYL BROMIDE	2.3		7.0 7.0 7.0 7.0	NOT ALLOWED	5.5.3	1.51	
1063	METHYL CHLORIDE (R40	2.1		14.5 12.7 11.3 10.0	ALLOWED		0.81	
1064	METHYL MERCAPTAN	2.3	2.1	7.0 7.0 7.0 7.0	NOT ALLOWED	5.5.3	0.78	
1067	DINITROGEN TEXTROXIDE, LIQUIFIED)	2.3	5.1 8	7.0 7.0 7.0 7.0	NOT ALLOWED	5.5.3	1.30	THE WALL THICKNESS SHOULT NOR BE LESS THAN 8 MM THANKS SHOULD BE HYDRAUILICALLY TESTED AND INTERNALLY INSPECTED AT INTERVALS NOT EXCEDEDING 2.5 YEARS

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1075	PETROLEUM GAS LIQUEFIED	2.1		SEE DEFINITION OF MAWP IN THIS STANDARD	ALLOWED	NORMAL	SEE 8.5	
1077	PROPYLENE	2.1		28.0 24.5 22.0 20.0	ALLOWED	NORMAL	0.43	
1079	SULPHUR DIOXIDE, LIQUEFIED	2.3	8	11.6 10.3 8.5 7.6	NOT ALLOWED	5.5.3	1.23	THE CALCULATED WALL STICKNESS SHOULD BE INCREASED BY 3 MM. WALL THICKNESS SHOULD BE ULTRASONICALLY VERIFIED AT INTERVALLS MIDWAY BETWEN PERIODIC HYDRAULIC TEST
1082	TRIFLUOROCHLORE THYLENE, INHIBITED (R1113)	2.3	2.1	17.0 15.0 13.1 11.6	NOT ALLOWED	5.5.3	1.13	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1083	TRYMETHYLAMINE, NHYDROUS	2.1		7.0 7.0 7.0 7.0	ALLOWED	NORMAL	0.56	
1085	VINYL BROMIDE, INHIBITED	2.1		7.0 7.0 7.0 7.0	ALLOWED	NORMAL	1.37	
1086	VINYL CHLORIDE, INHIBITED OR STABILIZED	2.1		10.6 9.3 8.0 7.0	ALLOWED	NORMAL	0.81	
1087	VINYL METHYL ETHER, INHIBITED	2.1		7.0 7.0 7.0 7.0	ALLOWED	NORMAL	0.67	
1581	CHLOROPICRIN AND METHYL BROMIDE MIXTURE	2.3		7.0 7.0 7.0 7.0	NOT ALLOWED	5.5.3	1.51	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1582	CHLOROPRICRIN AND METHYL CHLORIDE MIXTURE	2.3		15.2 13.0 11.6 10.1	NOT ALLOWED	5.5.3	0.81	
1858	HEXAFLUOROPROPYLENE (R1216)	2.2		19.2 16.9 15.1 13.1	ALLOWED	NORMAL	1.11	
1912	METHYL CHLORIDE AND METHYLENE CHLORIDE MIXTURE	2.1		15.2 13.0 11.6 10.1	ALLOWED	NORMAL	0.81	
1958	DICHLOROTETRAFLOURO-ETHANE (R114)	2.2		7.0 7.0 7.0 7.0	ALLOWED	NORMAL	1.3	
1965	HYDROCARBON GAS, LIQUIFIED, N.O.S. OR HYDROCARBON GAS MIXTURE, LIQUIFIED, N.O.S	2.1		SEE DEFINITION OF MAWP IN THIS STANDARD	ALLOWED	NORMAL	SEE 8.5	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1969	ISOBUTANE	2.1		8.5 7.5 7.0 7.0	ALLOWED	NORMAL	0.49	
1969	ISOBUTANE MIXTURE	2.1		SEE DEFINITION OF MAWP IN THIS STANDARD	ALLOWED	NORMAL	SEE 8.5	
1973	CHLORODIFLUOROMETHANE AND CHLOROPENTFLUOROETHANE MIXTURE WITH FIXED BOLING POINT, WITH APPROXIMATELY 49 % CHLORODIFLUORMETHANE (R502)	2.2		28.3 25.3 22.8 20.3	ALLOWED	NORMAL	1.05	
1974	CHLORODIFUOROBROMOMETHANE (R12B1)	2.2		7.3 7.0 7.0 7.0	ALLOWED	NORMAL	1.61	
1976	OCTAFLUOROCYCLO-BUTANE (RC318))	2.2		8.8 7.8 7.0 7.0	ALLOWED	NORMAL	1.34	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1978	PROPANE	2.1		22.5 20.4 18.0 16.5	ALLOWED	NORML	0.42	
1978	PROPANE MIXTURE	2.1		SEE DEFINITION OF MAWP IN THIS STANDARD	ALLOWED	NORML	SEE 8.5	
1983	1-CHLORO-2,2,2-TRIFLUORO-ETHANE (R133a	2.2		7.0 7.0 7.0 7.0	ALLOWED	NORML	1.18	
2424	OCTAFLUOROPROPANE (R218)	2.2		23.1 20.8 18.6 16.6	ALLOWED	NORML	1.07	
2517	1-CHLORO-1,1-DIFLORUO-ETHANE(R142b)	2.1		8.9 7.8 7.0 7.0	ALLOWED	NORML	0.99	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
2602	DICHLORODIFLUOROMETHANE AND DIFLUOROETHANE AZETROPIC MIXTURE WITH APPROXIMATELY 74% DICHLORODIFLUOROMETHANE (R500)	2.2		20.0 18.0 16.0 14.5	ALLOWED	NORMAL	1.01	
3159	1,1,1,2-TETRAFLUORO-ETHANE (R134a)	2.2		17.7 15.7 13.8 12.1	ALLOWED	NORMAL	1.04	
3220	PENTAFLUORO ETHANE(R125)	2.2		34.4 30.8 27.5 24.5	ALLOWED	NORMAL	0.95	
3252	DIFLUOROETHANE (R32)	2.1		43.0 39.0 34.4 30.5	ALLOWED	NORMAL	0.78	

U.N. NUMBER	SUBSTANCE	DIVISION	SUBSIDIARY RISK	MAX. ALLOWABLE WORKING PRESSURE (BAR) SMALL; BARE; SUN-SHIELD; INSULATED	OPENINGS BELOW LIQUID LEVEL	PRESSURE RELIEF	FILLING Kg/l	SPECIAL REQUIREMENTS
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
3296	HEPTAFLUOROPROPANE (R 227)	2.2		16.0 14.0 12.5 11.0	ALLOWED	NORMAL	1.20	
3297	ETHYLENE OXIDE AND CHLOROETETRAFLUORO-ETHANE MIXTURE, WITH NOT MORE THAN 8.8 % ETHYLENE OXIDE	2.2		8.1 7.0 7.0 7.0	ALLOWED	NORMAL	1.16	
3298	ETHYLENE OXIDE AND PENTAFLUOROETHANE MIXTURE, WITH NOT MORE THAN 7.9 % ETHYLENE OXIDE	2.2		25.9 23.4 20.9 18.6	ALLOWED	NORMAL	1.02	
3299	ETHYLENE OXIDE AND TETRAFLUOROETHANE MIXTURE, WITH NOT MORE THAN 5.6 % ETHYLENE OXIDE	2.2		16.7 14.7 12.9 11.2	ALLOWED	NORMAL	1.03	
3318	AMONIA IN WATHER SOLUTION OF DENSITY LESS TO 0.880 AT 15°C, WITH A MAXIMUM OF 50% OF AMMONIA.	2.3	8	SEE DEFINITION OF MAWP IN THIS STANDARD	ALLOWED	NORMAL	0.5	

*** N.O.S. NOT OTHERWISE SPECIFIED**