

**MERCOSUR
STANDARD**

NM-300-4:2002

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**Safety of toys
Part 4: Experimental Chemistry Sets and
related activities**



*MERCOSUR
STANDARDIZATION
ASSOCIATION*



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The present document was translated into English and revised by independent translators.



Foreword

The AMN – MERCOSUR Standardization Association – aims to promote and undertake the actions towards the development and harmonization of standards under the Southern Common Market – MERCOSUR, and is comprised by the National Standardization Agencies of the member countries.

The AMN performs its standards activity by means of the CSM – MERCOSUR Sectorial Committees – which were set up for clearly defined action fields.

The Draft MERCOSUR Standards, prepared under the CSM, are submitted to national vote through the Standards National Agencies of member countries.

The acceptance as MERCOSUR Standard through MERCOSUR Standardization Association requires consensus approval by its members.



Introduction

This MERCOSUR Standard is the part 4 of the Standard on Safety of toys. It addresses the maximum concentration limits for substances and preparations in chemical toys.

During the preparation of this Standard, toys in general were considered, and it was decided to address the defined products in the application field.

This Standard has the following parties:

- Part 1: General, mechanical and physical properties;
- Part 2: Flammability;
- Part 3: Migration of certain elements;
- Part 4: Experimental chemistry sets and related activities;
- Part 5: Chemical toys (sets) other than experimental sets;
- Part 6: Security of electric toys.

Part 4 shall be read in conjunction with Part 1, in particular, with the introduction and the sections 1 and 2 of Part 1.

Its purpose is to reduce the health risks to a child using the experimental set in a predictable manner, and taking into account the normal behavior of children.

When such experimental sets are used, the possible hazards shall be minimized by including the appropriate information in order to allow a recognized and controllable performance of the experiment.



Safety of toys

Part 4: Experimental Chemistry Sets and related activities

Scope

1.1 This part of MERCOSUR standard states the requirements for the maximum amount of certain substances and preparations used in Experimental Chemistry Sets and related activities.

1.2 This standard applies to chemical sets and complementary toys. It equally applies to experimental sets in the fields of mineralogy, biology, physics, microscopy and environmental sciences, whenever such sets contain one or more substances or chemical preparations.

1.3 This standard also establishes the requirements on the markings, list of contents, instructions for use, and for the materials used to perform the experiments.

1.4 This part of the Standard includes requirements regarding the maximum quantities of substances and preparations classified as hazardous, which excessive quantities can harm the health of children manipulating them.

Normative references

The following normative documents contain provisions which, through reference in this text, constitute requirements of this part of the MERCOSUR Standard. The referenced editions were valid at the time of this publication. As every Standard is subject to revisions, parties negotiating agreements based on this Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. The MERCOSUR member countries' normative Agencies maintain updated information on the latest standard editions at all times.

NM 300-1:2002 - Security of toys. Part 1: General properties, mechanical and physical

ISO 8317:1989¹ - Child-resistant packaging - Requirements and testing procedures for reclosable packages

Definitions

For the purposes of this part of MERCOSUR Standard, the following definitions apply:

chemistry set

a toy consisting of one or more chemical substances and/or preparations with or without equipment intended for carrying out chemical experiments

NOTE - The definition also covers toys for experiments within the fields of mineralogy, biology, physics, microscopy and environmental sciences whenever they contain one or more chemical substances and/or preparations.

supplementary chemistry set

a chemistry set which is intended to be used with a complete chemistry set

¹ This Standard will be used while a corresponding MERCOSUR standard is not available



Chemical substances

1.5 Only substances and preparations listed on Table 1 can be supplied in chemical sets, in the specified quantities.

NOTE - The quality of chemicals used shall be appropriate to the experiments described in instructions for use. In particular, chemicals shall not contain impurities or mixtures that may result in unforeseeable and dangerous reactions.

1.6 Other substances shall not be supplied with the toy. However, the instructions for use may prescribe the use of other substances, e.g. sugar, that are not considered dangerous substances or preparations

1.7 Additionally, denatured methylated alcohol and the reagents referred to on Table 2 may be prescribed for use, but shall not be provided with the toy.

1.8 Chemical substances and preparations classified as dangerous and according to definitions above, must bear such indication on their containers.

Table 1 — Maximum amounts of chemical substances and preparations and labelling

Chemical substances/ preparation ^a	Max. amount per set	Danger symbol(s) (see Figure 1 and Figure 2)	CAS number ^b	EINECS number ^b
Aluminium potassium sulfate ^c	10 g	—	10043-67-1	233-141-3
Ammonium carbonate ^g	5 g	Xn	10361-29-2	233-786-0
Ammonium chloride	30 g	Xn	12125-02-9	235-186-4
Ammonium iron (III) sulfate ^g	5 g	Xi	10138-04-2	233-382-4
Ammonium sodium hydrogen phosphate	5 g	—	13011-54-6	235-860-8
Calcium carbonate ^g	100 g	Xi	471-34-1	207-439-9
Calcium chloride	10 g	Xi	10043-52-4	233-140-8
Calcium hydroxide ^{d, g}	20 g	Xi	1305-62-0	215-137-3
Calcium nitrate ^g	5 g	Xi, O	10124-37-5	233-332-1
Calcium oxide ^{d, g}	10 g	C	1305-78-8	215-138-9
Calcium sulfate	100 g	—	7778-18-9	231-900-3
Charcoal ^c	100 g	—	7440-44-0	231-153-3
Citric acid ^g	20 g	Xi	77-92-9	201-069-1
Clove oil ^{c, g, i}	10 ml	Xn	84961-50-2	284-638-7
Copper sheet	100 g	—	7440-50-8	231-159-6
Copper (II) oxide ^g	10 g	Xn	1317-38-0	215-269-1
Copper (II) sulfate	15 g	Xn, N	7758-98-7	231-847-6



Table 1 — Maximum amounts of chemical substances and preparations and labelling (continued)

Chemical substances/ preparation ^a	Max. amount per set	Danger symbol(s) (see Figure 1 and Figure 2)	CAS number ^b	EINECS number ^b
Sodium hydrogen sulphate	30 g	Xi	7681-38-1	231-665-7
Sodium silicate solution (SiO ₂ :Na ₂ O > 2) [§]	100 ml	C	—	—
Sodium sulfate	100 g	—	7757-82-6	231-820-9
Sodium thiosulfate	50 g	—	7772-98-7	231-867-5
Sulfur [§]	15 g	F	7704-34-9	231-722-6
Tannin ^c	15 g	—	1401-55-4	215-753-2
Tartaric acid [§]	20 g	Xi	87-69-4	201-766-0
Tin (II) chloride [§]	15 g	C	7772-99-8	231-868-0
Tincture of iodine ^c (2,5 % m/V ethanolic solution) ^h	10 ml	Xn ^f , N ^f , F	—	—
Urea ^c	10 g	—	57-13-6	200-315-5
Zinc powder/zinc pellets	20 g	F, N	7440-66-6	231-175-3
Zinc sulfate (heptahydrate)	20 g	Xn, N	7446-20-0	231-793-3

^a The substances and preparations in Table 1 are listed in alphabetical order and may therefore be placed in different positions in the national translations.

^b Chemical Abstract Service (CAS) registry number and European Inventory of Existing Chemical Substances (EINECS) number are provided for information purposes only.

^c The chemical nomenclature is mainly based on IUPAC with the exceptions of the substances marked.

^d Only one of these substances shall be provided per set.

^e Only to be provided in sets intended for children over the age of 12 years.

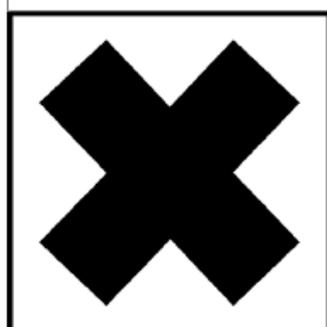
^f Xn and N apply to iodine, not to its ethanolic solution.

[§] The classifications of the substances correspond to the most stringent self-classifications according to manufacturer's literature.

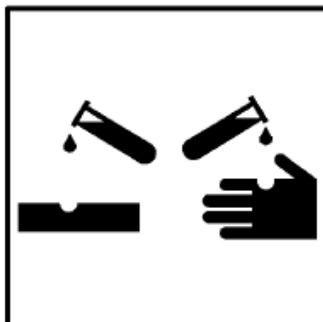
^h Denaturated alcohol (ethanol).

ⁱ The following R- and S-phrases shall be given:

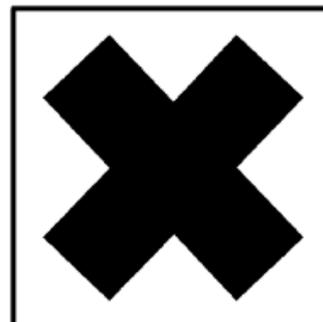
Clove oil Risk phrase: R43 may cause sensitization by skin contact
Safety advice phrase: S24 Avoid contact with skin.



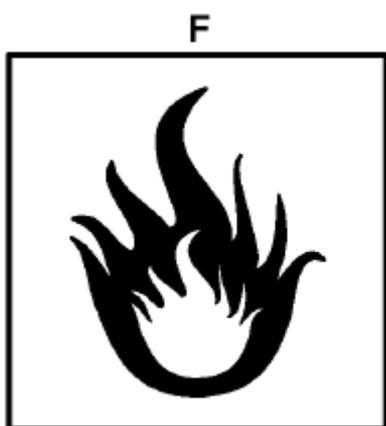
Harmful



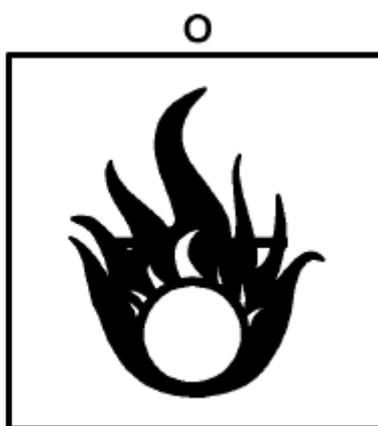
Corrosive



Irritant



Highly flammable



Oxidizing

Figure 1 – Danger symbols

1.9 Symbols: The dimensions of the symbols must be at least the tenth part (0.10) of the surface area of the label and must be printed in black on a yellow or orange color background

Equipment

1.10 General requirements

Chemistry sets shall be supplied with instructions for use, the containers necessary for carrying out the experiments described in the instructions for use, eye protection and if required, a test tube stand.

Supplementary sets shall be supplied with a contents list as specified in Item 7 and marked in accordance with 6.3.3.

All experiments described shall be evaluated by the manufacturer. In particular, substances shall not be produced in amounts that are injurious to health.

NOTE - Any known hazards arising from the use of the toy, especially during the experiments, should be described in detail (e.g. handling of chemicals, handling of glassware, delayed boiling point, back-flow of barrier water into overheated glassware, propagation of gases and handling of burners and other heating sources).



1.11 Containers and glasswares

1.11.1 Test tubes

1.11.1.1 Sets in which test tubes are heated

In sets where the instructions for use include chemical experiments in which test tubes are to be heated, these must be manufactured from borosilicate glass in order to withstand the heat. There are various methods to identify borosilicate glass, for example its density and its refraction index. The reference densities of glasses are:

- a) flat glass 2.40 ± 0.05 ;
- b) sodium glass 2.48 ± 0.05 ;
- c) borosilicate glass 2.25 ± 0.05 ;
- d) silicon glass 2.21 ± 0.05 .

The glass test tubes designed to be heated must be longer than 110 mm and have a minimum internal diameter of 15 mm.

The glass test tubes not intended to be heated, for example, those that are not intended for chemical experiments, shall not be longer than 90 mm and have a maximum internal diameter of 12mm.

1.11.1.2 Sets in which test tubes are not intended to be heated

In sets, where the instructions for use do not include chemical experiments in which test tubes are heated and the glass tubes are not made of borosilicate glass, all test tubes shall be labeled in accordance with section 6.2.

1.11.2 Other glasswares

In the sets which instructions for use include experiments in which glass materials must be heated, all such material shall be made from borosilicate glass, in order to resist the heating process.

The requirement does not apply to glass rods intended to be heated in order to be bent, curved or folded.

Other glass materials that are not intended to be heated, and whose appearance and shape might suggest otherwise, shall be clearly labeled according to 6.2.

1.11.3 Reagent containers

The containers for storage of reagents must differ in size and shape from other glass materials in the set, in order to avoid using them in the experiments.

All containers must be resistant to impacts and shall have been subjected to the resistance to falls test in NM 300-1.

1.11.4 Safety closures

Safety closures shall be designed so as to avoid child access to the contents. Once removed, such closures shall be easy to be put back.

NOTE – For opening it is advisable that two different movements are required, or a single movement coupled with the use of a specific opening tool. A reference in this sense can be found at ISO 8317.



1.11.5 Empty containers

Empty containers intended for the storage of reagents must have a maximum volume of 100 mL and must meet the established in table 2.

Table 2 - Empty containers for reagents

Reagent	Maximum volume of the empty container
Ammonia solution, 2 mol/l	50 ml
Hydrochloric acid, 2 mol/l	100 ml
Hydrogen peroxide, 1 mol/l	100 ml
Sodium hydroxide solution, 1 mol/l	100 ml

Note – The containers shall have safety closures, so that children under 10 years of age are not able to open them. For reference see ISO 8317.

1.12 Equipment for the transfer of liquids

The transfer of liquids shall not be made with mouth pipettes. If it is necessary to transfer liquids, a mechanical means that does not allow accidental ingestion shall be provided (for example a pipette equipped with a piston or a rubber aspirator)

1.13 Test tube stand and test tube holder

The test tube stand cannot topple over when a single test tube filled with 5 ml of water is placed in the outermost position and the opposite end of the stand is raised 15°.media in test tubes, shall not tip over when a test tube, placed in a hole farthest from, is filled with 5 mL of water and tilted at an angle of 15 degrees.

The sets must contain a functional holder for the test tubes for use when it is necessary to heat the test tube during the experiments.

1.14 Eye protection

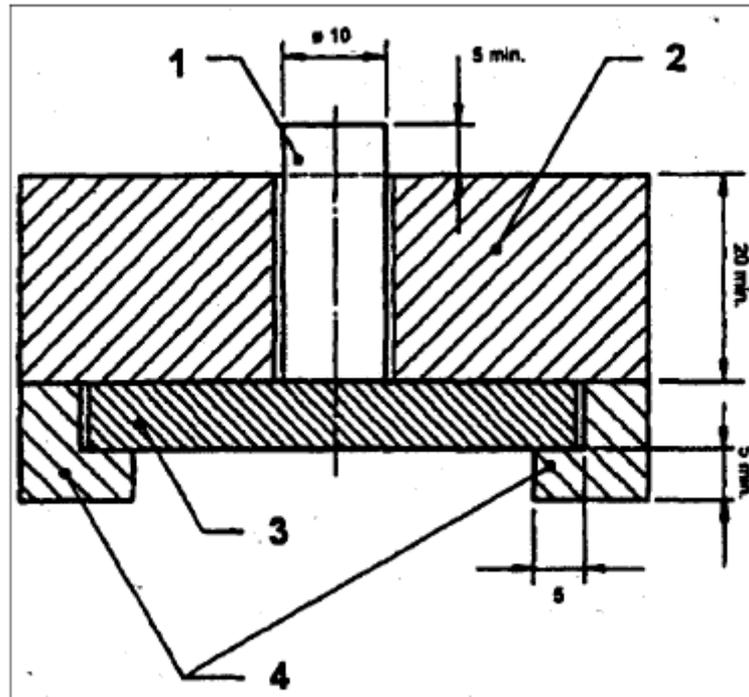
The eye protection shall be designed to provide maximum eye protection.

NOTE – The requirements established in NM 300-1 on imitation helmets and masks are not applicable to protective equipment in experimental sets.

The transparent material in protective eye wear may not shatter when subjected to the following test:

The transparent portion of the eye protector is removed and placed into the equipment shown in Figure 2, in such a manner that its entire perimeter is supported. The support must be made from a rigid material in such a shape to correctly accommodate the test sample shape and size.

The test is performed at a temperature of $(20 \pm 5) ^\circ \text{C}$. A mass of 1kg must be let fall in the copper cylinder from a distance of 100 mm from the top of the cylinder Let fall, in free fall, a mass of 1 kg to a distance of 100 mm, on the part top of the cylinder.



- 1 Copper cylinder
- 2 guide
- 3 sample
- 4 support

Figure 2 - Device to test protective eye wear

If the set does not contain protective eye wear for the supervising adult, outer packaging of the set must be marked according to 6.3.2.

Markings

1.15 General requirements

The markings must be visible, easily legible and indelible, permanent and written in the national language of the country of sale.

The minimum letter height for the word "WARNING" must be 7 mm.

The minimum letter height for the phrases of "WARNING", must be 3 mm and shall be easily legible

1.16 Markings of individual containers and glass containers

Individual containers shall bear the following indications:

- a) the name of the chemical substances or preparation, as indicated on Tables 1 and 2;
- b) The required Danger symbol, indicated on Tables 1 and 2.

NOTE - In addition, the common denomination of substances or preparations contained can be indicated.

Glass containers not intended to be heated shall be marked with the following phrase:

"Do not heat"



1.17 Markings on outer packaging

1.17.1 The outer packaging must contain the name and / or trademark and / or brand name, the address and telephone number of the manufacturer or its authorized representative, or importer.

The name and address can be abbreviated, provided that such abbreviation allows the identification of the manufacturer, its authorized representative, or the importer.

1.17.2 The packaging must also contain the following warnings:

ATTENTION! ONLY FOR CHILDREN ABOVE 10 YEARS OF AGE.

USE UNDER THE STRICT SUPERVISION OF AN ADULT WHO HAS STUDIED THE PRECAUTIONS INDICATED IN THE EXPERIMENT SET

ATTENTION! CONTAINS SOME DANGEROUS CHEMICALS

READ THE INSTRUCTIONS BEFORE USE, FOLLOW AND KEEP THEM AS REFERENCE.

DO NOT ALLOW ANY CHEMICAL SUBSTANCE TO COME IN CONTACT WITH ANY PART THE BODY, AND PARTICULARLY WITH THE MOUTH AND THE EYES.

KEEP SMALL CHILDREN AND ANIMALS AWAY FROM EXPERIMENTS

KEEP THE EXPERIMENTAL SET OUT OF REACH OF SMALL CHILDREN

When necessary (see 5.5):

"This set does not include protective eye wear for adults"

NOTE - If necessary, the manufacturer can specify an age greater than 10 years in the first warning notice above.

The sets containing potassium permanganate not are recommended for children under 12 years.

1.17.3 Complementary sets shall be marked with the following warnings on the external side of packaging:

"ATTENTION! THIS COMPLEMENTARY SET DOES NOT CONTAIN ALL EQUIPMENT AND REQUIRED SUBSTANCES TO PERFORM EXPERIMENTS.

THE COMPLETE SET IS REQUIRED TO PERFORM THE EXPERIMENTS"

Contents of the list of warnings and first-aid information

The list of warnings shall have the following information:

- a) list of chemicals provided;
- b) the special risk phrases and precautions established in this Standard, as appropriate for each substance;
- c) Manufacturer shall reserve a blank space intended to indicate the telephone number of the nearest poison center (central office or first-aid center) for the case of accidental ingestion of dangerous substances;
- d) general information of first- aid as follows:

In case of eye contact: Wash the eyes with plenty of water and keep eyes open, if necessary. Seek a doctor immediately;



In case of ingestion: Wash the mouth with water and drink iced water. Do not cause vomiting. Seek a doctor immediately;

In case of inhalation: Bring the person to an open, well ventilated place;

In case of skin contact and burn: Wash the affected area with water in abundance for 5 minutes;

When in doubt, seek a doctor immediately. Bring the substance with its packaging;

In case of injury, always seek doctor.

NOTE - Information of first aid must also be in the instructions for conducting the experiment.

e) Specific first-aid information, when appropriate

Instructions for use

1.18 General instructions

1.18.1 The instructions for use shall be provided in the national language of the country of sale.

1.18.2 The markings specified in 6.3 must be printed on the opening page of the instructions for use.

1.18.3 The first page (s) of the instructions for use shall contain a list of contents. This list shall refer to the information required in 8.2 and 8.3.

1.18.4 Detailed information on how to perform each experiment shall be provided.

1.18.5 When appropriate, danger symbols and special risk phrases, as well as precautions specified in this Standard shall be printed on the experiment descriptions. The same applies to first-aid information in the case of predictable accidents.

1.18.6 Information on disposal of used chemicals including substances and preparations not supplied with the toy, but needed for the described experiments, shall be provided. Emphasis shall be given to the need of disposing of food products used in the experiments.

1.18.7 The instructions shall take into account the national legislation regarding the disposal of chemical products...

1.18.8 The first pages of the instructions for use shall provide the following indications:

- a) Recommendations for supervising adults (see 8.2);
- b) the information required in section 7;
- c) the safety rules (see 8.3).

1.19 Advice for supervising adults

Recommendations for supervising adults shall comprise the following information:

- a) read and follow the instructions for use, the safety rules and first-aid information, and keep them for reference;
- b) the misuse of chemicals may cause damage to health. Only perform the experiments described in the instructions for use;
- c) the chemical set is recommended for children more than 10 years old (or more than 12 years, when appropriate);



d) taking into account the large variations in children's understanding abilities even within the same age group, supervising adults shall carefully evaluate which experiments are adequate and that offer smallest risk level. The instructions must allow supervising adults to evaluate each one of the experiments so that he/she can determine if they are adequate for a particular child.

e) the supervising adult shall examine the warnings and precautions and safety rules with the children before commencing the experiments. Particular attention shall be given to the handling of acids, alkalis and flammable liquids;

f) the area and surrounding areas used for the experiments must be kept free of obstructions and away from storage of foods. It must be well lit, well ventilated and close to a source of water. A table top with strong resistance the heat shall be preferred.

g) instructions relating to the use of a heat source.

1.20 Safety rules

The following safety rules shall be provided:

READ the instructions before use, follow them and keep them for reference;

KEEP SMALL CHILDREN AND ANIMALS AWAY from the area of the experiment, as well as any person not wearing protective eye wear;

ALWAYS USE eye protection;

KEEP the chemistry set out of reach of small children;

CLEAN all equipment after use;

MAKE SURE that all containers are closed completely and correctly stored after use;

WASH hands after finishing the experiments;

DO NOT USE equipment not supplied with the set;

DO NOT EAT, DRINK OR SMOKE in the area where the experiment is being performed;

AVOID all contact of chemicals with eyes and mouth;

DO NOT SAVE food products used in experiments. Throw them out immediately.



Attachment A (informative)

References

In the study that supports this Standard, the following documents were consulted:

AENOR - ASOCIACIÓN ESPAÑOLA DE NORMALIZACIÓN Y CERTIFICACIÓN
UNE-EN 71-4:1990 – Safety of Toys. Chemical experiment sets and related activities.

BSI - BRITISH STANDARDS INSTITUTION
BS-EN 71-4:1998 - Safety of toys. Part 4: Experimental chemistry sets and related activities.

COPANT - COMISIÓN PANAMERICANA DE NORMAS TÉCNICAS
COPANT 1657 Parte 4:1999 – Safety of toys.. Part 4: Chemical experiment sets and related activities.



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ICS 97.190; 97.200.50

Descriptors: toys, safety, accident prevention, toxicity, specifications, safety requirements, toxic substances, migration

Number of Pages: 14



Synthesis of the study phase

MERCOSUR Standard project 04:00-01-4

Safety of toys. Part 4: Chemistry Experimental Sets and related activities

1 INTRODUCTION

This part of this MERCOSUR Standard establishes the requirements related to the quantities of substances and preparations used in chemistry experimental sets and related activities. They also apply to chemical toys and complementary sets. This Standard also apply to mineralogy, biology, physics, microscopy and environmental experimental sets, whenever such sets contain one or more substances and/r chemical preparations.

This MERCOSUR Standard was developed by CSM 04 - Sectoral Mercosur Committee for Toys.

The base text for the MERCOSUR Standard 04:00-01-4 draft was prepared by (IRAM) in Argentina

2 SPECIALIZED COMMITTEE

This Standard was prepared by CSM 04 – Toys, and the Technical Secretary of CSM 04 was performed by IRAM.

The active members that participated in the preparation of this document were:

ABNT – Associação Brasileira de Normas Técnicas

INTN – Instituto Nacional de Tecnología y Normalización

IRAM – Instituto Argentino de Normalización

UNIT – Instituto Uruguayo de Normas Técnicas

3 PREVIOUS HISTORY

AENOR- ASOCIACIÓN ESPAÑOLA DE NORMALIZACIÓN Y CERTIFICACIÓN

UNE-EN 71-4:1990 Safety of Toys. Chemistry experimental sets and related activities.

BSI- BRITISH STANDARDS INSTITUTION

BS-EN 71-4:1998. Safety of toys. Part 4. Chemistry experimental sets and related activities

COPANT- Comisión PANAMERICANA DE NORMAS TÉCNICAS

COPANT 1657 Parte 4:1999 – Safety of toys. Chemistry experimental sets and related activities

4 CONSIDERATIONS



The base text for the MERCOSUR Standard 04:00-01-4 was prepared by Argentina, based on the EN 71-4:1998, in the UNE and BS versions.

It was submitted to the standardization agencies of the MERCOSUR member countries on September 17, 2001, for analysis by the Study Committees.

The draft was discussed in the technical meeting carried out in Buenos Ayres from October 29th to October 31st, 2001, in which form changes were made, and approved as a MERCOSUR Standard Draft.

It was submitted to vote in the CSM 04 in the period of 01/01/2002 to 03/31/2002.

During the voting period, approving vote was received from IRAM (Argentina) with observations regarding form, which were accepted and incorporated to the draft. Approving vote without observations was received from ABNT (Brazil), and UNIT (Uruguay) and INTN (Paraguay) refrained from voting.

Thus, the Draft was approved as Proposed MERCOSUR Standard.

The Draft was sent to AMN, according to the established in the MERCOSUR Standard Elaboration Procedures, for edition and approval as MERCOSUR Standard NM 300-4, in November, 2002.

The AMN – MERCOSUR Standardization Association – aims to promote and undertake actions towards development and harmonization of standards within the Southern Common Market – MERCOSUR, and is comprised by the National Standardization Agencies of the member countries.

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