

EU directive on the placing on the market of pyrotechnic articles. Elements to deal with the essential safety requirements for fireworks

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EU DIRECTIVE ON THE PLACING ON THE MARKET OF PYROTECHNIC ARTICLES

Elements to deal with the Essential Safety Requirements for Fireworks

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1 ABSTRACT

The Directive 2007/23/EC of the European Parliament and of the Council on the placing on the market of pyrotechnic articles has been adopted by the European Union (EU) on the 23rd of May, 2007. This Directive should help manufacturers and importers that had to comply with a different regulation in each country to get technical approvals of their pyrotechnic articles. Although this directive will reduce the administrative burden for everybody by introducing the CE marking and certification procedure, its substitution and application instead of the current national regulations may create difficulties in the beginning.

In this paper we present information related to the different parts of the Directive dealing specifically with fireworks ; taking into account the present French regulation and European standards on fireworks, we remind and comment topics like categorisation, labelling, testing methods for fireworks characterisation and requirements for safety levels ; these elements are reviewed and commented in the scope to help people concerned to comply with the Essential Safety Requirements (ESR) of the new Directive.

2 SCOPE OF THE DIRECTIVE

- free movement of pyrotechnic articles (including fireworks), while ensuring public security, safety of consumers and environmental protection.
- replacing some 27 parallel national approval procedures by one single EU directive
- reduction in costs for the industries concerned, and ensures that essential safety requirements for pyrotechnic articles are respected throughout the EU.

3 DEFINITIONS

- **Fireworks** : pyrotechnic article intended for entertainment purposes
- **Pyrotechnic article** : article containing explosive substances or an explosive mixture of substances designed to produce heat, light, sound, gas or smoke or a combination of such effects through self-sustained exothermic chemical reactions.
- **Person with specialist knowledge** : person authorised by a Member State to handle and/or use category 4 fireworks

4 TIME SCHEDULE

Entry into force :

This Directive has entered into force on the 20th day following its publication in the Official Journal of the European Union, i.e. 4 July 2007.

Transposition :

Member States shall adopt and publish, by 4 January 2010, the laws, regulations and administrative provisions necessary to comply with this Directive.

They shall forthwith communicate to the Commission the text of those provisions.

They shall apply those provisions by 4 July 2010 for fireworks of categories 1, 2 and 3 by 4 July 2013 for other pyrotechnic articles, for fireworks of category 4 and for theatrical pyrotechnic articles.

5 CONFORMITY ASSESSMENT PROCEDURES

Possible procedures allowed by the Directive are :

- a) "module B" (EC type-examination procedure) and
"module C" (conformity to type procedure)
or "module D" (production quality assurance procedure)
or "module E" (product quality assurance procedure)
- or b) "module G" (Unit verification procedure)
- or c) "module H" (Full product quality assurance procedure)

6 CATEGORISATION OF FIREWORKS

Directive : Fireworks shall be categorised as follows :

Category 1	Category 2	Category 3	Category 4
Fireworks which present a very low hazard and negligible noise level and which are intended for use in confined areas, including fireworks which are intended for use inside domestic buildings	Fireworks which present a low hazard and low noise level and which are intended for outdoor use in confined areas	Fireworks which present a medium hazard, which are intended for outdoor use in large open areas and whose noise level is not harmful to human health	Fireworks which present a high hazard, and whose noise level is not harmful to human health. (commonly known as fireworks for professional use)
For use only by people over 12 years old	For use only by people over 16 years old	For use only by people over 18 years old	For use only by people over 18 years old and with specialist knowledge
(i) the safety distance must be at least 1 m. (ii) the maximum noise level must not exceed 120 dB (A, imp), at the safety distance, (iii) category 1 must not comprise bangers, banger batteries, flash bangers and flash banger batteries, (iv) throwdowns must not contain more than 2,5 mg silver fulminate.	(i) the safety distance must be at least 8 m. (ii) the maximum noise level must not exceed 120 dB (A, imp), at the safety distance.	(i) the safety distance must be at least 15 m. (ii) the maximum noise level must not exceed 120 dB (A, imp), at the safety distance.	No explicit requirement on safety distance and noise.

For information : Initial proposal for categorisation from the European Standardisation Technical Committee 212 "Fireworks" (see ref.(4)) :

Category 1	Category 2	Category 3	Category 4
Fireworks which present a very low hazard and which are intended for use in confined areas, including fireworks which are intended for use inside domestic buildings	Fireworks which present a low hazard and which are intended for outdoor use in confined areas	Fireworks which present a medium hazard and which are intended for outdoor use in large, open areas	Fireworks which present a high hazard and which are intended for use by persons with specialist knowledge

Categorisation issued from the current French regulation (Art. 12 Decree nr 90-897 dated October the 1st, 1990) :

	Category 1	Category 2	Category 3	Category 4
	Fireworks which present a very low hazard	Fireworks which can be used as they are sold, without hazard for the user if he takes into account simple precautions described in a recommendation sheet.	Fireworks which can be used as they are sold, without hazard for the user if he takes into account procedures given in the document "instructions for use".	Fireworks which can be assembled and used only by holders of the qualification K4 licence, or under the control of such a person. Category 4 "ARP" (*) see notes (a) to (e)
	No general restriction on minimum age	For use only by people over 18 years old	For use only by people over 18 years old	For use only by people over 18 years old and titular of a qualification K4 licence
Spherical shell :	forbidden	Cal ≤ 65 mm NEQ ≤ 100 g	Cal ≤ 105 mm NEQ ≤ 500 g	Cal ≤ 200 mm (a)
Cylindrical shell :	forbidden	Cal ≤ 65 mm NEQ ≤ 100 g	Cal ≤ 105 mm NEQ ≤ 500 g	Cal ≤ 125 mm (b)
Shell / flash composition :	forbidden	forbidden	NEQ < 45g	Cal ≤ 65 mm or NEQ < 100g
Bangers :	NEQ < 3 g or NL1 < 161 dB	NEQ < 10 g or NL1 < 163 dB	Not applicable	Not applicable (c)
Bangers battery :	50 max bangers NL1 < 157dB	500 bangers max NL2 < 154dB	NEQ ≤ 500 g NL3 < 151 dB	Not applicable
Battery and combination :	NEQ < 10 g	NEQ ≤ 100 g	NEQ ≤ 500 g	NEQ ≤ 6 kg and Cal ≤ 40 mm
Roman candles :	NEQ < 10 g	NEQ ≤ 100 g	NEQ ≤ 500 g	Cal ≤ 75 mm (d)
Other fireworks :	NEQ < 10 g	NEQ ≤ 100 g	NEQ ≤ 500 g	Not applicable (e)

(*) In France : fireworks "Category 4 ARP" are fireworks category 4 with enhanced hazard ; these fireworks can be assembled and used only by the holder of the qualification K4 licence himself)

(a) Cal ≤ 300 mm or NEQ ≤ 10 kg for "K4 ARP"

(b) Cal ≤ 210 mm or Cal ≤ 100 mm and ahead ignition or NEQ < 7 kg for "K4 ARP"

(c) Cal ≤ 100 mm or NEQ < 150 g for "K4 ARP"

(d) NEQ ≤ 6 kg and Cal from 40 to 100 mm or angular battery with $\alpha > 30^\circ$ for "K4 ARP"

(e) Nautical shell, aerial wheel, ground shell with flash composition >45 g and < 70 g for "K4 ARP".

NL : Noise Level in dB (lin, peak)

NL1 : at 2,38 m

NL2 : at 8 m

NL3 : at 15 m

NEQ : Net Equivalent Quantity (of active explosive material)

For more information, see ref. (6).

7 LABELLING / INFORMATION FOR THE USER

Directive 2007/23/EC of the European Parliament and of the Council of 23 May 2007 on the placing on the market of pyrotechnic articles	1. Manufacturers shall ensure that fireworks are properly labelled visibly, legibly and indelibly in the official language(s) of the Member State in which the article is sold to the consumer. If the firework does not provide sufficient space for the labelling requirements, the information shall be provided on the smallest piece of packaging.			
	2. The labelling of fireworks shall include as a minimum a) the name and address of the manufacturer or, where the manufacturer is not established in the Community, the name of the manufacturer and the name and address of the importer b) the name and type of the firework, c) the minimum age limits, d) the relevant category e) instructions for use, f) the net equivalent quantity (NEQ) of active explosive material and g), depending of the category, :			
	Category 1	Category 2	Category 3	Category 4
	where appropriate: "for outdoor use only" and minimum safety distance.	"for outdoor use only" and, where appropriate, minimum safety distance(s).	the year of production, "for outdoor use only" and minimum safety distance(s).	the year of production "for use only by persons with specialist knowledge" and minimum safety distance(s).
French regulation (Art. 12 Decree nr 90-897 dated October the 1st, 1990)	The labelling of fireworks shall include :a) generic designation of the fireworks, b) commercial designation, c) category, d) "shall be used conforming to the regulation related to public safety and environment protection", e) French approval number, f) name and address of the responsible of the first putting on the market and g), depending of the category, :			
	Category 1	Category 2	Category 3	Category 4 (*)
	Precautions for safe use of the firework	"sale forbidden to people under 18 years old - Use shall conform to the recommendations sheet"	"sale forbidden to people under 18 years old - Use shall conform to instructions for use (**)"	"sale forbidden to people under 18 years old - Sale and use shall conform to provisions of articles nr 12 to 16 of the decree nr 90-897 dated October the 1st, 1990, related to fireworks regulation" "fireworks to be used only by holders of qualification K4 licence, or under the control of such a person." "firing exclusively with electrical igniter"

(*) for fireworks category "K4 ARP" one additional red label shall be stuck on the firework with the mentions : "Fireworks with enhanced hazards", "This fireworks shall be processed (installation, implementation, and firing...) only by a holder of the K4 qualification licence himself" and "safety distance shall be strictly applied"

(**) (much more detailed document than recommendations sheet)

8 ESSENTIAL SAFETY REQUIREMENTS

In the first following paragraph, we present a review of existing known methods used or intended to be used for checking the safety of fireworks ; in the second paragraph, we make a proposal of how these methods can help to check the essential safety requirements of fireworks to be certified.

7.1 EXISTING TESTING METHODS

8.1.1 Testing methods from the French approval procedures and regulation

Ref (*)	Title	Description
A11	Description	The pyrotechnic article is described (dimensions, mass, chemical analysis if required)
L4	Ignition duration	Time between ignition of the fuse and the first pyrotechnic output is measured
N1	Functioning	The correct and complete functioning of the fireworks is checked as well as the conformity to the expected effect and the recommendations from the instructions for use
J7	Drop test	The integrity of the fireworks after drop (1.2 m) is checked
E2	Thermal stability	The integrity of the fireworks is checked after a { 50°C, 3 days, 60 RH } conditioning
I6	vibrations	The integrity of the fireworks is checked after vibrations { 0.5 mm, 50 Hz, 60 min. }
N2	Formation of projected debris	For category 1 fireworks, checking that there is no harmful projection.
N3	Projection scale	Measurements of the distance of projections from small fireworks
N4	Effect in altitude	For fireworks functioning in altitude, measurements of altitude and checking of the effect
N5	Noise	Measurement of the noise of the fireworks.

(*) These methods are described in details in Ref. (6)

8.1.2 Documents issued by the CEN TC 212 Technical Committee

31 European standards corresponding to 31 fireworks from categories 1 to 3 have been published by the Technical Committee CEN TC 212 (see annex 1).

For each product, these "product" standards give testing procedures.

The scope of these procedures and their typical associated requirements are reminded in the table hereafter :

Ref.	Safety item	Typical requirements
CEN 1	Attachment of protruding fuse	Shall withstand 100 g whilst 10s
CEN 1b	Attachment of initiating fuse	Shall withstand 100 g whilst 10s
CEN 1c	Attachment of sealing paper or ignition head	Shall withstand mechanical shock {490 m/s ² ; 60 ms ; 25 mm} at 1 Hz during 2 hours
CEN 2	Protection of initial fuse	Cover on fuse or primary pack shall be present, or resistance to side ignition shall be proved (see CEN 2b)
CEN 2b	Side ignition test of initial fuse	The protruding fuse shall not ignite when a smouldering cigarette is placed on the side of the fuse

Ref.	Safety item	Typical requirements (continued)
CEN 3	Initial fuse ignition	The fuse shall ignite before 10 s ; the ignition shall be visible
CEN 4	Duration of initial fuse	Time to ignition of the first effect of the firework shall be 3 s to 13 s depending of the firework category
CEN 5	Determination of net explosive content	Maximum mass stated, depending on the category and type of the firework
CEN 6	Mass of report charge	Maximum mass is stated, depending on the composition : black powder, nitrate/metal based or perchlorate/metal based composition
CEN 7	Chemical compositions	List of excluded products, a) for safety reasons, b) for toxicity reasons, see annex 2
CEN 8	Material integrity	No hole or split in the case of the firework that may lead to pyrotechnic composition loose
CEN 9	Vertical stability	For fireworks designed to be placed on the floor, they shall not fall over when they are placed on a surface inclined at 10° to the horizontal ; they shall not neither fall over when functioning
CEN 10	Principal effect	The effect shall conform to the expected and described one
CEN 11	Functioning	The firework shall function completely
CEN 12	Material	Generally cardboard, wood, paper, plastics (non-metallic) ; ex : of mortar, of shell...
CEN 13	Means of monitoring the height of explosion / bursting of the pyrotechnic unit	Higher than 20 m ; depending on category and type of firework
CEN 14	Integrity in flight	No loose parts before the final effect (rockets, aerial wheels..)
CEN 15	Sound pressure level	Maximum level stated, depending on the firework category (ex : 120 dB (A,imp) at a horizontal distance at 15 m from testing point and at a height of 1 m above the ground)
CEN 16	Burning matter	Maximum distance from the test point is stated for no burning or incandescent matter falling to the ground ; depends on the firework category
CEN 17	Angle of ascent	+/- 15° from the vertical axis (rocket or aerial wheel for example).
CEN 18	Projected debris and mass of debris	Maximum distance from the test point and maximum mass are stated for debris falling to the ground ; depending on the firework category
CEN 19	Labelling	Type and name categories, safety information (depending on the category), instruction for use, name, address and telephone number of the manufacturer, the distributor or the importer, reference to the standard
CEN 20	Thermal conditioning	4 weeks at 50 °C
CEN 21	Mechanical conditioning	{50 g ; 60 ms ; 25 mm}, 1 Hz, 1 hour
CEN 22	Resistance to ignition by an abrasive surface	No ignition when striking on an abrasive paper sheet conforming to ISO 6344-3
CEN.23	Length of uncoated end of wooden stick	Minimum 20 mm length or 40 % total length (for Bengal matches)
CEN 24	Determination of the location of the shell	For information, only used for shell in mortars
Ref.	Safety item	Typical requirements (continued)

CEN 25	Attachment of friction head	For information, only used for Bengal matches
CEN 26	Performance test	For information, differs for the various fireworks
CEN 27	Length of handle	For information, only used for hand-held fountains
CEN 28	Length of hand-held sparkler	For information, only used for hand-held sparklers
CEN 29	Attachment of separate handle	For information, only used for hand-held fountains
CEN 30	Droop test	For information, only used for hand-held sparklers
CEN 31	Length of pull string	For information, only used for party-poppers
CEN 32	Protection of throwdowns	For information, only used for throwdowns

8.1.3 Standards issued by the CEN Technical Committee nr 321 "Explosives for civil use - detonators and relays"

Although the following documents involve complete electric detonators, they may be helpful to issue methods for electrical characterisation of igniters for fireworks, as required in the ESR of the Directive; indeed, electric igniters used for fireworks are mainly of the same type than electric fusehead used in detonators for mines and quarries, and their connection to the firing line and "blasting machine" is made quite in a similar way.

Standard Ref.	Title	Description
EN 13763-17	Determination of no-fire current	Maximum current that the electric detonator can withstand without firing
EN 13763-18	Determination of series firing current	Current necessary for reliable ignition of electric detonators connected in series
EN 13763-19	Determination of firing impulse	Electric pulse necessary for reliable ignition of electric detonator (for discharge electric capacitance based blasting machine)
EN 13763-20	Determination of total electrical resistance	Information needed for reliable ignition of electric detonator connected in series
EN 13763-22	Determination of capacitance:, insulation resistance, and insulation breakdown of leading wires	For safety against electrostatic discharge and reliable ignition

8.2 Possible testing methods and procedures to deal with the Essential Safety Requirements :

	Essential safety requirements	Existing methods that may contribute to comply with the ESRs
(1)	Each firework must attain the performance characteristics specified by the manufacturer to the notified body in order to ensure maximum safety and reliability.	N1, CEN 10, 11
(2)	Each firework must be designed and manufactured in such a way that it can be disposed of safely by a suitable process with minimum effect on the environment.	CEN 7, A11 Note (a)

	Essential safety requirements (continued)	Existing methods that may contribute to comply with the ESRs
(3)	<p>Each firework must function correctly when used for its intended purpose. Each pyrotechnic article must be tested under realistic conditions. If this is not possible in a laboratory, the tests must be carried out in the conditions in which the fireworks are to be used.</p> <p>The following information and properties - where applicable - must be considered or tested:</p> <p>(a) Design, construction and characteristic properties, including detailed chemical composition (mass and percentage of substances used) and dimensions ;</p> <p>(b) The physical and chemical stability of the fireworks in all normal, foreseeable environmental conditions ;</p> <p>(c) Sensitivity to normal, foreseeable handling and transportation ;</p> <p>(d) Compatibility of all components as regards their chemical stability ;</p> <p>(e) Resistance of the pyrotechnic article to moisture where it is intended to be used in humid or wet conditions and where its safety or reliability may be adversely affected by moisture ;</p> <p>(f) Resistance to low and high temperatures, where the pyrotechnic article is intended to be kept or used at such temperatures and its safety or reliability may be adversely affected by cooling or heating of a component or of the fireworks as a whole ;</p> <p>(g) Safety features intended to prevent untimely or inadvertent initiation or ignition ;</p> <p>(h) Suitable instructions and, where necessary, markings in respect of safe handling, storage, use (including safety distances) and disposal in the official language or languages of the recipient Member State ;</p> <p>(i) The ability of the pyrotechnic article, its wrapping or other components to withstand deterioration under normal, foreseeable storage conditions ;</p> <p>(j) Specification of all devices and accessories needed and operating instructions for safe functioning of the pyrotechnic article.</p> <p>During transportation and normal handling, unless specified by the manufacturer's instructions, the fireworks should contain the pyrotechnic composition.</p>	<p>N1, CEN 11</p> <p>A11, Note (b)</p> <p>E2, I6, J7, CEN 20, 21</p> <p>I6, J7, CEN 21,</p> <p>E2, CEN 20</p> <p>No method at present</p> <p>No method at present</p> <p>L4, CEN 2, 3, 22</p> <p>See § 7 Note (a)</p> <p>E2, I6, J7, CEN 20, 21</p> <p>(a)</p> <p>I6, J7, CEN 8</p>
(4)	<p>fireworks must not contain :</p> <p>(a) commercial blasting agents, except for black powder or flash composition ;</p> <p>(b) military explosives.</p>	<p>Note (b) CEN 7 A11</p>

	Essential safety requirements (continued)	Existing methods that may contribute to comply with the ESRs
(5)	The fireworks must at least also comply with the following requirements :	
	(1) The manufacturer must assign fireworks to different categories according to Article 3 characterised by net explosive content, safety distances, noise level, or similar. The category must be clearly indicated on the label.	See § 4
	(a) For category 1 fireworks, the following conditions must be met : (i) the safety distance must be at least 1m. However, where appropriate the safety distance may be less, (ii) the maximum noise level must not exceed 120dB(A,imp), or an equivalent noise level as measured by another appropriate method, at the safety distance, (iii) category 1 must not comprise bangers, banger batteries, flash bangers and flash banger batteries, (iv) throwdowns in category 1 must not contain more than 2,5 mg silver fulminate.	See § 4
	(b) For category 2 fireworks, the following conditions must be met : (i) the safety distance must be at least 8 m. However, where appropriate the safety distance may be less, (ii) the maximum noise level must not exceed 120dB(A,imp), or an equivalent noise level as measured by another appropriate method, at the safety distance.	See § 4
	(c) For category 3 fireworks, the following conditions must be met : (i) the safety distance must be at least 15 m. However, where appropriate the safety distance may be less, (ii) the maximum noise level must not exceed 120dB(A, imp), or an equivalent noise level as measured by another appropriate method, at the safety distance.	See § 4
	(2) Fireworks may only be constructed of materials that minimise risk to health, property and the environment from debris.	Note (b), N1, N2, N3, N4, CEN 9, 10, 11, 12, 14, 16, 17, 18
	(3) The method of ignition must be clearly visible or must be indicated by labelling or instructions.	See § 7
	(4) Fireworks must not move in an erratic and unforeseeable manner.	Note (b), N1, N2, N3, N4, CEN 9, 10, 11, 12, 14, 16, 17, 18
	(5) Fireworks of categories 1, 2 and 3 must be protected against inadvertent ignition either by a protective cover, by the packaging, or by the construction of the article. Fireworks of category 4 must be protected against inadvertent ignition by methods specified by the manufacturer.	CEN 2, 3, 22

Essential safety requirements	(continued)	Existing methods
The ignition devices (<i>fuse and electric fusehead are used for fireworks</i>) must at least also comply with the following requirements:		
(1) Ignition devices must be capable of being reliably initiated and be of sufficient initiation capability under all normal, foreseeable conditions of use.		See below (6), (7) No method at present for initiation capability
(2) Ignition devices must be protected against electrostatic discharge under normal, foreseeable conditions of storage and use.		(c)
(3) Electric igniters must be protected against electromagnetic fields under normal, foreseeable conditions of storage and use.		(c)
(4) The covering of fuses must be of adequate mechanical strength and adequately protect the explosive filling when exposed to normal, foreseeable mechanical stress.		CEN 1, 2
(5) The parameters for the burning times of fuses must be provided with the article.		CEN 4
(6) The electrical characteristics (e.g. no-fire current, resistance, etc.) of electric igniters must be provided with the article		EN 13763- 17, 18, 19, 20, 22
(7) The wires of electric igniters must be sufficiently insulated and must be of sufficient mechanical strength, including the solidity of the link to the igniter, taking account of their intended use.		See ref. (8)

(a) Instructions, including disposal, to be given to the user in a document "instructions for use" or equivalent

(b) Mandatory information to be given by the manufacturer or importer in his technical file when applying for CE certification

(c) For that purpose, electric sensitivity of electric igniters is limited in France (firing current must be over 200 mA)

9 CONCLUSION

The Commission has given a mandate to CEN to prepare harmonised standards to support the new Directive.

Although the scope of the Directive is broader than the current scope of CEN/TC 212, this Technical Committee has been designated to carry out the standardisation work.

The title of CEN/TC 212 was "Fireworks" and its current scope was "Standardisation of ready-for-use pyrotechnic articles (= consumer fireworks) for entertainment purposes, particularly from the point of view of their safe use".

Its new foreseen title will be "Pyrotechnic articles" and its new scope "Standardisation of pyrotechnic articles, in accordance with the Essential Safety Requirements from the Pyrotechnic Articles Directive, particularly from the point of view of the protection and safety of consumers"

Concerning Fireworks, the mandate given to CEN/TC 212 is

- to draw up a fireworks standard containing a list of articles which fall under category 1 without any doubt, a list of articles which do not fall under category 1, as well as a procedure/guideline/criteria which determines which article falls in category 1,
- to adapt the existing standards accordingly,
- to review the existing standards in order to accommodate possible category 4 fireworks,
- to develop new category 4 firework standards.

We hope the information collected and presented in this paper will help to clarify the context in some minds and contribute to the future European standardisation work.

10 REFERENCES

- (1) Directive 2007/23/EC of the European parliament and of the council of 23 May 2007 on the placing on the market of pyrotechnic articles,
- (2) CEN/TC 212 Fireworks (Doc. CEN/TC 212 / N677), dated 2007-07-12 : preliminary proposal for fireworks categorisation,
- (3) "Décret no 90-897 du 1er octobre 1990 portant réglementation des artifices de divertissement, textes généraux, ministère de l'industrie et de l'aménagement du territoire" - J.O n° 232 dated 6 October 6th, 1990,
- (4) Standard EN 14035 -2, Fireworks - Part 2: Categorisation,
- (5) European standards for 'consumer fireworks' vs. European directive 'Pyrotechnic articles', NEN conference prepared by Ir. J. Leenders, Secretary of CEN/TC 212, and presented on the 2005-10-18 by Dr. D. Eckhardt, member of CEN/TC 212,
- (6) Regulations and procedures for the French approval of fireworks - Commission des substances explosives - sous-commission Artifices de Divertissement - INERIS - June 2007 (available, in French, on the INERIS web site),
- (7) CEN/TC 212 Fireworks (Doc. CEN/TC 212 / N678), dated 2007-07-26 : Fireworks category 1, 2 and 3 : overview of existing test methods according to the EN 14035 standards,
- (8) EN 13763-xx standards "Explosives for civil uses - Detonators and relays"
 - EN 13763-17 : Determination of no-fire current of electric detonators.
 - EN 13763-18 : Determination of series firing current of electric detonators.
 - EN 13763-19 : Determination of firing impulse of electric detonators.
 - EN 13763-20 : Determination of total electrical resistance of electric detonators.
 - EN 13763-22 : Determination of capacitance, insulation resistance, and insulation breakdown of leading wires.

ANNEX 1

Standards from the TC 212

In total the following 31 European standards have been published:

EN 14035 -1, Fireworks - Part 1: Terminology
EN 14035 -2, Fireworks - Part 2: Categorisation
EN 14035 -3, Fireworks - Part 3: Aerial wheels - Specification and test methods
EN 14035 -4, Fireworks - Part 4: Bangers and banger batteries - Specification and test methods
EN 14035 -5, Fireworks - Part 5: Batteries and combinations - Specification and test methods
EN 14035 -6, Fireworks - Part 6: Bengal flames - Specification and test methods
EN 14035 -7, Fireworks - Part 7: Bengal matches - Specification and test methods
EN 14035 -8, Fireworks - Part 8: Bengal sticks - Specification and test methods
EN 14035 -9, Fireworks - Part 9: Crackling granules - Specification and test methods
EN 14035 -10, Fireworks - Part 10: Double Bangers - Specification and test methods
EN 14035 -12, Fireworks - Part 12: Flash bangers and flash banger batteries - Specification and test methods
EN 14035 -13, Fireworks - Part 13: Flash pellets - Specification and test methods
EN 14035 -15, Fireworks - Part 15: Fountains - Specification and test methods
EN 14035 -17, Fireworks - Part 17: Ground spinners - Specification and test methods
EN 14035 -18, Fireworks - Part 18: Hand-held fountains - Specification and test methods
EN 14035 -19, Fireworks - Part 19: Hand-held sparklers - Specification and test methods
EN 14035 -20, Fireworks - Part 20: Jumping crackers - Specification and test methods
EN 14035 -21, Fireworks - Part 21: Jumping ground spinners - Specification and test methods
EN 14035 -22, Fireworks - Part 22: Mines - Specification and test methods
EN 14035 -23, Fireworks - Part 23: Non-hand-held sparklers - Specification and test methods
EN 14035 -24, Fireworks - Part 24: Novelty matches - Specification and test methods
EN 14035 -25, Fireworks - Part 25: Party-Poppers - Specification and test methods
EN 14035 -27, Fireworks - Part 27: Rockets - Specification and test methods
EN 14035 -28, Fireworks - Part 28: Roman candles - Specification and test methods
EN 14035 -29, Fireworks - Part 29: Serpents - Specification and test methods
EN 14035 -31, Fireworks - Part 31: Shell-in-mortars - Specification and test methods
EN 14035 -33, Fireworks - Part 33: Spinners - Specification and test methods
EN 14035 -34, Fireworks - Part 34: Table bombs - Specification and test methods
EN 14035 -35, Fireworks - Part 35: Throwdowns - Specification and test methods
EN 14035 -36, Fireworks - Part 36: Wheels - Specification and test methods
EN 14035 -38, Fireworks - Part 38: Shot tubes - Specification and test methods

The following 7 draft standards have been withdrawn:

prEN 14035-11, Fireworks - Part 11: Electrical igniters - Specification and test methods
prEN 14035-14, Fireworks - Part 14: Flying squib - Specification and test methods
prEN 14035-16, Fireworks - Part 16: Friction-ignited flash bangers - Specification and test methods
prEN 14035-26, Fireworks - Part 26: Percussion caps - Specification and test methods
prEN 14035-30, Fireworks - Part 30: Shells - Specification and test methods
prEN 14035-32, Fireworks - Part 32: Snaps - Specification and test methods
prEN 14035-37, Fireworks - Part 37: Whistlers - Specification and test methods

ANNEX 2

TC 212 list of chemical substances forbidden for fireworks :

- arsenic or arsenic compounds;
- mixtures containing a mass fraction of chlorates greater than 80 %;
- mixtures of chlorates with metals;
- mixtures of chlorates with red phosphorus;
- mixtures of chlorates with potassium hexacyanoferrate(II);
- mixtures of chlorates with sulfur;
- mixtures of chlorates with sulfides; (not yet excluded in current French recommendations)
- lead or lead compounds; (not yet excluded in current French recommendations)
- mercury compounds;
- white phosphorus;
- picrates or picric acid;
- potassium chlorate with a mass fraction of bromates greater than 0,15 %;
- sulfur with an acidity, expressed in mass fraction of sulphuric acid, greater than 0,002 %;
- zirconium with a particle size of less than 40 μm .