

**AMERICAN PYROTECHNICS ASSOCIATION, STANDARD 87-1
(December, 2001 Edition)**

* 4.3.2 Devices containing any chemical not specified in Table 4.3-1. For each item for which approval is sought, the manufacturer shall submit a sample of each pyrotechnic mixture containing any chemical not specified in Table 4.3-1 to a person approved by DOT to examine explosives or the applicant may obtain a test report from a recognized Competent Authority (for fireworks manufactured abroad). The manufacturer shall then submit a Fireworks Approval Application (see Appendix D), together with the appropriate laboratory reports to DOT. DOT may then issue approval based on the information contained in the application and accompanying laboratory report(s).

**TABLE 4.3-1
* Standard Fireworks Chemicals**

<u>Chemical</u>	<u>Typical Use</u>
Aluminum	Fuel
Ammonium Perchlorate	Oxygen Donor
Antimony	Fuel
Antimony Sulfide	Fuel
Barium Carbonate	Neutralizer
Barium Nitrate	Oxygen Donor
Barium Sulfate	Oxygen Donor
Bismuth Oxide	Oxygen donor
Boric Acid	Neutralizer
Calcium Carbonate	Neutralizer
Calcium Sulfate	Oxygen Donor
Carbon or Charcoal	Fuel
Copper Metal	Color Agent
Copper Oxide	Oxygen Donor, Color Agent
Copper Salts (except Copper Chlorate)	Color Agent
Dextrine	Fuel/Binder
Hexamethylenetetramine (Hexamine)	Fuel
Iron and Iron Alloys (e.g., ferro/titanium)	Fuel
Iron Oxide	Oxygen Donor
Magnalium (Magnesium/Aluminum)	Fuel
Magnesium (in display fireworks and theatrical pyrotechnics only)	Fuel
Magnesium Carbonate	Neutralizer
Magnesium Sulfate	Oxygen Donor
Nitrocellulose - see Miscellaneous Compounds	
Nitrocellulose based lacquers	Binder
Phosphorus, Red (only as provided in Table 3.7.1)	Fuel

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<u>Chemical (continued)</u>	<u>Typical Use</u>
Potassium or Sodium Benzoate	Whistle
Potassium Bichromate (Potassium Dichromate) (not to exceed 5% of formulation)	Oxygen Donor
Potassium Chlorate (only as provided in Table 3.7.1)	Oxygen Donor
Potassium Hydrogen Phthalate	Whistle
Potassium Nitrate	Oxygen Donor
Potassium Perchlorate	Oxygen Donor
Potassium Sulfate	Oxygen Donor
Silicon	Fuel
Sodium Bicarbonate (Sodium Hydrogen Carbonate)	Neutralizer
Sodium Nitrate	Oxygen Donor
Sodium Salicylate	Whistle
Sodium Salts (except Sodium Chlorate)	Color Agent
Sodium Sulphate	Oxygen Donor
Strontium Carbonate	Color Agent
Strontium Nitrate	Oxygen Donor
Strontium Salts (except Strontium Chlorate)	Color Agent
Strontium Sulfate	Oxygen Donor
Sulfur	Fuel
Titanium (particle size must not pass through 100 mesh sieve if 1.4G or 1.4S Fireworks)	Fuel

Miscellaneous Compounds:

Organic compounds (compounds such as lactose, shellac, red gum, chlorinated paraffin and polyvinyl chloride, consisting of some combination of carbon with hydrogen, oxygen and/or chlorine; nitrogen may be present if it accounts for less than 10% (by weight) of the compound.)

Nitrocellulose with not more than 12.6% nitrogen by mass, that meets the criteria for classification as a 4.1 Flammable Solid, is permitted as a propelling or expelling charge provided there is less than 15 grams of nitrocellulose per article.

NOTE: Exact chemical identity of each "Organic compound" must be included when submitting an Approval Application (See Appendix D) to DOT.

*** 4.4 Approval for Combination Devices for Display Purposes.** When two or more articles of consumer fireworks, display fireworks, or theatrical pyrotechnics that have

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3.6.2.8 Aerial Devices. Each device intended to produce a visible or audible effect high in the air must be designed to produce the effect at or near the apex of its flight.

*** 3.6.2.9 Smoke Devices.** Each smoke device must be so constructed that it will neither burst nor produce excessive flame (excluding fuse and small but brief bursts of flame accompanying normal smoke production). Smoke devices may not contain plastic in direct contact with the pyrotechnic composition, nor may smoke devices resemble, in color and configuration, banned fireworks devices, such as M-80 Salutes, Cherry Bombs, or Silver Salutes.

*** 3.7 Prohibited Chemicals and Components**

*** 3.7.1 Prohibited Chemicals.** Consumer fireworks devices offered or intended for sale to the public may not contain a chemical enumerated in Table 3.7-1, except for small amounts (<0.25% by weight) as impurities, and except as specified therein.

NOTE: Display fireworks and theatrical pyrotechnics (Section 2.15) are not subject to the provisions of this section.

*** TABLE 3.7-1
Prohibited Chemicals for Consumer Fireworks**

- (a) Arsenic Sulfide, Arsenates, or Arsenites
- (b) Boron
- (c) Chlorates, except:
 - (1) In colored smoke mixtures in which an equal or greater weight of sodium bicarbonate is included.
 - (2) In party poppers
 - (3) In those small items (such as ground spinners) wherein the total powder content does not exceed 4 grams of which not greater than 15 percent (or 600 milligrams) is potassium, sodium, or barium chlorate.
 - (4) In firecrackers
 - (5) In Toy Caps
- (d) Gallates or Gallic Acid
- (e) Magnesium (magnesium/aluminum alloys, called magnalium, are permitted).
- (f) Mercury salts
- (g) Phosphorus (red or white) except that red phosphorus is permissible in caps and party poppers.
- (h) Picrates or Picric Acid
- (i) Thiocyanates
- (j) Titanium, except in particle size that does not pass through a 100-mesh sieve.
- (k) Zirconium
- (l) Lead tetroxide (red lead oxide) **and other lead compounds**

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- * 3.7.2 **Prohibited Components.** No component of any consumer fireworks device or novelty, may upon functioning, project or disperse any metal, glass, or brittle plastic fragments.
- * 3.7.3 **Forbidden Devices.** Any device intended for sale to the public that produces an audible effect (other than a whistle) by a charge of more than 130 milligrams (2 grains) of explosive composition per report. Devices obtained for bona-fide pest control purposes in accordance with regulations promulgated by CPSC in Title 16, Code of Federal Regulations are not forbidden if approved in accordance with Part 173.56 of Title 49 CFR.

For transportation purposes, the term forbidden devices also includes mixtures or devices containing a chlorate and an ammonium salt or an acidic metal salt, devices that contain yellow or white phosphorus, devices that combine an explosive and a detonator or blasting cap, and any device that has not been approved by the DOT.

* 3.8 **Specific Requirements for Theatrical Pyrotechnics**

- * 3.8.1 Theatrical pyrotechnics that are approved as UN0431, Articles, Pyrotechnic, 1.4G shall not bear a warning label that resembles the required wording on a consumer fireworks device. A warning label providing instructions to a trained operator is permitted, but alternative wording must be used.
- * 3.8.2 Theatrical pyrotechnics may or may not have an ignition device attached.
- * 3.8.3 All requests for approval of a device as Articles, Pyrotechnic shall be accompanied by a signed certification stating that the article is intended for professional use in the entertainment industry and will not be offered for sale to the general public.
- * 3.8.4 Approvals for classification as Articles, Pyrotechnic shall be evaluated based on the weight of pyrotechnic composition in the individual article, and compared to the allowable weights for the corresponding category of 1.4G consumer fireworks. If a 1.4G classification is desired for an article containing more pyrotechnic composition than is permitted for a comparable consumer firework, the DOT approval procedure in 49 CFR 173.56(b)(1) shall be followed.

* 3.9 **Approval.** All consumer fireworks (Fireworks UN0336), novelties and theatrical pyrotechnics offered for transportation in the United States shall be classified and approved for transportation purposes by the DOT, in accordance with the following procedure.

*3.9.1 **Fireworks and Novelties containing mixtures of chemicals specified in Table 4.3-1 but none of the chemicals prohibited by Sec. 3.7.** For each item for