

## Permitted and Restricted Chemicals Entertainment Industry and Technical Pyrotechnics (APA 87-1C)

Chemical	Formula	Typical Use	Restrictions
Alloprene (Chlorinated Rubber)	Not Required	Color Intensifier	
Aluminum > 53 microns	Al	Fuel	The individual or combined use of metal powders greater than 53 microns, with benzoates, phthalates, salicylates and terephthalates: 1) must not exceed 10 percent of the total lift charge formulation weight 2) must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Aluminum ≤ 53 microns	Al	Fuel	Permitted only in reports
Ammonium Dichromate	(NH <sub>4</sub> ) <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	Oxygen Donor / Colored Ash	1) Not to exceed 5 percent of formulation; 2) Prohibited if mixed with a chlorate.
Ammonium Perchlorate	NH <sub>4</sub> ClO <sub>4</sub>	Oxygen Donor	Prohibited if mixed with a chlorate
Anthracene	C <sub>14</sub> H <sub>10</sub>	Fuel	
Antimony	Sb	Fuel	
Antimony Sulfide	Sb <sub>2</sub> S <sub>3</sub>	Fuel	Prohibited if mixed with a chlorate
Antimony Trioxide	Sb <sub>2</sub> O <sub>3</sub>	Oxygen Donor	
Barium Carbonate	BaCO <sub>3</sub>	Color Agent	
Barium Chlorate	Ba(ClO <sub>3</sub> ) <sub>2</sub>	Oxygen Donor / Color Agent	Smoke formulations must contain a minimum of 2 percent of bicarbonates or carbonates
Barium Nitrate	Ba(NO <sub>3</sub> ) <sub>2</sub>	Oxygen Donor / Color Agent	
Barium Oxalate	BaC <sub>2</sub> O <sub>4</sub>	Color Agent	
Barium Phthalate	Ba(C <sub>8</sub> H <sub>5</sub> O <sub>4</sub> ) <sub>2</sub>	Whistle / Color Agent	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Barium Sulfate	BaSO <sub>4</sub>	Oxygen Donor / Color Agent	
Benzoic Acid	C <sub>6</sub> H <sub>5</sub> COOH	Whistle	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Bismuth Trioxide (Bismuth Oxide)	Bi <sub>2</sub> O <sub>3</sub>	Oxygen Donor	
Boric Acid (Boracic Acid)	H <sub>3</sub> BO <sub>3</sub>	Neutralizer	
Calcium Carbonate	CaCO <sub>3</sub>	Neutralizer	
Calcium Sulfate	CaSO <sub>4</sub>	Oxygen Donor	
Calcium Sulfate (Gypsum)	CaSO <sub>4</sub> ×2H <sub>2</sub> O	Oxygen Donor	
Carbon Black or Lamp Black	C	Fuel	
Charcoal (Carbon)	C	Fuel	
Chlorinated Rubber	Not Required	Color Intensifier	
Chlorinated Wax (Chlorinated Paraffin)	Not Required	Color Intensifier	
Chloro-rub	Not Required	Color Intensifier	
Copper Metal	Cu	Color Agent	Particle size is not required
Cork	Not Required	Fuel	
Cotton (Fiber / Powder) (Cellulose)	Not Required	Fuel	

Cryolite (Sodium Hexafluoroaluminate)	Na <sub>3</sub> AlF <sub>6</sub>	Color Agent	
Cupric Acetate, Anhydrous (Verdigris)	Cu(CH <sub>3</sub> COO) <sub>2</sub>	Color Agent	Prohibited if mixed with a chlorate
Cupric Acetate, Hydrated (Verdigris)	Cu(CH <sub>3</sub> COO) <sub>2</sub> · (H <sub>2</sub> O) <sub>2</sub>	Color Agent	Prohibited if mixed with a chlorate
Cupric Benzoate (Copper Benzoate)	Cu(C <sub>6</sub> H <sub>5</sub> CO <sub>2</sub> ) <sub>2</sub>	Whistle / Color Agent	Prohibited if mixed with a chlorate. The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Cupric Carbonate	CuCO <sub>3</sub>	Color Agent	Prohibited if mixed with a chlorate
Cupric Chloride	CuCl <sub>2</sub>	Color Agent	Prohibited if mixed with a chlorate
Cupric Oxide	CuO	Color Agent	Prohibited if mixed with a chlorate
Cupric OxyChloride (Copper OxyChloride)	CuCl <sub>2</sub> - 3Cu(OH) <sub>2</sub>	Color Agent	Prohibited if mixed with a chlorate
Cupric Sulfate	CuSO <sub>4</sub>	Color Agent	Prohibited if mixed with a chlorate
Cuprous Chloride (Copper Chloride)	Cu <sub>2</sub> Cl <sub>2</sub>	Color Agent	
Cuprous Oxide (Copper Oxide)	Cu <sub>2</sub> O	Color Agent	
Dextrin or Dextrine	Not Required	Binder/Fuel	
Diatomaceous Earth; Silica; Kieselgur	SiO <sub>2</sub> · nH <sub>2</sub> O	Filler / Density Control	
Dicopper chloride trihydroxide	Cu <sub>2</sub> (OH) <sub>3</sub> Cl	Color Agent	Prohibited if mixed with a chlorate
Diphenylamine	(C <sub>6</sub> H <sub>5</sub> ) <sub>2</sub> NH	Stabilizer	
Epoxy (Thermosetting polymer)	Not Required	Binder	
Flour (Wheat, Corn or Rice)	Not Required	Binder	
Glucose	C <sub>6</sub> H <sub>12</sub> O <sub>5</sub>	Binder	
Gum Arabic	Not Required	Binder	
Hexachlorophene (Nabac)	C <sub>13</sub> H <sub>6</sub> Cl <sub>6</sub> O <sub>2</sub>	Fuel	
Hexamethylenetetramine (Hexamine)	C <sub>6</sub> H <sub>12</sub> N <sub>4</sub>	Fuel	
Iron Metal	Fe	Fuel / Sparks	Particle size is not required
Iron (II, III) Oxide (Black)	Fe <sub>3</sub> O <sub>4</sub> or FeO/Fe <sub>2</sub> O <sub>3</sub>	Oxygen Donor	
Iron (III) Oxide (Red)	Fe <sub>2</sub> O <sub>3</sub>	Oxygen Donor	
Iron/Titanium Alloy (Ferro/Titanium)	Fe/Ti	Fuel / Sparks	Particle size is not required
Isophthalic Acid (Meta -Phthalic Acid)	C <sub>6</sub> H <sub>4</sub> (COOH) <sub>2</sub>	Whistle	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Lactose	C <sub>12</sub> H <sub>22</sub> O <sub>11</sub>	Binder/Fuel	
Lampblack	C	Fuel	
Linseed Oil	Not Required	Fuel	
Magnalium > 53 microns	Mg/Al	Fuel	The individual or combined use of metal powders greater than 53 microns, with benzoates, phthalates, salicylates and terephthalates: 1) must not exceed 10 percent of the total lift charge formulation weight 2) must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Magnalium ≤ 53 microns	Mg/Al	Fuel	Permitted only in reports

Magnesium > 53 microns	Mg	Fuel	Magnesium is Prohibited in 3.2.1.21 (Shells). The individual or combined use of metal powders greater than 53 microns, with benzoates, phthalates, salicylates and terephthalates: 1) must not exceed 10 percent of the total lift charge formulation weight 2) must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Magnesium ≤ 53 microns	Mg	Fuel	1) Permitted only in reports 2) Magnesium is Prohibited in Section 3.2.1.21 (Shells)
Magnesium Carbonate	MgCO <sub>3</sub>	Neutralizer	
Magnesium Stearate	Not Required	Binder	
Magnesium Sulfate	MgSO <sub>4</sub>	Oxygen Donor	
Nitrocellulose ≤ 12.6 percent nitrogen by mass	Not Required	Fuel	1) Limited to 75 grams per tube; 2) Limited to 500 grams per device.
Nitrocellulose Lacquer ≤ 12.6 percent nitrogen by mass	Not Required	Binder	Limited to 5 percent of formulation
Par Oil (Chlorinated Wax)	Not Required	Color intensifier	
Parlon (Chlorinated rubber)	Not Required	Color intensifier	
Phthalic Acid ( <i>Ortho</i> -Phthalic Acid)	C <sub>6</sub> H <sub>4</sub> (COOH) <sub>2</sub>	Whistle	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Polyvinyl Alcohol (PVA)	[CH <sub>2</sub> CH(OH)] <sub>n</sub>	Binder	
Polyvinyl Butyral (PVB)	(C <sub>8</sub> H <sub>14</sub> O <sub>2</sub> ) <sub>n</sub>	Binder	
Polyvinyl Chloride (PVC)	(C <sub>2</sub> H <sub>3</sub> Cl) <sub>n</sub>	Color Intensifier	
Polyvinylidene chloride (Saran Resin)	(C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub> ) <sub>n</sub>	Color Intensifier	
Potassium Benzoate	KC <sub>6</sub> H <sub>5</sub> CO <sub>4</sub>	Whistle	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Potassium Chlorate	KClO <sub>3</sub>	Oxygen Donor	Smoke formulations must contain a minimum of 2 percent of bicarbonates or carbonates
Potassium Dichromate (Potassium Bichromate)	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	Oxygen Donor	Not to exceed 5 percent of the formulation
Potassium Fluorosilicate	K <sub>2</sub> SiF <sub>6</sub>	Color Intensifier	
Potassium hexafluoroaluminate (Cryolite)	K <sub>3</sub> AlF <sub>6</sub>	Color Agent	
Potassium Hydrogen Phthalate (KHP)	KC <sub>8</sub> H <sub>5</sub> O <sub>4</sub>	Whistle	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Potassium Nitrate	KNO <sub>3</sub>	Oxygen Donor	
Potassium Oxalate	K <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	Color Agent	
Potassium Perchlorate	KClO <sub>4</sub>	Oxygen Donor	
Potassium Silicofluoride	K <sub>2</sub> SiF <sub>6</sub>	Color Intensifier	
Potassium Sulfate	K <sub>2</sub> SO <sub>4</sub>	Oxygen Donor	
Red Gum (Accaroid Resin)	Not Required	Binder	
Resinox (Phenolic Resin)	Not Required	Binder	

Rice Flour (Rice Starch)	Not Required	Binder	
Rice Hull	Not Required	Density Control	
Rice Hull (Coated)	Not Required	Fuel	Specify chemical formulation of the coating
Salicylic Acid	C <sub>6</sub> H <sub>4</sub> (OH)COOH	Whistle	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Shellac	Not Required	Binder	
Silica	SiO <sub>2</sub> ·nH <sub>2</sub> O	Moisture Absorber	
Silicon	Si	Fuel	
Silver	Ag	Fuel	Particle size is not required
Silver Oxide	Ag <sub>2</sub> O	Oxygen Donor	
Smoke Dye (Blue) Lysine	C <sub>6</sub> H <sub>14</sub> N <sub>2</sub> O <sub>2</sub>	Smoke Dye	
Smoke Dye (Blue) Methylene Blue	C <sub>16</sub> H <sub>18</sub> ClN <sub>3</sub> S	Smoke Dye	
Smoke Dye (Blue) Phthalocyanine (Blue)	C <sub>32</sub> H <sub>16</sub> CuN <sub>8</sub>	Smoke Dye	
Smoke Dye (Blue) Ultramarine	Na <sub>2</sub> S <sub>2</sub> ·3NaAlSiO <sub>4</sub>	Smoke Dye	
Smoke Dye (Green); Solvent Green 3; 1,4-di-p-toluidino-anthraquinone	C <sub>26</sub> H <sub>20</sub> O <sub>2</sub> (NH) <sub>2</sub> (CH <sub>3</sub> ) <sub>2</sub>	Smoke Dye	
Smoke Dye (Green) Lysine; 2, 6-diaminohexanoic acid	C <sub>6</sub> H <sub>14</sub> N <sub>2</sub> O <sub>2</sub>	Smoke Dye	
Smoke Dye (Orange); Orange 7; a-xylene-azo-b-naphthol	C <sub>16</sub> H <sub>11</sub> N <sub>2</sub> NaO <sub>4</sub> S	Smoke Dye	
Smoke Dye (Orange); Oil Orange Pigment	C <sub>26</sub> H <sub>28</sub> N <sub>2</sub> O <sub>2</sub>	Smoke Dye	
Smoke Dye (Red); Disperse Red 9; 1-methylamino-anthraquinone	C <sub>15</sub> H <sub>11</sub> NO <sub>2</sub>	Smoke Dye	
Smoke Dye (Red); Solvent Red 3; 1-Naphthalenol, 4-[(4-ethoxyphenyl)azo]	C <sub>18</sub> H <sub>16</sub> N <sub>2</sub> O <sub>2</sub>	Smoke Dye	
Smoke Dye (Red); Para Red; Pigment Red-1; p-nitroaniline red	C <sub>16</sub> H <sub>11</sub> N <sub>3</sub> O <sub>3</sub>	Smoke Dye	
Smoke Dye (Violet) 1,4-diamino-2,3-dihydroanthraquinone	C <sub>14</sub> H <sub>12</sub> N <sub>2</sub> O <sub>2</sub>	Smoke Dye	
Smoke Dye (Violet); Rhodamine B; (Basic Violet 10)	C <sub>28</sub> H <sub>31</sub> ClN <sub>2</sub> O <sub>3</sub>	Smoke Dye	
Smoke Dye (Yellow); Solvent Yellow 33; 2-(2-quinolyl)-1, 3-indandione; Chinoline Yellow	C <sub>18</sub> H <sub>11</sub> O <sub>2</sub> N	Smoke Dye	
Smoke Dye (Yellow); Auramine; Basic Yellow 2	C <sub>17</sub> H <sub>22</sub> ClN <sub>3</sub>	Smoke Dye	
Smoke Dye (Yellow); Vat Yellow 4; Dibenzo(a,h)pyrene-7,14-dione; (Dibenzochrysenedione); (Dibenzpyrenequinone); (Golden Yellow GK); (Tyrian Yellow I-GOK)	C <sub>24</sub> H <sub>12</sub> O <sub>2</sub>	Smoke Dye	
Smoke Dye (Yellow); Dimethyl Yellow; Methyl Yellow (Butter Yellow); 4-Dimethylaminoazobenzene; N, N-Dimethyl-4-phenylazoaniline; Solvent Yellow 2; Oil Yellow	C <sub>14</sub> H <sub>15</sub> N <sub>3</sub>	Smoke Dye	
Smokeless Powder	Not Required	Expelling Agent	Must be "UN0161, Powder, smokeless, 1.3C", and have a valid US EX Approval
Smokeless Powder	Not Required	Expelling Agent	Must be "UN0509, Powder, smokeless, 1.4C", and have a valid US EX Approval
Sodium Benzoate	NaC <sub>6</sub> H <sub>5</sub> CO <sub>2</sub>	Whistle	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Sodium Bicarbonate; (Sodium Hydrogen Carbonate)	NaHCO <sub>3</sub>	Neutralizer	
Sodium Carbonate	Na <sub>2</sub> CO <sub>3</sub>	Neutralizer	
Sodium Chlorate	NaClO <sub>3</sub>	Oxygen Donor	Smoke formulations must contain a minimum of 2 percent of bicarbonates or carbonates

Sodium Fluorosilicate; (Sodium Silicofluoride)	Na <sub>2</sub> SiF <sub>6</sub>	Color Intensifier	
Sodium hexafluoroaluminate (Cryolite)	Na <sub>3</sub> AlF <sub>6</sub>	Color Agent	
Sodium Nitrate	NaNO <sub>3</sub>	Oxygen Donor	
Sodium Oxalate	Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	Color Agent	
Sodium Salicylate	C <sub>7</sub> H <sub>5</sub> NaO <sub>3</sub>	Whistle	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Sodium Sulfate	Na <sub>2</sub> SO <sub>4</sub>	Oxygen Donor	
Starch (Amylum) (Wheat, Corn, Rice)	Not Required	Binder	
Stearic Acid (Octadecanoic Acid)	Not Required	Fuel	
Strontium Carbonate	SrCO <sub>3</sub>	Color Agent	
Strontium Chloride	SrCl <sub>2</sub>	Color Agent	
Strontium Nitrate	Sr(NO <sub>3</sub> ) <sub>2</sub>	Oxygen Donor / Color Agent	
Strontium Oxalate	SrC <sub>2</sub> O <sub>4</sub>	Color Agent	
Strontium Phthalate	Sr(C <sub>8</sub> H <sub>5</sub> O <sub>4</sub> ) <sub>2</sub>	Whistle / Color Agent	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Strontium Sulfate	SrSO <sub>4</sub>	Color Agent	
Sucrose	C <sub>12</sub> H <sub>22</sub> O <sub>11</sub>	Fuel	
Sulfur	S	Fuel	
Terphthalic Acid (Para -Phthalic Acid)	C <sub>6</sub> H <sub>4</sub> (COOH) <sub>2</sub>	Whistle	The individual or combined use of benzoates, phthalates, salicylates and terephthalates with metal powders greater than: 1) 53 microns must not exceed 10 percent of the total lift charge formulation weight; 2) 53 microns must not exceed 30 percent of the total propellant charge formulation weight (excluding whistles)
Titanium > 149 microns	Ti	Fuel	
Wood Powder (Cellulose)	Not Required	Fuel	
Zirconium ≥ 250 microns	Zr	Fuel	