

2018 APA STANDARD 87-1B

STANDARD FOR THE CONSTRUCTION, CLASSIFICATION, APPROVAL, AND TRANSPORTATION OF DISPLAY FIREWORKS

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NOTE: The latest version of Appendix I, II, and III are available on the PHMSA website at PHMSA.DOT.GOV

PART 1: Introduction and Applicability

1.1 Introduction

This document describes requirements related to Display Fireworks classed as, UN0335, Fireworks, Division 1.3G and Quick Match Fuse classed as, UN0101, Fuse, non-detonating *instantaneous or quickmatch*, Division 1.3G, only and is not intended to supersede the transportation requirements in accordance with Title 49 Code of Federal Regulations (CFR) Parts 100-185.

The American Pyrotechnic Association (APA) is a primary national industry association for manufacturers, importers, wholesalers, distributors, and retailers of consumer fireworks, display fireworks, and entertainment industry and technical pyrotechnic devices. The U.S. Department of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (PHMSA) has jurisdiction over the packaging and transportation of hazardous materials in commerce, pursuant to *Title 49 CFR, Parts 100-185*.

This document is subject to review and every effort is made to keep the standard consistent with Federal regulations. The APA will periodically review and amend this standard every five years or more frequently as appropriate. Proposed changes to this standard may be submitted to the APA in writing. Submitters should provide the proposed language, substantiation and request that the change be considered for incorporation by reference. Users are cautioned to obtain the latest edition of this document and all applicable regulations before making any decisions based on the material noted in this standard.

This document should not be confused with Federal, state or municipal specifications or regulations, insurance requirements or national safety codes. However, when incorporated by reference (IBR) in Title 49 CFR, those portions of this document that apply to the manufacturing and transportation of display fireworks have the force of a Federal regulation, and the manufacturers, importers, wholesalers, distributors, retailers and shippers of display fireworks are subject to penalties pertaining thereto.

This document describes a standard in which classifications are assigned based on the weight and type of chemical composition contained in each specific device. When a specific Approval is sought for a device that does not comply with the requirements of this standard, this standard may not be used and the Approval procedures specified in 49 CFR § 173.56(b) or (f) must be followed.

Pursuant to the procedure described in 5 U.S.C. 552(a) and 1 CFR Part 51, Parts 1 through 5 of this document have been incorporated by reference into 49 CFR § 171.7. The Appendices to this document are not incorporated by reference and are provided solely as guidance materials. Unless otherwise noted, all CFR references cited in this standard refer to sections in effect on October 1, 2017.

Requests for classification approvals under the procedures described in this document can be sent to the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration, Office of Hazardous Materials Safety, Approvals & Permits Division, East Building, 1200 New Jersey Avenue, SE Washington, DC 20590-0001 or by using the e-mail address: fireworks@dot.gov or submitted on line through the PHMSA website.

The information contained in this document was obtained from sources believed to be reliable and is based on technical information and experience currently available from members of the APA and others. However, the Association, and its members, make no guarantee of the results and assume no liability or responsibility in connection with the information or suggestions contained within, or that abnormal or unusual circumstance may not warrant or suggest further requirements or additional procedures.

1.2 Applicability

This document applies to fireworks meeting requirements of display fireworks, quickmatch fuse and fuse, delay. Pursuant to the procedure described in 5 U.S.C. 552(a) and 1 CFR Part 51, Parts 1 through 5 of this document has been incorporated by reference into 49 CFR § 171.7. Specifically, this document details the requirements for obtaining approvals for the transportation of Display Fireworks classed as UN0335, Fireworks, Division 1.3G and Quickmatch and Fuse, Delay classed as UN0101, Fuse, non-detonating UN0101, Division 1.3G. The Appendices to this document are not incorporated by reference and are provided solely as guidance materials.

PART 2: Display Fireworks and Quickmatch Fuse – Definitions and General Requirements

2.1 Introduction

This standard is limited in scope to the classification requirements for transportation of display fireworks and quickmatch and fuse, delay.

This standard provides display firework and quickmatch manufacturers with requirements and information on how to submit an application request for classification of a 1.3G Firework or 1.3G Quickmatch. Under 49 CFR §§ 173.64 display fireworks and quickmatch are permitted to be approved by PHMSA for transportation, if the display fireworks and quickmatch are compliant with the APA Standard 87-1B incorporated by reference.

2.2 Classification

Only display fireworks, and quickmatch fuse and fuse, delay, which comply with this standard, may be approved by PHMSA. For devices not listed in this standard, see 49 CFR § 173.56.

2.3 Definitions of Some Common Display Firework Terms

Term	Definition
Aerial Device	A device designed to produce its effect(s) in the air
Applicant	The manufacturer of the display firework or quickmatch or fuse, delay
Approval (also known as a competent authority approval)	Written authorization from the Associate Administrator of the Office of Hazardous Materials Safety, Pipeline and Hazardous Materials Safety Administration, of the U.S. DOT or other designated Department official, to perform a function that requires prior authorization under subchapter C of 49 CFR Parts 100-185
Assembled Device	A display piece made (assembled together) from other devices with valid approval and/or certification transported by private carriage
Attachments	Attachments are external components of an aerial device
Black Match, Fuse	Uncovered fuse made from thread impregnated with black powder
Black Powder	A chemical composition used in firework devices
Break/Burst Charge	A chemical composition used to open an aerial device
Cake	A multiple tube device that is fused and assembled together to form one device
Chain (Finale Chain; Flight)	Aerial shells connected together for the purpose of being ignited in succession
Chaining Quickmatch	Quickmatch equipped with connections used to create a finale chain
Chemical Composition	Chemical formulations contained in a firework device
Combination Device	Multiple categories of devices that are fused and assembled together to form one device
Display Fireworks	Devices containing chemical compositions, that are intended for use in professional firework shows and designed to produce visible or audible effects and comply with the limits and requirements of this standard
Driver	A firework component (tube) that contains a propellant charge

Term	Definition
Effect	A chemical composition, other than lift charge or burst charge, which upon functioning will burn or explode to produce a visual and/or audible result
Electric Igniter (E-Match)	A device used for the electrical ignition of pyrotechnic devices
EX Number	An explosive classification approval number preceded by the prefix "EX", assigned by the Associate Administrator of PHMSA to a device that has been reviewed and classed under the provisions of 49 CFR §§ 173.56 or 173.64
Firework Device	A device containing chemical compositions, which upon functioning produces a desired effect that is intended for public or professional use
Flash Powder	A term for a chemical composition used to produce a report
Fuse	A core of fine grained powder surrounded by a flexible material
Fuse, Connecting	A fuse used to connect tubes and/or components in a device
Fuse, Ignition	A fuse used to initiate the functioning of a display firework device
Fuse, Quickmatch instantaneous, non-detonating UN0101	A piece of black match that is encased in a paper and/or plastic sheath designed to burn fast
Fuse, Safety UN0105	A thread-wrapped black powder train that is coated with a water resistant material and resists side ignition. (Not approvable under this standard)
Fuse, Time (Fuse, Delay)	A fuse whose function is to create a time delay
Ground Device	A device that is designed to produce its effects at or near ground level
Handle	A part of the device intended to be held in the hand while the device functions
Ignition Powder	A chemical composition used to ensure ignition transfer between components in a device
Inserts	An internal component of a device that can contain a burst charge
Lift or Lifting Charge	A chemical composition intended to expel external components from a device
Manufacturer of Fireworks	An entity that produces the firework device
Particle Size	A measurement, expressed in microns, of a chemical component (typically used for metal powders)
Propellant Charge	A chemical composition that burns at a controlled rate to produce thrust, which causes movement of a device
Pyrotechnic composition	A chemical mixture, which upon burning, and without explosion, produces a visual display, whistle, and/or motion.
Report	A concussive effect with or without flash of light produced by the ignition of a chemical composition
Safety fuse	A fuse that can be used to ignite display fireworks
Spike	A part of the device used to keep the device upright and secure in the ground while it functions
Tail	A chemical composition that burns during the flight of an aerial device to produce a visual effect

2.4 General Requirements

These requirements, where applicable, must be met for all display fireworks constructed under this standard.

General Requirements for Display Fireworks	
Aerial Device	Must be designed to produce its effect(s) in the air

General Requirements for Display Fireworks															
Aerial Shell Attachments	<p>Aerial shells can be approved with or without attachments. The attachments:</p> <ol style="list-style-type: none"> 1. Must remain attached to the aerial shell during transportation; 2. Must not leak chemical composition during transportation; 3. Must be constructed of sturdy materials, such as (but not limited to) plastic, Kraft paper, or cardboard (excluding tails); and 4. May be ignited by its own independent fuse 														
Aerial Shell Chaining	<p>Chaining is permitted under the following conditions:</p> <p style="text-align: center;">Aerial Shell (Color with or without report) and Aerial Shell of Shells</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Shell Diameter (mm)</th> <th>Maximum Number of Shells Per Chain</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">75 or less</td> <td style="text-align: center;">12</td> </tr> <tr> <td style="text-align: center;">100</td> <td style="text-align: center;">8</td> </tr> <tr> <td style="text-align: center;">125</td> <td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">150</td> <td style="text-align: center;">5</td> </tr> </tbody> </table> <p style="text-align: center;">Aerial Shell (Report Only)</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Shell Diameter</th> <th>Maximum Length of Chain</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">65 or less</td> <td style="text-align: center;">12</td> </tr> </tbody> </table>	Shell Diameter (mm)	Maximum Number of Shells Per Chain	75 or less	12	100	8	125	5	150	5	Shell Diameter	Maximum Length of Chain	65 or less	12
Shell Diameter (mm)	Maximum Number of Shells Per Chain														
75 or less	12														
100	8														
125	5														
150	5														
Shell Diameter	Maximum Length of Chain														
65 or less	12														
Applicant	Must be the manufacturer. In addition, foreign applicants must have a U.S. Designated Agent who may submit an application to PHMSA on their behalf (See 49 CFR § 105.40)														
Assembled Device	Must comply with requirements in Part 5														
Black Match	Must be made with black powder														
Black Powder	Must consist of a mixture of charcoal or carbon and either potassium or sodium nitrate, potassium perchlorate, with or without sulfur and may contain a binder.														
Break/Burst Charge	<ol style="list-style-type: none"> 1. Is not restricted to black powder; however, the use of report composition is prohibited 2. The individual or the combined use of metal powders greater than 53 microns, benzoates, phthalates, salicylates and terephthalates must not exceed 10 percent of the total burst charge formulation weight 3. Secondary burst charges are only permitted in inserts 														
Cake	<p>Must be a multiple tube device:</p> <ol style="list-style-type: none"> 1. Must contain items marked “yes” on line 81 of the requirement tables, 2. Must comply with the individual device requirement tables for specific weight limits, chemical restrictions and special conditions, and 3. Must be fused and assembled together to form one device. (Sequential fusing not required) 														
Chaining Fuse	A piece of quickmatch equipped with connections used to create a finale chain														
Chemical Composition	Must be the formulation(s) used to produce the pyrotechnic effects that are listed on the application request and must be formulated from the chemicals in the List of Permitted and Restricted Chemical Table for Display Fireworks (available on the PHMSA.gov website).														
Chemical Restrictions	Must be adhered to when using restricted chemicals in any chemical composition (available on the PHMSA.gov website)														

General Requirements for Display Fireworks	
Combination	<p>Must contain more than one device fused together to form new device (other than just tube devices):</p> <ol style="list-style-type: none"> 1. Must contain items marked “yes” on line 82 of the requirement tables, 2. Must comply with the individual device requirement tables for specific weight limits, chemical restrictions and special conditions, and 3. Must be fused and assembled together to form one device. (Sequential fusing not required)
Construction	<ol style="list-style-type: none"> 1. Materials must be suitable for the intended purpose and the integrity of the device must be maintained during transportation and handling; and 2. Product must not leak pyrotechnic composition during transportation and handling
Dimensional Series	Only devices that are marked “yes” on line 83 of the requirements table are permitted to be approved as a series. See Series Application for additional requirements.
Driver	<ol style="list-style-type: none"> 1. Contains the propellant charge; 2. Must be constructed of sturdy materials such as (but not limited to) plastic, Kraft paper, or cardboard; and 3. Must be securely attached to the device so as not to separate or come loose during transportation
Effects	Must be formulated from the chemicals listed in the Permitted and Restricted Chemicals Table. Lift charge, burst charge, and fuses are not considered effects
Effect Series	Only devices that are marked “yes” on line 83 of the requirements table are permitted to be approved as a series. See Series Application for additional requirements.
Electric Igniter (E-Match)	Devices approved under this standard are not permitted to be shipped with an electric igniter installed, excluding devices defined in Part 5;
Finished Display Firework	<p>A display firework that:</p> <ol style="list-style-type: none"> 1. Meets the General Requirements for that specific device; 2. Meets all the requirements in the requirement tables in Part 3; 3. Passes the Thermal Stability Test in Part 4; 4. Has no loose chemical composition in the packaging; 5. Marked with the EX Number on the device, or packaging if the device is too small; and 6. Any device manufactured, prior to October 1, 2018, is not required to be marked with the EX Number.
Fuse	Connecting, Delay, Ignition and Quickmatch Fuse are not required to be listed on the chemical composition sheet. If fuse is listed on the chemical composition sheet, formulations of nitrate and perchlorate salts mixed with or without charcoal, sulfur, benzoates, and binders are permitted.
Ground Device	Must be designed to produce its effect(s) at or near the ground level
Handle	May be cardboard, paper tube, plastic, wire or wood
Insert	A cylindrical or spherical receptacle containing pyrotechnic and/or non-pyrotechnic effects
Lift or Lifting Charge	<ol style="list-style-type: none"> 1. Is not restricted to black powder; however, the use of report composition is prohibited, and 2. The individual or the combined use of metal powders greater than 149 microns, benzoates, phthalates, salicylates and terephthalates must not exceed 10 percent of the total lift charge formulation weight
Manufacturer of Display Fireworks	Must be the entity that produces the device

General Requirements for Display Fireworks	
Mines	<ol style="list-style-type: none"> 1. Must be a cylindrical or a spherical receptacle; 2. Must not exceed 250 millimeters in outside diameter; 3. Must be constructed of sturdy material, such as (but not limited to) plastic, Kraft paper, or cardboard; and 4. May only contain secondary burst charges
Particle Size	Must be provided in microns, when aluminum, magnalium, magnesium, and/or titanium are used in a chemical formulation. The smallest particle size is all that is required, but a range can be provided
Propellant Charge	<ol style="list-style-type: none"> 1. Formulations are not limited to black powder; and 2. Individual or combined use of metal powders greater than 53 microns, benzoates, phthalates, salicylates and terephthalates must not exceed 30 percent of the total propellant charge formulation weight (excludes whistles)
Reports	<ol style="list-style-type: none"> 1. A single report is permitted when line 21 is marked yes and is limited to 71 grams per individual tube or shell; and 2. Multiple reports are permitted when line 26 is marked yes and are limited to 25 grams each
Rocket Stick	Must remain securely attached to the device while in transportation
Series Application	<p>A series is a group of closely related devices that are categorized as a dimensional series or an effect series and meet the following requirements:</p> <ol style="list-style-type: none"> 1. Series approvals are limited to one category of device; 2. Dimensional series: <ol style="list-style-type: none"> a. Must contain the same chemical compositions; and b. Only vary in size, weight, and/or numbers of tubes in the device 3. Effect series: <ol style="list-style-type: none"> a. Must be the same size, maximum weight and numbers of tubes; and b. Only vary in the effects produced (chemical formulations vary)
Shells (aerial)	Single or stacked cylindrical or spherical receptacles constructed of sturdy materials such as (but not limited to) plastic, Kraft paper, or cardboard
Smoke Compositions	Formulations that incorporate chlorates must contain a minimum of two (2) percent of an acid neutralizer (bicarbonates or carbonates)
Tails and External Attachments	<ol style="list-style-type: none"> 1. Tails - may be either an external or an internal component of an aerial shell or a mine device. External tails must remain securely attached to the device during handling and transportation 2. Attachments - must remain securely attached to the device during handling and transportation
Thermal Stability Test	Must be conducted in accordance with the requirements outlined in Part 4 of this standard or 49 CFR § 173.64(a)(2)
Tubes	Must be constructed of sturdy materials such as (but not limited to) plastic, fiberglass, Kraft paper, or cardboard

PART 3: Specific Requirements for Display Fireworks

3.1. Introduction

In addition to the general requirements in section 2.4, this part contains the specific requirements for each type of display fireworks that can be approved under this standard. The chemical composition weights listed in this standard are the maximum weight limits permitted for the components and the finished device. The requirements for ground devices, aerial devices, cakes and combinations, quickmatch and fuse, delay are provided in the following tables. When a requirement is not applicable, it was omitted from the requirements table. The units of measure for the following tables are grams for weights and millimeters for dimensions, abbreviations I.D. = inner diameter, O.D. = outer diameter. Devices in APA Standard 87-1B, are for professional use only.

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- 3.2.1.2 - Flasher / Strobe
- 3.2.1.3 - Fountain (Cone, Cylindrical, Gerb)
- 3.2.1.4 - Ground Report
- 3.2.1.5 - Illuminating Torch (Lance)
- 3.2.1.6 - Smoke
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- 3.2.1.8 - Wheel

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3.2.4 Miscellaneous

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- 3.2.4.2 - Fuse- (Delay, Time)
- 3.2.4.3 - Blank Requirements Table

3.2.1 Ground Device

3.2.1.1 - Firecracker

	Firecracker – a device that consists of a paper-wrapped or cardboard tube that produces a single report.	
	Attribute	Requirements
1	Composition weight in finished device	0.5 grams
6	Lift charge permitted	No
11	Propellant charge permitted	No
14	Burst charge permitted	No
15	Secondary burst charge permitted	No
20	Reports	--
21	Reports permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	0.5 grams
26	Multiple reports permitted	No
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple driver tubes permitted	No
40	Inserts and Shells	--
41	Inserts permitted	No
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
61	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical Restrictions	No
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	Multiple firecrackers can be fused together to form a string. There is no limit to the number of firecrackers in a string.

3.2.1 Ground Device

3.2.1.2 - Flasher / Strobe

	Flasher - a device containing a chemical composition that produces a crackling / flashing / strobing light effect.	
	Attribute	Requirements
1	Composition weight in finished device	100 grams
6	Lift charge permitted	No
11	Propellant charge permitted	No
14	Burst charge permitted	No
15	Secondary burst charges permitted	No
20	Reports	--
21	Report(s) permitted	No
24	Single report per tube or shell permitted	No
26	Multiple reports permitted	No
30	Tubes	--
31	Tube required	No
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	No
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	No
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	No

3.2.1 Ground Device

3.2.1.3 - Fountain (Cone, Cylindrical and Gerb)

	Fountain - a device that produces a shower of any combination of colored sparks, color flame, crackle, smoke, whistle and/or micro star effects.	
	Attribute	Requirements
1	Composition weight in finished device	3000 grams
3	Composition weight per tube	3000 grams
6	Lift charge permitted	No
11	Propellant charge permitted	No
14	Burst charge permitted	No
15	Secondary burst charges permitted	No
20	Reports	--
21	Report(s) permitted	No
24	Single report per tube or shell permitted	No
26	Multiple reports permitted	No
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	No
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	No
80	Cake, Combinations and Series	--
81	Device permitted in a cake	Yes
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	Tube may be cone or cylindrical shaped

3.2.1 Ground Device

3.2.1.4 - Ground Report

	Ground Report – a device that consists of a paper-wrapped, cardboard tube or casing that produces a single report or multiple reports at ground level	
	Attribute	Requirements
1	Composition weight in finished device	75 grams
3	Composition weight per tube	75 grams
6	Lift charge permitted	No
11	Propellant charge permitted	No
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	75 grams
29	Percent of report composition in the finished device	100 percent
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	No
44	Inner shells permitted	Yes
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	No

3.2.1 Ground Device

3.2.1.5 - Illuminating Torch - (Lance)

Illuminating Torch - a device that emits a colored flame with or without crackles or sparks		
	Attribute	Requirements
1	Composition weight in finished device	3000 grams
3	Composition weight per tube	3000 grams
6	Lift charge permitted	No
11	Propellant charge permitted	No
14	Burst charge permitted	No
15	Secondary burst charges permitted	No
20	Reports	--
21	Report(s) permitted	No
24	Single report per tube or shell permitted	No
26	Multiple reports permitted	No
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	No
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	No
80	Cake, Combinations and Series	--
81	Device permitted in a cake	Yes
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	No

3.2.1 Ground Device

3.2.1.6 - Smoke

Smoke - a device that produces smoke as its primary effect		
Attribute	Requirements	
1	Composition weight in finished device	7000 grams
3	Composition weight per tube	7000 grams
6	Lift charge permitted	No
11	Propellant charge permitted	No
14	Burst charge permitted	No
15	Secondary burst charges permitted	No
20	Reports	--
21	Report(s) permitted	No
24	Single report per tube or shell permitted	No
26	Multiple reports permitted	No
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	No
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	Formulations that incorporate chlorates must contain a minimum of 2 percent of an acid neutralizer (bicarbonates or carbonates)
80	Cake, Combinations and Series	--
81	Device permitted in a cake	Yes
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	A pot can be used in place of a tube

3.2.1 Ground Device

3.2.1.7 - Waterfall / Showers

	Waterfall - a multiple tube device fused together and designed to be supported above the ground that emits a shower of flames and sparks downward, creating a cascade effect.	
	Attribute	Requirements
1	Composition weight in finished device	3000 grams
3	Composition weight per tube	150 grams
6	Lift charge permitted	No
11	Propellant charge permitted	No
14	Burst charge permitted	No
15	Secondary burst charges permitted	No
20	Reports	--
21	Report(s) permitted	No
24	Single report per tube or shell permitted	No
26	Multiple reports permitted	No
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	Yes
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	No
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	No
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	Tube chaining is permitted

3.2.1 Ground Device

3.2.1.8 - Wheel

	Wheel – a multi-tube device intended to be attached to a support so it can rotate and produce a shower of sparks, whistle and/or other effects.	
	Attribute	Requirements
1	Composition weight in finished device	7000 grams
3	Composition weight per tube	1000 grams
6	Lift charge permitted	No
11	Propellant charge permitted	Yes
12	Propellant charge weight per tube	350 grams
14	Burst charge permitted	No
15	Secondary burst charges permitted	No
20	Reports	--
21	Report(s) permitted	No
24	Single report per tube or shell permitted	No
26	Multiple reports permitted	No
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	Yes
35	Driver required	No
36	Multiple drivers permitted	Yes
40	Inserts and Shells	--
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for propellant charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	No

3.2.2 Aerial Device

3.2.2.1 - Aerial Shell and Mine Preloaded (Color with or without reports)

	Aerial Shell and Mine, Preloaded (Color with or without reports) - a device that launches and ignites a preloaded shell (cylindrical or spherical) into the air that bursts open to produce an effect and may simultaneously ignite and project effects directly out of the tube. (Effects may be pyrotechnic and/or non-pyrotechnic)	
	Attribute	Requirements
1	Composition weight in finished device	1000 grams
3	Composition weight per tube	1000 grams
6	Lift charge permitted	Yes
11	Propellant charge permitted	No
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	250 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	Yes
43	Shell diameter (O.D.)	100 millimeters
44	Inner shells permitted	Yes
45	Inner shell diameter (O.D.)	70 millimeters
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for lift and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	Yes
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	1.) Tails and external attachments are permitted. 2.) Device may, but is not required to, contain effects that are ignited and projected from the tube simultaneously with the shell. Non-pyrotechnic effects will be projected but not ignited.

3.2.2 Aerial Device

3.2.2.2 - Aerial Shell Preloaded (Report Only)

Aerial Shell, Preloaded (Report only) - a device that launches and ignites a preloaded shell (cylindrical or spherical) into the air that bursts open to produce a report		
Attribute	Requirements	
1	Composition weight in finished device	150 grams
3	Composition weight per tube	150 grams
6	Lift charge permitted	Yes
11	Propellant charge permitted	No
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	75 grams
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	Yes
43	Shell diameter (O.D.)	75 millimeters
44	Inner shells permitted	Yes
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for lift and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	Yes
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	Tails and external attachments are permitted

3.2.2 Aerial Device

3.2.2.3 - Aerial Shell (Color with or without reports)

Aerial Shell (Color with or without reports) - a device (cylindrical or spherical) that is launched and ignited from a tube into the air and bursts open to produce an effect (Effects may be pyrotechnic and/or non-pyrotechnic)		
Attribute	Requirements	
1	Composition weight in finished device	7000 grams
6	Lift charge permitted	Yes
11	Propellant charge permitted	No
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	1750 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	No
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	Yes
43	Shell diameter (O.D.)	250 millimeters
44	Inner shells permitted	Yes
45	Inner shell diameter (O.D.)	70 millimeters
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for lift and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	1.) Tails and external attachments are permitted 2.) Chaining, see General Requirements for chaining restrictions

3.2.2 Aerial Device

3.2.2.4 - Aerial Shell (Report Only)

Aerial Shell (Report only) - a device (cylindrical or spherical) that is launched and ignited from a tube into the air and bursts open to produce a report(s)		
	Attribute	Requirements
1	Composition weight in finished device	150 grams
6	Lift charge permitted	Yes
11	Propellant charge permitted	No
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	75 grams
30	Tubes	--
31	Tube required	No
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	Yes
43	Shell diameter (O.D.)	75 millimeters
44	Inner shells permitted	Yes
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for lift and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	1.) Tails and external attachments are permitted 2.) Chaining, see General Requirements for chaining restrictions

3.2.2 Aerial Device

3.2.2.5 - Aerial Shell of Shells

	Aerial Shell of Shells - a device (cylindrical or spherical) that is launched and ignited from a tube into the air and bursts open to produce an effect, inner shells may also be (cylindrical or spherical) (Effects may be pyrotechnic and/or non-pyrotechnic)	
	Attribute	Requirements
1	Composition weight in finished device	7000 grams
6	Lift charge permitted	Yes
11	Propellant charge permitted	No
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	1750 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	No
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	Yes
43	Shell diameter (O.D.)	250 millimeters
44	Inner shells permitted	Yes
45	Inner shell diameter (O.D.)	70 millimeters
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for lift and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	1.) Tails and external attachments are permitted 2.) Chaining, see General Requirements for chaining restrictions

3.2.2 Aerial Device

3.2.2.6 - Aerial Spinner (Helicopter)

Aerial Spinner - a device that spins and rises into the air with or without a blade or propeller and may produce a secondary effect while in flight		
Attribute	Requirements	
1	Composition weight in finished device	1000 grams
6	Lift charge permitted	No
11	Propellant charge permitted	Yes
12	Propellant charge weight per tube	350 grams
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	250 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	Yes
35	Driver required	Yes
36	Multiple drivers permitted	Yes
37	Minimum number of drivers required	1
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for propellant and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	No

3.2.2 Aerial Device

3.2.2.7 - Girandola

	Girandola - a device that spins and rises into the air and may produce secondary effects while in flight	
	Attribute	Requirements
1	Composition weight in finished device	7000 grams
3	Composition weight per tube	1000 grams
6	Lift charge permitted	No
11	Propellant charge permitted	Yes
12	Propellant charge weight per tube	350 grams
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	1750 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	Yes
35	Driver required	Yes
36	Multiple drivers permitted	Yes
37	Minimum number of drivers required	3
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for propellant and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	A propeller or blade is permitted, but not required

3.2.2 Aerial Device

3.2.2.8 - Mine (Shell, Tube, Bag)

	Mine – a device that ignites and projects its effect directly out of the launch tube. Effects may be both pyrotechnic and/or non-pyrotechnic	
	Attribute	Requirements
1	Composition weight in finished device	7000 grams
6	Lift charge permitted	Yes
11	Propellant charge permitted	No
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	25 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	1750 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	No
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	Yes
43	Shell diameter (O.D.)	250 millimeters
44	Inner shells permitted	Yes
45	Inner shell diameter (O.D.)	70 millimeters
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for lift and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	1.) Burst charges are limited to secondary effects (e.g., crossettes and inserts). 2.) Bags are permitted in lieu of tubes or shell casings. 3.) Chaining, see General Requirements for chaining restrictions

3.2.2 Aerial Device

3.2.2.9 - Mine Preloaded

	Mine Preloaded – a device that ignites and projects its effect directly out of the launch tube. Effects may be pyrotechnic and/or non-pyrotechnic.	
	Attribute	Requirements
1	Composition weight in finished device	1000 grams
3	Composition weight per tube	1000 grams
6	Lift charge permitted	Yes
11	Propellant charge permitted	No
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	25 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	250 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	Yes
43	Shell diameter (O.D.)	150 millimeters
44	Inner shells permitted	Yes
45	Inner shell diameter (O.D.)	70 millimeters
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for lift and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	Yes
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	1.) Burst charges are limited to secondary effects (e.g., crossettes and inserts). 2.) Bags are permitted in lieu of tubes or shell casings

3.2.2 Aerial Device

3.2.2.10 - Missile - Fin Stabilized

Missile - Fin Stabilized - a device that contains a driver attached to a set of fins (primary stabilizer) which may produce a secondary effect after launching		
Attribute	Requirements	
1	Composition weight in finished device	1000 grams
3	Composition weight per tube	1000 grams
6	Lift charge permitted	No
11	Propellant charge permitted	Yes
12	Propellant charge weight per tube	350 grams
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	250 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	Yes
36	Multiple drivers permitted	No
37	Minimum number of drivers required	1
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	No
44	Inner shells permitted	Yes
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for propellant and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	No

3.2.2 Aerial Device

3.2.2.11 – Missile - Spin Stabilized

	Missile - Spin Stabilized - a device that contains a driver that sits on a launch spike attached to a base block. The driver spins (primary stabilizer) as it travels upward and may produce a secondary effect after launching	
	Attribute	Requirements
1	Composition weight in finished device	1000 grams
3	Composition weight per tube	1000 grams
6	Lift charge permitted	No
11	Propellant charge permitted	Yes
12	Propellant charge weight per tube	350 grams
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	250 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	Yes
36	Multiple drivers permitted	No
37	Minimum number of drivers required	1
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	No
44	Inner shells permitted	Yes
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for propellant and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	No

3.2.2 Aerial Device

3.2.2.12 – Rocket (Sky Rocket)

	Rockets – a device that contains a driver attached to a guidance device for display. Rockets may produce a secondary effect	
	Attribute	Requirements
1	Composition weight in finished device	1000 grams
3	Composition weight per tube	1000 grams
6	Lift charge permitted	No
11	Propellant charge permitted	Yes
12	Propellant charge weight per tube	350 grams
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	71 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	250 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	Yes
36	Multiple drivers permitted	Yes
37	Minimum number of drivers required	1
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	No
44	Inner shells permitted	Yes
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for propellant and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	A guidance device is required.

3.2.2 Aerial Device

3.2.2.13 - Roman Candle

Roman Candle - a device that expels a series of stars, shells, or other effects into the air		
Attribute	Requirements	
1	Composition weight in finished device	1000 grams
3	Composition weight per tube	1000 grams
6	Lift charge permitted	Yes
11	Propellant charge permitted	No
14	Burst charge permitted	Yes
15	Secondary burst charges permitted	Yes
20	Reports	--
21	Report(s) permitted	Yes
24	Single report per tube or shell permitted	Yes
25	Single report weight	25 grams
26	Multiple reports permitted	Yes
27	Multiple report weight (individual)	25 grams
28	Multiple report weight in the finished device	250 grams
29	Percent of report composition in the finished device	25 percent
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
38	Outer tube diameter (I.D.)	50 millimeters
40	Inserts and Shells	--
41	Inserts permitted	Yes
42	Shell casing required	No
44	Inner shells permitted	Yes
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	See General Requirements for lift and burst charge restrictions.
80	Cake, Combinations and Series	--
81	Device permitted in a cake	Yes
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	Burst charges are limited to secondary effects (e.g., crossettes and inserts).

3.2.3 Cake and Combination

3.2.3.1 - Cake

Cake - a device that consists of multiple tubes fused together to form one device.		
Attribute	Requirements	
1	Composition weight in finished device	20000 grams
3	Composition weight per tube	See individual device requirements
6	Lift charge permitted	See individual device requirements
14	Burst charge permitted	See individual device requirements
15	Secondary burst charges permitted	See individual device requirements
20	Reports	--
21	Report(s) permitted	See individual device requirements
24	Single report per tube or shell permitted	See individual device requirements
25	Single report weight	See individual device requirements
26	Multiple reports permitted	See individual device requirements
27	Multiple report weight (individual)	See individual device requirements
28	Multiple report weight in the finished device	See individual device requirements
29	Percent of report composition in the finished device	See individual device requirements
30	Tubes	--
31	Tube required	Yes
32	Multiple tubes permitted	Yes
35	Driver required	No
36	Multiple drivers permitted	No
38	Outer tube diameter (I.D.)	See individual device requirements
40	Inserts and Shells	--
41	Inserts permitted	See individual device requirements
42	Shell casing required	See individual device requirements
43	Shell diameter (O.D.)	See individual device requirements
44	Inner shells permitted	See individual device requirements
45	Inner shell diameter (O.D.)	See individual device requirements
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	See individual device requirements
72	Restrictions	See individual device requirements
80	Cake, Combinations and Series	--
82	Device permitted in a combination	Yes
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	See individual device requirements

3.2.3 Cake and Combination

3.2.3.2 - Combination

	Combination –multiple of devices that are fused and assembled together to form one device (e.g., a fountain combined with an Aerial Spinner).	
	Attribute	Requirements
1	Composition weight in finished device	20000 grams
3	Composition weight per tube	See individual device requirements
6	Lift charge permitted	See individual device requirements
11	Propellant charge permitted	See individual device requirements
12	Propellant charge weight per tube	See individual device requirements
14	Burst charge permitted	See individual device requirements
15	Secondary burst charges permitted	See individual device requirements
20	Reports	--
21	Report(s) permitted	See individual device requirements
24	Single report per tube or shell permitted	See individual device requirements
25	Single report weight	See individual device requirements
26	Multiple reports permitted	See individual device requirements
27	Multiple report weight (individual)	See individual device requirements
28	Multiple report weight in the finished device	See individual device requirements
29	Percent of report composition in the finished device	See individual device requirements
30	Tubes	--
31	Tube required	See individual device requirements
32	Multiple tubes permitted	See individual device requirements
35	Driver required	See individual device requirements
36	Multiple drivers permitted	See individual device requirements
37	Minimum number of drivers required	See individual device requirements
38	Outer tube diameter (I.D.)	See individual device requirements
40	Inserts and Shells	--
41	Inserts permitted	See individual device requirements
42	Shell casing required	See individual device requirements
43	Shell diameter (O.D.)	See individual device requirements
44	Inner shells permitted	See individual device requirements
45	Inner shell diameter (O.D.)	See individual device requirements
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes
64	Multiple ignition points permitted	Yes
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	See individual device requirements
72	Restrictions	See individual device requirements
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	No
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	See individual device requirements

3.2.4 Miscellaneous

3.2.4.1 - Quickmatch

	Quickmatch – a thread impregnated with fine grained black powder that is encased in a loose fitting paper or plastic sheath designed to burn fast and approved as UN0101, Fuse, non-detonating instantaneous or quickmatch.	
	Attribute	Requirements
1	Composition weight in finished device	400 grams
6	Lift charge permitted	No
11	Propellant charge permitted	No
14	Burst charge permitted	No
15	Secondary burst charges permitted	No
20	Reports	--
21	Report(s) permitted	No
24	Single report per tube or shell permitted	No
26	Multiple reports permitted	No
30	Tubes	--
31	Tube required	No
32	Multiple tubes permitted	No
35	Driver required	No
36	Multiple drivers permitted	No
40	Inserts and Shells	--
41	Inserts permitted	No
42	Shell casing required	No
44	Inner shells permitted	No
60	Ignition Requirements	--
65	Electric igniter permitted	No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes
72	Restrictions	Limited to nitrate and/or perchlorate salts with charcoal and with or without sulfur and /or a binder
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	1.) Must have a protective outer covering 2.) Must provide a statement that composition is less than or equal to 6.6grams per linear meter, and 3.) The length must not exceed 60 meters per inner packaging

3.2.4 Miscellaneous

3.2.4.2 – Fuse, Delay (Fuse, Time)

	Fuse, Delay – a core of fine grained powder surrounded by a flexible woven fabric. When ignited, it burns at a predetermined rate without any external explosive effect. Approved under this standard as UN0335 Fireworks 1.3G.	
	Attribute	Requirements
1	Composition weight in finished device	1200 grams
6	Lift charge permitted	No
11	Propellant charge permitted	No
13	Fountain powder permitted	No
14	Burst charge permitted	No
15	Secondary burst charge permitted	No
20	Reports	--
21	Reports permitted	No
30	Tubes	--
31	Tube required	No
32	Multiple tubes permitted	No
33	Cone required	No
35	Driver tube required	No
36	Multiple driver tubes permitted	No
40	Inserts and Shells	--
41	Inserts permitted	No
50	Base, Spike and Handle Requirements	--
51	Attached base required	No
52	Spikes, handles, or sticks required	No
53	Spikes, handles, or sticks permitted	No
60	Ignition Requirements	--
61	Ignition fuse required	No
70	Chemical Restrictions	--
71	Chemical Restrictions	No
72	Restriction	
80	Cake, Combinations and Series	--
81	Device permitted in a cake	No
82	Device permitted in a combination	No
83	Series applications permitted	Yes
90	Special Conditions	--
91	Are there any special conditions	Yes
92	Special conditions	1.) Must have a protective outer covering 2.) Must provide a statement that composition is less than or equal to 20 grams per linear meter, and 3.) The length must not exceed 60 meters per inner packaging

3.2.4 Miscellaneous

3.2.4.3 - Blank Requirements Table

Blank Requirements Table		
	Attribute	Requirements
1	Composition weight in finished device	[Number] (grams)
3	Composition weight per tube	[Number] (grams)
6	Lift charge permitted	Yes or No
11	Propellant charge permitted	Yes or No
12	Propellant charge weight per tube	[Number] (gram)
14	Burst charge permitted	Yes or No
15	Secondary burst charges permitted	Yes or No
20	Reports	--
21	Report(s) permitted	Yes or No
24	Single report per tube or shell permitted	Yes or No
25	Single report weight	[Number] (grams)
26	Multiple reports permitted	Yes or No
27	Multiple report weight (individual)	[Number] (grams)
28	Multiple report weight in the finished device	[Number] (grams)
29	Percent of report composition in the finished device	(Number) (percent)
30	Tubes	--
31	Tube required	Yes or No
32	Multiple tubes permitted	Yes or No
35	Driver required	Yes or No
36	Multiple drivers permitted	Yes or No
37	Minimum number of drivers required	Yes or No
38	Outer tube diameter (I.D.)	[Number] (millimeters)
40	Inserts and Shells	--
41	Inserts permitted	Yes or No
42	Shell casing required	Yes or No
43	Shell diameter (O.D.)	[Number] (millimeters)
44	Inner shells permitted	Yes or No
45	Inner shell diameter (O.D.)	[Number] (millimeters)
60	Ignition Requirements	--
62	Ignition fuse permitted	Yes or No
64	Multiple ignition points permitted	Yes or No
65	Electric igniter permitted	Yes or No
70	Chemical Restrictions	--
71	Chemical restrictions	Yes or No
72	Restrictions	Text
80	Cake, Combinations and Series	--
81	Device permitted in a cake	Yes or No
82	Device permitted in a combination	Yes or No
83	Series applications permitted	Yes or No
90	Special Conditions	--
91	Are there any special conditions	Yes or No
92	Special conditions	[Text]

Part 4: Thermal Stability Test Requirements for Display Fireworks and Quickmatch and Fuse, Delay

4.1 Introduction

All devices offered for transportation must be thermally stable. Thermal stability is assessed by subjecting a finished device or the chemical compositions as they will appear in the finished devices to a constant temperature of 75 degree C (167 degree F) for 48 consecutive hours with no ignition or marked decomposition occurring.

Safety Notes-

- When testing quantities of pyrotechnic composition in excess of several grams, the thermal stability test must be conducted in an isolated facility. Personnel must not be working in the vicinity. Barricading of the ovens must be considered.
- It is strongly recommended that the thermal stability testing not be conducted on large, intact devices, which could produce devastating consequences. The components used in such large devices should be tested rather than a completed device.
- Samples should be placed in a pan or aluminum foil to prevent/minimize oven contamination.
- The oven to be wiped cleaned after each test and fully cleaned on a regular basis.

4.2 General Requirements for Thermal Stability Testing

Testing Requirement	<ul style="list-style-type: none">• Any device approved for transportation by DOT must be thermally stable. The explosive material must not ignite spontaneously or undergo marked decomposition when subjected to a temperature of 75 degree C (167 degree F) for 48 consecutive hours.• When the thermal stability test is conducted on components rather than the finished device, the components that would be in contact with each other in the finished device must be placed in contact with each other for thermal stability testing.
Recommended Equipment	A commercial laboratory-type oven is best for conducting the thermal stability test with explosion-proof wiring. The oven must be capable of controlling temperature to ± 2 degrees C.
Safety Factors	<ul style="list-style-type: none">• Safety is critical in the performance of thermal stability tests.• It must be assumed that there is distinct possibility that the sample will ignite/explode during the test, and precautions must be taken to minimize the consequences of ignition and the resultant fire or explosion.
Recording Requirements	<ul style="list-style-type: none">• Test Date• Test Location/Company• Name of Person performing the test and job Title• Test Results – did the device ignite, explode or undergo any significant decomposition.

Part 5: Special Provisions for Transportation

5.1 Misfired Fireworks

Misfired undamaged devices that are to be returned from the display site to the supplier shall be permitted to be transported under the EX approval of the original device and shall be packed separately from unused, unfired devices, and transported only by private motor carrier.

Shall not contain loose pyrotechnic composition. Electric Matches must be shunted if present.

5.2 Assembled Devices and Set Pieces

Assembled devices and Set pieces made exclusively from devices with valid EX approval and/or FCA Certification shall not require a new approval provided:

- a. The device is transported by private motor carrier
- b. The device is transported using the EX numbers and/or FC Certification for the individual components. A minimum of five EX numbers and/or FC Numbers are required unless the device contains less.

The use of fuse that has been cut to a length less than the original approval for the fuse is permitted in assembled devices and set pieces. The original EX number or FC number for the fuse shall be used as one of the components of the assembled device.

Devices that are too large to be placed in non-bulk packaging, shall be permitted to be transported by private motor carrier without external packaging to a display site. The devices must be secured against movement inside the vehicle and all pyrotechnic material must be protected against unintentional/inadvertent ignition.

5.3 Transportation of Fireworks with Fusees (highway flares) and Electric Igniters

Fusees (highway flares) and/or electric igniters for use in a firework display are permitted to be transported in a motor vehicle with fireworks, provided the flares and/or electric igniters are packaged in a separate specification package, in accordance with Title 49 CFR.

5.4 Transportation with installed Electric Igniter (E-Match)

Devices approved under this standard are not permitted to be shipped with an electric igniter installed, except fireworks transported within the United States by private motor carrier, provided;

- a. Devices with electric igniters installed shall only be transported from a U.S. manufacturer's or display operator's facility to a firework display site, or to an approved storage site for subsequent shipment to a display site.
- b. The electric igniters must be approved and assigned an EX number in accordance with Title 49 CFR, § 173.56.
- c. Devices approved under the APA Standard or § 173.56 may be shipped with electric igniters installed.
- d. Electric igniters installed in fireworks must be rated by the manufacturer to have a no fire current of not less than 0.20 amperes

- e. Electric igniters must be securely attached to the fuse or to the lift charge to prevent significant movement of the electric igniter.
- f. The electric igniters must have a covering (shroud) over the pyrotechnic match head.
- g. The leg wires of the electric igniter must be shunted (shorted) at all times during transportation.
- h. Devices transported with electrical igniters installed are prohibited on aircraft.

If electric igniters are shipped in the same package with the explosive, the electric igniters must be packaged in compliance with the electric igniter approval.

APPENDICES

APPENDIX I	Permitted and Restricted Chemicals
APPENDIX II	Applying for an Approval
APPENDIX III	Designation of a U.S. Agent of Service
APPENDIX IV	Process to Amend the Standard

NOTE: While these appendices are included in this standard, they will not be incorporated by reference into Title 49 CFR. This material is for reference use only, current versions of Appendix I, II and III can be found on the PHMSA website at PHMSA.DOT.GOV.

APPENDIX I: Permitted and Restricted Chemical Table for Display Fireworks

1. Permitted and Restricted Chemical Table for Display Fireworks and Quickmatch is controlled by PHMSA (available on the PHMSA website). Any requests for modifications must be submitted to PHMSA for review at fireworks@dot.gov.
2. Under the provisions of this standard, only chemicals listed in the Permitted and Restricted Chemical Table for Display Fireworks may be used in the manufacturing of display firework devices and quickmatch.
3. Devices may not contain any chemical not listed in the Permitted and Restricted Chemical Table for Display Fireworks, except in amounts less than 0.25 percent by weight as impurities.
4. A manufacturing tolerance of up to one (1) percent is permitted for individual chemicals used in display fireworks and quickmatch formulations.
5. Specific restrictions for individual chemicals are provided in the Permitted and Restricted Chemical Table for Display Fireworks.

Permitted and Restricted Chemical Table

Only chemicals in the table below are permitted to be used in devices manufactured under this standard. Using any combination of these chemicals to produce an effect in a device must comply with the total chemical composition limits in rows 1, 3, 12, 25, 27, and 28, respectively of the requirement tables in PART 3.

Permitted and Restricted Chemicals for Display Fireworks (APA 87-1B)			
Chemical	Formula	Typical Use	Restrictions
Alloprene (Chlorinated Rubber)	Not Required	Color Intensifier	
Aluminum > 53 microns	Al	Fuel	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Aluminum ≤ 53 microns	Al	Fuel	Permitted only in reports
Ammonium Dichromate	(NH ₄) ₂ Cr ₂ O ₇	Oxygen Donor / Colored Ash	1) Not to exceed 5 percent of formulation; 2) Prohibited if mixed with a chlorate.
Ammonium Perchlorate	NH ₄ ClO ₄	Oxygen Donor	Prohibited if mixed with a chlorate
Antimony	Sb	Fuel	
Antimony Sulfide	Sb ₂ S ₃	Fuel	
Antimony Trioxide	Sb ₂ O ₃	Oxygen Donor	
Barium Carbonate	BaCO ₃	Color Agent	
Barium Chlorate	Ba(ClO ₃) ₂	Oxygen Donor / Color Agent	Smoke formulations must contain a minimum of 2 percent of bicarbonates or carbonates

Permitted and Restricted Chemicals for Display Fireworks (APA 87-1B)			
Barium Nitrate	Ba(NO ₃) ₂	Oxygen Donor / Color Agent	
Barium Oxalate	BaC ₂ O ₄	Color Agent	
Barium Phthalate	Ba(C ₈ H ₅ O ₄) ₂	Whistle / Color Agent	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Barium Sulfate	BaSO ₄	Oxygen Donor / Color Agent	
Benzoic Acid	C ₆ H ₅ COOH	Whistle	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Bismuth Trioxide (Bismuth Oxide)	Bi ₂ O ₃	Oxygen Donor	
Boric Acid (Boracic Acid)	H ₃ BO ₃	Neutralizer	
Calcium Carbonate	CaCO ₃	Neutralizer	
Calcium Sulfate	CaSO ₄	Oxygen Donor	
Calcium Sulfate (Gypsum)	CaSO ₄ ×2H ₂ O	Oxygen Donor	
Charcoal (Carbon)	C	Fuel	
Chlorinated Rubber	Not Required	Color Intensifier	
Chlorinated Wax (Chlorinated Paraffin)	Not Required	Color Intensifier	
Copper Benzoate	Cu(C ₆ H ₅ CO ₂) ₂	Whistle / Color Agent	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Copper (II) Salts (Cupric Salts) Acetates, Carbonates, Chlorides, Oxides, and Sulfates, etc		Color Agent	Prohibited if mixed with a chlorate
Copper Metal	Cu	Color Agent	Particle size is not required
Cryolite (Sodium Hexafluoroaluminate)	Na ₃ AlF ₆	Color Agent	
Cuprous Chloride (Copper Chloride)	Cu ₂ Cl ₂	Color Agent	
Cuprous Oxide (Copper Oxide)	Cu ₂ O	Color Agent	
Dextrin or Dextrine	Not Required	Binder/Fuel	
Dicopper chloride trihydroxide	Cu ₂ (OH) ₃ Cl	Color Agent	Prohibited if mixed with a chlorate
Diphenylamine	(C ₆ H ₅) ₂ NH	Stabilizer	
Epoxy (Thermosetting polymer)	Not Required	Binder	

Permitted and Restricted Chemicals for Display Fireworks (APA 87-1B)			
Flour (Wheat, Corn or Rice)	Not Required	Binder	
Glucose	C ₆ H ₁₂ O ₅	Binder	
Hexachlorophene (Nabac)	C ₁₃ H ₆ Cl ₆ O ₂	Fuel	
Hexamethylenetetramine (Hexamine)	C ₆ H ₁₂ N ₄	Fuel	
Iron	Fe	Fuel / Sparks	Particle size is not required
Iron (II, III) Oxide (Black)	Fe ₃ O ₄ or FeO ÷ Fe ₂ O ₃	Oxygen Donor	
Iron (III) Oxide (Red)	Fe ₂ O ₃	Oxygen Donor	
Iron/Titanium Alloy (Ferro/Titanium)	Fe/Ti	Fuel / Sparks	Particle size is not required
Isophthalic Acid (Meta-Phthalic Acid)	C ₆ H ₄ (COOH) ₂	Whistle	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Lactose	C ₁₂ H ₂₂ O ₁₁	Binder/Fuel	
Lampblack	C	Fuel	
Linseed Oil	Not Required	Fuel	
Magnalium > 53 microns	Mg/Al	Fuel	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Magnalium ≤ 53 microns	Mg/Al	Fuel	Permitted only in reports
Magnesium > 53 microns	Mg	Fuel	Not to exceed 10 percent by weight in a lift and/or burst charge, or 30 percent in a propellant formulation (Excluding whistles)
Magnesium ≤ 53 microns	Mg	Fuel	Permitted only in reports
Magnesium Carbonate	MgCO ₃	Neutralizer	
Magnesium Stearate	Not Required	Binder	
Magnesium Sulfate	MgSO ₄	Oxygen Donor	
Nitrocellulose ≤ 12.6 percent nitrogen by mass	Not Required	Fuel	1) Limited to 100 grams per tube; 2) Limited to 1000 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 (Ortho-Phthalic Acid)	C ₆ H ₄ (COOH) ₂	Whistle	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)

Permitted and Restricted Chemicals for Display Fireworks (APA 87-1B)			
Polyvinyl Alcohol (PVA)	$[\text{CH}_2\text{CH}(\text{OH})]_n$	Binder	
Polyvinyl Butyral (PVB)	$(\text{C}_8\text{H}_{14}\text{O}_2)_n$	Binder	
Polyvinyl Chloride (PVC)	$(\text{C}_2\text{H}_3\text{Cl})_n$	Color Intensifier	
Polyvinylidene chloride (Saran Resin)	$(\text{C}_2\text{H}_2\text{Cl}_2)_n$	Color Intensifier	
Potassium Benzoate	$\text{KC}_6\text{H}_5\text{CO}_3$	Whistle	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Potassium Chlorate	KClO_3	Oxygen Donor	Smoke formulations must contain a minimum of 2 percent of bicarbonates or carbonates
Potassium Dichromate (Potassium Bichromate)	$\text{K}_2\text{Cr}_2\text{O}_7$	Oxygen Donor	Not to exceed 5 percent of the formulation
Potassium Fluorosilicate	K_2SiF_6	Color Intensifier	
Potassium hexafluoroaluminate (Cryolite)	K_3AlF_6	Color Agent	
Potassium Hydrogen Phthalate (KHP)	$\text{KC}_8\text{H}_5\text{O}_4$	Whistle	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Potassium Nitrate	KNO_3	Oxygen Donor	
Potassium Oxalate	$\text{K}_2\text{C}_2\text{O}_4$	Color Agent	
Potassium Perchlorate	KClO_4	Oxygen Donor	
Potassium Silicofluoride	K_2SiF_6	Color Intensifier	
Potassium Sulfate	K_2SO_4	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	$\text{C}_6\text{H}_4(\text{OH})\text{COOH}$	Whistle	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Shellac	Not Required	Binder	
Silica	$\text{SiO}_2 \cdot n\text{H}_2\text{O}$	Moisture Absorber	
Silicon	Si	Fuel	

Permitted and Restricted Chemicals for Display Fireworks (APA 87-1B)			
Silver	Ag	Fuel	Particle size is not required
Silver Oxide	Ag ₂ O	Oxygen Donor	
Smoke Dye (Blue) Lysine	C ₆ H ₁₄ N ₂ O ₂	Smoke Dye	
Smoke Dye (Blue) Methylene Blue	C ₁₆ H ₁₈ ClN ₃ S	Smoke Dye	
Smoke Dye (Blue) Phthalocyanine (Blue)	C ₃₂ H ₁₆ CuN ₈	Smoke Dye	
Smoke Dye (Blue) Ultramarine	Na ₂ S ₂ Y 3NaAlSiO ₄	Smoke Dye	
Smoke Dye (Green) 1,4-di- p-toluidino-anthraquinone (Solvent Green 3)	C ₂₆ H ₂₀ O ₂ (NH) ₂ (CH ₃) ₂	Smoke Dye	
Smoke Dye (Green) Lysine – 2, 6-diaminohexanoic acid	C ₆ H ₁₄ N ₂ O ₂	Smoke Dye	
Smoke Dye (Orange) a-xylene-azo-b-naphthol (Orange 7)	C ₁₆ H ₁₁ N ₂ NaO ₄ S	Smoke Dye	
Smoke Dye (Orange) Oil Orange Pigment	C ₂₆ H ₂₈ N ₂ O ₂	Smoke Dye	
Smoke Dye (Red) 1-methylamino- anthraquinone (Disperse Red 9)	C ₁₅ H ₁₁ NO ₂	Smoke Dye	
Smoke Dye (Red) 1-Naphthalenol, 4-[(4- ethoxyphenyl)azo] (Solvent Red 3)	C ₁₈ H ₁₆ N ₂ O ₂	Smoke Dye	
Smoke Dye (Red) Para Red (Pigment Red1) (p-nitroaniline red)	C ₁₆ H ₁₁ N ₃ O ₃	Smoke Dye	
Smoke Dye (Violet) 1,4-diamino-2,3- dihydroanthraquinone	C ₁₄ H ₁₂ N ₂ O ₂	Smoke Dye	
Smoke Dye (Violet) Rhodamine B (Basic Violet 10)	C ₂₈ H ₃₁ ClN ₂ O ₃	Smoke Dye	
Smoke Dye (Yellow) 2-(2-quinoly)-1, 3- indandione (Chinoline Yellow) (Solvent Yellow 33)	C ₁₈ H ₁₁ O ₂ N	Smoke Dye	
Smoke Dye (Yellow) Auramine (Basic Yellow 2)	C ₁₇ H ₂₂ ClN ₃	Smoke Dye	

Permitted and Restricted Chemicals for Display Fireworks (APA 87-1B)			
Smoke Dye (Yellow) Dibenzo(a,h)pyrene-7,14- dione (Dibenzochrysenedione) (Dibenzpyrenequinone) (Golden Yellow GK) (Tyrian Yellow I-GOK) (Vat Yellow 4)	$C_{24}H_{12}O_2$	Smoke Dye	
Smoke Dye (Yellow) Methyl Yellow (Butter Yellow); Dimethyl Yellow; 4- Dimethylaminoazobenzene (N, N-Dimethyl-4- phenylazoaniline) (Solvent Yellow 2) (Oil Yellow)	$C_{14}H_{15}N_3$	Smoke Dye	
Sodium Benzoate	$NaC_6H_5CO_2$	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)	$NaHCO_3$	Neutralizer	
Sodium Carbonate	Na_2CO_3	Neutralizer	
Sodium Chlorate	$NaClO_3$	Oxygen Donor	Smoke formulations must contain a minimum of 2 percent of bicarbonates or carbonates
Sodium Fluorosilicate	Na_2SiF_6	Color Intensifier	
Sodium hexafluoroaluminate (Cryolite)	Na_3AlF_6	Color Agent	
Sodium Nitrate	$NaNO_3$	Oxygen Donor	
Sodium Oxalate	$Na_2C_2O_4$	Color Agent	
Sodium Salicylate	$C_7H_5NaO_3$	Whistle	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Sodium Silicofluoride	Na_2SiF_6	Color Intensifier	
Sodium Sulfate	Na_2SO_4	Oxygen Donor	
Starch (Amylum) (Wheat, Corn, Rice)	Not Required	Binder	
Stearic Acid (Octadecanoic Acid)	Not Required	Fuel	
Strontium Carbonate	$SrCO_3$	Color Agent	
Strontium Chloride	$SrCl_2$	Color Agent	
Strontium Nitrate	$Sr(NO_3)_2$	Oxygen Donor / Color Agent	

Permitted and Restricted Chemicals for Display Fireworks (APA 87-1B)			
Strontium Oxalate	SrC_2O_4	Color Agent	
Strontium Phthalate	$\text{Sr}(\text{C}_8\text{H}_5\text{O}_4)_2$	Whistle / Color Agent	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Strontium Sulfate	SrSO_4	Color Agent	
Sucrose	$\text{C}_{12}\text{H}_{22}\text{O}_{11}$	Fuel	
Sulfur	S	Fuel	
Terphthalic Acid (<i>Para</i> -Phthalic Acid)	$\text{C}_6\text{H}_4(\text{COOH})_2$	Whistle	Not to exceed 10 percent by weight in a lift and burst, or 30 percent in a propellant formulation (Excluding whistles)
Titanium > 149 microns	Ti	Fuel	
Wood Powder (Cellulose)	Not Required	Fuel	

APPENDIX II Applying for an Approval

1. Introduction

There are two options a manufacturer may use to obtain authorization to transport display fireworks as Fireworks, UN0335, 1.3G and quickmatch as Fuse, non-detonating instantaneous or quickmatch, UN0101, 1.3G:

1. Submit an application to U.S. DOT/PHMSA Approvals for an EX Number for devices manufactured in accordance with the applicable requirements in 49 CFR § 173.64 fireworks@dot.gov.
2. Submit an application to U.S. DOT/PHMSA Approvals for an explosive in accordance with 49 CFR § 173.56. Additional information can be found on the PHMSA website.

2. Procedures for obtaining an approval in accordance with 49 CFR § 173.64

Complete a fireworks approval application	See Sample Application in Part 5.
Applications must contain seven key elements	<ol style="list-style-type: none"> a. Identification of the applicant; b. Selection of the device category; c. Description of the device, dimensions and composition limits; d. Chemical Formulation Sheet (list of all effects and chemicals used to produce the effects); e. Diagram of device (with labels identifying the major components of the device); f. Thermal Stability Test results (must be certified with test date); and g. Signed Certification with compliance with the APA Standard 87-1B.
Application cover sheet should contain the following elements	<ol style="list-style-type: none"> a. Identification of the applicant; and b. Summary of request
U.S. Designated Agent Letter	All foreign applicants must have and submit a copy of their U.S. Designated Agent Letter with each application.
Submit an application package to DOT/PHMSA	<p>The package should include a cover letter, an application (includes description of the device, diagram(s) and chemical formulation sheet(s)) and U.S. Agent letter.</p> <p>The application package can be submitted three ways:</p> <ol style="list-style-type: none"> 1. Mail: U.S. Department of Transportation Office of Hazardous Materials Transportation Approvals and Permits PHH-32 1200 New Jersey Avenue, SE East Building, 2nd Floor, Washington, DC 20590-0001 2. Email: fireworks@dot.gov 3. Online: PHMSA online application PHMSA.DOT.GOV
Contact	APA:

Information	<p>Ms. Julie L. Heckman American Pyrotechnics Association 301-907-8181 or jheckman@americanpyro.com</p> <p>PHMSA: Chief of Energetic Materials U.S. Department of Transportation 202-366-4512 or fireworks@dot.gov</p>
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3. Example of EX Application Cover Letter

<p style="text-align: center;">Your Corporate Letterhead</p> <p>(Date of Letter)</p> <p>U.S. Department of Transportation Office of Hazardous Materials Transportation Approvals and Permits PHH-32 1200 New Jersey Avenue, SE East Building, 2nd Floor, Washington, DC 20590-0001</p> <p>Chief of Energetic Materials:</p> <p>We wish to request an approval for the device described in the enclosed firework application, submitted under the provisions of 49 CFR § 173.64.</p> <p>Classification is requested for this device(s) as Fireworks UN0335, 1.3G</p> <p>The approval letter, or any questions regarding this application, should be sent to the address listed on the enclosed application or you may send questions via email to: _____.</p> <p>Thank you for your attention to our request.</p> <p>Sincerely,</p> <p>Signature, Title</p>
--

4. Application Sheet Criteria - the following table provides the criteria and information required to complete an EX application. The application must be in English.

Criteria	Description
Item Name	a. Item Name, item name of the series (if applicable) and/or an Item Number/Code should be provided to identify the product. b. The identifier (i.e.: Item Name or Item Code) must be constant throughout the application.
Name and Address of Manufacturer Applicant	a. Must be the manufacturer of the device. b. Name of a responsible person (and their job title) at the applicant company c. Provide telephone number, fax number and email address.
Designated US Agent	a. Include a designated U.S. Agent of Service in accordance with 49 CFR §105.40. b. Provide the name of designated agent, telephone number, fax number and email address.
Manufacturer's information	a. Provide company name b. Physical address of the facility c. Name and title of applicant d. Phone number e. Email address.
DOT Class	DOT classification on application clearly identified
Device Category	a. The Category of the device must be identified in the application. b. If not listed in APA 87-1B, the application can be submitted in accordance with 49 CFR §173.56.
Description of Device	A clear definition of the device, explaining the effects produced must be included.
Packaging Requirements	Where specific packaging requirements are critical to the classification of the product, the applicant must comply with the packaging requirements.
Thermal Stability Test	a. Tester name and title b. Testing location c. Tested item: finished product or component chemical mixtures d. Test date and results.
Signed and Dated	Application must be signed and dated by the person identified in Section ii above.

5. Sample EX Application:

1. Item Name [Product Code]: 10" Red, Yellow, Blue & Crackle w/ Report [10RdYIBICrReport]
2. This is a series application (Y/N): N
3. Manufacturer: (Manufacturer located outside the U.S., must complete item # 4)

Name/Title: Joseph Smith, Manager
Company Name: Smith Liling Fireworks Mfg. Co.
Address: Huanglai Town, Liuyang City, Hunan, China 410317
Phone: 86-731-8378-XXXX
Fax: 86-731-8379-XXXX
Email: smithfireworks@smithchina.com

Physical Manufacturing Location (if different from address above):

Company Name: Smith Liling Fireworks Mfg. Co. (company name must be the same as above)
Address: Huanglai Town, Liuyang City, Hunan, China 410317
Phone: 86-731-8378-XXXX
Fax: 86-731-8379-XXXX
Email: smithfireworks@smithchina.com

4. Designated U.S. Agent of Service (attached)

Name/Title: Margie Smith/Vice-President
Company Name: Smith Fireworks, Inc.
Address: 236 Fireworks Lane, Sunset, KS 63456
Phone: (xxx) xxx-xxxx
Fax: (xxx) xxx-xxxx
Email: msmith@smithfireworks.com

5. DOT UN Number, Proper Shipping Name, Hazard Division:

- UN0335, Fireworks, 1.3G
 UN0101, Fuse, non-detonating *instantaneous or quickmatch*, 1.3G

6. Category of Device: (under APA 87-1B):

3.2.1 Ground Devices, Individual

- 3.2.1.1 - Firecracker
- 3.2.1.2 - Flasher / Strobe
- 3.2.1.3 - Fountain (Cone, Cylindrical, Gerbs)
- 3.2.1.4 - Ground Report
- 3.2.1.5 - Illuminating Torch / Lance
- 3.2.1.6 - Smoke
- 3.2.1.7 - Waterfall
- 3.2.1.8 - Wheel

6. Category of Device: (under APA 87-1B) continued:

3.2.2 Aerial Devices, Individual

- 3.2.2.1 - Aerial Shell and Mine Preloaded (Color with or without reports)
- 3.2.2.2 - Aerial Shell Preloaded (Report Only)
- 3.2.2.3 - Aerial Shell (Color with or without reports)
- 3.2.2.4 - Aerial Shell (Report Only)
- 3.2.2.5 - Aerial Shell of Shells
- 3.2.2.6 - Aerial Spinner
- 3.2.2.7 - Girandola
- 3.2.2.8 - Mine (Shell, Tube, Bag)
- 3.2.2.9 - Mine Preloaded
- 3.2.2.10 - Missile - Fin Stabilized
- 3.2.2.11 - Missile - Spin Stabilized
- 3.2.2.12 - Rocket
- 3.2.2.13 - Roman Candle

3.2.3 Cakes

- 3.2.3.1 - Cake
- 3.2.3.1 - Combination

3.2.4 Miscellaneous

- 3.3.4.1 - Quickmatch
- 3.3.4.2 - Fuse (Delay, Timed)

****NOTE:** When selecting Cakes or Combination Devices, check the appropriate combined category/categories of device to describe the finished/complete cake or combination device.

- 7. Diagram of the Device and Diagram Component Table: (attached)
- 8. Chemical Composition: (attached)
- 9. Description of Device (weights are considered maximum):

Number of tubes containing composition:	<u>N/A</u>
Total composition weight per tube(s) (grams):	<u>N/A</u>
Total lift charge in device (grams):	<u>450</u>
Total burst charge in device (grams):	<u>1235</u>
Total weight of effect(s) in device (grams):	<u>3652</u>
Does item have a report? (Yes/No)	<u>YES</u>
Weight of individual report (grams):	<u>71</u>
Does the device have multiple reports: (Yes/No)	<u>NO</u>
Weight of each multiple report (grams):	<u>N/A</u>
Number of multiple reports in the device:	<u>N/A</u>
Total weight of report in device (grams):	<u>71</u>
Total composition in device (grams):	<u>5337</u>

10. Thermal stability test results:

A thermal stability test of this device was completed on

<u>7/02/16</u>	<u>James Jones</u>	<u>Supervisor</u>	<u>Smith Fireworks Mfg. Co.</u>
Date	Name of Tester	Job Title	Company

The test was performed on: finished item component chemical mixtures, as present together in the device. The device did not ignite, explode, or undergo any significant decomposition during heating at 75° C (167° F) for 48 hours.

11. Certification:

This is to certify that the device for which approval is requested conforms to APA Standard 87-1B and that the descriptions and technical information contained in this application are complete and accurate. Only an authorized representative from the company can certify the firework application.

<u>8/1/16</u>	<u>()</u>	<u>Joseph Smith</u>
Date	Signature of applicant named above	Typed name of applicant, in English

FIREWORKS APPROVAL APPLICATION

Chemical Composition Sheet

1. Item Name [Product Code]: 10" Red, Yellow, Blue & Crackle w/ Report [10RdYIBICrReport]

Total composition in the device (grams): 5429

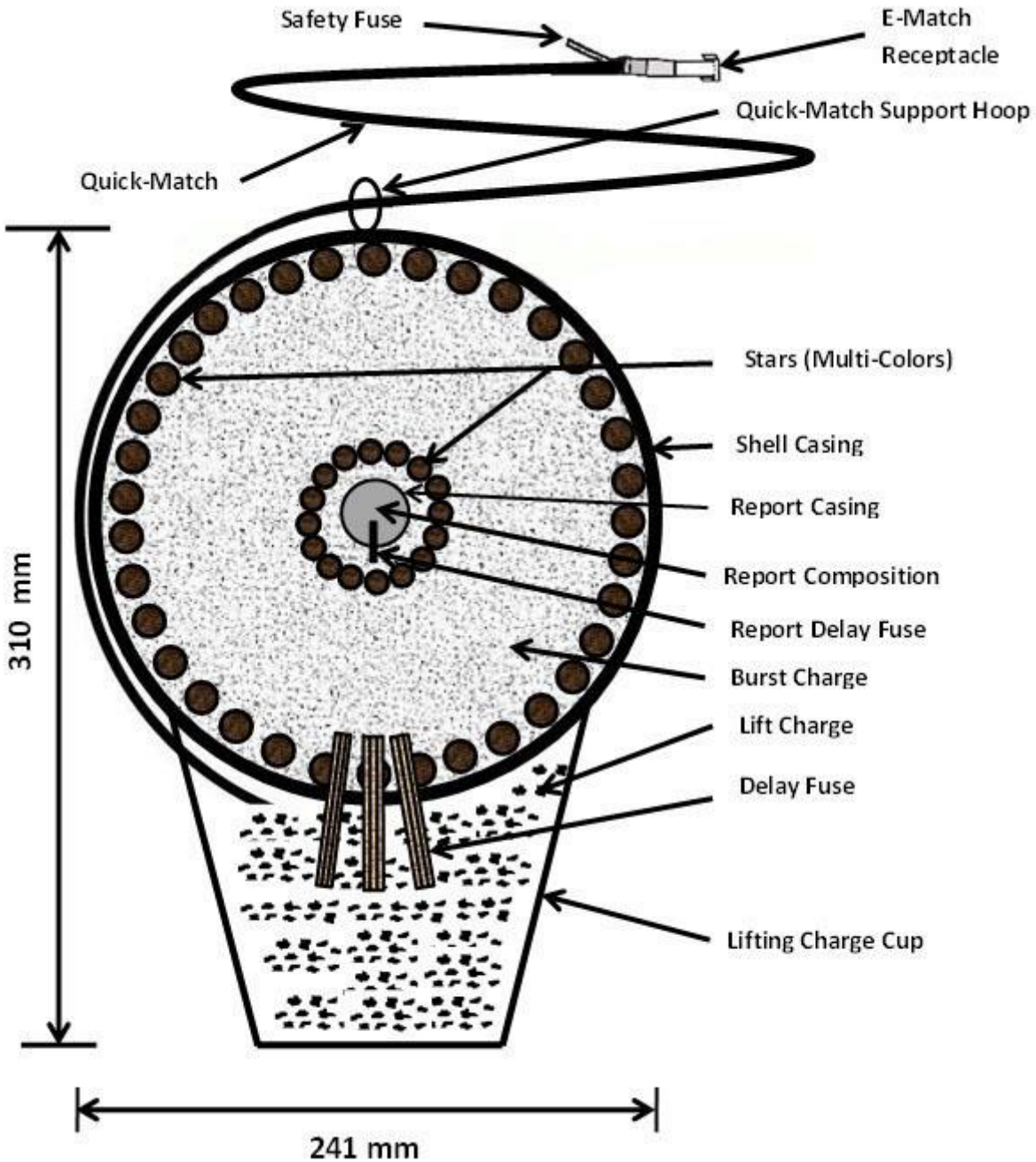
Name and Weight for each composition in the device (grams)

1. Red Stars 1000 2. Yellow Stars 1000 3. Blue Stars 1000 4. Crackling Stars 581
 5. Report 71 6. Burst Charge 1235 7. Lift Charge 450

Chemicals	Formulas	1	2	3	4	5	6	7
Potassium Nitrate	KNO ₃							74
Potassium Perchlorate	KClO ₄	38	45	50		65	65	
Barium Nitrate	Ba(NO ₃) ₂		15					
Strontium Carbonate	SrCO ₃	24						
Sulfur	S			10			10	11
Charcoal	C						15	15
Chlorinated Rubber		8		6				
Copper Oxide	CuO			23	68			
Cryolite	Na ₃ AlF ₆		10					
Rice Starch	(C ₆ H ₁₀ O ₅) _n		5	5				
Polyvinyl chloride	(C ₂ H ₃ Cl) _n				2			
Phenolic Resin	C ₄₈ H ₄₂ O ₇	10	10	6				
Restricted Chemicals								
Aluminum > 53 Microns	Al							
Magnalium > 53 Microns	Al-Mg	20	15		30		10	
Magnesium ≤ 53 Microns	Mg					35		
Total Weight Percent		100	100	100	100	100	100	100

Diagram of Device

Item Name [Product Code]: 10" Red, Yellow, Blue & Crackle w/ Report [10RdYIBICrReport]



Item Name [Product Code]: 10" Red, Yellow, Blue & Crackle w/ Report [10RdYIBICrReport]

Diagram Component Table

No.	Description	Dimension(s) (mm)	Inner Diameter (mm)	Outer Diameter (mm)	Total Composition Weight (g)
1	Safety Fuse	25		3	
2	Quick-Match	300		5	
3	E-Match Receptacle	30			
4	Quick-Match Support Hoop	16		16	
5	Stars				3652
6	Report Casing	28			
7	Report Delay Fuse	10		3	
8	Report Composition				71
9	Burst Charge				1235
10	Lift Charge				450
11	Delay Fuse	80		6	
12	Lift Charge Cup	126		93	
13	Shell Casing	236			
	TOTAL COMPOSITION				5337

For a blank application, see the PHMSA website.

APPENDIX III: Designation of a U.S. Agent of Service

Instructions for Designating a U.S. Agent of Service as required by 49 CFR § 105.40. If the manufacturer is a non-resident of the United States, the manufacturer is required to designate a permanent resident (individual, firm, or a domestic corporation) of the United States to act as their U.S. Designated Agent and receive documents on their behalf. The non-resident manufacturer may have more than one U.S. Designated Agent and a copy of the designation must be submitted with each application.

1 Designated Agent(s):

- May be an individual, firm, or a domestic corporation,
- May represent any number of principals,
- May not reassign responsibilities under a designation to another person.

2 A designation must:

- Be written, signed and dated,
- Identify the section in the Hazardous Materials Regulations that requires you to file a designation,
- Description of the activity the designation will provide,
- Certify that the designation is in the correct legal form required to make it legal and binding under the laws, corporate bylaws, and other requirements that apply to designations at the time and place you are making the designation,
- Provide the applicant's full legal name, the principal name of the business, and mailing address. Although not required, the inclusion of electronic contact information (i.e., email, fax and phone number) allows for a more expedited processing of the approvals,
- Statement the designation will remain in effect until you withdraw or replace it,
- Provide the full legal name and mailing address of the U.S. Designated Agent. Although not required the inclusion of electronic contact information (i.e., email, fax and phone number) allows for a more expedited processing of the approvals.
- A declaration of acceptance signed by both the non-resident company and the designated agent, and
- Any additional information if required.

3 Additional Information;

- Refer to §§ 105.40 and 107.705 for any additional information or requirements.

4 Sample Letter:

Suggested Sample Letter – Designation of U.S. Agent of Service in accordance with 49 CFR § 105.40.

Submit on Company Letterhead

Note: The “Letter of Designation” needs to be signed and dated by both parties

(date of letter)

To:
U.S. Department of Transportation
Pipeline and Hazardous Materials Safety
Administration, Approvals and Permits (PHH-30)
1200 New Jersey Avenue, SE
East Building, 2nd Floor
Washington, DC 20590-0001

From:
ABC China, Inc.
2222 Beijing Road
Beihai, Guangxi, China 536000
E-mail address
Phone number
Fax number

Director, Approvals and Permits

ABC China, Inc. is filing this designation of agent for service, in accordance with 49 CFR §105.40. The US based agent of service listed below will represent us on matters concerning firework applications submitted to U.S. Department of Transportation.

Joe Round Manager
Global Drive
2000 N. Pacific Blvd., Suite 1
Portland, OR 12345
EMAIL: xyz@globaldrive.com
TEL: (212) xxx-xxxx
FAX: (212) xxx-xxxx

This designation is legal and binding in accordance with 49 CFR §105.40(b)(2) and will remain in effect until it is withdrawn or replaced by us. By the dated signatures below ABC China, Inc. accepts this designation of agent and Global Drive accepts the agent's responsibilities.

PRINCIPAL

Name/Title: John Smith / Manager
Company: ABC China, Inc.

Signed: _____
Date: _____

AGENT

Name/Title: Joe Round/ Manager
Company: Global Drive

Signed: _____
Date: _____

APPENDIX IV: Process to Amend the APA Standard 87-1B

1 Scope - The purpose of this Appendix is to illustrate the procedures to be utilized in correcting any errors in the material presented in this standard, and to address any new regulation changes that may appear before the next scheduled review cycle.

2 Frequency of new editions of APA Standard 87-1B - The document shall be reviewed during the end of the third year following publication of a new edition of the standard. The APA Standards Committee shall be responsible for initiating each review of the document, with the goal of finalizing the next edition of the standard within five years from date of incorporation of the previous edition into Title 49 CFR.

3 Procedure for Revising the Standard

- a. A notice shall appear in an APA Bulletin advising the Association membership that a review of the document is about to commence, and inviting comments and suggestions from interested parties.
- b. Fireworks trade publications shall be notified that a review of APA 87-1B is underway, and that comments regarding possible changes to the standard should be sent by regular mail, express delivery, or by email to the APA office.
- c. The APA office will formally notify Federal agencies that are involved in the regulation of fireworks that revisions to the standard are underway, and that comments from the agencies will be considered by the APA Standards Committee for inclusion in the new edition. These agencies will include the U.S. Consumer Product Safety Commission; the U.S. Department of Justice's Bureau of Alcohol, Tobacco, Firearms & Explosives; U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration; the U.S. Department of Labor's Occupational Safety & Health Administration; and the U.S. Environmental Protection Agency.
- d. A minimum of a 30-day notice shall be provided to all interested parties that the revision is underway and comments on the new edition will be accepted until a specified date.
- e. Following this comment period, the APA Standards Committee shall meet to review all comments that have been received. The timing of the meeting shall coincide with one of the regularly scheduled meetings of the APA.
- f. The Committee shall meet and discuss the comments that have been received regarding changes to the standard. The Committee shall decide by majority vote to accept, reject, or modify the recommended changes. If necessary, the Committee shall develop additional changes to the standard based on input from Committee members.
- g. The approved changes shall be incorporated into a revised version of the standard, and a copy of the draft document shall be forwarded to the APA Board of Directors for their review and approval. Any changes requested by the Board shall become part of the final draft version.
- h. The final draft version of the new edition of the standard shall then be formally submitted to the Pipeline and Hazardous Materials Safety Administration (PHMSA) of the U.S. Department of Transportation for their review and comments. Any comments from PHMSA shall then be circulated among the members of the APA Standards Committee, and the comments will either be accepted or held for further study and discussion with PHMSA.

- i. Once both parties (APA and PHMSA) are satisfied with the content of the document, the standard shall be returned to the APA Board of Directors for formal adoption, and then officially submitted to PHMSA for incorporation by reference into 49 CFR § 171.7(f)(1).
- j. The date of incorporation of the new edition of the standard into 49 CFR § 171.7 shall serve as the effective date for the new edition of the standard.