

ABOUT THE STANDARD

The American Fireworks Standards Laboratory (AFSL) is an independent, non-profit corporation established in 1989 by members of the fireworks industry to reduce the potential risks of injury associated with fireworks. At the request of U.S. Display Fireworks importers, AFSL is implementing a Product Evaluation and Certification Program for Professional Display Fireworks. The overall objective of the program is to ensure that AFSL certified Display Fireworks devices may be transported, stored and used safely.

In furtherance of this objective, AFSL established a Display Fireworks Standards Committee to develop and maintain voluntary safety and quality Standards for Professional Display Fireworks. The Standards Committee is comprised of representatives from the fireworks industry, federal and state regulatory authorities, and technical experts.

Requirements developed by the Committee incorporate manufacturing, packaging and shipping requirements established by the Department of Transportation via APA Standard 87-1, the Bureau of Alcohol, Tobacco, Firearms and explosives (ATF), and the National Fire Protection Association (NFPA). Also, the Committee developed provisions above and beyond the federal regulations to further improve safety and provide good manufacturing practices for producing consistent, high quality products. Any product that complies with the AFSL Standards also meets all federal requirements.

The Standards Committee continuously monitors the Standards to assure that any modifications to federal regulations are incorporated. In addition, as product designs change and technology improves, the Committee reviews and revises the Standards as necessary to assure that innovations in the manufacturing process do not compromise the safety of the product.

The Display Fireworks Program includes a factory audit program, product evaluations conducted at participating manufacturers, and a container loading supervision program for products manufactured in China to determine whether they are being produced in conformance with the AFSL Standards. The requirements for Display Fireworks that are described below enable manufactures to produce Display Fireworks devices in accordance with applicable United States mandatory requirements and AFSL voluntary requirements for composition, construction, Labeling and transportation.

Products that are determined to comply with AFSL requirements are certified through the application of the AFSL security sticker to individual shipping cartons in a each Shipping Lot. In addition, each carton within a certified Shipping Lot is stamped with a Lot Identification number to allow for traceability of certified Lots.

Participation in the program by manufacturers as well as U.S. importers is voluntary. U.S. importer participants, through their agents (Shippers) in China request that their fireworks shipments be certified in China by AFSL, using an independent, internationally renowned testing laboratory retained for that purpose. A random sample taken from each Shipping Lot is evaluated to determine if they comply with the applicable provisions of the applicable Standard.

Because the testing program does not evaluate each item within the Shipping Lot, the application of the AFSL mark to the shipping carton is not a guarantee that each item within the shipment complies with the Standards. However, the mark is an assurance that a randomly selected sample from the Shipping Lot has been tested and met all requirements.

Any questions regarding the Display Standards should be addressed to the AFSL office at 7316 Wisconsin Avenue, Suite 214, Bethesda, MD 20814; telephone: 301-907-9115; facsimile: 301-907-9117; e-mail: afslhq@afsl.org; Website: www.afsl.org.

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Chapter 1 PRODUCTS COVERED, DEFINITIONS

1-1 Scope

1-1.1 This Standard shall apply to the following:

1-1.1.1 Manufacturing, labeling, packaging and shipping of finished Display Fireworks intended for professional use and commercial Displays.

1-1.1.2 This Standard shall not apply to products intended for consumer use.

1-1.1.3 The requirements of this Standard apply to the following Categories and classifications of Display Fireworks:

- a. UN0333 Fireworks, 1.1G, PGII
UN0335, Fireworks, 1.3G PGII
Shells
Mines
Comets
Roman candles
Multi Shot Aerial Devices (Cakes, Plates)
Fountains
Strobe (Pots)
Waterfalls
- b. UN0431, Articles Pyrotechnic for Technical Purposes, 1.4G, PGII
Shells
Mines
Comets
Roman Candles
Multi Shot Aerial Devices (Cakes, Plates)
Fountains
Strobe (Pots)
Waterfalls
Igniters
Lances

- c. UN0432, Articles Pyrotechnic for Technical Purposes, 1.4S, PGII
Shells
Mines
Comets
Roman Candles
Multi Shot Aerial Devices (Cakes, Plates)
Fountains
Strobe (Pots)
Waterfalls
Igniters
Lances

- d. UN0454, Igniters, 1.4S, PGII
Igniters

- e. UN0325, Igniters, 1.4G, PGII
Igniters

- f. UN0101, Fuse-non Detonating (instantaneous or Quickmatch), 1.3G, PGII
Quickmatch
Black Match Fuse

1-2 Definitions

1-2.1 **AFSL:** American Fireworks Standards Laboratory.

1-2.2 **APA:** American Pyrotechnic Association.

1-2.3 **Aerial Shell:** A cartridge containing pyrotechnic composition, a burst charge, and a time fuse. The Aerial Shell is generally propelled into the air from a Mortar by an attached black powder Lift Charge. The Lift Charge is ignited by a lead fuse or Electric Match/Igniter. Comets and Mines are not Aerial Shells.

1-2.4 **Articles Pyrotechnic:** Pyrotechnic devices for professional use that are similar to Consumer Fireworks in chemical composition and construction but not intended for consumer use. Such articles meet the weight limits for Consumer Fireworks but not labeled as such and classified by U.S. Department of Transportation Regulations in 49 CFR 172.101 as UN 0431 or UN 0432.

1-2.5 **ATF:** Bureau of Alcohol, Tobacco and Firearms and Explosives.

1-2.6 **Black Match Fuse:** An uncovered fuse made from thread impregnated with black powder and used for igniting pyrotechnic devices.

1-2.7 **Blocking and Bracing:** The method of making loaded cargo seaworthy within shipping containers where dunnage (usually lumber) is used to secure, immobilize and protect cargo by preventing its free movement or shifting during transit.

1-2.8 **Bulk Salute:** Salute components prior to final assembly into Aerial Shells, and finished Salute Shells held separately prior to being packed with other types of Display Fireworks.

1-2.9 **Burst Charge:** Chemical composition used to break open a pyrotechnic device after it has been propelled through the air, igniting and expelling a secondary effect (i.e.: ignition of stars).

1-2.10 **Category:** The type of devices specified in Section 1-1.1.3, and does not refer to the size or the effect of the device.

1-2.11 **Chain Fusing:** The manner of fusing used to fire a series of individual devices from a single ignition. Usually a single, fast burning fuse (quick match) is run to a series of items, where it is attached to each item or to

each item's fusing. Finales and barrages are typically chain fused.

1-2.12 **Chemical Composition:** All pyrotechnic and explosive mixtures contained in a fireworks device. Inert materials or organic matter such as rice hulls used for density control are not considered to be chemical composition.

1-2.13 **Comet:** A single pellet of pyrotechnic composition that is ignited and simultaneously propelled into the air from a Mortar or tube; a Comet is self-consuming as it rises into the air and can be designed to split apart.

1-2.14 **Consumer Fireworks:** Small fireworks devices containing restricted amounts of pyrotechnic composition, designed primarily to produce visible or audible effects by combustion, that comply with the construction, Chemical Composition, and Labeling regulations for the U.S. Consumer Product Safety Commission (CPSC), as set forth in CPSC 16 CFR 1500 and 1507, 49 CFR 172, APA Standards 87-1, and AFSL Standards for Consumer Fireworks.

1-2.15 **Display Fireworks:** (Division 1.1G {UN0333} Fireworks, Division 1.3G {UN0335} Fireworks, Division 1.4G {UN0431} Articles Pyrotechnic for Technical Purposes, Division 1.4S {UN0454} Igniters, Division 1.4G {UN0325} Igniters, Division 1.4S {UN0432} Articles Pyrotechnic for Technical Purposes, Division 1.3G {UN0101} Fuse-non detonating (instantaneous or Quickmatch). Fireworks devices or components in a finished state, designed primarily to produce visible or audible effects by combustion, deflagration, or detonation. This term includes, but is not limited to Salutes containing more than 2 grains (130mg) of explosive materials, Aerial Shells containing more than 40 grams of pyrotechnic compositions exclusive of Lift Charge, and other display pieces which exceed the limits of explosive

materials for classification as Consumer Fireworks.

1-2.16 **DOT:** U.S. Department of Transportation

1-2.17 **Electric Match (Igniter):** A device used for the electrical ignition of pyrotechnic products that contain a small amount of pyrotechnic material that ignites when a specified electric current flows through leads.

1-2.18 **Explosive Number (EX#):** The number assigned by DOT to each manufacturer for each explosive device it manufactures and ships.

1-2.19 **Finale:** A rapidly fired sequence (barrage) of aerial fireworks typically fired at the end of a display.

1-2.20 **Finale Chains:** A group of Aerial Shells fused together into a chain for fast consecutive firing.

1-2.21 **Finished Display Fireworks:** A manufactured article or device that is ready for packaging and shipping.

1-2.22 **Fountain/Gerb:** A device consisting of a heavy tube solidly filled with pyrotechnic composition that when ignited, projects a jet or broad spray of fire and sparks.

1-2.23 **Girandola:** A horizontal Wheel with angled drivers that rotates quickly and rises into the air. Once it reaches its peak, it usually produces a visual and/or audible effect.

1-2.24 **Labeling:** Includes any identification, cautions, and other information required by this Standard or by any federal government agency including written, printed, or graphic information or design placed upon a fireworks device and/or upon the immediate and/or shipping package of any such device(s).

1-2.25 **Leader/Fuse:** A short piece of Quickmatch with a Safety Cap used as the “leader fuse” or ignition fuse on Display Fireworks Aerial Shell.

1-2.26 **Lift Charge: Pyrotechnic** composition used to propel a component of a pyrotechnic device out of a tube or Mortar. Granulated black power positioned beneath a Shell, which when ignited propels the Shell into the air. The Lift Charge is normally enclosed in paper (or in some Shells, in plastic) and is ignited by the Shell Leader. The Lift Charge is sometimes referred to simply as “lift”.

1-2.27 **Lowering Rope:** A length cord or cable attached to the orienting loop on the Display Shell which is used to lower the Shell into the Mortar.

1-2.28 **Marking:** The Labeling of the proper shipping name, identification number (UN number), instructions, cautions, weight, or specification mark or combination thereof to a hazardous material item or to a package of hazardous material. Marking also includes any required specification marks on an item or a shipping carton and/or container.

1-2.29 **Mine:** A device containing multiple pyrotechnic effects that are simultaneously ignited and dispersed into the air from a Mortar or a tube.

1-2.30 **Mortar:** A tube, closed at one end, from which Aerial Shells, Mines, and Comet devices are fired into the air.

1-2.31 **Multi Shot Aerial Device (Cake, Plate):** A chain-fused fireworks device that propels a series of Aerial Shell, Comet, or Mine effects into the air from collectively attached tubes.

1-2.32 **NFPA:** National Fire Protection Association

1-2.33 **Placards:** A warning symbol of a square-on-point configuration mounted on each side and end of a truck, rail car or freight container which informs the public and emergency personnel of the hazardous nature of the cargo, as specified in Title 49 CFR - 173.56. This symbol is also required on shipping cartons as specified in Title 49 CFR – 172.411 and 172.406.

1-2.34 **Orienting Loop:** A loop at the top of the Shell which is intended to assure the correct orientation of the Shell when it is lowered into the Mortar.

1-2.35 **Quickmatch Fuse** (Instantaneous fuse): Blackmatch Fuse that is encased in a loose fitting paper or plastic sheath to make it burn extremely rapidly.

1-2.36 **Raw Material:** A material or substance used in the primary production or manufacturing of Display Fireworks.

1-2.37 **Roman Candle:** A chain-fused fireworks that propels a series of Aerial Shells, Comets or Mine effects into the air from a single tube.

1-2.38 **Safety Cap:** A tube, closed at one end, which is placed over the end of the fuse (until the intended ignition) to protect it from damage and accidental ignition.

1-2.39 **Salute:** Fireworks designed to produce an explosive sound as their primary effect.

1-2.39.1 **Aerial Salute:** A Salute that functions as an Aerial Shell.

1-2.39.2 **Ground Salute:** A Salute that functions from a stationary or secured position.

1-2.40 **Set Piece:** A ground display such as Lancework, Wheels, Fountains and/or other devices which function while on poles, frames, or other structures.

1-2.40.1 **Lance:** A thin cardboard tube packed with color-producing pyrotechnic composition used to construct ground display pieces.

1-2.40.2 **Lancework:** A frame on which numerous Lance are mounted, connected by Quickmatch or sticky match. These are used to produce lighted designs, emblems, slogans, etc.

1-2.41 **Shipping Lot:** A group of Display Fireworks devices that are finished and packaged for shipping, having the same Category and size. For Aerial Shells, the Shipping Lot must be further defined by shape (spherical or cylindrical). For Multi-shot Aerial Devices (Cakes/Plates), the Shipping Lot must be further defined by the number of tubes and shape (fan or vertical) per device.

1-2.42 **Theatrical Pyrotechnics:** Pyrotechnic products for professional use, similar to Consumer Fireworks in Chemical Composition, pyrotechnic limits and construction but typically ignited with Electric Match and not intended for consumer use.

1-2.43 **Thermal Stability:** A test of explosive materials to ensure they do not ignite spontaneously or undergo marked decomposition when subjected to a temperature of 75°C for forty-eight (48) consecutive hours.

1-2.44 **Water Falls:** A series of long duration Gerbs that are hung upside down and fired simultaneously to create a cascade of sparks. These are commonly hung from a wire suspended between two poles.

1-2.45 **Wheel:** A pyrotechnic device that rotates on a central axis consisting of multiple Gerbs or rockets attached to a framework.

1-2.46 **Work-in-progress Product:** A Display Fireworks or Component that has entered the production process but is not yet a finished product. Work in progress therefore

refers to all materials and partly finished products that are at various stages of the production process.

Chapter 2 REQUIREMENTS FOR AFSL REGISTERED FACTORIES

NOTE: During the start-up phase of the program, factory audits will be conducted on an annual basis. After an evaluation of the results of the audits and a review of the compliance rates for the participating factories, AFSL will determine whether annual audits will continue to be necessary or whether the period of time between audits may be extended.

2-1 Factory Participation

Any factory/manufacturer based in China that manufactures and ships to U.S participating Importers Display Fireworks may participate in the program by becoming an AFSL-registered factory. Registered Factories must successfully undergo an annual factory audit described in section 2-2 below in order to receive and maintain their listing as an AFSL-registered factory. **See Appendix A for the Display Fireworks Factory Audit Checklist.**

2-1.1 Factories must maintain all Business License, Insurance, Export License from CIQ, Manufacturers permission documentation and other Documents related to production for a period of 5 years after expiration.

2-1.2 Factory Owners or Senior Management Representative must participate in the Annual AFSL Training Program for Display Fireworks.

2-1.3 In order to participate in the program, factories producing fireworks for the U.S. market must become an AFSL-Registered Factory.

2-2 Operational Requirements for Registered Factories

2-2.1 Factory must develop and maintain quality assurance records.

2-2.1.1 Factory must develop and maintain a Quality Policy.

2-2.1.2 The policy must be adequately communicated to all employees.

2-2.1.3 Factory must have a Quality Manual.

2-2.1.4 Factory must have adequate Quality Assurance (QA) Personnel.

2-2.1.5 Factory must have the training of QA Personnel documented and adequate.

2-2.1.6 All documents must be adequately controlled.

2-2.1.7 Factory must have a master list of documents.

2-2.2 Factory must have a supplied materials quality assurance program.

2-2.2.1 Evaluation procedures must be established for raw material suppliers with adequate documentation.

2-2.2.2 Factory must maintain a list of approved pyrotechnic raw material suppliers that are only used in their procurement practices.

2-2.2.3 Factory must have the most current list of permissible chemicals (see the Appendix B for more detail).

2-2.2.4 Incoming raw materials must be evaluated and documented by written documentation.

2-2.2.5 Unsafe, defective, and/or non-conforming raw materials, chemical compositions, components, and work-in-progress products must be identified and isolated from other raw materials, chemical compositions,

components, and work-in-progress products in the factory.

2-2.2.6 Factory must have a process for stopping production if raw materials do not conform to prescribed specifications.

2-2.2.7 Raw material(s) can be tracked through the production process and identified with specific finished product Lots.

2-2.2.8 Incoming chemical raw materials must be stored off the floors.

2-2.2.9 Factory must use an appropriate physical inventory management method.

2-2.3 Factory must develop and maintain a written process control procedure.

2-2.3.1 Setup and Operating parameters for chemical management must be documented and monitored during the production run.

2-2.3.2 Mixing/combining machines must be thoroughly cleaned before use and safely stored.

2-2.3.3 Training of production workers/key operators must be documented and adequate.

2-2.3.4 Operators must be trained to identify defective material and communicate to QA/QC Personnel.

2-2.3.5 Unsafe, defective, and/or non-conforming raw materials, chemical compositions, components, and work in progress products must be identified and isolated from other raw materials, chemical compositions, components, and work in progress products in the factory.

2-2.3.6 Work-in-progress and final products must be adequately stored or contained to prevent contamination.

2-2.3.7 Finished product Lots must be coded to identify product dates and other Lot designations.

2-2.3.8 Factory must have documented container loading procedures.

2-2.3.9 Employees must be trained on the container loading procedures and documentation. They can demonstrate compliance to procedures.

2-2.4 Factory must have certification documents.

2-2.4.1 Factory must have required Business License, Export License from CIQ, Manufacturer permission documentation and other Documents related to type of production.

2-2.4.2 Carton Manufacturer Certification specified in the AFSL Standards for Display Fireworks must be followed for production being manufactured for the U.S. Market.

2-2.4.3 The Drop Test requirement specified in the AFSL Standards for Display Fireworks must be followed for production being manufactured for the U.S. Market.

2-2.4.4 The Thermal Stability Testing specified in the AFSL Standards for Display Fireworks must be followed for production being manufactured for the U.S. Market.

2-2.4.5 The Factory Owner or Senior Management Representative must participate in the Annual AFSL Training Program.

2-2.5 Factory must be committed to social responsibility.

2-2.5.1 Factory must not employ underage workers.

2-2.5.2 Factory must not employ Forced Labor or engage in Human trafficking practices.

Chapter 3 DISPLAY FIREWORKS PRODUCT SPECIFICATIONS

3-1 General Requirements

3-1.1 Prior to being offered for transportation in the United States, all Display Fireworks must be classified and approved by DOT in accordance with the procedures specified in 49 CFR and APA 87-1.

3-1.2 Display Fireworks subject to this Standard must comply with all AFSL Standards specified herein; requirements of APA 87-1, UN recommendations; requirements of ATF; requirements of DOT; and requirements of NFPA.

3-1.3 All fireworks subject to this Standard must not have Electric Matches or Igniters attached to them or packaged with them in the same packaging carton.

3-2 Shipping Carton Requirements

3-2.1 General Requirements for Shipping Cartons

3-2.1.1 Display Fireworks packaged in shipping cartons must match Markings on the outside of cartons. The required Markings must be in English language, using Roman letters and Arabic numerals.

3-2.1.2 Display Fireworks devices and the cartons in which they are packaged must not have any mold, mildew or water damage present during packaging, transportation, handling and normal operation.

3-2.1.3 Shipping cartons for products subject to this Standard must not be so difficult to open that the contents might be damaged as a result of opening of the carton.

3-2.1.4 Shipping cartons must not have any visible damage that would affect the integrity of the package.

3-2.1.5 Fireworks devices contained in the shipping cartons must be securely packaged for shipping in such a way that they are protected from moisture or physical damage during transportation and so that there is no risk of any of the contents escaping from the shipping carton.

3-2.1.6 The gross weight of Shipping Cartons shall not exceed the authorized weight identified by the UN container marking required in Section 3-2.2.6.

3-2.2 Shipping Carton Markings

3-2.2.1 EX numbers for fireworks contained in shipping cartons must be marked on the shipping carton or on shipping documents.

3-2.2.2 Shipping cartons containing five (5) or more different fireworks devices must be marked with at least five (5) of the EX numbers covering items in the carton, or the EX numbers must appear on the shipping paper.

3-2.2.3 Each shipping carton of Display Fireworks in a finished production Lot must bear a code which identifies the production date for the product.

3-2.2.4 Each shipping carton must be marked with the correct UN number and shipping name. The identification number marking preceded by "UN" must be marked in characters at least 12 mm (0.47 inches) high.

3-2.2.5 Each carton of Display Fireworks must have an orange (For Orange-- Use PANTONE® 151 U), diamond-shaped label pasted or printed on the box. The use of the word *Explosive* on the label is optional. Each

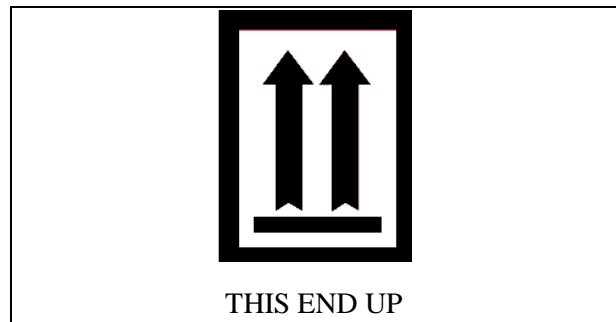
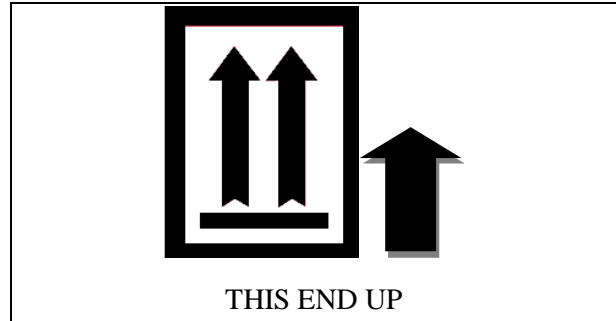
diamond (square-on-point) label prescribed in this subpart must be at least 100 mm (3.9 inches) on each side with each side having a solid line inner border 5.0 to 6.3 mm (0.2 to 0.25 inches) from the edge. In addition, the background color on the EXPLOSIVE 1.3 and EXPLOSIVE 1.4 labels must be orange. The compatibility group letter “G” or “S” must be the same size as the division number and must be shown as a capitalized Roman letter. For the EXPLOSIVE 1.4 labels, the compatibility group letter must be shown as a capitalized Roman letter. Division numbers must measure at least 30 mm (1.2 inches) in height and at least 5 mm (0.2 inches) in width. The label must be located on the same surface of the package as, and near, the proper shipping name marking.



3-2.2.6 Each shipping carton of Display Fireworks must bear the UN box certification information as specified in IMDG Code Section 6.1.3.1 Construction and Testing of Packaging, as shown below.



3-2.2.7 Each shipping carton containing Display Fireworks must bear orientation arrows indicating the direction in which the cartons are stacked, similar to the illustrations below:



3-2.2.8 All required markings on shipping cartons must not be obscured by tapes, straps, or other packaging materials.

3-2.3 Carton Integrity and Spacing

3-2.3.1 Shipping cartons must be square or rectangular in shape having sides that are 90 degrees, and maintain this shape during transportation, storage and handling.

3-2.3.2 Shipping cartons stacked to a minimum height of 3 meter (10 feet) must remain straight, sturdy and maintain their original shape.

3-2.3.3 Inner packaging, fittings, and cushioning materials, and the placing of Display Fireworks in packages, must be such that the Display Fireworks are prevented from becoming loose in the outer packaging during transportation.

3-2.3.4 Aerial Shells with rising effects (including: Tails, Comets, and Whistles) must be separated from each other in order to prevent friction and impact. Plastic or paper bags, padding, trays, partitioning in the inner or outer packaging must be used for this purpose.

3-2.3.5 Display Fireworks must be packaged in inner packaging, such as bags (paper or plastic), receptacles (fiber board, plastic, or wood), sheets (paper or plastic), that prevents the Display Fireworks from contacting the outer packaging (shipping carton).

3-2.4 Shipping Carton Manufacturing Specifications

3-2.4.1 Except as provided in Section 3-2.4.3 below, shipping cartons containing products weighing 20kg (44 lbs.) or over must be manufactured from a minimum of seven (7) layers of cardboard material as specified in section 3-2.4.4, below.

3-2.4.2 Shipping cartons containing products weighing less than 20kg (44 lbs.) must be manufactured from a minimum of five (5) layers of cardboard material, as specified in section 3-2.4.4, below.

3-2.4.3 Shipping cartons containing Multi Shot Aerial Devices (Cakes) manufactured with all tubes in a vertical configuration and weighing 20kg (44 lbs.) or over may be manufactured from a minimum of five (5) layers of cardboard material provided that the gross weight of the product does not exceed 35kg (77 lbs.).

3-2.4.4 For both five-layer and seven-layer cartons, cardboard used in the production of the cartons must meet the following criteria:

3-2.4.4.1 The outside material (that which has the label and hazard logo) must be at least 230 grams (0.5 lbs.) per square meter (10.8 square feet).

3-2.4.4.2 The Flute (the corrugated material inside) must be at least 140 grams (5.0 oz.) per square meter (10.8 square feet).

3-2.4.4.3 The inner layer material (the layer that is between the Flute and the inside) must be at least 120 grams (4.2 oz.) per square meter (10.8 square feet).

3-2.4.4.4 The inside material (the layer that faces the product) must be at least 175 grams (6.2 oz.) per square meter (10.8 square feet).

3-2.4.4.5 Paper used in the manufacture of shipping cartons subject to these requirements must not be made out of recycled material.

3-3 Requirements for Display Shells, Cakes and Other Products

3-3.1 Drop Test Requirement

3-3.1.1 All Display Fireworks as defined in section 1-1.3 subject to this Standard that are being manufactured for the U.S. market must be subjected to and comply with the 12 Meter (39 feet) Drop Test as specified in the United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria, 5th Revised Edition, 2009, section 14.5.2, “4(b) (ii) Twelve Metre Drop Test for unpackaged articles, packaged articles and packaged substances.”

3-3.1.2 The Drop Test must be performed by approved lab such as CIQ, SGS or other AFSL-approved lab.

3-3.1.3 The Drop Test must be current (Within the last 12 months).

3-3.1.4 The manufacturer must maintain valid copies of all Drop Test records performed on products subject to this Standard for a period of 5 years from the date of test, and

must provide copies of such records to AFSL upon request.

3-3.1.5 The Drop Test must be performed on representative samples [i.e. largest size/caliber of devices] for each Category in their most common export packaging.

3-3.1.6 The Drop Test on cartons may be performed with various Shells effects of like size packaged together.

3-3.1.7 The Drop Test may also be performed on various types of Cake effects packaged in fiberboard containers.

3-3.2 Requirements for Thermal Stability

3-3.2.1 All Display Fireworks subject to this Standard that are approved for transportation must be thermally stable. The explosive material must not ignite spontaneously or undergo marked decomposition when subjected to a temperature of 75°C (167° F) for 48 consecutive hours.

3-3.2.2 Each composition for a Display Fireworks device subject to this Standard must be tested to determine Thermal Stability, in accordance with procedures specified in **Appendix D** of this Standard.

3-3.2.3 Manufacturers must maintain for a period of 5 years from the date of the test and provide to AFSL upon request a list of all products manufactured and their associated Thermal Stability Certifications/Reports to match.

3-3.2.4 The Thermal Stability Certifications/Reports must be issued by CIQ or SGS, or other AFSL-approved laboratory.

3-3.2.5 If a factory conducts its own Thermal Stability tests, it must provide the test records and oven calibration documentation to AFSL for review.

3-3.3 Requirements for Aerial Shells

3-3.3.1 Shells must be identified only in terms of the inside diameter (not the circumference) of the Mortar in which the Shells can be safely used (e.g., 3 inches (76mm) Shells are only for use in 3 inches (76mm) Mortars).

3-3.3.2 Aerial Shell sizes must match the Shell sizes printed on the shipping carton.

3-3.3.3 Each Shell including its rising effects, if present, must be constructed so that the difference between the inside diameter of the Mortar in which it can be safely used and the outside diameter of the Shell is not less than $\frac{1}{8}$ inches (3.2mm) and not more than $\frac{1}{4}$ inches (6.4mm) for Shells not exceeding 3 inches (76mm). For Shells larger than 3 inches (76mm), the Shell including its rising effects, if present, must be constructed so that the difference between the inside diameter of the mortar in which it can be safely used and the outside diameter of the Shell is not less than $\frac{1}{8}$ inch (3.2mm) and not greater $\frac{1}{2}$ inch (12.7mm).

3-3.3.4 Rising effects on Shells (including: Tails, Comets, and whistles) must be individually covered in a manner that does not allow any pyrotechnic composition to be exposed.

NOTE: *Packaging a Shell inside a plastic bag is not adequate to meet this requirement. A separate cover for the Tails, Comets, and whistles must be used.*

3-3.3.5 The construction of the items must be adequate to prevent leakage or loss of any measurable amount of pyrotechnic composition during packaging, transportation, handling and normal operation.

3-3.3.6 The Lift Charge assembly must be securely attached to the Shell to ensure that

pyrotechnic composition leakage does not occur during transportation, handling, and storage.

3-3.3.7 Display Shells larger than 6 inches must contain a Lowering Rope that is equal in length to six times the diameter of the Shell that can support two times the weight of the Shell.

3-3.3.8 All spherical Display Shells must contain an orienting loop securely attached to the top center of the Shell to assure proper orientation of the Shell when it is inserted into the Mortar.

3-3.4 Requirements for Fuses

3-3.4.1 All Fuses and Leaders on Display Fireworks devices must be attached in a manner to ensure they remain securely attached during transportation, handling, and storage.

3-3.4.1.1 Fuses on Display Shells 6 inches (152mm) and smaller, must be securely attached so that they are able to support the weight of the Shell plus another Shell equal in size.

3-3.4.1.2 Fuses on Display Shells larger than 6 inches (152mm) must be able to support the weight of the Shell plus 227 grams (8 oz.) weight attached to the Fuse.

3-3.4.1.3 Fuse connections on Shells in Finale Chains must be securely attached so that they are able to support twice the weight of the largest shell in the chain.

3-3.4.2 Connecting Fuses on Finale Chains must be constructed in a manner to remain free of any tearing or separation from the attached Shells and other fusing.

3-3.4.3 Fuses on Display Shells must be packed in the same compartment as the Shell itself in a manner that prevents them from being located under seams.

3-3.4.4 A Safety Cap must be installed over the exposed end of all Fuses.

3-3.4.4.1 The Safety Cap must be of a different color from that used for the paper covering of the Fuse.

3-3.4.4.2 The Safety Cap must be designed and installed in a manner to prevent the fuse from being exposed during normal handling, storage, and transportation.

3-4 **Product Labeling and Markings**

3-4.1 Display Fireworks must not contain artwork, graphics, labeling or packaging that would suggest that items are Consumer Fireworks or intended for consumer use.

3-4.2 Display Fireworks must have an appropriate Warning Labels attached to each Shell or device, as specified in section 3-4.2.2.

3-4.2.1 Warning labels must be placed in a conspicuous location on the top panel of the Cake, or on the body of the Shell and other devices.

3-4.2.2 All Display Fireworks devices must bear a warning label that includes at a minimum the statement “**WARNING: DANGEROUS EXPLOSIVE. IF FOUND, DO NOT HANDLE. CONTACT LOCAL FIRE OR POLICE DEPARTMENT. FOR PROFESSIONAL USE ONLY**”. This statement must be printed in letters 3.2mm (1/8 in.) in height that are capitalized, underlined, printed on a contrasting background inside a borderline, and placed on a label that is 5810mm² (9

inches²), unless the size of the device is too small to bear such label, in which case the label may be reduced to a size that will fit onto the

device, in accordance with the following specifications.

DEVICE TYPE	LABEL SIZE	
	9 inch ²	<9 inch ²
Shell and Mine Devices		
≤5"		X
≥6"	X	
Multi Shot Aerial Device (where the top panel of the device is ≥9 inch ²)	X	
Multi Shot Aerial Device (where the top panel of the device is <9 inch ²)		X
Roman Candle		X
Comets		X
Fountains		X
Strobe (Pots)		X
Waterfalls		X

Sample of Warning Label:

<p><u>WARNING: DANGEROUS EXPLOSIVE</u></p> <p>IF FOUND, DO NOT HANDLE --</p> <p>CONTACT LOCAL FIRE OR POLICE DEPARTMENT</p> <p>FOR PROFESSIONAL USE ONLY</p>
--

3-4.3 Display Fireworks excluding Articles Pyrotechnic must also bear a product description label containing the following information:

3-4.3.1 The size of the device [e.g., “3 in.”].

3-4.3.2 The Category of the device [e.g., Mine, Comet, etc.], as specified in Section 1-1.1.3.

3-4.3.3 A description of the device [e.g., “red peony”].

3-4.3.4 The name and location of the manufacturer (City and Country).

3-4.3.5 Date and shift code of manufacture.

NOTE: Where a manufacturer operates his plant for only one shift during the day, he does not need to show the shift of manufacture.

3-4.3.6 The name and address of Importer.

Sample Product Information Label:

DESCRIBE SIZE AND EFFECT (S)
NAME OF MANUFACTURER AND LOCATION (CITY & COUNTRY)
NAME AND ADDRESS OF IMPORTER

DATE AND SHIFT CODE OF MANUFACTURE

3-4.4 Articles Pyrotechnic intended for professional use must be so marked, and labels must include the following information:

3-4.4.1 The product category.

3-4.4.2 For Fountains, Gerbs, and other preloaded devices, the duration, height, and diameter of the effect, as applicable.

3-4.4.3 The name and location of the manufacturer (City and Country).

3-4.4.4 Date and shift code of manufacture.

Sample Product Information Label:

PRODUCT CATEGORY
DURATION, HEIGHT, AND DIAMETER OF EFFECTS
NAME OF MANUFACTURER AND LOCATION (CITY & COUNTRY)
DATE AND SHIFT CODE OF MANUFACTURE

NOTE: Display Fireworks that are too small to bear the required labeling and markings specified above on the individual items must bear the required labeling and markings on the unit packaging

Chapter 4 CONTAINER LOADING SUPERVISION

4-1 General Requirements

4-1.1 To ensure that only AFSL approved/certified products are loaded into exporter's shipping or transport containers, the loading of all containers that contain AFSL-certified Display Fireworks must be supervised by a qualified AFSL inspector.

4-1.2 The packing list must be checked to verify that it matches the cartons within the container including quantity, product description and size of Display Fireworks.

4-1.3 After container loading is completed, products must be properly blocked, braced, and sealed with an AFSL seal designed for this purpose.

4-1.4 Complete procedures for container loading supervision along with a loading supervision checklist are contained in **Appendix C**.

4-2 Requirements for Packing List

4-2.1 Each person who offers a Display Fireworks device for transportation must describe the item on a shipping paper. The description must include the UN identification number (col.4,) the proper shipping name (see Title 49 CFR §172.101, hazardous materials table, col. 2) the hazard class of the material (col.3,) the packing group (col.5,) and the total quantity covered by the description (Title 49 CFR §172.202(a).) Display Fireworks should be described as UN0335 Fireworks, 1.3G, PG II, X lb. or kg. In addition, the shipper shall certify that the shipment is properly classified, marked and labeled (Title 49 CFR §172.204(a).)

NOTE: *EX numbers must also appear on packing list or on each shipping carton.*

4-3 Carton Inspections Prior to Loading

4-3.1 The quantity of products listed on packing list must be equal to the amount loaded into containers.

4-3.2 All shipping cartons must bear the original AFSL security stickers used to certify the products.

4-3.3 All shipping cartons must bear the original AFSL Lot Identification number stamped on the cartons when certified.

4-3.4 Products that have not been certified by AFSL may not be loaded into containers with Display Fireworks that have been certified by AFSL.

4-3.5 Shipping cartons must maintain their physical integrity in accordance with section 3-2.3 of this Standard.

4-3.6 Shipping cartons that bear instructions for carton stacking must be stacked in the prescribed manner when loaded.

4-4 Container Inspections

4-4.1 Shipping Containers must have proper numbering posted in the proper location on containers.

4-4.2 Shipping Containers must be clean, must be free of insect or other infestation, and must be free of any harsh or dangerous odors or fumes.

4-4.3 Shipping Containers must be water tight and have no unacceptable damage to the container or water seal.

4-4.4 The condition of the container must be documented with photographic evidence prior to the loading process.

4-5 Container Loading Supervision

4-5.1 Inspection Prior to Loading

4-5.1.1 The Inspection shall identify the consignment previously inspected and released for shipment by ensuring that the AFSL sticker is on each carton.

4-5.1.2 The following minimum number of packing units must be selected at random from the whole consignment to verify the consignment is what SGS previously inspected:

Cartons per line item	Cartons to be opened
1 to 5 cartons	1 carton
5 to 20 cartons	2 cartons
20 to 50 cartons	3 cartons
50 to 100 cartons	4 cartons
100 plus cartons	5 cartons

4-5.2 Inspection during Loading of the Container

4-5.2.1 The physical loading of the container must be monitored and documented by AFSL in accordance with procedures provided in **Appendix C**.

4-5.2.2 The quantity of products listed on packing list must be reconciled with the quantity actually loaded into containers.

4-5.2.3 Any problems observed must be documented in a Container Loading Supervision Report as provided for in section 4-5.7, below.

4-5.2.4 Any interruption at the time of loading such as waiting for more vehicles, work breaks, or for any other reason that the Inspector has to leave the job site during loading, the

container must be sealed in the absence of the AFSL Inspector.

4-5.3 Partial Loading of Containers

4-5.3.1 If the container is only 3/4, 1/2, or 1/4 full after loading is complete, the goods must be blocked and braced in order to secure the cargo from collapsing and/or incurring damage during transit.

4-5.4 **Photographic Documentation of Loading.** Photographs shall be taken at each stage of the container loading process, as specified in **Appendix C**.

4-5.5 Sealing of Containers

4-5.5.1 All containers containing AFSL certified Display Fireworks must be sealed with the AFSL Container Security Seal immediately upon completion of loading.

4-5.5.2 The seal must be firmly affixed on the right-hand door with the nut of the hasp retaining bolt welded to the bolt itself (and not on the door). If the container has several openings, all doors must be sealed.

- **See Appendix C for Container Loading Procedures**

APPENDIX A Display Fireworks QMS Program Audit

Display Fireworks QMS Program Audit

燃放类烟花质量管理体系工厂审核报告

						<i>AFSL-FACTORY QMS PROGRAM AUDIT INCLUDING GUIDELINE- V1 OVERVIEW</i>		
	1 – Quality Assurance Records	2– Supplied Materials Quality Assurance	3- Process Control	4 - Certification Documents	5 – Social Responsibility			
	1.1	2.1-C	3.1	4.1-C	5.1-ZT			
	1.2	2.2-C	3.2	4.2-C	5.2-ZT			
	1.3-C	2.3-C	3.3-C	4.3-C				
	1.4-C	2.4-C	3.4-C	4.4-C				
	1.5	2.5	3.5	4.5-C				
	1.6	2.6	3.6					
	1.7	2.7	3.7-C					
		2.8-C	3.8					
		2.9-C	3.9					
						TOTAL Checkpoints	Checkpoint Individual Value	Total Points Available
No. Standard Checkpoint	5	3	6	0	0	14	2	28
Conformed standard checkpoint								
No. Critical Checkpoints	2	6	3	5	2	18	4	72
Conformed critical checkpoint								
TOTAL Checkpoint	7	9	9	5	2	32	6	100
	The Audit will be graded on a Pass/Fail Total Points Calculation. Scores of ≥ 80 points = Pass, and < 80 points or Non-Compliance with Zero Tolerance = Fail. Distribute the factory registration number of AFSL-DF-AAA as the audit result is PASS.						Reached points	
	For type of follow up audit: Decided by auditor based on site situation. Onsite follow up: If NC about implementation; If result failed. Deadline: 2 months Desktop review: If NC of documentation/records only. Deadline: 1 month						Result (Pass / failed)	
							Follow up audit type (Onsite or desktop)	

APPENDIX A DISPLAY FIREWORKS FACTORY AUDIT CHECKLIST

Manufacturer: 厂名			
Address: 地址			
Representative : (Name and Title) 厂方代表 (姓名, 职务)			
Telephone : 电话		Fax Number: 传真	
Date of Audit 审核日期		Email: 电邮	
Applicable business and other legally required licence numbers with the expiration: Pyrotechnic manufacture license, business license, health licences, liability insurance, etc. 各种相关证照及有效期: 生产许可证, 工商执照, 健康证书, 责任保险, 等。			
Product Manufactured 产品类型			
List of Machines used for Production 所使用的机械			
Subcontractors (Contact Information and Explain processes) 分包商 (联系方式和分包工序)			
Factory Area in m ² 厂区面积		Number of Employees 雇员人数	
Audit team leader:		Additional team member(s):	

审核组长		审核员	
This report is confidential and distribution is limited to the SGS office, association and manufacturer representative.			

Audit Objectives 审核目的

Conducting Factory evaluation to determine level of Compliance to AFSL Display Fireworks Certification Program (DFCP) Quality Management Systems (QMS) requirements.
 评估工厂判定其对美标燃放类烟花质量管理体系要求的符合水准
 Audit Summary Below is to be completed during the Factory Visit and provided to Management as Corrective Action Recommendations.
 下列审核报告将在工厂完成并提供给厂方作为整改建议

Audit Summary – To be completed and left with Factory Management			
审核报告 — 在厂内完成并交给厂方			
Date 日期		Manufacture r 厂名	
Mark Non-Compliance (NC) Column if any Critical Questions are NC or if 2 or more Non-Critical Questions are NC, even if overall score is Compliance {C}, include Corrective Action for Non-Critical Questions (Critical Questions are BOLD and marked 1.1-C or question 1.1 is Critical) 发现 1 个严重问题或 2 个及 2 个以上非严重问题即为不合格 (NC)，即使最终成绩合格 (C)，对所发现的非严重问题的整改措施将用黑体标出			
	Compliance {C}合格	Non-Compliance {NC}不合格	Corrective Action Plan 整改措施计划
Quality Assurance Record 质量保证记录			
Supplied Materials Quality Assurance 来料检验			

APPENDIX A DISPLAY FIREWORKS FACTORY AUDIT CHECKLIST

Process Control 过程控制			
Certification Documents 认证文件			
Social Responsibility 社会责任			
Check this Box if ALL Critical Corrective Action Opportunities -identified above- could be verified by Desktop Audit (i.e. inadequate policy or procedure that once remediated can be verified by Sending the Documents or photo verification to AFSL)			

Management Comments: 厂方意见			
Management Representative Signature 厂方代表签名		Date 日期	
Management Representative Name and Title 厂方代表姓名和职务		Chop / Corporate Seal (if applicable) 公章	
Auditor Signature 审核员签名		Date 日期	

1. Quality Assurance Records 质量保证记录		Compliance 合格	Non-Compliance 不合格
1.1	Does the Factory have a Quality Policy? 是否制定了质量方针? <u>Guideline 指引:</u> 1. Validation by interview with General Manager (GM), or		

	<p>Management Representative (MR) on what the Quality Policy is.</p> <p>询问总经理或管理者代表，其质量方针内容。</p> <p>2. In case of GM or MR not available on site, validation by interview with Supervisor/Manager of Quality Control (QC)/ Quality Assurance (QA) Team.</p> <p>也可询问主管或/QC 经理/QA 人员。</p>		
1.2	<p>Has the policy been adequately communicated to all employees?质量方针是否被充分的传达给了所有员工。</p> <p><u>Guideline 指引:</u></p> <p>1. Basic requirement 基本要求:</p> <p>a. A written quality policy has been published to all employees by white board, slogan, banner, etc. (validate by random interview). 质量方针应利用白板，标语，横幅等方式公告给所有员工（以抽查员工的方式进行验证）。</p> <p>2. Best practice 目前相对较好的做法:</p> <p>a. A written quality policy is documented in a quality manual. It is published (not only by a simple method - e.g. white board, slogan, banner, etc.) 质量方针应以文件化的形式包含在质量手册中。</p> <p>b. The printed quality manual (by documentation of a Quality Management System - e.g. QMS ISO9001) is available and within the possession to all employees. 在各工序段都有印刷成册的质量手册。（按照某一质量体系：如 ISO9001）。</p>		
1.3-C	<p>Does the Factory have a Quality Manual? (Critical) 是否有质量手册? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Basic requirement 基本要求:</p>		

	<p>a. A Quality Manual (QM) has been established and published to different functional departments.制定质量手册并派发各部门。</p> <p>2. Best practice 目前相对较好的做法:</p> <p>a. A QM is available in line with the QMS ISO9001 with accredited certificate. The QM has been issued, approved, and published to related departments for implementation. 经过 ISO9001 认证有效的质量手册派发各部门贯彻执行。有质量手册，并且质量管理体系已经获得 ISO9001 认证（意思是质量手册通过认证审核被认可适当有效）。质量手册经过正式程序的制定，审阅，签发并颁发给相关职能部门以遵照执行。</p>		
<p>1.4-C</p>	<p>Does the Factory have adequate Quality Assurance (QA) Personnel? (Critical) 是否有足够的品保人员? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Requirement 基本要求:</p> <p>a. At least 1 person in a QA role monitors the quality of the production, especially finished goods, acting as a “client representative” and/or “3rd party representative” (by conducting and documenting Final Random Inspection (FRI) and/or Pre-shipment Inspection (PSI).) 至少有一人担当品保人员监控质量，特别是成品质量，象“客户代表”或“第三方代表”一样执行和记录成品抽检或装运前检验。</p>		
<p>1.5</p>	<p>Is the training of QA Personnel documented and adequate? 对品保人员的培训是否适当并有记录？</p> <p><u>Guideline 指引:</u></p> <p>1. Basic requirement 基本要求:</p> <p>a. Confirmation by random interview with QA Personnel who must demonstrate familiarity with the roles and responsibilities of the QA process, requirements, and execution of service.随机询问品保人员，表现必须熟悉</p>		

	<p>其品保职责，程序，要求和手段。</p> <p>2. Best practice 目前相对较好的做法:</p> <p>a. Training Records are maintained and define type of training provided and the date the training was administered. Validation document review. 保留培训记录，分门别类，标注日期。</p> <p>b. An ongoing training schedule for continuous improvement is maintained. 制定实时培训计划保持持续改进进步。</p>		
1.6	<p>Are documents adequately controlled? 文件是否控制良好?</p> <p><u>Guideline 指引:</u></p> <p>a. Only for the documents related to chemical formulation and chemical component, e.g. pyrotechnic. 只针相关化学配方和化学成分的文件控制，例如火药。</p> <p>b. All key documents are controlled by a document control mechanism which includes: Topic, Review, and Approvals. This especially covers the documents related to Policies and Procedures, Standard Operating Procedures, Work Instructions, Operating Safety Instructions, Inspection Criteria, Specifications, Sample Management, and the List of Permissible Chemical. 所有重要文件都在管理机制下管理，包括：主题，审阅，和核准。特别要包括与方针和程序有关的文件，标准运作程序，工作指导，安全指导，检验要求，规格，样品管理和可用化学品列表。</p>		
1.7	<p>Is there a master list of documents? 是否有一个主文件列表?</p> <p><u>Guideline 指引:</u></p> <p>1. A master list includes the document topic and approval. 有一个主列表, 该列表包括文件主题和审批。</p> <p>2. Distribution records are regularly maintained and updated. 保有分发记录并及时更新。</p>		

	<p>3. Registration log records are maintained related to both distribution of updated documents as well as withdrawing/ cancelation of expired documents. 详细记录更新文件的分发和过期文件的收回销毁。</p>		
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Comment of Non-compliance 对不合格项的评价:

<p>2. Supplied Materials Quality Assurance 来料检验</p>	<p>Compliance 合格</p>	<p>Non-Compliance 不合格</p>
<p>2.1-C Are evaluation procedures established for raw material suppliers with adequate documentation? (Critical) 对原料供应商的评估程序是否有适当的记录? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Basic requirement 基本要求 :</p> <p>a. Legal documentation assessment to suppliers: the suppliers have to provide legal documentation required by local government, e.g. business license, Permit of special industry. 只针对供应商合法资质的评估, 例如营业执照, 危险品销售许可证等。</p>		
<p>2.2-C Does the Factory maintain a list of approved pyrotechnic raw material suppliers that are only used in their procurement practices? (Critical) 是否有认可火药供应商目录, 并只对目录所列商家采购? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. An Approved Supplier List (ASL) is available and updated</p>		

	<p>regularly. 有认可火药供应商目录并及时更新。</p> <p>2. Validate by random check that raw material purchases are only sourced by Suppliers identified on the ASL. 随机抽查火药采购是否来自目录所列之商家。</p>		
<p>2.3-C</p>	<p>Does Factory have the most current list of permissible chemicals (see the Appendix for more detail)? (Critical) 是否有最新的可用化学品清单（见附页）？(关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Requirement 基本要求：</p> <p style="padding-left: 40px;">a. List of permissible chemicals is available. 有可用化学品清单。</p> <p>NOTE: If the result is not compliance, the auditor gives the factory the copy of the Audit Appendix. 如果此项的审查结果是不合格, 审查员会给工厂一份审查附录的副本。</p>		
<p>2.4-C</p>	<p>Are incoming raw materials evaluated and documented (not by visual inspection but by written documentation)? (Critical) 来料经过评估并有文件记录（文字记录而非目测）？(关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Basic requirement 基本要求:</p> <p style="padding-left: 40px;">a. Documented evaluation of raw materials for compliance is available. 有来料符合标准的评估记录。</p> <p style="padding-left: 40px;">b. In comparison to Purchasing Document 对照采购单。</p> <p>2. Best practice 目前相对较好的做法:</p> <p style="padding-left: 40px;">a. Test Reports or Certificate of Compliance are available. 有测试报告和合格证书。</p> <p style="padding-left: 40px;">b. Compare to MSDS (Material Safety Data Sheet). 对照</p>		

	<p>化学品安全说明书。</p>		
<p>2.5</p>	<p>Are unsafe, defective, and/ or non-conforming raw materials, chemical compositions, components, and work in progress products identified and isolated from other raw materials, chemical compositions, components, and work-in-progress products in the Factory? 危险的, 瑕疵的, 和不合格的原料, 化学成分, 部件和正在加工的产品是否标识和隔离?</p> <p><u>Guideline</u> (Specify the chemicals only): <u>指引</u>: (只针对化学品):</p> <ol style="list-style-type: none"> 1. Verify if a Defect Classification System is being used only for chemicals. 确认工厂是否有使用一套不良缺陷分类系统,只针对化学品。 <ol style="list-style-type: none"> b. Defect Classification System - Classify non-conformance into <p>different levels (i.e. Critical, Major and Minor) based on the severity.</p> <p>不良缺陷分类系统 - 根据不良的严重程度对原材料(针对化学品)的不良品有无分级(如严重,重大,轻微)。</p> 2. Define the method of identifying non-conformance classification Critical, Major and Minor defectives for chemicals only. 规定重要, 重大和轻微不合格项的定级方法,只针对化学品。 <ol style="list-style-type: none"> a. Critical - Rejected raw materials are segregated clearly from accepted ones. It has led to or would lead to contamination, even has led to or would lead to safety issues such as heat energy or fire. 严重缺陷 - (如合格的原料是否与有缺陷的原料未清晰隔离和标识,可以导致或极可能导致混合混用, 造成引起发热,着火等严重安全事故)。 b. Major -Rejected raw materials are segregated clearly from accepted ones. It has led to or would lead to unsuspected mixture or contamination. It has not led to or would not lead to safety issues such as heat energy or fire but quality issues only. 重大 - (如 		

	<p>合格的原料是否与有缺陷的原料未清晰隔离和标识,可以导致或极可能导致非预期的成份或比例混合,不能到达预期的质量效果,但无产生安全事故的可能)。</p> <p>c. Minor –Rejected raw materials are segregated clearly from accepted ones there are not identified labels. It’s not convenient for fast identification but would not lead to mixture or contamination. 轻微 - (如合格的原料和有缺陷的原料隔离清楚,但缺标识或标识不清,不易分辨,但不至于导致混用)。</p> <p>3. Define method of isolation and disposal or re-conditioning. 规定隔离和销毁或返工的方法。</p>		
2.6	<p>Is there a process for stopping production if raw materials do not conform to prescribed specifications? 若原料不符合规格是否有停产措施?</p> <p><u>Guideline 指引:</u></p> <p>1. Review QA/QC procedures to verify authority to stop production in the event of non-conforming product detection. 查看 QA/QC 程序, 确认一旦发现产品不合格, 是否有停产错失。</p>		
2.7	<p>Can raw material(s) be tracked through the production process and identified with specific finished product Lots? 是否能在生产过程中跟踪各原料并对应到成品批次。</p> <p><u>Guideline 指引:</u></p> <p>1. Verify if raw materials are clearly identified with an item name and/or number, incoming date and/or inspection date, quantity, etc., then during the production process if the Lot number identifies the raw material(s) used. 查验原料是否表明品名/货号, 来料日期/检验日期, 数量, 等, 生产过程的原料要表明批次号。</p>		

<p>2.8-C</p>	<p>Are incoming chemical raw materials stored off the floors? (Critical) 储存化学原料是否离地? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. It's acceptable for raw materials to be stored on: shelving, racking, pallets, or on the ground provided that there is a water-proofing barrier material present (e.g. painting, film, etc.) 储存在货架, 柜子, 托板, 或铺有防水材料 (油漆, 膜) 的地上都行。</p>		
<p>2.9-C</p>	<p>Is there an appropriate physical inventory management method being used (for example: First-In - First-Out (FIFO) for all raw materials? (Critical) 是否有仓储管理方法用于各种原料 (如: 先进先出)? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Check with the Warehouse Workers for documented or verbal procedures for raw material inventory management and report which method is being used. 询问仓库人员原料仓储管理的文件或口头描述使用何种方法。</p> <p>2. Verify the actual operation procedures with one key material. 核对某一重要物料的实际操作程序。</p> <p>3. Define method of isolation and disposal or re-conditioning of unsafe, defective, and/or non-conforming raw material. 针对危险的, 有瑕疵的, 和不合格原料, 对其制定隔离, 销毁或返工的方法。</p>		

Comment of Non-compliance 对不合格项的评价:

3. Process Control 过程控制		Compliance 合格	Non-Compliance 不合格
3.1	<p>Are setup and operating parameters for chemical management documented and monitored during the production run? 生产进行中对化学品管理的设置和运作是否有记录和监控？</p> <p><u>Guideline 指引:</u></p> <p><i>For Set Up 设置:</i></p> <ol style="list-style-type: none"> 1. Check is the procedure for First Piece Inspection (FPI) and if it is being used by interview with Production Supervisor/Manager and QC/QA Supervisor/Manager. 询问生产主管/经理和品检/品保主管/经理是否对首件产品进行检验，是否是生产中的固定程序。 2. Review the records of FPI to validate that it is actually being performed. 检查首样检验的记录确认其真实执行。 <p><i>For Monitoring 监控:</i></p> <ol style="list-style-type: none"> 3. Check the monitoring methods and supervision of production by interview with production Supervisor/Manager and Quality Team. 询问生产主管/经理和品管人员了解监控方法和对生产的督导。 4. Check the monitoring records. 检查监控记录。 		
3.2	<p>Are mixing / combining machines thoroughly cleaned before use and safely stored? 搅拌机使用前是否清洁和安置妥当？</p> <p><u>Guideline 指引:</u></p> <ol style="list-style-type: none"> 1. Check if there are procedures or Work Instruction available or not. 查看是否有程序和工作指导。 2. Observe and interview the Operators to validate their understanding of the cleaning of mixing/ combining machinery before use. 观察和询问操作员是否知道使用前要清洁搅拌机。 		

<p>3.3-C</p>	<p>Is the training of production workers/key operators documented and adequate? (Critical) 对生产工人/主要操作人员的培训是否适当并有记录? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Check the training records and verify that the workers responsible for the chemicals management have been trained, especially key operators. 翻查培训记录确认其接受过培训, 特别是主要操作人员。</p>		
<p>3.4-C</p>	<p>Are Operators trained to identify defective material and communicate to QA/QC Personnel? (Critical) 操作人员是否熟练鉴定瑕疵并告知品管人员? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Interview production workers who are responsible for the chemicals management only. Determine if they follow Work Instructions, and understand how to identify and process defective materials. 现场询问只涉及化学品的生产工人以确认他们是否遵从工作指导, 并了解如何鉴定和处理有瑕疵的材料。</p>		
<p>3.5</p>	<p>Are unsafe, defective, and/ or non-conforming raw materials, chemical compositions, components, and work-in-progress products identified and isolated from other raw materials, chemical compositions, components, and work-in-progress products in the Factory? 危险的, 瑕疵的, 和不合格的原料, 化学成分, 部件和正在加工的产品是否标识和隔离?</p> <p><u>Guideline (Specify the chemicals only): 指引: (只针对化学品):</u></p> <p>2. Verify if a Defect Classification System is being used only for chemicals. 确认工厂是否有使用一套不良缺陷分类系统, 只针对化学品。</p> <p>a. Defect Classification System - Classify non-conformance into</p> <p>different levels (i.e. Critical, Major and Minor) based on the severity.</p>		

	<p>不良缺陷分类系统 - 根据不良的严重程度对原材料 (针对化学品)的不良品有无分级(如严重,重大,轻微)。</p> <p>4. Define the method of identifying non-conformance classification Critical, Major and Minor defectives for chemicals only. 规定重要, 重大和轻微不合格项的定级方法,只针对化学品。</p> <p>d. Critical - Rejected raw materials are segregated clearly from accepted ones. It has led to or would lead to contamination, even has led to or would lead to safety issues such as heat energy or fire. 严重缺陷 - (如合格的原料是否与有缺陷的原料未清晰隔离和标识,可以导致或极可能导致混合混用, 造成引起发热,着火等严重安全事故)。</p> <p>e. Major –Rejected raw materials are segregated clearly from accepted ones. It has led to or would lead to unsuspected mixture or contamination. It has not led to or would not lead to safety issues such as heat energy or fire but quality issues only. 重大 - (如合格的原料是否与有缺陷的原料未清晰隔离和标识,可以导致或极可能导致非预期的成份或比例混合, 不能到达预期的质量效果,但无产生安全事故的可能)。</p> <p>f. Minor –Rejected raw materials are segregated clearly from accepted ones there are not identified labels. It's not convenient for fast identification but would not lead to mixture or contamination. 轻微 - (如合格的原料和有缺陷的原料隔离清楚,但缺标识或标识不清, 不易分辨,但不至于导致混用)。</p> <p>5. Define method of isolation and disposal or re-conditioning. 规定隔离和销毁或返工的方法。</p>		
3.6	<p>Are work-in-progress and final products adequately stored or contained to prevent contamination? 半成品和成品是否妥善保管防止被污染?</p>		

	<p><u>Guideline 指引:</u></p> <p>1. Separate storage and/or isolation method(s) must be evident within the production by the use of different containers, locations, and identification. 明显的隔离方法, 使用不同的容器, 分开摆放并标识清晰。</p>		
3.7-C	<p>Are finished product Lots coded to identify product dates and other Lot designations? (Critical) 成品批次是否按生产日期和其它特性进行编号。(关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Lot numbers or date codes are used for the identification of individual product. 单个产品上标有批号和日期号。</p>		
3.8	<p>Does the Factory have documented container loading procedures? 是否记录装柜过程。</p> <p><u>Guideline 指引:</u></p> <p>1. Are the Factory's container loading procedures documented, available, and suitable? 装柜记录是否存在和完好?</p>		
3.9	<p>Have employees been trained on the container loading procedures and documentation? Can they demonstrate compliance to the procedures? 雇员是否受过装柜程序的培训并保留记录? 是否能执行程序?</p> <p><u>Guideline 指引:</u></p> <p>1. Verify that the employees have been trained on the container loading procedures by verification of training records. 查看培训记录了解是否有装柜程序的培训。</p> <p>2. By interview, verify with the Loading and Shipping Supervisors that they can prove knowledge of the stated procedure. 询问发货主管, 了解其是否熟悉既定程序。</p> <p>3. If possible, observe the loading process and verify that the practices being followed are in compliance with the stated</p>		

	procedures.如果可能，观察装柜过程是否符合既定程序。		
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Comment of Non-compliance 对不合格项的评价:

4.Certification Documents 认证文件		Compliance 合格	Non-Compliance 不合格
4.1-C	<p>Factory has required Business License, Export License from CIQ, Manufacturer permission documentation and other Documents related to type of production? (Critical) 是否拥有开展生产所需的各种证照，工商执照，出口许可证，生产许可证等? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Document review is required 查看下列文件.</p> <p><i>Mandatory documents include 必须有的:</i></p> <ul style="list-style-type: none"> a. Business license issued by local administration of industry and commerce.工商执照。 b. Manufacturing permission of firework issued by the Local Government.烟花生产许可。 c. Export License of Factory or trading agent issued by Local International Business and Economic Committee. 出口许可证。 		
4.2-C	<p>Is the Carton Manufacturer Certification specified in the AFSL Standards for Display Fireworks being followed for production being manufactured for the U.S. Market? (Critical) 纸箱制造商证书是否符合美标所展示烟花标准对美线产品的要求? (关键)</p> <p><u>Guideline 指引:</u></p>		

	<p>1. By document review, the following must be verified 检查文件记录, 必须核实以下的文件:</p> <p>a. Validate by random check that cartons have Carton Manufacturer Certification. 随机抽查纸箱, 核实是否有纸箱制造商证书。</p>		
<p>4.3-C</p>	<p>Is the Drop Test requirement specified in the AFSL Standards for Display Fireworks being followed for production being manufactured for the U.S. Market? (Critical) 跌落测试是否符合美标所展示烟花标准对美线产品的要求? (关键)</p> <p><u>Guideline 指引:</u></p> <p>a. By document review, the following must be verified 检查文件记录, 以下几点必须核实:</p> <p>a. The Drop Test is performed by approved lab. 跌落测试是由认可的实验室执行。</p> <p>b. The Drop Test has to be current. 跌落测试必须是在有效期内的。</p>		
<p>4.4-C</p>	<p>Is the Thermal Stability Testing specified in the AFSL Standards for Display Fireworks being followed for production being manufactured for the U.S. Market? (Critical) 热稳定测试是否符合美标所展示烟花标准对美线产品的要求? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. By document review, the following must be verified 检查文件记录, 必须核实以下的文件:</p> <p>a. List of all products manufactured and their associated Thermal Stability Certifications/Reports to match. The Thermal Stability Certifications/Reports can be issued by CIQ or SGS. (If the factory self-tests for Thermal Stability, then they must provide the test record and oven calibration documentation for review). 所有产品清单, 与之对应的热稳定测试报告。该报告可以由 CIQ 或者 SGS 出具。(如果工厂自行测试, 则必须提供测试记录, 烘箱校准证明)。</p>		

4.5-C	<p>Has the Factory Owner or Senior Management Representative participated in the Annual AFSL Training Program? Who attended and when? (Critical) 工厂主或高级管理者代表是否参加美标所的年度培训? 何时何人参加的? (关键)</p> <p><u>Guideline 指引:</u></p> <p>1. Obtain and report the information provided by the Factory Management and include in this report for verification by AFSL. 获取厂方管理层提供的资料, 报告给美标所以供核实。</p>		

Comment of Non-compliance 对不合格项的评价:

5. Social Responsibility 社会责任	Compliance 合格	Non-Compliance 不合格
<p>5.1-ZT Factory does not employ underage workers. (Zero Tolerance) 工厂没有雇佣童工。 (零宽限)</p> <p><u>Guideline 指引:</u></p> <p>1. Document review is required 查看下列文件.</p> <p><i>Mandatory documents and procedures include 必须有的:</i></p> <p>Copy of valid laws and regulations on child labor OR demonstrated understanding of the requirements? Policy includes procedures and process for home-workers if applicable. 是否有关于童工的法律和法规复印件或者是否能证明对这些要求的理解? 政策包括家庭工人的程序和过程 (如适用)。</p>		

	<p>Written policy on hiring AND demonstrate that this policy has been communicated to all workers? 是否有雇佣的书面政策以及能证明这些政策已传达到所有的工人?</p> <p>Documented procedures to verify the age of workers at the time of recruitment? 在招聘的时候, 是否有书面的程序以核实工人的年龄?</p>		
<p>5.2-ZT</p>	<p>Factory does not employ Forced Labor or engage in Human trafficking practices. (Zero Tolerance) 工厂没有涉及强迫劳动或从事人口贩卖的事宜。(零宽限)</p> <p><u>Guideline 指引:</u></p> <p>1. Document review is required 查看下列文件.</p> <p><i>Mandatory documents include 必须有的:</i></p> <p>Copy of valid laws and regulations on Forced Labor OR demonstrated understanding of the requirements? 是否有关于强迫劳动的法律和法规复印件或者是否能证明对这些要求的理解?</p> <p>Written policy on Forced Labor AND demonstrate that this policy has been communicated to all workers? Policy includes procedures and process for home-workers if applicable. 是否有对于强迫劳动的书面政策以及能证明这些政策已传达到所有的工人? 政策包括家庭工人的程序和过程 (如适用)。</p> <p>Are workers free to leave the facility premises after normal working hours or other restrictions placed on the workers? 正常工作时间后工人可否自由离开工厂或者对工人是否有其它限制?</p> <p>Are workers required to lodge deposits such as illegal withholding of salary, training fee, employment broker fee, fee for tools, fee for uniforms, or original documents such as ID papers? 工厂是否非法扣发工资, 以及工人是否需要交缴培训费, 就业代理费, 工具费用, 工作服费用, 或扣压如身份证等证件原件?</p>		

Comment of Non-compliance 对不合格项的评价:

APPENDIX B LIST OF PERMISSIBLE CHEMICALS

Permissible Chemicals	
Standard Fireworks Chemicals For Display and Theatrical Pyrotechnics	
Chemical	Typical Use
Aluminum	Fuel
Ammonium Perchlorate	Oxygen Donor
Antimony	Fuel
Antimony Sulfide	Fuel
Barium Carbonate	Neutralizer
Barium Nitrate	Oxygen Donor
Barium Sulfate	Oxygen Donor
Bismuth Oxide	Oxygen Donor
Boric Acid	Neutralizer
Calcium Carbonate	Neutralizer
Calcium Sulfate	Oxygen Donor
Carbon or Charcoal	Fuel
Copper Metal	Color Agent
Copper Oxide	Oxygen Donor/Color Agent
Copper Salts (except Copper Chlorate)	Color Agent
Dextrine	Fuel/Binder
Hexamethylenetetramine (Hexamine)	Fuel
Iron and Iron Alloys (e.g., ferro/titanium)	Fuel
Iron Oxide	Oxygen Donor
Magnalium (Magnesium/Aluminum)	Fuel
Magnesium (in Display Fireworks and Theatrical Pyrotechnics only)	Fuel
Magnesium Carbonate	Neutralizer
Magnesium Sulfate	Oxygen Donor
Nitrocellulose, <12.6% Nitrogen (see Miscellaneous Compounds)	
Nitrocellulose Based Lacquers	Binder
Phosphorus, Red (only as provided in table 3.7-1)	Fuel
Potassium or Sodium Benzoate	Whistle/Burst

APPENDIX B LIST OF PERMISSIBLE CHEMICALS

Potassium Bichromate (Potassium Dichromate) (not to exceed 5% of formulation)	Oxygen Donor
Potassium Chlorate (only as provided in table 3.7-1)	Oxygen Donor
Potassium Hydrogen Phthalate	Whistle
Potassium Nitrate	Oxygen Donor
Potassium Perchlorate	Oxygen Donor
Potassium Sulfate	Oxygen Donor
Silicon	Fuel
Sodium Bicarbonate (Sodium Hydrogen Carbonate)	Neutralizer
Sodium Nitrate	Oxygen Donor
Sodium Salicylate	Whistle
Sodium Salts (except Sodium Chlorate)	Color Agent
Sodium Sulphate	Oxygen Donor
Strontium Carbonate	Color Agent
Strontium Nitrate	Oxygen Donor
Strontium Salts (except Strontium Chlorate)	Color Agent
Strontium Sulfate	Oxygen Donor
Sulfur	Fuel
Titanium (particle size must not pass through 100 mesh sieve if 1.4G Fireworks)	Fuel

APPENDIX C CONTAINER LOADING PROCEDURES

DISPLAY PROGRAM – LOADING SUPERVISOR

1. Objective

To ensure that only AFSL approved/ certified products are loaded into exporter’s shipping containers or transport containers.

2. Responsibility

2.1 Inspector is responsible to inspect the container condition and identify the consignment before inspection.

2.2 Inspector is responsible to document any damage observed.

2.3 Inspector is responsible to take photos per the requirements of the loading supervision process.

2.4 Inspector is responsible to apply the AFSL seal immediately upon completion of the loading.

2.5 Inspector is responsible to report all inspection findings.

3. Contents of Loading Supervision

3.1 There are two location scenarios for the loading supervision process:

3.1.1. Loading the container at the consolidation warehouse – A AFSL Inspector shall supervise the loading into the container yard.

3.1.2. Loading at the exporter’s warehouse/manufacturer – Upon completion of inspection the loading is confirmed directly into the container by the AFSL Inspector at the exporter’s warehouse/manufacturer.

3.1.2.1 The following special precautions must be observed and reported to shippers with appropriate documentation:

A. Loading one or more days after inspection - the stack of inspected goods shall be sealed and photographed following the inspection;

B. Prior to the loading on the scheduled date, the Inspector will check the seal and general condition of the packages/stack to ensure that the inspected goods have not been tampered with;

C. Normally SGS will not perform loading supervision for less than container loads (LCL), unless it is a shipper’s specific request. In these cases, SGS will request that the exporter/forwarder arranges the loading supervision, when the container is planned to be sealed for shipment;

D. If the AFSL Stickers are missing or any sign of substitution of inspected goods is observed, the Inspector must record this information, obtain evidence (photo), and contact the office for immediate notification to the shipper;

E. Any products that are not identified with an AFSL Sticker must not ship. Partial shipment of a certified Lot can be made provided that $\geq 95\%$ of the total carton count is deemed acceptable;

F. If any of the above interventions cannot be performed, the shipper must be notified immediately in writing and identical documentation included in the final report.

3.2 Prior to loading the container

3.2.1. The Inspector shall inspect the container for general condition, container number, cleanliness, infestation, odor, and water seal. Any container found to be in an unsuitable condition (e.g. different numbers on the exterior, any hole in the steel part, loss of door packing, etc.) shall be rejected.

3.2.2. The Inspection shall identify the consignment previously inspected and released for shipment by the means of ensuring that the AFSL sticker is on each carton.

3.2.3. The following minimum number of packing units must be selected at random from the whole consignment to verify the consignment is what AFSL previously inspected:

Cartons per line item	Cartons to be opened
1 to 5 cartons	1 carton
5 to 20 cartons	2 cartons
20 to 50 cartons	3 cartons
50 to 100 cartons	4 cartons
100 plus cartons	5 cartons

3.3 During loading of the container

3.3.1. During loading, the Inspector must supervise the following:

3.3.1.1. Check the actual quantities and compare with the order's requirements / batch code. Identify the consignment (series of Lots) previously inspected and released for shipment.

3.3.1.2. Check the general appearance of the cargo and/or package.

3.3.1.3. Verify the number of packing cases to ensure the correct quantity is loaded and the Marking against the contractual specifications / packing list.

3.3.1.4. Make sure that the appropriate handling was conducted during the whole process of loading.

3.3.1.5. Check the stowing on the means of transport and the protection against natural elements.

3.3.1.6. Check the loading documents and record container/seal number.

All serious problems and special points observed during loading process must be documented, and communicated to the shipper via the relevant Section Head (S/H) for further resolution.

3.3.2. If there is any interruption at the time of loading such as waiting for more vehicles, work breaks, or for any other reason that the Inspector has to leave the job site during loading, the container must be sealed in the absence of the AFSL Inspector.

3.3.3. If the container is only 3/4, 1/2, or 1/4 full after loading is complete, the goods must be secured in the container in a way to prevent the cargo from collapsing and/or incurring damage during transit. The container must be properly blocked or braced in these circumstances.

Blocking and Bracing: The method of making loaded cargo seaworthy within shipping containers. Were materials (usually lumber) are used to secure, immobilize, and protect cargo by preventing its free movement or shifting during transit.

3.3.4. Photographs shall be taken as per instruction for inspection execution. Usually the inspector shall take photographs in the following process:

- A. Identify the consignment
- B. Empty container
- C. 1 / 4 full
- D. 1 / 2 full
- E. 3 / 4 full
- F. Full
- G. Blocking and bracing
- H. Close right hand door (the one with the container number)
- I. Closing door with the seals
- J. Any abnormal events about consignment, container, stuffing...etc.

3.4 Sealing of containers

3.4.1. The Inspector shall apply the AFSL seal immediately on completion of loading.

The AFSL seal must be solid, uniquely numbered, and firmly fixed on the right-hand door with the nut of the hasp retaining bolt welded to the bolt itself (and not on the door). If the container has several openings, all doors must be sealed. Any circumstance which may affect the reliability of this service must be reported to the shipper with adequate explanations.

3.4.2. If the customer's shipping agent applies their seals on the loaded container, the Inspector shall record the seal numbers in the report.

3.5 Reporting

3.5.1. The Inspector shall prepare the Loading Supervision Report in the standard format immediately upon completion of loading and submit to the office or the shipper (with the S/H's instruction) within 1 business day or 24 hours when possible.

3.5.2. The Inspector should report the status of the container when the container is not full. (i.e. 1/4 full, 1/2 full, 3/4 full, or 90% full etc.)

3.5.3. A hard copy or electronic version of the report is provided to the Applicant.

3.5.4. The electronic report is uploaded into the AFSL database.

3.5.5. The original Container Loading Supervision Report should be used and kept in a file which will provide more detailed information should a claim occur.

3.5.6. Picture taking is required for every intervention. Unless there is a specific issue with the findings, pictures taken must be stored in the file. Pictures will be used as evidence by AFSL if a claim occurs.

3.6 Handling of some cases

3.6.1. If an Inspector finds that a container is being packed or loading has finished upon their arrival at the site, they will require the exporter/supplier to unload all the cargo and re-pack it in order to count the shipment quantity.

3.6.2. If the exporter/ supplier refuses 3.6.1. The Inspector will reject to seal the container and report it to the office immediately.

3.6.3. If the packing is too fast to control, the Inspector will require that the exporter/supplier stop and proceed in a manner that can be effectively managed by the Inspector. Failure to comply will force the Inspector to reject the Loading Supervision and they will report the issue to the office immediately.

APPENDIX D THERMAL STABILITY TEST FOR FIREWORKS

The composition formula for each fireworks device approved for transportation as a 1.1G, 1.3G or 1.4G explosive by DOT must be thermally stable. The explosive material must not ignite spontaneously or undergo marked decomposition when subjected to temperature of 167°F (75°C) for 48 consecutive hours.

Thermal Stability Test is performed by placing a weighed sample in a preheated oven. The oven temperature should be monitored throughout the experiment to determine that a minimum temperature of 75°C is maintained. The sample is removed after 48 hours and it is allowed to cool to room temperature. The weight loss should be minimal, and no significant change in color or physical appearance should be noticeable. The sample fails the Thermal Stability Test if it ignites, explodes, or markedly decomposes during the testing.

NOTE: It is strongly recommended that the Thermal Stability **not** be conducted on large, intact devices, which could produce devastating consequences in the event of an ignition during testing. The **components** used in such large fireworks can be tested, rather than the complete device. Any components that would be in contact with each other in the finished item must be placed in contact for the Thermal Stability Testing. The sample should be placed in a pan or on aluminum foil during the test to prevent any pyrotechnic dust or particles from contaminating the oven. The oven should be cleaned on a regular basis.

Equipment

A commercial laboratory-type oven is best for conducting the Thermal Stability Test, and explosion-proof wiring and equipment is preferred. An oven capable of controlling temperature to $\pm 2^\circ\text{C}$ is preferred for the test.

A major factor in the selection of equipment and design of the test facility will be the type of fireworks to be tested. If quantities of pyrotechnic composition in excess of several grams are to be tested, the Thermal Stability Tests must be conducted in an isolated facility. Personnel should not be working in the vicinity of an un-barricaded oven while a Thermal Stability Test is in progress.

Safety is critical in the performance of Thermal Stability Tests. It must be assumed that there is a distinct possibility that the sample will ignite during the test, and precautions must be taken to minimize the consequences of ignition and the resultant fire or explosion.