

**Outdoor
Fireworks
Display**

Fireworks FAQ

Q. Who is required to have a fireworks exhibitor license?

A. Any person who wishes to be an exhibitor (commonly referred to as a "lead shooter") of indoor, outdoor, theatrical, or special effects fireworks in Ohio.

Q. What are the minimum qualifications for a new fireworks exhibitor license?

A. As outlined in the OFC every applicant for a new fireworks exhibitor license shall:

1. Submit a properly completed application on a form prescribed by the State Fire Marshal along with the \$50 fee.
2. Submit with the application one (1) of the following:
 - o Written and signed documentation from an Ohio licensed fireworks exhibitor, manufacturer, or wholesaler attesting to the applicant's proficiency in the handling and discharging of fireworks in a manner that emphasizes the safety and security of the public, or
 - o A copy of a valid license issued by another state authorizing the applicant to conduct all types of fireworks exhibitions and discharging any and all types of "1.3G" fireworks.
3. Provide evidence that you do not have any felony convictions.
4. Pass the Fireworks Exhibitor Licensing Exam with a score of 70% or higher.

The application can be downloaded from www.com.ohio.gov or copied from the forms section of this publication.

Q. Do I have to retest for each renewal?

A. No. Retesting would only be required if you failed to have your renewal application and fees received by our office prior to expiration of your current license. To renew annually you will submit the renewal form, payment, evidence that you do not have any felony convictions, and proof of continuing education prior to the license expiration date. If your exhibitor license has expired, you must submit an application, pay the associated fees and retest the same as a new applicant.

Q. What are the continuing education requirements for exhibitors?

A. Exhibitors shall attend a continuing education program approved by the State Fire Marshal once every three years. The program shall consist of at least six hours of instruction. A licensed exhibitor or the exhibitor's designee who attends a required program shall, within one year after attending the program, and on an annual basis during the following two years, conduct in-service training for other employees of the licensee.

Q. If I'm a licensed fireworks exhibitor, do the people who help me set up an exhibition have to have fireworks exhibitor licenses?

A. No. Individuals involved only in the setup or clean up of the discharge site before or after the exhibition and do not handle 1.3G fireworks, are not required to be registered.

Q. Does an exhibitor need to register their employees?

A. Yes. The exhibitor shall annually register with the State Fire Marshal all employees who assist the licensed exhibitor in conducting fireworks exhibitions. At the time of registration, the exhibitor must provide written verification that the employee completed a minimum of three hours in-service education in the safe operation of a public display. The employee must be registered with the State Fire Marshal at least 14 days prior to assisting the licensed exhibitor in conducting a fireworks exhibition and no later than 7 days after the date hired.

An employee, once registered with the state, may work for any Ohio licensed exhibitor. Only exhibitors, registered employees, and fire safety inspectors shall be permitted within the discharge perimeter of an exhibition (ORC 3743.56).

Q. How do I register a Fireworks Exhibitor Assistant?

A. The employee registration form is available on-line, in the back of this book, or can be obtained by calling (614) 752-7126. Complete the form and return it with payment and evidence that the applicant does not have any felony convictions. Payment can be made by credit card, check, or money order made payable to: The Treasurer of the State of Ohio. A \$25.00 fee is required for each fireworks exhibitor assistant being registered. For any assistants registered the previous year, you may renew their certificate and pay on-line at www.com.ohio.gov/fire/eLicense.aspx by signing onto your exhibitor renewal page.

Q. How can I find a person is licensed as an exhibitor or assistant?

A. A person can search listings of all individuals or companies licensed by the State Fire Marshal's office at the link provided below. Select *fireworks exhibitor or exhibitor assistant information* and choose a *county* to find those that are currently licensed in the area. http://www.com.state.oh.us/sfm/fire_lookups.aspx

Q. What is Quickmatch?

A. This is a black match that is encased in a loose-fitting paper or plastic sheath to make it rapidly burn. Quick match is used for aerial shells and for simultaneous ignition of a number of pyrotechnic devices, such as lances in a ground display piece.

Q. Where can a licensed exhibitor obtain fireworks for an exhibition?

A. Ohio licensed exhibitors may obtain fireworks to be used at a specifically permitted exhibition from either an Ohio licensed wholesaler or manufacturer of fireworks. Exhibitors may also obtain fireworks from an out-of-state shipper with an SFM issued permit that allows the shipper to ship fireworks into the state. See ORC 3743.54, 3743.55 and 3743.40 for more details.

Q. Can a licensed exhibitor acquire and use 1.4g fireworks?

A. Yes. A licensed exhibitor may acquire and use 1.4g product in an outdoor exhibition that is properly permitted. See ORC 3743.54, 3743.55.

Q. When does the working relationship between the exhibitor and the fire department begin and how can we make it better?

A. Communication is the key to a successful show. The exhibitor should make contact with the AHJ (authority having jurisdiction) well in advance of the exhibition to find what their requirements are. Fireworks, pyrotechnic, and flame effect exhibitions must follow all NFPA and OFC standards, but those requirements are the minimum standard for a show. The jurisdiction(s) where an exhibition is being held may require additional measures to ensure that it is a safe & incident free performance. Talking early and talking often can cut down or eliminate those little surprises or miscommunications that create problems. It also gives the exhibitor enough time to provide support documents and any other information that might be required.

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5" Per NFPA 1123 section A.8.1.4.2, in considering when wind speed is excessive for the reasonably safe performance of a fireworks display, there are two primary considerations as follows:

- (1) The potential for an increased risk of hazardous debris from the display falling into the spectator areas
- (2) The potential for an increased probability of fire that is made excessively difficult to control

Covering the mortars with plastic will keep the shells dry in the event of rain. Securing the plastic tightly over the top of the guns will keep the wind from blowing the plastic off, and when the plastic is taut across the top the shells, they can be shot with the plastic still on. Moisture damaged pyrotechnic materials should not be used.

NFPA 1123 section 9.4.4 When a serious electrostatic discharge hazard exists, such as during an electrical storm, all electrostatic discharge-sensitive operations shall be suspended, and personnel shall withdraw to a safe location.

NFPA 1123 section 8.1.4.2* If high winds, precipitation, or other adverse weather conditions prevail or begin such that a hazard exists in the opinion of the operator or the AHJ, the fireworks display shall be postponed or discontinued until weather conditions improve.

* The AHJ will be the final judge as to what is acceptable.

Aerial Device (Display)

A fireworks device designed to be launched into the air for use in a fireworks display.

Aerial Salute

A salute that functions as an aerial shell.

Aerial Shell

A cartridge containing pyrotechnic composition, a burst charge, and an internal time fuse or module, that is propelled into the air from a mortar and that is intended to burst at or near apogee.

Assistant

A person who works under the supervision of the pyrotechnic operator.

Automatic Electrical Firing Unit

A panel or box that operates automatically to provide the source of electric current used to ignite electric matches.

Barrage

A rapidly fired sequence of aerial fireworks.

Battery

A collection of fireworks devices, such as a group of mortars (finale battery) or a bundle of roman candles (candle battery), fused together in such a manner that they are fired within a short period of time.

Break. An individual burst from an aerial shell, generally producing either a visual effect (stars) or noise (salute).

Cake

A chain-fused firework that propels a series of aerial shell, comet, or mine effects into the air from collectively attached tubes.

Chain Fusing

A series of two or more aerial shells fused to fire in sequence from a single ignition.

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.

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 of the U.S. Consumer Product Safety Commission (CPSC), as set forth in CPSC 16 CFR 1500 and 1507, 49 CFR 172, and APA Standard 87-1,

Standard for the Construction and Approval for Transportation of Fireworks, Novelties, and Theatrical Pyrotechnics. [1124, 2006]

Discharge Site

The area immediately surrounding the fireworks mortars used for an outdoor fireworks display.

Display Fireworks

Large fireworks devices that are explosive materials intended for use in fireworks displays and designed to produce visible or audible effects by combustion, deflagration, or detonation, as set forth in CPSC 16 CFR 1500 and 1507, 49 CFR 172, and APA Standard 87-1, *Standard for the Construction and Approval for Transportation of Fireworks, Novelties, and Theatrical Pyrotechnics.* [1124, 2006]

Electrical Ignition

A technique used to ignite fireworks using a source of electric current.

Electrical Firing Unit

A device that provides and controls the electric current used to ignite fireworks during a display.

Fallout Area

The area over which aerial shells are fired. The shells burst over the area, and unsafe debris and malfunctioning aerial shells fall into this area. The fallout area is the location where a typical aerial shell dud falls to the ground depending on the wind and the angle or mortar placement.

Fireworks

Any composition or device for the purpose of producing a visible or an audible effect for entertainment purposes by combustion, deflagration, or detonation, that meets the definition of *Consumer Fireworks* or *Display Fireworks* as set forth in this code. [1124, 2006]

Fireworks Display

A presentation of fireworks for a public or private gathering.

Ground Display Piece

A pyrotechnic device that functions on the ground (as opposed to an aerial shell that functions in the air) and that includes fountains, wheels, and “set pieces.”

Handheld Electrical Firing Unit

A small, handheld unit with manually operated switches that control the flow of electric current to electric matches attached to fireworks devices.

Hazardous Debris

Any debris produced or expelled by the functioning of a pyrotechnic device that is capable of causing personal injury or unpredicted property damage.

Manual Electrical Firing Unit

A panel or box with manually operated switches that control the flow of electric current to electric matches attached to fireworks devices.

Manual Ignition

A technique used to ignite fireworks using a handheld ignition source such as a fusee or portfire.

Lance

A thin cardboard tube packed with color-producing pyrotechnic composition used to construct ground display pieces.

Lift Charge

The composition that propels (lifts) the pyrotechnic device into the air.

Loader

An assistant who loads or reloads aerial shells, comets, or mines into mortars.

Black Match

A fuse made from string that is impregnated with Black Powder.

Electric Match

An electric device that contains a small amount of pyrotechnic material that ignites when current flows through the device.

Quick Match

A black match that is encased in a loose-fitting sheath.

Mine

A device containing multiple pyrotechnic effects that are simultaneously ignited and dispersed into the air from mortar or tube.

Mortar

A tube from which certain aerial devices are fired into the air.

Mortar Rack

A frame containing one or more mortars.

Mortar Trough

Aboveground structure filled with sand or similar material into which mortars are positioned.

Operator

The person with overall responsibility for the operation and safety of a fireworks display.

Black Powder. A low explosive consisting of an intimate mixture of potassium or sodium nitrate, charcoal, and sulfur. [1126, 2006]

Portfire

A long tube containing slow-burning pyrotechnic composition that is sometimes used to ignite fireworks at outdoor fireworks displays.

Pyrotechnic Material (Pyrotechnic Special Effects Material)

A chemical mixture used in the entertainment industry to produce visible or audible effects by combustion, deflagration, or detonation. [1124, 2006]

Pyrotechnic Special Effect

A special effect created through the use of pyrotechnic materials and devices. [1126, 2006]

Pyrotechnics

Controlled exothermic chemical reactions that are timed to create the effects of heat, gas, sound, dispersion of aerosols, emission of visible electromagnetic radiation, or a combination of these effects to provide the maximum effect from the least volume. [1124, 2006]

Pyrotechnic Device

Any device containing pyrotechnic materials and capable of producing a special effect as defined in this code. [1126, 2006]

Ready Box

A storage container for aerial devices for use during setup and display.

Ready Box Tender

An assistant who controls and dispenses the contents of ready boxes during a fireworks display.

Roman Candle

A chain-fused firework that propels a series of aerial shell, comet, or mine effects into the air from a single tube.

Safety Cap

A tube, closed at one end, that is placed over the end of the fuse until the intended ignition to protect it from damage and accidental ignition.

Salute

Fireworks designed to produce an explosive sound as their primary effect.

Shooter

A member of the fireworks display crew (either the operator or an assistant) who performs the actual ignition of the fireworks, either by manual or electrical means.

Spotter

A member of the fireworks display crew (either the operator or an assistant) who observes the firing and bursting of aerial shells and other display fireworks for the purpose of detecting proper mortar angling, noting the occurrence of duds, and observing for other potentially hazardous situations.

Sponsor

The organization (person, group, or government agency) that arranges with a duly authorized fireworks supplier for its services in presenting a fireworks display or in providing fireworks for use in a display.

Ground Salute

A salute that functions from a stationary or secured position.

Display Site

The immediate area where a fireworks display is conducted, including the discharge site, the fallout area, and the required separation distance from mortars to spectator viewing areas, but not spectator viewing areas or vehicle parking areas.

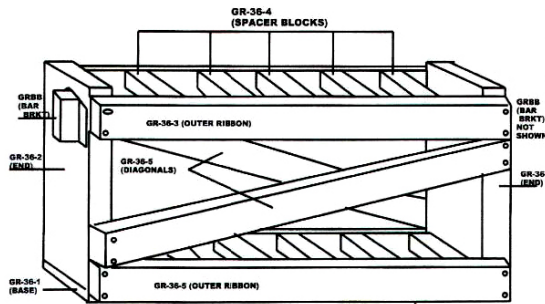
The following photos and diagrams are to be used only as examples of how to stabilize mortars, mortar racks, candles, and cakes. Stability is verified by the licensed fireworks exhibitor and fire official immediately prior to the fireworks exhibition. Each item shall be individually addressed in an appropriate manner (apply pressure and determine it cannot fall over or move on the ground) to ensure its integrity and stability prior to providing affirmative documentation of such stability on the required inspection checklist.

Refer to NFPA 1123 (2006 edition) and Ohio Fire Code 1301:7-7-33 for specific requirements.

Racks & Mortars

Q. What is a fireworks rack?

A. A fireworks rack contains a given number of aerial mortar tubes (aka “guns”) of a given size. Aboveground racks should be constructed to withstand a catastrophic malfunction in a mortar. Wooden racks should have sides and bottom plates of at least 2 in. (5 cm) nominal thickness. The racks should be boxed on both sides at the top and bottom by 1 in. x 6 in. (2.5 cm x 15 cm) nominal thickness boards or ½ in. (1.3 cm) thick plywood. Blocks of 2 in. (5 cm) nominal thickness should be attached to the horizontal boards between each mortar of inside diameter greater than 3 in. (76 mm). Boards should be fastened by nails, screws, or other fasteners that penetrate a minimum of 1 in. (2.5 cm) into the member to which a board is attached.



RACK WEIGHT (COMPLETE W/ MORTARS)

25 LBS.

Q. What is a mortar?

A. A mortar is the tube that is secured in the rack and holds the shells. Most display fireworks are shot from mortars. Mortars shall be of sufficient length to allow aerial shells to be propelled to the height at which the aerial shells were designed to burst. Paper, HDPE, and fiberglass mortars shall be permitted to be used. Cast iron, stove pipe, corrugated culvert, clay, bamboo, and wood shall not be used to make mortars. Metal mortars shall be permitted to be either seamed or seamless. Where seamed mortars are used, mortars shall be placed so that all seams face either right or left when the line of mortars are viewed. NFPA 1123 provides minimum mortar requirements. Mortars shall be positioned and spaced so that shells are propelled over the fallout area and to afford maximum protection to the shooter, loader, and audience.



Q. How do you secure the mortar racks for the show?

5" Racks should be secured to prevent tipping over by attaching stakes or spikes driven into the ground, banding, using A-frames, or other equivalent means. Aboveground wood frame mortar racks with lightweight mortar materials such as paper, HDPE, or fiberglass generally will not withstand a catastrophic aerial shell malfunction in a mortar (NFPA 1123 section A4.6.1)

There are a variety of techniques depending on what type of surface you are shooting from. Sandbags, trenches, boxes, screens, or barriers are additional methods used to secure aerial fireworks devices. **The AHJ will be the final judge as to what is acceptable. The fire safety inspector must be confident that the racks are set up and secured in a way that will allow for an incident free exhibition.** The important thing is that the racks & mortars are secured in an upright and safe position and stay secure throughout the show. As a shell lifts from the rack it does so with enough intensity to move or damage the tubes and whatever shells are left in the rack. If a rack is not safely secured it may fall over and the remaining shells will discharge into the crowd. If the rack is too unyielding, the force of a shell firing may damage the rack and/or any shells yet to be fired. This creates a situation where the remaining shells are being fired from unstable or damaged tubes and/or racks.



Mortars buried within drums or troughs are not considered to be buried in the ground. If troughs and drums are used, they shall be filled with sand or soft dirt and, in all cases, shall

be free of stones or other potentially dangerous debris. Troughs shall be reinforced or

braced in a minimum of two places on the sides at intervals not greater than every 4 ft (1.2 m). Mortars shall be buried to a depth of at least two-thirds of their length, either in the ground or in aboveground troughs or drums.

Q. Why are some racks at an angle?
5" Aerial shells, comets and mines, and Roman candles and cakes shall be permitted to be angled for a display to allow for wind and to carry their effects away from the main spectator viewing area. The mortars or tubes shall be angled so that any dud shells or components will drop in the fallout area.



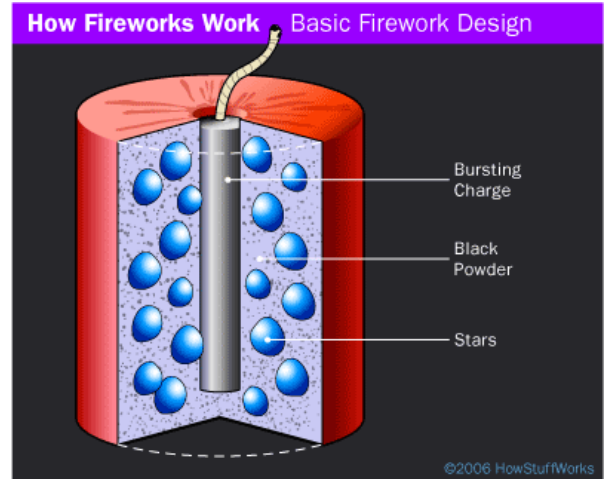
Shells



Q. What is a Firework Shell?

5" A cylindrical or spherical cartridge containing lift charge, burst charge and effect composition. Shells are most commonly 2 inches (50 mm) to 6 inches (152 mm) in diameter, and are fired from metal, high-density polyethylene (HDPE), fiberglass, or heavy cardboard tubes. Upon firing, the lift charge is consumed and the cartridge is expelled into the air. A pyrotechnic effect is produced near the apex of flight. Aerial shells are typically ignited by means

of a quick match fuse or electric match. The lift charge is a pyrotechnic composition used to propel the mine or shell device into the air. A lift charge is limited to black powder (potassium nitrate, sulfur, and charcoal) or similar pyrotechnic composition without metallic fuel. Aerial shells exceeding 10 inches (250 mm) in diameter or containing a burst charge that has metallic fuel may be approved under this NFPA 1123 as Fireworks, UN0333, 1.1G. Note: All aerial shells that are not contained in a launch tube (D.3.1.2.5) or sold as part of a reloadable shell kit (D.3.1.2.6) may only be approved under the provisions of NFPA 1123 as Fireworks, UN0335, 1.3G.



Each shell shall be identified only in terms of the inside diameter (not the circumference) of the mortar in which it can be safely used [e.g., 3 in. (76 mm) shells are only for use in 3 in. (76 mm) mortars]. Each shell shall 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 no less than 1/8 in. (3.2 mm) and not more than 1/4 in. (6.4 mm) for shells not exceeding 3 in. (76 mm) or 1/2 in. (12.7 mm) for shells larger than 3 in. (76 mm). Each shell needs to be marked with the type of shell, the diameter measurement, and the name of the manufacturer or distributor.

Cakes and Candles

Q. What is a Fireworks Cake?

A. The term cake refers to a dense-packed collection of mine/shell tubes in which multiple effects are chained together to fire back to back. It propels a series of aerial shells, comets, or mine effects into the air from collectively attached tubes. Total chemical composition including lift charges of any multiple-tube devices may not exceed 200 g.



Q. Why are some cakes covered with foil?

A. Weather-resistant coverings shall be placed over the mouth of mortars wherever there is imminent danger of water collecting in the mortars. Foil & black plastic are commonly used for this purpose. Foil may also be used to prevent premature ignition from any sparks produced by other devices in the show, particularly nearby cakes.



Q. Is there any special considerations for the larger cakes?

A. A cake fires one after another from start to finish with no way to stop it. Therefore, if a tube explodes, the other surrounding tubes could be knocked out of place pointing in an undesirable direction. To prevent this, you can place large cakes in the wooden boxes to keep all tubes pointed straight up even in the event of a malfunction. Another option is to bury $\frac{3}{4}$ of the cake. All bundles, box items, cakes, candle placements, and mortar racks shall be inherently stable or be properly secured and

braced to prevent repositioning. It is not acceptable to create inherent stability of mortar racks only by connection to other mortar racks. The stability of all mortars, bundles, box items, cakes, candle placements and mortar racks shall be verified by the licensed fireworks exhibitor and fire official immediately prior to the fireworks exhibition. Each such item shall be individually addressed in an appropriate manner to ensure its integrity and stability prior to providing affirmative documentation of such stability on the required inspection checklist. **The AHJ will be the final judge as to what is acceptable. The fire safety inspector must be confident that all devices are set up and secured in a way that will allow for an incident free exhibition.**

Q. What are the required distances?

A. For aerial shells, comets, mines, Roman candles, and cakes that are discharged vertically, the minimum required spectator separation distance shall be the same as the minimum required radius specified in chart 5.1.3 in the 2006 Edition of NFPA 1123. Where there is doubt concerning the strength of racks holding chain-fused mortars, the separation distances from those racks to spectators shall be twice those listed in Table 5.1.3.1 for the largest mortar in the sequence. Keep in mind that the distances in this chart are the minimum requirements. The AHJ can increase the distance if so desired.

Table 5.1.3.1 Distances for Outdoor Aerial Shell Display Sites: Minimum Separation Distances from Mortars to Spectators for Land or Water Displays

Mortar Size ^a		Minimum Secured Diameter of Site ^b		Vertical Mortars ^c		Angled Mortars ^d ¹ / ₃ Offset		Mortars to Special Hazards ^e	
in.	mm	ft	m	ft	m	ft	m	ft	m
≤1	25	150	46	75	23	75	23	150	46
1.5	38	210	64	105	32	75	23	210	64
2	50	280	85	140	43	95	29	280	85
2.5	63	350	107	175	54	115	35	350	107
3	76	420	128	210	64	140	43	420	128
4	102	560	171	280	85	190	58	560	171
5	127	700	213	350	107	230	70	700	213
6	152	840	256	420	128	280	85	840	256
7	178	980	299	490	149	320	98	980	299
8	203	1120	341	560	171	370	113	1120	341
10	254	1400	427	700	213	460	140	1400	427
12	305	1680	512	840	256	560	171	1680	512

Note: >12 in. (>305 mm) requires the approval of the AHJ.

a See 4.1.1.

b See 5.1.3.

c See 5.2.1.3.

d See 5.2.1.3. Note that for angled mortars, the minimum secured diameter of the display site does not change. Only the location of the mortars within the secured area changes when the mortars are angled.

e See 5.1.4. Note that this is only the distance to the special hazards. The minimum secured diameter of the display site does not change.

Q. What is a candle?

A. Candles come in different sizes and effects. All are constructed of heavy paper or a cardboard tube containing not more than 20 g of chemical composition.

Q. How do we setup a fireworks candle?

A. All chain-fused aerial fireworks devices, including those not in mortar racks such as roman candle batteries and multi-tube aerial items, shall be positioned using stakes, racks, sandbags, earth, or equivalent means to prevent tip over or hazardous movement during operation.



Hand Firing or Electronic Firing

As with varying techniques to securing a rack, the exhibitor/shooter may have a personal preference for hand firing and electronic firing. **The AHJ will be the final judge as to what is acceptable.**



Typically, for electrical ignition, electric matches are attached to or inserted into fireworks devices prior to the display and are connected to wires leading back to an electrical firing unit. During the display, the operator or an assistant controls the ignition of the fireworks using the electrical firing unit.

Electrical firing/ignition is often used for larger displays, for displays fired on frequent occasions at a fixed location, and for other displays where precise control over the timing of the fireworks is

desired for aesthetic reasons. The operator and all assistants shall be positioned a minimum of 75 ft (23 m) from any mortar or shall be positioned behind a protective barrier approved by the AHJ during an exhibition that is using an electrical firing system. The electrical firing unit shall be set up and located so that there is a clear line of sight to the mortars and to other parts of the discharge site, unless a spotter is in direct communication with the shooter controlling the electrical firing unit. Only those persons necessary for the firing of the display shall be permitted in the vicinity of the electrical firing unit during the display.

Where more than one shooter is to hand ignite the aerial shells for an outdoor fireworks display, the line of mortars should be separated in some manner, and only one shooter should be lighting shells in each area.

Where both manual firing and electrical ignition are used during a display, the mortars to be used for manual firing shall be separated from the mortars to be used for electrical ignition by a distance of at least 25 ft (7.7 m)

