

# Fireworks Display Safety



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**Provided by:**

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Intergovernmental Risk Pool**





- Make sure that all fireworks are transported according to Department of Transportation requirements with respect to certification of drivers and placarding. The U.S. Department of Transportation provides detailed information and guidance at DOT's Hazmat Safety <https://www.phmsa.dot.gov/hazmat/energetic-materials-approvals/fireworks>
- Fireworks should be stored correctly before the show. Refer to Alcohol Tobacco and Firearms for regulations and guidance on temporary storage ([www.atf.gov](http://www.atf.gov), and look for "explosives"). For answers to frequently asked questions, see [www.atf.gov/questions-and-answers/explosives-gas](http://www.atf.gov/questions-and-answers/explosives-gas)
- The National Fire Protection Association (NFPA) Standard 1124: Code for the Manufacturing, Transportation, Storage, and Retail Sale of Fireworks and Pyrotechnic Articles, provides guidelines in the areas of transportation and storage. The potential landing area should be a clear open space. Spectators, vehicles, etc. should not be located within the potential fallout area of the display. The public should be kept at least 100 feet away from preparation areas. If the secured area is breached by the public, all work should halt until the issue is resolved.

## Distance

The NFPA distance standard is a function of mortar size. See **NFPA 1123 Table 5.1.3.1**. For example, the NFPA recommends the display radius should be a minimum of 420 feet for 6-inch vertical mortars (70 feet of distance per mortar inch). Use the largest mortar size to determine the radius. Safety distances are doubled for hazardous items (such as fuel storage tanks, etc). The distance can be exceeded for safety of the spectators. Some pyrotechnicians recommend at least 100 feet per mortar inch. If hospitals, schools, churches, nursing homes, or detention centers are nearby, the distance should at least be doubled to 840 feet for 6-inch mortars according to the NFPA standards, but no less than 600 feet for smaller mortars (see Texas Occupations Code, Chp. 2154.251), unless there is a written authorization from the organization. The trajectory of the shells should not come within 25 feet of any overhead object at the minimum.

Debris should not fall outside the fallout zone. An ideal situation would be to have only one way in and out of the fallout zone, such as using a fenced-off field. If this is not possible, boundaries appropriate for preventing persons from entering the exclusion zone should be erected. Sufficient numbers of fire, police, and other personnel should be stationed at the boundaries to watch for persons trying to enter the possible fallout area. Security personnel should handle crowd control and other problems and emergencies that arise. In order to do this they will need appropriate communications equipment. These spotters should also be able to contact the display operator in the case of a problem, so that the show can be delayed if necessary and the crowd moved back further, or the show even cancelled if conditions warrant. Spotters should also watch the flight and behavior of the fireworks to verify they are functioning properly. If the situation is unsafe, such as debris falling on spectators, the pyrotechnician should be immediately and directly contacted so that firing can be ceased.

Summer often brings dry conditions and your entity should be prepared to respond in the event of fire. The fallout area should not have high grass. The area should be cross-cut or cut and raked. Firefighting personnel should be stationed nearby with appropriate pumper trucks and equipment.

## Display Site

A circumference of 40 to 50 feet around the mortars should be watered down just before the show. A test shell fired before the show could help determine the wind factor at higher altitudes. Consider the date of when an event would be rescheduled due to weather, technical problems, etc. Make the public aware of this "rain date" in pre-event publicity. As with many special events, consider having emergency medical care available at the event. Also, if the wind increases to where debris is falling on spectators, the display should be cancelled or discontinued until conditions improve.

## Pyrotechnic Operators

The firework display operator for a 1.3G show must be a licensed pyrotechnician at least 21 years of age and an operator of a 1.4G public display should have an appropriate license and carry and be able to present their “pocket license” upon request. Assistants must be at least 18. The display operator should know where the assistants are at all times during the show. For electronically controlled displays, the pyrotechnic operator and crew should be at least 75-100 feet away from the mortars when firing. Display personnel should wear personal protective equipment such as hearing protection, safety glasses, full length pants, long-sleeved shirt, steel-toed boots, and head protection. Flashlights should be used for signaling purposes. At least two approved Class A type 2 1/2-gallon fire extinguishers or charged hose connected to a water line should be kept nearby. The operator should have radio contact with personnel at the boundary areas and must be prepared to deal with an emergency, stopping or delaying the show if necessary. Operators and assistants must be trained, aware of the conditions around them, ready to respond, and sober. Personnel should not smoke around the fireworks. (See link to safety guidelines on the last page.)



*Display set-up, note fire extinguishers.*

Some companies that sell fireworks provide affordable training on safe techniques and procedures. Personnel should attend update training periodically.

## Mortars



The mortars, or firework firing tubes, should be inspected for defects such as dents, bent ends, damaged interiors, or damaged plugs, before use. Defective mortars should not be used. The mortars should be correctly pointed, braced, and secured. The NFPA code and State Fire Marshal’s office have specifications on mortar materials and bracing. Fill dirt can be used in trenches to fill in spaces between the mortars in order to prevent movement. Mortar sizes that are to be reloaded should not be intermixed with other mortar sizes. NFPA 1123 Section 4.7-Trailer Firing addresses the use of trailers to

fire pyrotechnics. Refer to the NFPA standards for mortar construction and set up, including banning zip ties to secure devices.

If your entity provides a display in which the shells are hand-lit, take additional safety precautions. Have a ready box (NFPA 1123 Section 4.2.4) that is weather resistant that protects contents from burning debris with a self-closing cover or other equivalent means of closure. Hand-lit firework displays are dangerous because they require the shooter to light the mortars individually with a torch or fuse. If your entity does this type of display, careful organization is vital. For example, a person should be in charge of only one mortar size to prevent confusion. The shooters must concentrate and follow a specific plan for the display. Displays controlled by electronic means are safer. Electronic firing systems have become more affordable and are normally reliable.



