FIRE DEPARTMENT • CITY OF NEW YORK

STUDY MATERIAL FOR THE EXAMINATION FOR CERTIFICATE OF FITNESS FOR SPFX COFs

SPFX for Film (E-01)	**Entire book**
SPFX for Film Apprentice(E-03)	**Entire book**
Pyro for Special Events (indoor/outdoor) (E-02)	Sections 1-14
Pyro for Special Events Apprentice (E-04)	Sections 1-14
Theatrical SPFX C (E-05) **(Premise Related)**	Sections 1-14
Smoke/Haze Operator/SPFX Safety (E-06)	Sections 1-10

Note: If you need assistance determining which certificate of fitness is required for a specific Special Effect, contact Explosives Unit at Explounit@fdny.nyc.gov

All applicants are required to apply and pay for an exam online before arriving at the FDNY. It can take about 30 minutes to complete.

Simplified instructions for online application and payment can be found here: http://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf

Create an Account and Log in to:
http://fires.fdnycloud.org/CitizenAccess

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EXAM SPECIFIC INFORMATION
FOR
Special Effects Series

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REQUIREMENTS FOR CERTIFICATE OF FITNESS APPLICATION

General requirements:
Review the General Notice of Exam:
http://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf

Special requirements for the Special Effects (E-series) Certificate of Fitness:

- Must be a U.S. Citizen
- Must be at least 18 years of age
- Upload *supporting documents* including:
  - Upload resume detailing experience.
  - copies of any Explosives related licenses, training courses/certificates or other Certificate of Fitness from NYC or alternate jurisdictions with online application.
- Fingerprinting required:
  - Instructions for fingerprinting will be sent to **qualified candidates** by email **(Exception: E-06, does not require fingerprinting)**
- E-Series COFs are **not walk-in exams**. You must be **approved** to take exam. **(Exception: E-06 can walk-in, provided there is an employment letter)**

Application fee must be paid with online submission:
Accepted forms of payment:

- Credit/debit card (*American Express, Discover, MasterCard, or Visa*)
- Personal or company check or money order (*made payable to the New York City Fire Department)*

A convenience fee of 2% will be applied to all card payments.

EXAM INFORMATION

The E-01 exam will consist of **50** multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limited exam. Based on the number of questions, you will have **75 minutes** to complete the test.

The E-02 exam will consist of **50** multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limited exam. Based on the number of questions, you will have **75 minutes** to complete the test.

The E-03 exam will consist of **25** multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limited exam. Based on the number of questions, you will have **38 minutes** to complete the test.

The E-04 exam will consist of **25** multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limited exam. Based on the number of questions, you will have **38 minutes** to complete the test.

The E-05 exam will consist of **20** multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limited exam. Based on the number of questions, you will have **30 minutes** to complete the test.

The E-06 exam will consist of **20** multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limited exam. Based on the number of questions, you will have **30 minutes** to complete the test.

A passing score of at least 70% is required in order to secure a Certificate of Fitness. Call (718) 999-1595 for additional information.

https://www.nyc.gov/assets/fdny/downloads/pdf/business/cof-spfx-e-series.pdf

If all the requirements are met and the applicant passes the exam a certificate will be issued the same day. Applicants who fail the exam will receive a failure report. To retake the exam applicants will need to submit a new application and payment.

RENEWAL REQUIREMENTS

COFs Certificates of Fitness are valid for a period of **three years** from the date of issuance. At the end of this period, the certificate expires unless the commissioner approves its renewal. Please be advised that certificate renewals shall be at the discretion of the commissioner in the interest of public safety. The department may

review the certificate holder's qualifications and fitness. E-series holders must ensure that their original Certificate of Fitness card is available for inspection at all times by the FDNY.

The renewal fee is $15. Certificate of Fitness can be revoked at any time.

FDNY reserves the right to require applicants to take a re-examination upon submission of renewal applications.

You may receive a courtesy notice by email of renewal 90 days before the expiration date. However, it is your responsibility to renew your Certificate. It is very important to renew your C of F before it expires. Renewals submitted 90 days (up to one year) after the expiration date will incur a $25 penalty in addition to the renewal fee. Certificates expired over one year past expiration date will not be renewed and a new exam will be required.

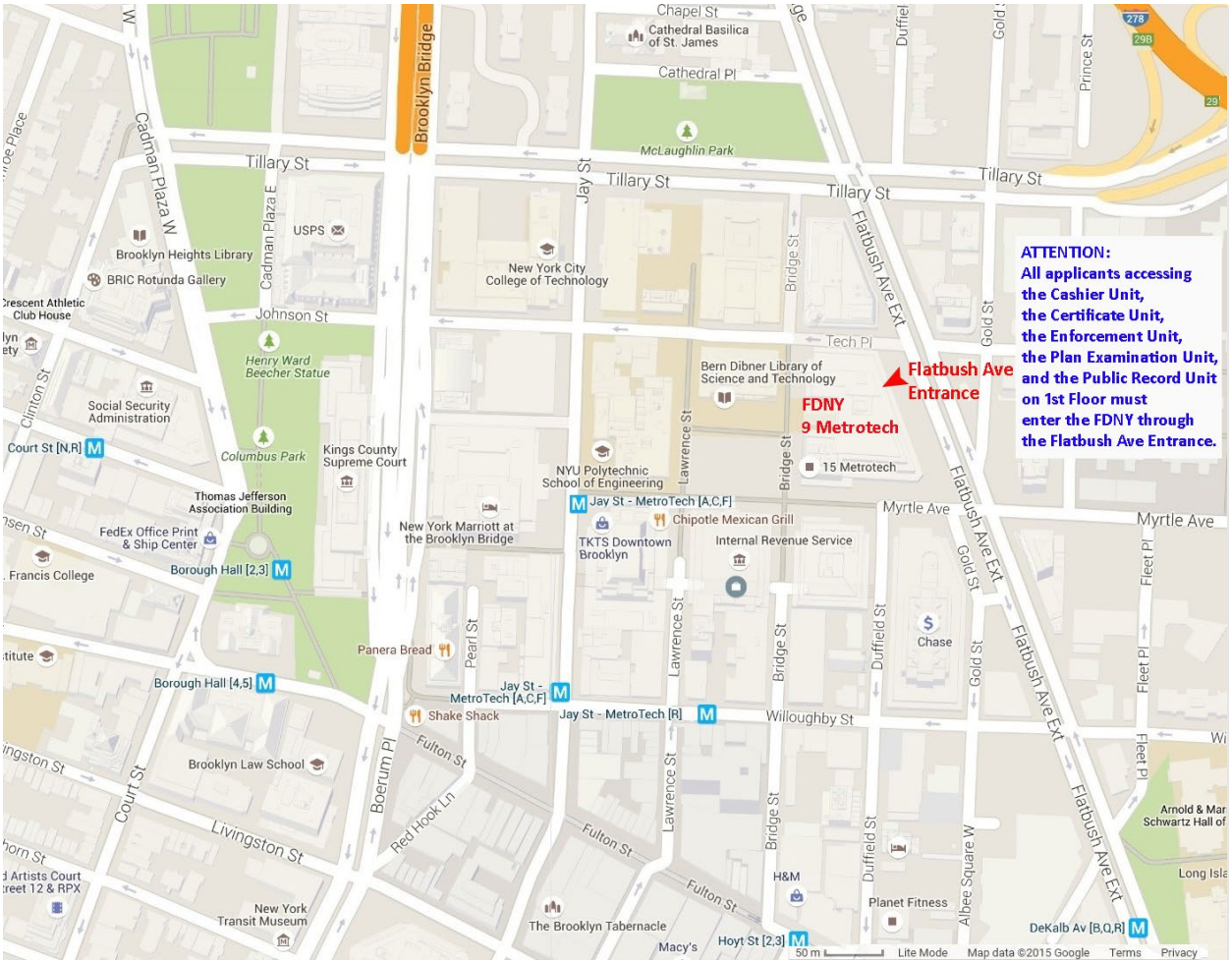
You can request a change to your mailing address, the work location, or a replacement certificate, online.

Renewal fee can be paid by one of the following methods:

- Credit card (American Express, Discover, MasterCard, or Visa)
- Debit card (MasterCard or Visa)
- E-check

For renewals go to:
http://fires.fdnycloud.org/CitizenAccess/SAML/NYCIDLogin.aspx

EXAM SITE: **FDNY Headquarters,** 9 MetroTech Center, Brooklyn, NY. Enter through the **Flatbush Avenue entrance (between Myrtle Avenue and Tech Place)**.



ABOUT THE STUDY MATERIAL

This study material will help you to prepare for the written examination for Special Effects Certificates of Fitness exam for Pyrotechnicians. This study material includes information taken from the New York City Fire Code as well as industry safety standards. The study material does not contain all the information you need to know in order to perform the responsibilities of special effects safely. It is your responsibility to become familiar with all applicable laws, rules and regulations of the federal, state and city agencies having jurisdiction, even though such requirements are not included in this study material. You need to be familiar with the New York City Fire Code Chapter 1, Section 105.6, Chapter 56, Section 5609 which regulates the use of special effects. **It is critical that you read AND understand this booklet to help increase your chance of passing this exam.**

ABOUT THE TEST

You must pass a multiple choice and verbal test to qualify for the certificate of fitness. A score of 70% correct is required in order to pass the multiple-choice section of the test. All questions have four answer options. Only ***one*** answer is correct for each question. If you do not answer a question, or if you mark more than one answer to a single question, your answer to that question will be scored as incorrect. Read each question carefully before marking your answer. There is no penalty for guessing.

SAMPLE QUESTIONS

Which of the following are allowed to be used while taking a Certificate of Fitness examination at 9 Metro Tech Center?

I. cellular phone
II. study material booklet
III. reference material provided by the FDNY
IV. mp3 player

A. III only
B. I, II, and III
C. II and IV
D. I only

Only reference material provided by the FDNY is allowed to be used during Certificate of Fitness examinations. Therefore, the correct answer would be A. You would touch “A” on the computer terminal screen.

If the screen on your computer terminal freezes during your examination, who should you ask for help?

A. the person next to you
B. the firefighters
C. the examiner in the testing room
D. the computer help desk

If you have a computer related question, you should ask the examiner in the testing room. Therefore, the correct answer would be C. You would touch “C” on the computer terminal screen.

If you do not know the answer to a question while taking an examination, who should you ask for help?

A. the person next to you
B. the firefighters
C. the examiner in the testing room
D. you should not ask about test questions since FDNY staff cannot assist applicants

You should not ask about examination questions or answers since FDNY staff cannot assist applicants with their tests. Therefore, the correct answer would be D. You would touch "D" on the computer terminal screen.

1. Introduction

Special effects, even minor effects, are not only used for theatre productions, television, and motion pictures but also for special events to either enhance production or to simulate real events that may be too dangerous or unreasonable to perform without appropriate supervision.

Special Effects are also used for entertainment purposes such as magic shows and stage performances. Fire acts require a Fire producer or Fire performer license. Use of prop guns and blank loads requires an armorer or a prop master with weapons training.

Using special effects anywhere is dangerous, especially in a heavily populated city such as New York. Improper use or storage of equipment, chemicals, and explosives creates a risk to individuals and property.

It is important when working with all pyrotechnic devices and chemicals that the Material Safety Data Sheet/ Safety Data Sheet is available.

The **E-01 formerly known as the E-18, Class A** Certificate of Fitness. This Certificate allows the holder to perform high level special effects for filming purposes, television and movies. This Certificate of Fitness holder must be familiar with the Film Fire Safety plan and work closely with the Film Site Safety Certificate of Fitness holder to ensure safe production locations.
Apprentice: E-03

The **E-02 formerly known as E-18, Class A** Certificate of Fitness. Pyrotechnician in charge of special effects. This Certificate allows the holder to supervise and perform all high-level special effects conducted by all Special Effect Certificate holders. This certificate can cover indoor and outdoor SPFX including concerts and festivals.
Apprentice: E-04

The **E-03/E-04, formerly known as E-19, Class B** Certificate of Fitness. This Certificate allows the holder to conduct low level effects such as cyro, candles, lighters and matches. These are apprentice licenses.

The **E-05, formerly known as E-27/E-30, Class C** Certificate of Fitness is a premise-related Certificate of Fitness. This Certificate can cover minor effects associated with theatre shows including water-based smoke/haze effects, minor flame effects using inspector approved amounts of candles, cigarettes, lighters, and matches. E-05 COFs holders are also responsible for fire safety practices at location and are also able to serve as Safety Personnel when not executing pyrotechnic tasks.

The **E-06, formerly known as E-27/E-30** Certificate of Fitness and can cover water-based smoke machines, hazers that use no more than 20 lb compressed gas tanks. This also includes nitrogen for confetti and streamers. E-06 COFs holders are also responsible for fire safety practices at location and are also able to serve as Safety Personnel when not executing pyrotechnic tasks.

All required FDNY permits, and Certificate of Fitness must be obtained prior to performing any special effect. Additionally, every Certificate of Fitness holder must have his or her valid certificate in possession (not expired) while performing any kind of special effect. The performance of any special effect without FDNY approval, permits, and a valid certificate of fitness is unlawful and subject to disciplinary action.

Case Studies

These case studies are only being provided for educational purposes. The facts are based upon public reports and not meant to express any legal opinion or assessment by the FDNY. It is being provided as a "lesson(s) learned" so COF holders might learn from past publicly reported. It might lead to avoiding similar incidents.

The format of these case studies includes fires and non-fire emergencies. It will include a summary of reported facts and lessons learned.

Undertaker burned by his pyro during the Elimination Chamber pay-per-view
Feb 21, 2010

Mark William Calaway, the 44-year-old Texan who wrestles under the name The Undertaker for the WWE, was injured by flames during a pay-per-view special. Part of The Undertaker's grand entrance includes flames shooting up from the stage. Unfortunately, one of those flames ignited while he was over the flame unit, standing in that spot. The Undertaker removed his jacket after being burned and tossed it to the floor where it burst into flames.
A miscue of the pyrotechnics caused the accident during the Elimination Chamber event.

Despite his injuries, The Undertaker chose to continue his performance at the Elimination Chamber event. He wrestled for a full 30 minutes while dousing himself with water off camera.

Lesson learned:

- Use of spotters
- Always have line of sight
- Always have radio contact
- Make sure to rehearse with and without talent
- Check air flow

Halle Berry hurt in blast during Bond film scene
April 2002

THE Oscar-winning actress Halle Berry was injured in Spain while filming her starring role in the new James Bond movie Die Another Day.
Berry, 33, was being directed in a risky scene which involved her co-star Pierce Brosnan, playing Agent 007, shooting down a helicopter.
Many explosions took place as the stuntmen flew the helicopter in dangerous maneuvers. ***A piece of debris from a smoke grenade flew into Berry's left eye.***

The Hollywood star was “quite lucky” as it didn’t leave her with any lasting damage and the fragment was removed from her eye in a 30-minute operation, in a nearby clinic.

Lesson Learned:

*Always have safety meetings about effects and possible dangers
*Maintain proper distances
*Use of proper PPE

Horror Stuns the Circus Acrobat Accidentally Sets Himself on Fire

Madison Square Garden, New York
April 14, 1998

The Greatest Show on Earth became a circus of horrors yesterday when an acrobat accidentally set himself ablaze as thousands of stunned parents and wide-eyed children looked on. Peals of laughter turned to screams of terror as the Ringling Bros. and Barnum & Bailey Circus performer caught fire while jumping a flaming rope in a grass skirt. Jacques Mbembo, 24, was in serious condition at New York Hospital-Cornell Medical Center with second and third-degree burns over 20% of his body.

A group in traditional Gabonese garb of leopard skin and grass skirts was jumping a burning rope when Mbembo's skirt lit up, witnesses said. "He dropped to the ground and rolled around. Other performers kept up the act but when the flames wouldn't go out, he ran out of the room with the grass on fire.
At least two circus workers said there was an off-stage scramble for fire extinguishers as Mbembo burned. ***They said the extinguishers were supposed to be next to the center ring, but were misplaced.*** Mbembo did at least one somersault as he desperately tried to douse himself, witnesses said. After several panicked moments, an assistant ringmaster in a tuxedo ran to Mbembo with a fire extinguisher and put out the flames.

Lessons Learned:

- All costumes and materials must be flameproofed
- Extinguishers must be in correct travel distances

Bruce Lee's Son, Brandon, Killed in Movie Accident
Wilmington, N.C
1993

Brandon Lee (son of Bruce Lee) died of a gunshot wound on March 31, 1993 at the filming studio in Wilmington, North Carolina, at the age of 28, after an accidental shooting on set of *The Crow*.

In the fatal scene, which called for the revolver to be actually fired at Lee from a distance of 12–15 feet, ***the dummy cartridges were exchanged with blank rounds, which feature a live powder charge and primer, but no bullet, thus allowing the gun to be fired without the risk of an actual projectile. But since the bullet from the dummy round was already trapped in the barrel, this caused the .44 Magnum bullet to be fired out of the barrel with virtually the same force as if the gun had been loaded with a live round***, and it struck Lee in the abdomen, mortally wounding him.

Lessons Learned:

*Always double check equipment
*Conduct a test shot within proper safety distances

2. Definitions

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.

AIRBURST. A pyrotechnic device that is suspended in the air to simulate outdoor aerial fireworks shells without producing hazardous debris.

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

AUDIENCE. Spectators whose primary purpose is to view a performance.

BINARY SYSTEM. A two-component pyrotechnic system.

BLACK POWDER. A low explosive consisting of an intimate mixture of potassium or sodium nitrate, charcoal, and sulfur.

BLANK AMMUNITION (*Theatrical Ammunition*)**.** A type of ammunition for a firearm that contains gunpowder but no projectile.

CITY-WIDE. Certificates are usable and valid at any location within the 5 boroughs (E-01, E-02, E-03, E-04, E-06).

COMBUSTIBLE. Capable of being burned. Can be fiber or liquid.

CRYOGENIC. A fluid having a boiling point lower than -130°F at 14.7 pounds per square inch absolute (psia) (an absolute pressure of 101.3kPa).

CYROGENIC CONTAINER. A pressure container, low-pressure container, or atmospheric container of any size designed or used for the transportation, handling, or storage of cryogenic fluid, and which utilizes venting, insulation, refrigeration or a combination thereof to maintain the pressure within design parameters for such containers and to keep the contents in a liquid state.

DANGER AREA. The immediate area surrounding the special effect or pyrotechnic performance. The distance of the danger area depends on the actual effect that is taking place.

DRY ICE. The solid form of carbon dioxide. It is primarily used as a cooling agent but often used to create theatrical/performance fog.

ELECTRIC MATCH. Is a device that uses an externally applied electric current to ignite a combustible compound.

FLAME PASTE. Flammable paste that burns with an orange flame.

FLAMMABLE. Easily ignited and quick burning. Can be in liquid or solid form.

FLAMMABLE CYROGENIC FLUID. A cryogenic fluid that is flammable in its vapor state.

FLASH CLOTH. A cotton-based material which is stronger than the traditional flash paper but produces the same orange flame effect with no residue. It can be sewn into objects allowing the designer to create different effects.

FLASH CORD. Popular for magician's tricks. It burns quick with a bright orange flame and vanishes without residue.

FLASH COTTON. Creates an instantaneous flash and burns very quick

FLASH PAPER. Paper made from nitrocellulose and burns very quickly and completely with a bright orange flame that leaves no ash.

FOG. Created by glycol/ water mixtures heated until the fluid vaporizes creating a thick translucent or opaque cloud of liquid droplets.

GENERAL SUPERVISION. Supervision by the Certificate of Fitness holder who is responsible for performing the duties of the certificate holder but need not be personally present on the premises at all times. When using hazardous special effect materials, when COF is not present, material must be ***locked and secured***.

HANDLING. The removal of the material from its container, or any other action or process that may affect the material, other than its storage or use.

HAZE. An unobtrusive cloud made of liquid droplets that are intended to primarily reveal lighting beams. Like fog, it can be created with a glycol/water mixture.

HEALTH HAZARD. A classification of a chemical for which there is statistically significant evidence that acute or chronic health effects are capable of occurring in exposed persons. the term "health hazard" includes chemicals that are toxic, highly toxic and corrosive.

LIQUID. A material having a melting point that is equal to or less than 68°F and a boiling point that is greater than 68°F at 14.7 psia. When not otherwise identified, the term "liquid" includes both flammable and combustible liquids.

LOW LYING FOG. A thick fog that stays close to the ground. As it is warmed or agitated, rises and gradually disappears.

LYCOPODIUM POWDER. Is a fine yellow powder derived from the spores of a plant that can be used for fire effects.

MATERIAL SAFETY DATA SHEET/ SAFETY DATA SHEET (MSDS/SDS). A document prepared in accordance with the regulations of the United Stated Department of Labor, as set forth in 29 CFR Part 1910.1200 or a federally approved state OSHA plan which sets forth information concerning hazardous material. It contains health and physical hazards of the material used, procedures that should be followed in case of an emergency and safety work practices. MSDS does not show the cost of the hazard.

PERMIT. A written statement issued by the commissioner authorizing the manufacture, storage, handling and use or transportation of hazardous materials, or other material, or to conduct an operation or to maintain a facility, for which a permit is required by the NYC Fire Code.

PERSONAL SUPERVISION. Supervision by a Certificate of Fitness holder who is required to be personally present on the premises, or other proximate location acceptable to the FDNY, while performing the duties for which the certificate is required.

PERSONAL PROTECTIVE EQUIPMENT (PPE). Protective clothing, helmets, goggles, or other garments or equipment designed to protect the user from bodily injury or infection. The hazards addressed by protective equipment include physical, electrical, heat, chemicals, biohazards, and airborne matter.

PREMISES. Any real property, including buildings and structures thereon, or any part thereof

PREMISES RELATED (SITE SPECIFIC). The Certificate of Fitness is only valid at the address present on the Certificate. (E-05, theatres).

PROXIMATE AUDIENCE. An audience closer to pyrotechnic devices than allowed by NFPA 1123.

PYROTECHNIC ARTICLE OR DEVICE. Any article or device containing pyrotechnic material.

PYROTECHNIC EFFECT SIMULATION EQUIPMENT. (SIMULATED PYROTECHNIC DEVICE.)

Equipment that uses a chemical mixture, heat source, and the introduction of oxygen to initiate or maintain combustion and is used to produce visible or audible effects by combustion, deflagration, or detonation.

PYROTECHNIC MATERIAL. A chemical mixture consisting predominantly of solids that, upon ignition, can produce a controlled, self-sustaining, and self-contained exothermic reaction, that functions without external oxygen, resulting in a visible or audible effect by combustion, deflagration, or detonation.

SITE SPECIFIC. SEE PREMISES RELATED

SMOKE. Atmospheric effect composed of solid particles released during combustion. Produced by either pyrotechnic materials or other flammable substances.

SPECIAL EFFECT. A visible or audible effect used for entertainment or other display purposes, created by any material, article or device of an explosive, flammable or combustible nature, including pyrotechnic materials, articles and devices and fireworks, 1.4G, but excluding fireworks, 1.3G.

3. Permits and Permissions

Permits must be always kept on the premises. It must be readily available for inspection by any FDNY or NYPD employee.

A permit is required to store, handle, or use any quantity of special effects.

A special effects permit shall be obtained for each display or other event involving the conduct of a special effect by the sponsor of the display or other event or, with the sponsor's written authorization, by a person holding a Certificate of Fitness for special effects.

Keep in mind that permits are site specific.

A special effects permit shall be issued in the name of the applicant and shall specify the name of the sponsor, the date, time and location of the display or other event, the number and kind of pyrotechnic articles or devices to be discharged or otherwise used, or other materials, articles or devices used to create the special effects, and such other terms and conditions as the commissioner may prescribe as necessary or appropriate for the safe conduct of the display or other event.

The commissioner may issue a special effect permit to a television, motion picture or theatrical production company that regularly conducts special effects at a designated location within a specific building or structure, for a specific amount of time.

In order to apply for a special effects permit, a Letter of Intent/ Permission from property owner, Insurance and inspection request through FDNY Business (Online Application) are required. Information on the Letter of Intent/Permit application can be found in Appendix A of this document.

Other permits may be necessary for production or performance (i.e. a permit for the use of a fire hydrant). You must check with other agencies such as the Department of Environmental Protection (DEP), Department of Buildings (DOB), Department of Labor (DOL), New York State, or the Temporary Place of Assembly (TPA) Unit of the FDNY.

Yearly Smoke and Haze permits can be issued.
(See Section 6 of this document)

The use of all pyrotechnics shall be approved by AHJ (Authority Having Jurisdiction). The AHJ shall determine that measures are established to provide crowd management, security fire protection and other emergency services. All

planning and use of pyrotechnics shall be coordinated with the venue manager and producer.

Event/Production	Requires
NYC Special Events	CECM Permit (Citywide Event Coordination and Management
NYC Film Productions	Mayor's Office of Media and Entertainment (MOME) schedule A permit
NYC- Parks Property	Parks Permit/Permission
Product higher than 300ft	FAA- Permit or Notice to Airmen
All Special Effects	FDNY Explosive Unit Permit

4. General requirements for Special Effects

As a safety requirement, all Pyrotechnic Certificate of Fitness holders must be dedicated to one specific task at a time regardless of what anyone else may request. No pyrotechnic task can be left without supervision.

It is also important to have an assistant to serve as a "watch person" when conducting special effects.
There are several general safety requirements put forth in the NYC Fire Code that must be followed when conducting special effects.

- The quantity of the materials and/or devices used must be the **minimum** amount necessary to produce the desired effect.
- The FDNY Commissioner may require a demonstration of the materials and/or devices used to create a special effect.
- The FDNY Commissioner may require Fire Department personnel and apparatus to monitor the preparation and use of a special effect in the interest of public safety.
- The FDNY Commissioner may state that there is a **maximum** amount of special effect materials and/or devices that are allowed to be stored in any approved facility. The location and design of the facility must be approved by the FDNY Commissioner.
- All special effect materials and/or devices, while in temporary storage, must remain in their approved containers until required for use the shortest time practical must be used between the time of removal from storage to the actual use of the special effect.
- Never leave any pyrotechnic material and/or devices unattended unless it is in a secured storage facility.
- If pyrotechnic material is removed from its original packaging, the replacement container must be properly labeled.
- Always protect utilities when indoors (such as sprinkler heads, electrical wiring, etc…)

****REMEMBER****

- **It is necessary to notify FDNY Explosives Unit if there are any changes being made to the setup, products, or devices being used.**

NFPA 1126 is a standard for the use of pyrotechnics before a proximate audience. NFPA is the National Fire Protection Association. NFPA produces documents to provide guidance to public safety officials for the safe use of pyrotecnic special effects at both indoor and outdoor locations. The purpose of this standard is to provide requirements for reasonable protection for pyrotechnic operators, performers, support personnel, and proximate audience where pyrotechnic special effects are used indoors and outdoors.

Overall SPFX Site Safety

Line of Sight

A clear line of sight must be maintained for all effects. Keep in mind that smoke effects as well as other effects that may create smoke could greatly decrease line of sight. In these cases, there should be an alternate means including radio contact to ensure all safety personnel are aware of the status of effects taking place.

Flame Resistance/ Flame proofing.

All materials must either be inherently flameproof or be treated for flame resistance by a C-15 COF holder. Proof of Flame resistance (AFFIDAVIT OF FLAME RESISTANCE: flame retardant treatment, inherently flame-resistant, flame-retardant coating, or flame-retardant scenery) must be included with permit request. Keep in mind that a Field flame test may be conducted by a Fire Department representative to determine the adequacy of a flame-retardant treatment or to determine whether a material is inherently flame-resistant.

It is recommended by the Fire Department that if the material has received a flame-retardant treatment or is inherently flame-resistant, it should undergo **annual** field flame testing. If the material fails an annual field flame test, it should immediately undergo another flame-retardant treatment.

Housekeeping

Always check:

- materials and pyrotechnic devices prior to each use.
- devices for leaks.
- expiration dates on all materials.
- proper signage (i.e. no smoking signs).
- means of egress.
- warning labels, SDS sheets and owner's manuals.
- that products are returned to original packaging and correctly label boxes.
- to make sure all exit signs are visible.
- if flammable/combustible materials are removed or returned to proper storage.
- fire extinguishers are properly tagged and located.

Never

- point pyrotechnic devices directly at anyone.
- smoke in the vicinity of pyrotechnic devices or fuel.
- store combustible materials near flammable devices.
- block fire lanes.
- cover any exit signs without a fire guard being present at location.
- leave special effects day boxes, prepped props or materials unattended.
- use untreated combustible materials.

Storage of special effects materials, articles, and devices:

- They must be stored in a ***secured and sprinklered*** area with signage that is visible to first responders.
- They must be in properly labeled containers.
- if needed, store in flammable cabinets.
- flammables and combustibles must never be stored together.
- There are specific storage requirements for particular special effects materials, articles, and devices.
- Portable "day boxes" (type 3 magazine) can be used for the temporary storage of materials needed for the day. The "day-box" must be always under the personal (direct) supervision of a COF holder.
- Indoor and outdoor storage of propane is ***strictly prohibited*** unless permitted by the FDNY.
- Storage area must be properly vented.
- In the storage area, there should be at least 3 feet between material and electrical equipment.

- In studios (television/movie), all special effects materials, articles and devices must be stored according to the rules.
- Storage area must be protected from all vehicular traffic.

Safety Meetings

The Safety meeting should include specific information about the special effect/stunt, emergency plans, and who are the necessary participants. The safety meeting should also include discussion of the site diagram. The site diagram illustrates where the pyrotechnician is located as well as how the effect is designed and/or laid out.

In the safety meeting it should be expressed to all staff that no one is allowed to enter the area of a special effect until the "All clear" is given by the pyrotechnician in charge or FDNY inspector.

The Safety meeting is the time to ask questions. NEVER assume or guess. Ask to ensure the safety of all involved including the possible audience.

It is very important that everyone knows exactly what is going to occur with the special effect and stunt and the SPFX Certificate of Fitness holder should be present at all Safety Meetings.

Important points to discuss:

- Location of all exits
- Fire extinguisher usage
- Escape plan
- Rally points

Signage and Safety Information

As a Certificate of Fitness holder, you are responsible to check and ensure that the areas where effects are occurring have the proper safety signage.

Signage must be visible to first responders.

The Safety Data Sheets (SDS) should always be on hand for all products being used.

Never assume anything, especially about safety.

Request for an Inspection

Request for inspection must be received at least 3 business days ahead of scheduled event/effect through FDNY Business.

Required Paperwork:

- Schedule A (needed for outdoors)
  Permission/Consent (needed for private property)
- Insurance (FDNY/City of NY as additional insured)

- Copies of all Certificate of Fitness cards
- Flame certs for all soft goods
- MSDS Sheets
- Site Diagrams

*More paperwork may be requested by inspector

Preparing for an Inspection

You should always prepare for FDNY Explosive and Entertainment inspection. As the Certificate of Fitness holder, you must contact all necessary parties (building representative, head pyro) In preparation for inspection, you should check for:

- Production point of contact
- Schedule.
    - Are there any testing days, rehearsals for effect?
- Security plan
    - Where is storage?
    - Are there fireguards, where are they located?
    - Extinguishing system (sprinklers, extinguishers, etc)
- Safety plan
    - Means of Egress and Emergency exit
    - Emergency evacuation plan
    - First aid station
    - SIGNAGE
- Pyro plot plan with distances
- Product list with quantities (pull sheet)
- Disposal Plan
- Flame proof certifications
- Smoke alarm locations and COFs
- Fire Extinguisher locations/tags
- Other COF holders on site their licenses and expiration date for such certificate.

5. Smoke Effects

All FDNY and NYC Building Codes must be followed.

There are several different ways that smoke can be created for entertainment purposes. Smoke can be created by pyrotechnic materials such as smoke cookies, or smoke cartridges, compressed gases, smoke grenades, flammable substances such as incense or smoke pencils/pens or a combination of chemicals and machines, each with its own degree of hazard.

All smoke and fog effects run the risk of inhalation, asphyxiation dangers, and visual impairment. Most are only used for a short period of time, which limits the dangers that come with the length of exposure. When using smoke, fog or haze effects in a confined space, always keep proper ventilation to avoid potential respiratory issues that can be contributed to long term exposure.

When using smoke effects, it is advised to conduct a smoke test. A smoke test can be used to determine the distance smoke will carry and what smoke detectors may need to be taken offline for the duration of the effect.

When fire alarm systems are disabled, it is very important to have the Fire Safety Director, Fire Alarm related Certificates of Fitness holders, fireguard(s) and/or a Fire Department Representative must be present to maintain the safety of the property and people present. The number of fireguards required varies according to building size, layout, and amount of people present. Whereas the amount of fire extinguishers required varies according to the effect being conducted. A Fire Department representative will determine the number of fireguards and extinguishers required to perform the effect safely. Smoke effects should never obscure egress; exit signs and paths must always be visible.

Smoke effects can be classified into three categories: smoke, fog and haze.

Smoke

a. Smoke generating devices.
   There are several smoke generating devices that are based on zinc chloride such as *smoke cookies*. According to the Department of Transportation, smoke cookies are classified as flammable solids. The smoke is created by heating or burning the product.

b. Smoke gun
is a handheld smoke machine that requires no electricity to work. It may be run on batteries for its ignition to spark. It can be used to create large amounts of smoke using gas cartridges. They are commonly used to create a foggy atmosphere or to add to fire scenes. For safety reasons, they should never be pointed directly at anybody.

Proper PPE should always be used when using a smoke gun. It is important to remember that they generate a lot of heat while in use and should be allowed to cool before being handled and never placed near combustible materials.

Smoke guns should *always* be held upright and checked for leaks before each use.

c. Ammonium chloride is another common way smoke is created for on stage as well as outdoors. It is not recommended for indoor use or use within an enclosed space as it generates hydrochloric acid when dissolved in the respiratory system.

d. Burning organic material creates smoke but also the hazard of an open flame. Frankincense, paper, and other materials are often used to create a smoke effect.

Fog

Fog may be one of the most widely used special effects in theatres; there are several ways fog can be generated.

a. Glycol and glycol/water mixture

Low lying fog machine

Fog is generated by using fog fluid (glycol or glycol/water mixture) with a heat exchanger to heat the liquid until it vaporizes creating a thick dense cloud. Sometimes, a thermal fogger (like pesticides) with a petroleum product (i.e. fuels, kerosene or other petroleum distillate) is used for fog effects. The fogger ignites the fuel and mixes air and glycol or glycol/water to create a dense fog.

b. Dry Ice (Solid Carbon Dioxide)
It is considered one of the safest ways to create a low-lying fog in an enclosed space. Dry ice is frozen carbon dioxide that when exposed to air, changes from a solid to a gas. This also causes a low-lying thick fog.

Dry ice can also create fog when it is combined with water near boiling. At atmospheric pressure carbon dioxide cannot exist as liquid and it instantaneously produces gas creating a thick white fog.

Dry ice in water

When stored in a sealed container with water, dry ice can form a bomb that will result in flying shards which are dangerous and can cause blunt force trauma and hearing damage.

Dry ice can burn skin and ingesting it can also be a hazard to one's health.

c. CO_2 (Carbon Dioxide: Liquid/Gas)
Liquid carbon dioxide stored in compressed cylinders can be used with fog machines to create a low-lying fog effect. Liquid CO_2 is used to chill fog which keeps it low to the ground. As it warms it will rise and gradually disappear.

CO_2 as a gas used in a cryojet, produces large amounts of dense white smoke that is odorless and disappears almost immediately.

d. N_2 (Nitrogen: Liquid)
Like dry ice, liquid nitrogen creates a low-lying fog effect. Liquid nitrogen is pumped into a closed container containing boiling water (steam) creating a thick dense fog. The effect of a rolling fog that lies close to the ground can be made with the use of a fan placed at the output of the container, directing the fog where it is needed. Also known as dry fog because even though it is created with water droplets, as it disappears there is little to no liquid left behind.

Haze
A haze effect is a light cloud effect usually used in conjunction with lighting beams. Haze effects are usually produced by a haze machine in one of two ways. Either by using a mineral oil spray pump electrically powered or using compressed CO_2 or using glycol/water, similar to a fog effect. If only a small amount of haze is needed, it can be produced with aerosol canisters that contain mineral oil under pressure.

Safety with smoke effects

- **Always** make sure that permits and certificate of fitness are current.
- **Always** have the MSDS/SDS for all products on hand.
- **Always** inform everyone involved in production in advance when there will be smoke, fog and haze in use and the type that will be used.
- **Always** discuss the hazards and safety precautions that will be taken while the hazards are in use.
- **Always** use the minimum concentration of smoke for the minimum period of time necessary. That way the members of the production team are not exposed to heavy concentrations.
- **Only** allow the essential production personnel in the vicinity when smoke, fog and haze are in use. Be mindful that you may have to evacuate areas where smoke, fog or haze can travel
- **Always** use respirators and proper PPE when using chemicals for smoke, fog, or haze, especially in enclosed areas
- **Always** maintain adequate ventilation, quickly exhaust excess smoke, fog, or haze when indoors.
- **Always** have a fire guard on hand when burning materials for smoke effects
- **Never** crouch down or lie down in dry ice fog effects. Carbon dioxide gas can cause asphyxiation.
- **Always** use proper labels and color designation for CO_2 and nitrogen canisters
- **Always** replace caps and securely strap canisters of CO_2 and nitrogen for safety.

Smoke Alarms Usage
Keep note that if smoke alarms must be disabled, you must:

Scout location and confirm proper Certificate of Fitness Holders (see below) for Alarm Panel are onsite. This is property owner's responsibility since they are required by the 2022 NYC Fire code to have responsible persons on staff to monitor alarm daily.
*If Certificate of Fitness Holders are not present on site, production has option to supply required Certificate of Fitness Holders *

Once you have applied for a permit with the Mayor's office of Media and Entertainment (MOME) permit, submit copies of all paperwork including Certificate of Fitness holders and permission letter to perform effect to FDNY when submitting application for SPFX.

Note:
Permission letter must include permission to perform Special Effects and to take the alarm system out of service if necessary.

If you need assistance determining which certificate of fitness is required for Special Effect, contact Explosives Unit at Explounit@fdny.nyc.gov

Once determined system will be out of service during filming at location, email notification must be sent by production to FDNY Explosives Unit at Explounit@fdny.nyc.gov

*All notification other notifications required by code must be confirmed (FDNY, Central station etc)

All Permit requests must be submitted at least three (3) business days in advance. We completely understand the nature of the industry and that last-minute requests may be unavoidable. We will do our best as always to accommodate these requests. Email Explosives Unit detailing SPFX, requested date and time and reason for late request to Explounit@fdny.nyc.gov.

As soon as possible or prior to wrapping production at location for the day, confirm all notifications have been sent and system will be restored and operational (in-service).

Safety with Smoke Machines and smoke producing devices.

- Many Fog machines, e.g.,"Artem" types generate a great deal of heat during operation. They should never be located near combustible materials and should be allowed to cool before handling.

- Water based fog fluid should be used instead of petroleum-based fluids that can produce combustible smoke, especially hazardous near special effects flame and sparks.

- Fog, haze, smoke machines used indoors should have adequate ventilation, since people with breathing problems may be affected. Substituting different fog fluids for those recommended by the manufacturer could produce toxic fumes dangerous to health.

- Although not used often, dry ice fog effects can cause problems when used in confined spaces since the carbon dioxide gas can cause asphyxiation by reducing oxygen concentration in the air. Oxygen sensors should be installed in such instances. Performers should not crouch or lie down in this fog and slippery performance surfaces are also a possible hazard of its use. Touching dry ice burns skin and ingesting it can be very dangerous to one's health. When sealed in a container with water, dry ice forms a bomb that produces dangerous flying shards and a load report which can cause blunt force trauma and hearing damage.

- Smoke may activate Fire Alarm Smoke detection system initiating a false alarm.
- Unsafe conditions may be created when the alarm system is taken out of service without proper Safety Staff.
- When using compressed gases like LNG, additional safety precautions must be implemented.

New York City Mayor's Office of Film, Theatre and Broadcasting
FDNY Permit required for smoke, fog, and haze special effects.

6. Yearly Smoke/Haze Permit Request Requirements

Theatres and entertainment venues can request long term permits to use water-based haze.

In order to apply for a yearly smoke, haze or fog permit you must:

1. Apply online for permit with FDNY Explosives Unit thru FDNY Business
2. Submit:
   - Out of Service Safety Plan including:
     - minimum of fire safety personnel
     - Letter of consent with permission to take Smoke Alarm Out of Service, if necessary.
     - Venue insurance certificate with NYC/FDNY as additionally insured. (Permit will be until insurance expiration)
     - Provide the name and COF number of the person responsible for water-based haze, fog or smoke device and material.
     - Provide covering COF for Alarm impairment and supervision of panel F-01 and S-95 or F-01 and F-89, T-89, F-53.
   - SDS Sheets for fluid.

You must Email notification to FDNY Explosives Unit when yearly permit is being used for event include Alarm System Status, Quantity and Type of Smoke Machine and Fluid used.

There is a minimum of 2(two) 2A 10-BC portable fire extinguishers required.

7. Storage

General Storage
Some general storage ideas to keep in mind with special effects materials, articles and devices:

- They must be stored in a ***secured and sprinklered*** area with signage that is visible to first responders.
- They must be in properly labeled containers.
- If needed, store in flammable cabinets.
- Flammables and combustibles must never be stored together.
- There are specific storage requirements for special effects materials, articles and devices.
- Portable "day boxes" can be used for the temporary storage of materials needed for the day. The "day-box" must be always under the personal (direct) supervision of a COF holder.
- Indoor and outdoor storage of propane is ***strictly prohibited*** unless permitted by the FDNY.
- The storage area must be properly vented.
- In the storage area, there should be at least 3 feet between material and electrical equipment.
- Expiration dates on all materials must be checked regularly.

In studios (television/movie/commercial), all special effects materials, articles and devices must be stored according to the rules.

Outdoor Storage

- must be located at a distance from any building's HVAC or venting system.
- must not be located close to manholes.
- must not cause any trip hazard.
- must have proper signage including hazard placards.
- must be provided with proper barricades and locks.

Truck Storage
When storing materials on a truck:
The truck must be parked as close as safely possible to effect.

Flash paper Storage.
Stored in a refrigerated environment.

CO_2 storage
CO_2 tanks must be:

- properly caged.
- properly secured.
- in an area equipped with fume sensors.
- in an area with explosion proof lighting.
- in an area that can open from the inside.

Blank Ammunition Storage
Firearms must be stored, unloaded and locked in a location separate from the ammunition and away from unauthorized people.

Keep in mind that blanks are still considered explosives and should be stored and treated as such.

Propane Storage
Propane, used indoors for fire effects, must be kept in a storage bunker while in use but must not remain overnight. There should always be someone in the line of sight of propane effects and can shut it off. If line of sight is not possible, they must be in constant radio contact with someone who has a line of sight.

The FDNY Explosive Unit requires that propane tanks be held inside of these heavy-duty bunkers while being stored and used for effects. The bunkers are filled with sandbags and carefully constructed to protect the propane tanks from damage and, in the worst case, direct the force of an accidental explosion or rupture, up and away from surrounding people and property. The bunkers can also be fitted with an active "sniffer" system that will automatically shut down the fuel supply in the event of a leak.

Propane tanks used for special effects must always be stored in an upright position to keep the pressure relief valve in proper functioning order and to prevent leaks.

Empty propane tanks must be stored separately from full propane tanks and **never** in an upside-down position. Empty propane tanks must be treated the same as full tanks for safety purposes.

8. Post Effect Safety

Areas in which special effects are taking place must be policed, monitored, and canvassed to ensure there are no remaining embers or debris. Ventilation must be provided until ignition and cleanup have been completed.

Proper equipment such as heat guns, range finders, infrared thermometers, and sniffers are strongly recommended for use on special effects.

Never reuse artificial material that has been used and swept up as they may have been contaminated with moisture and/or other debris from the .

All Special Effects Materials must be properly disposed of according to MSDS/SDS and/or manufacturer's guidelines.

Chemicals used to generate some of these effects are hazardous and it is important to dispose of the waste as directed by the manufacturer and in accordance with local laws and regulations (Department of Environmental Conservation (DEC)).

It is the responsibility of the Special Effects Certificate of Fitness holder to make sure all special effects materials, articles, and devices are removed from premises and/or locked and secured after each performance and/or scene.

An "all clear "must be issued by the FDNY or SPFX Certificate of Fitness holder before anyone enters the special effects area.

A fireguard must also be kept on site to ensure safety post effect.

9. Fire Safety and Extinguishers

At least two (2) portable fire extinguishers of the proper classification and size for the hazard present must be readily accessible while special effects, materials and devices are being handled. Often CO2 and water extinguishers are used, but always refer to MSDS for proper extinguisher for product being used.

The Certificate of Fitness (COF) holder or watchperson must be familiar with the different types of fire extinguishers that are present. The COF holder or watchperson must know how to operate the extinguishers in a safe and efficient manner. He/she must know the difference between the various types of fires and the extinguishers appropriate for use in that fire. The different classes of fires are described below.

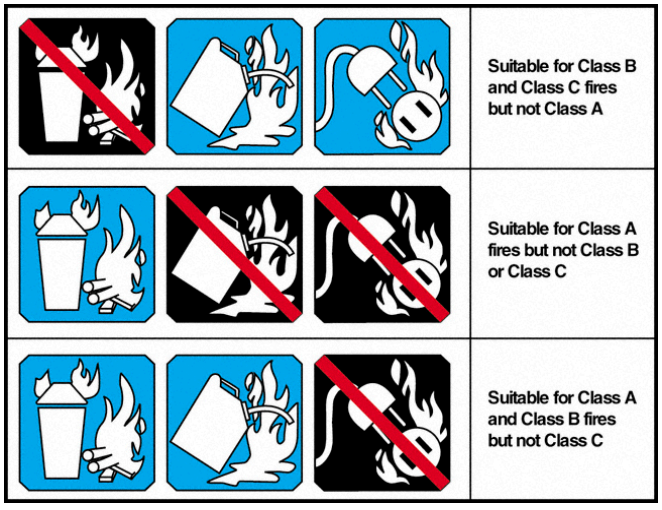
Classes of Fire Extinguishers

CLASSES OF FIRES	TYPES OF FIRES	PICTURE SYMBOL
A	Wood, paper, cloth, trash & other ordinary materials.	
B	Gasoline, oil, paint and other flammable liquids.	
C	May be used on fires involving live electrical equipment without danger to the operator.	
D	Combustible metals and combustible metal alloys.	
K	Cooking media (Vegetable or Animal Oils and Fats)	

A **<u>Multipurpose dry chemical</u>** fire extinguisher may be used to extinguish Class A, B, or C fires.

Typical Symbols Painted on Fire Extinguishers

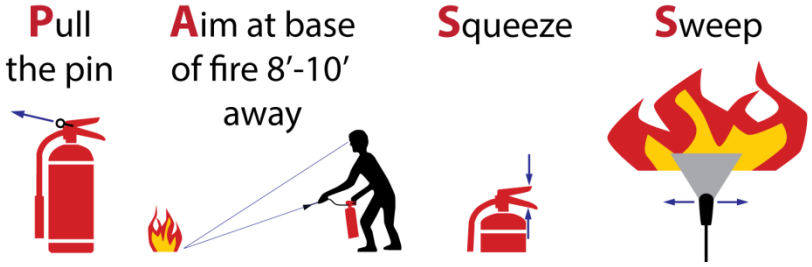
The symbol with the shaded background and the slash indicates when the extinguisher must not be used. Symbols may also be painted on the extinguisher. The symbols indicate what kind of fires the extinguishers may be used on. The COF holder and watch person must understand these symbols. Examples of these symbols are shown below.



Generally, operation instructions are clearly painted on the side of the fire extinguisher. They clearly describe how to use the extinguisher in case of an emergency. An example of these instructions is shown below.

In case of any fire, 911 must be called.

Fire extinguishers must be used in accordance with the instructions painted on the side of the extinguisher. They clearly describe how to use the extinguisher in case of an emergency. The Certificate of Fitness holder or watchperson should be familiar with the use of portable fire extinguishers. When it comes to using a fire-extinguisher just remember the acronym P.A.S.S. to help make sure you use it properly. **P.A.S.S. stands for Pull, Aim, Squeeze, Sweep.** An example of these instructions is depicted in the picture below.



Portable Fire Extinguisher Inspections

MONTHLY

The portable fire extinguishers are required to be checked monthly. The owner of the business is responsible for selecting a person to do a monthly inspection. This monthly inspection is called a "quick check".

The **QUICK CHECK** should check if:
(1) the fire extinguisher is fully charged;
(2) it is in its designated place;
(3) it has not been actuated or tampered with;
(4) there is no obvious or physical damage or condition to prevent its operation.

The information of the monthly inspection record must include the date of the inspection, the name/initials of the person who did the inspection. This monthly quick-check record must be kept on the back of the PFE tag or by an approved electronic method that provides a permanent record.

ANNUALLY

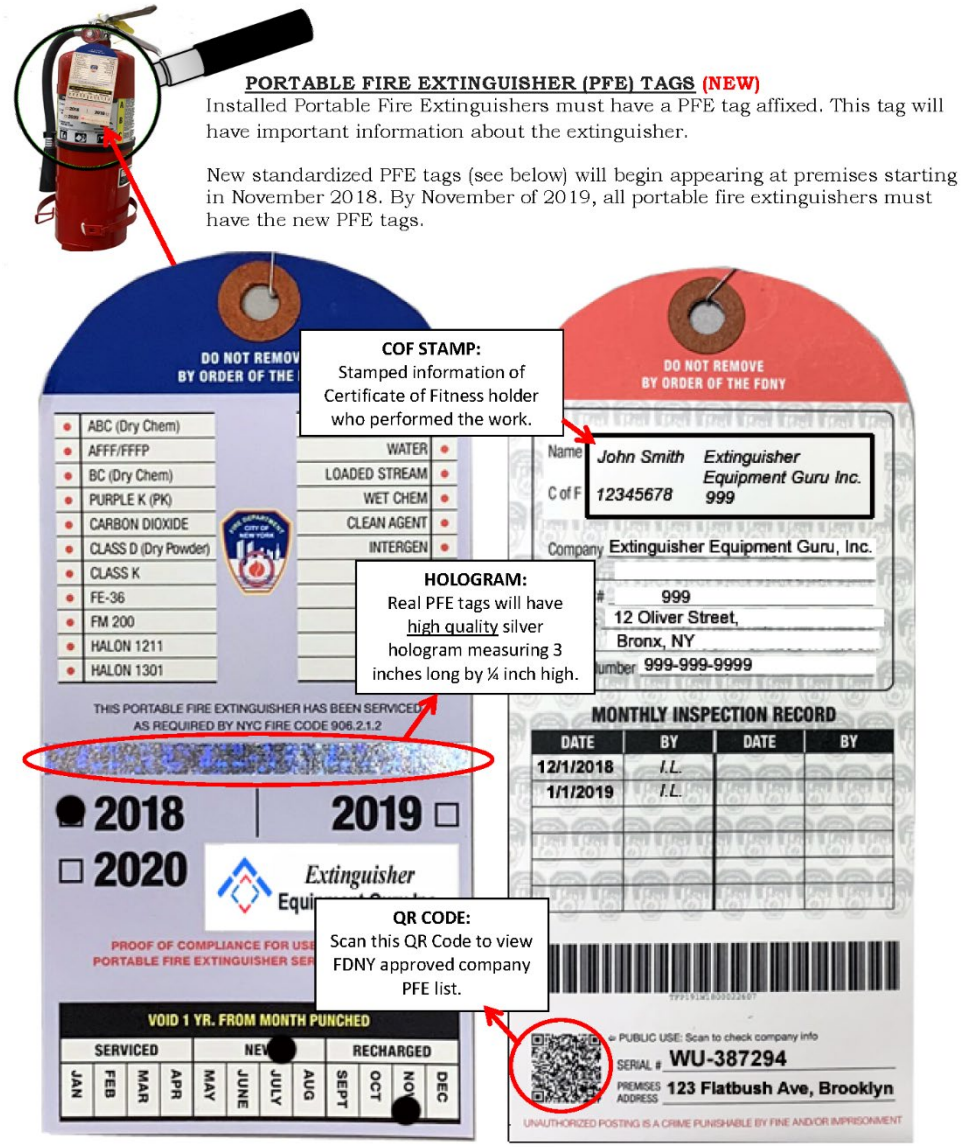
At least annually all Portable Fire Extinguishers must be checked by a W-96 Certificate of Fitness holder from FDNY approved company. After each annual inspection W-96 COF holder will replace the PFE tag. The information of the annual inspection record must be indicated on the new PFE tag.

Portable Fire Extinguisher Tags

TIPS

A real hologram strip is 3 inches long by ¼ inch wide. Counterfeit tags will NOT have a high-quality silver hologram. The hologram on a counterfeit tag will NOT change color as it is moved against the light.

If your PFE tags look different than the one pictured above, contact your supervisor. If you suspect your PFE is a counterfeit, contact FDNY immediately by e-mail: Tags.Decal@fdny.nyc.gov



Notification of unsafe condition
The person responsible for Pyrotechnic effects should notify their supervisor or site safety manager if an unsafe condition has been created. Any person who becomes aware of a fire, explosion, large spill, leak or any other emergency shall immediately report such emergency to the Fire Department (Call 911). No owner or other person shall issue any directive or take any action to prevent or delay the reporting of a fire or other emergency to the Fire Department. After calling the Fire Department, the supervisor or the site safety manager or other designated person should also be notified.

The Certificate of Fitness holder must know the locations of and how to operate all fire extinguishing devices, SPFX control devices, and know the location of the fire alarm stations installed at the facility. In case of a fire, explosion, or emergency, the Certificate of Fitness (COF) holder must notify the Fire Department by phone immediately. The Certificate of Fitness holder must know the telephone number of the Fire Department Borough Communication Office. The borough phone numbers are listed as follows. These phone numbers must be posted near the phones most likely to be used in case of an emergency.

Manhattan (212) 999-2222
Bronx (718) 999-3333
Brooklyn (718) 999-4444
Queens (718) 999-5555
Staten Island (718) 999-6666

After notification by phone, the local fire alarm must be sounded. In some cases, the activation of the fire alarm will transmit a signal to the Fire Department via a FDNY approved central station company. The C of F holder shall initiate an orderly evacuation when necessary, following a hazardous incident and take reasonable steps to isolate the hazard until the Fire Department arrives. The Certificate of Fitness holder must answer any questions asked by Firefighters and officers when they arrive. For example, he or she must indicate the location of the fire, describe the type of fire protection devices available, and describe the materials stored on the fire floor. The Bureau of Fire Prevention must be notified as soon as possible after an explosion or fire has occurred. The Bureau of Fire Prevention may require a detailed report on the causes and the consequences of the explosion or fire. Generally, this report must be filed within ten days after the incident.

You must check with your supervisor if lithium batteries are allowed on the premises. The use and/or charging of lithium batteries can have devasting consequences.

10. Lithium-ion Battery Safety

Lithium-ion batteries are rechargeable batteries found in electric bikes, scooters, cars, laptops, tablets, phones, and many other common household devices.

Lithium-ion battery fires have caused deaths, serious injuries, and devastating damage to property around the city. It's important to follow rules for safe storage, charging, and disposal for these types of batteries.

If you own a lithium-ion powered device or plan to buy one, the FDNY has important safety tips that you should follow. These tips apply to all devices powered by lithium-ion batteries, including phones, tablets, laptops, e-cigarettes, toys, high-tech luggage, and even robotic vacuum cleaners.

Immediately stop using or charging battery and call 911 if you notice:

- **Fire or Smoke**
- **Overheating**
- **Change in color or shape**
- **Odd noises**
- **Leaking**
- **Strange smell**

ALWAYS:

- purchase and use devices certified by a Nationally Recognized Testing Laboratory (NRTL).
- follow the manufacturer's instructions for:
  - charging and storage.
  - correct battery, cord, and power adapter
- keep exit path clear at all times.
- plug directly into a wall electrical outlet for charging.
- keep batteries and devices at room temperature.
- store and/or charge batteries away from anything flammable.
- keep away from heat sources.
- bring batteries to a **NYC Battery Recycling Center.** Visit nyc.gov/batteries for more information.

NEVER:

- use aftermarket batteries or chargers.
- use damaged or altered batteries
- plug into a power strip or overload an outlet.
- overcharge or leave battery charging overnight.
- charge a battery or device under your pillow, on your bed, or near a couch.
- leave e-bikes or e-scooters unattended while charging.
- block your primary way in or out of a room/space with e-bikes, e-scooters, wheelchairs, etc.
- place batteries in Trash or Recycling bin. **It is ILLEGAL.** Visit nyc.gov/batteries for disposal locations and information.

In the event of a Fire,
Leave and CLOSE the door.
Call 911 once you are in a safe location.

Charging Lithium Ion
Lithium-ion batteries do not have to be fully charged; partial charge is the most suitable.
When **charging more than five (5)** personal mobility devices or their removable batteries, it must be in a **dedicated room with ventilation** and a self-closing door.

For a total battery capacity of 20 kilowatt-hours (kWh), a 2-foot separation between charging batteries is required. For a total battery capacity up to 50 kWh, a 3-foot separation is needed.

Chargers must only be used with a compatible battery pack. The original equipment manufacturer (OEM) charger interplays with the battery pack using the battery management system (BMS). The wrong battery/charger combination may not work safely. For example, the 100% cutoff to prevent overcharging, which damages batteries, may not work which can easily create hazardous conditions such as fires, explosions, and injuries.

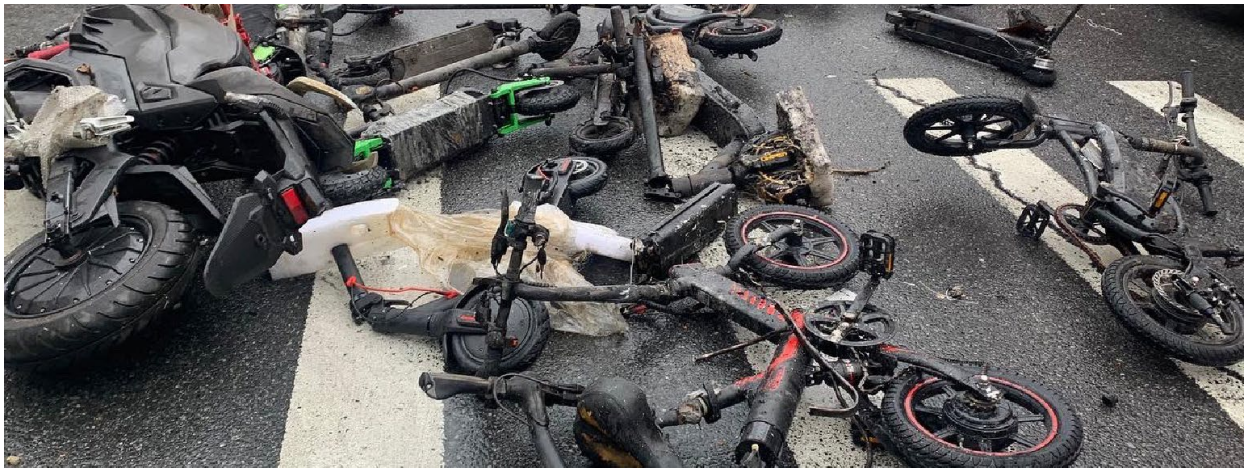
Always check with the manufacturer or retailer of the personal mobility device, an authorized repair shop or a testing laboratory such as Underwrites Laboratories (UL) to see if replacement is recommended or listed and safe for use with that device. Using unauthorized parts, including batteries and/or chargers, may cause damage, fire and possibly void your warranty.

Extinguishing Lithium-ion
Water may not prevent a battery from burning and spreading. Battery cells are known to explode and quickly spread to another battery. It can spread to another devices.

Fire Extinguishers
do not work
on lithium-ion batteries fires.

Unexpected Re-ignition.
Reignition is common. Lithium-Ion Batteries are known to unexpectedly re-ignite (without warning) minutes, hours and even days after all visible fire has been put out.

Lithium-ion batteries can enter an uncontrollable, self-heating state. This can result in the release of gas, cause fire and possible explosion.
These batteries may continue to generate heat even when there is no visible sign of fire. Once heat reaches a certain level, fire may reignite on the battery and surrounding area.



11. Managing/ Supervising a Special Effects Job

When managing a job that has special effects, you must know your space. You must make sure that all pre-site inspections and safety meetings have been conducted, all safety protocols are in place including proper disposal of waste. It is also important to make sure:

- All Certificate of Fitness cards are valid
- proper PPE is available and in use.
- to check fire suppression availability and accessibility.
- that pyro and stage plan align safely and properly.
- that with smoke effects, all smoke alarms, detectors, and HVAC have been taken offline. Once the effect is complete, you must also make sure system has been restored to proper working order.
- that there is proper clearance from actors/audience for effects.
- all SDS sheets are available.
- gas powered effects have proper ventilation.
- that all permits, product list, and storage inventory have been secured and are available.

12. Minor Pyro effects

Dust and Snow

a. Dust

In scenes that require a beach or desert-like atmosphere there may be a need for dust or a sand-like substance. Often, vermiculite is used as a sand substitute. This type of product used in enclosed places can be a hazard if it comes in contact with a spark or any other sources of ignition.

b. Snow

Artificial snow can be made of combustible products such as shredded paper, polypropylene, chemical mixtures, foam, or a similar plastic product. It should never be stored, used, or handled near flames or other heat/ignition sources although it can be flame proofed. The MSDS/SDS should always be on hand for any artificial snow product that is used.

Sometimes crushed ice can be used to create a snow effect generating high levels of carbon monoxide because of the equipment in use and potentially creating hazard to electrical equipment.

Another option for snow that is ideal for large outdoor areas, is the use of ***snow candles***. Snow candles are a candle sized tube that can create snow for about 2 minutes by releasing flakes of ash as it is shaken or swung around. The ash created simulates lightly falling snow.

Novelty Fireworks
are defined as ground fireworks that typically produce a weak explosion and sound. It may let off a spark or a whistle. Novelty fireworks are considered non-explosive and limited in their potential to harm people and property but are still considered illegal items in this jurisdiction and require an FDNY permit.

a. Sparklers
are handheld fireworks that burn slowly. They may give off a colored spark which can be identified by the color of the tip of each rod. This can range from 10 inches to 36 inches in length and can be made with bamboo sticks or metal skewers. Since sparklers can reach up to 1800°-3000°F, sparklers should only be used by those with a great understanding of their inherent risk.

b. Poppers/Snaps
do not have any type of visual effects but serve as a fuse-less firecracker that makes a loud pop sound when thrown to the ground.

13. Compressed and Cryogenic Gas Effects

Most compressed gases are toxic or highly toxic. Compressed gases are gases and mixtures of gasses stored under pressure in cylinders. There are 3 major groups of compressed gas: liquefied gases, non-liquefied gases, and dissolved gas.

a. Liquefied Gases
A liquefied gas is a gas that is kept in a cylinder that is almost full of liquid under pressure. Gas fills the space above the liquid in the cylinder and as the gas is removed enough liquid evaporates to replace it, keeping the pressure constant. Some examples of liquefied gases are anhydrous ammonia, chlorine, propane, nitrous oxide, and carbon dioxide. The gases above can be used for freeze, smoke, fog, air blast and flame effects.

NOTE:
*Propane cylinders must be recertified every 12 years. The recertification is an inspection process so that it continues to be safely operable.

*A permit is required to handle propane gas.

*Any vehicle carrying propane must be DOT placarded.

b. Non- Liquefied Gas
Non-liquefied gases are also known as compressed gases. At normal temperatures, these gases do not become liquid even at high pressures. Examples of these gases are oxygen, hydrogen, nitrogen, helium, argon which can be used for fog and welding effects.

c. Dissolved Gas
   Acetylene is a common dissolved gas, and it happens to be extremely chemically unstable making it an explosive hazard.

Safety with Compressed and Cryogenic effects:

- **Always** make sure that permits and your certificate of fitness are current.
- **Never** smoke in the area where compressed and cryogenic gases are being used.
- **Always** suspend gas lines if possible (i.e. above doorways) and/or secure lines under cable protectors
- **Never** have gas lines as a possible tripping hazard or close to lighting
- **Never** use natural gas tanks indoors
- Always keep the tanks secured in an upright position.

14. Effects using Fire/Flame/Sparks

Fire Effects can be used to create atmosphere, a crackling fireplace in the background of a scene, a burning garbage can outside of an office building or even as the focal point of a performance such as a person being set on fire.

In New York City the FDNY regulates all fire effects, even things as simple as a lit cigarette in a performance (on stage or in a filmed production).

There have been many developments over the years that make fire effects safer than ever before. It is possible to use flickering lights instead of flame effects. There also have been combustible gels and liquids fuels that are less dangerous than gases, rubber cement and other hazardous and flammable materials.

All fire generating equipment must be properly maintained and all-natural gas* or LPG lines** used must meet all codes and all stationary flame fixtures or holders must be firmly secured.

a. Flame Bars

Are used to simulate fire using LPG rated hoses and equipment.

Flame Bar

**Hardlined gas lines must be installed and approved by a licensed plumber*

***LPG hoses must have a minimum burst pressure of 350 psi.*

b. Sparks

Spark producing devices including grinding wheels, 1.4G pyrotechnic devices including gerbs, comets, mines, and sparklers.

c. Flame Units

Are devices that produce a continuous stream of flame. These devices use different flammable gases and liquids such as methane, butane, alcohol, Isopar, or propane to produce various size flames for special effects. The flammable contents can commonly be found in canisters for flames/flame balls.

Names of common flame unit devices:

- Salamanders
- G-flames
- Wave
- Chameleon flame unit
- 5-Master flame unit

d. Squibs

A squib is a miniature explosive device used for special effects. It may be cylindrical like tiny stick of dynamite or a in a circular shape. The detonator is a wire connected to a remote electronic trigger.

Squibs are commonly used to simulate bullet hits or glass breaks for pyrotechnic effects for film and live theatrics.

e. Powders
Even though the powder by itself is not flammable, when it is spread in the air it is surrounded by oxygen, allowing for combustion. The powder in the air will ignite and burn explosively (ex: Lycopodium).

It is also important to note that household powder products such as baking powder/soda, baby powder, cornstarch, dust, coffee creamer and talc (talcum powder) can produce a similar effect.

f. Flash paper
is a form of nitrocellulose. It burns quickly with a bright flame. It is commonly used for coins and close-up magic effects.

g. Electric Matches
An electric match is a device that uses an externally applied electric current to ignite a combustible compound. Electric matches typically consist of a pair of 22-guage lead wires joined at the end with smaller diameter "bridge wire" that has been coated with a pyrotechnic initiator mixture formulated to ignite at relatively low temperatures.

h. Cigarettes and Cigars
Any items used to ignite a cigarette are permittable such as lighters and matches. They should be extinguished in sand, water or non-alcohol-based gel and not disposed of in garbage until extinguished and cooled.

i. Candles
Any items used to ignite a candle are permittable such as lighters and matches. Candles and their holders must be secured. If the candle will be reused, the excess wax and wick must be cleaned. Candles must always be properly extinguished at the end of the scene. Candles must be soaked for a reasonable amount of time prior to disposal.

j. Body Burns

This stunt is one of the most dangerous of all stunts for a movie/television performer. ***This should only be attempted by highly trained professionals who holds an E-01 Certificate of Fitness.*** It must be done with extreme caution and exactness as the difference of a missed inch or even 3 seconds can be the difference between a safe stunt and life-threatening damage. With body burns, it is *extremely important* that there is an EMS team along with highly trained professionals present.

Body burns can be a partial or full body stunt. A *partial burn* is defined as limited, restricted to a specific part of the body. Whereas a *full burn takes place*

over an extensive portion of the performer's body. Breathing apparatus and eye protection are needed for these types of burns.

To perform the stunt of a body burn, first, the area of the performer's body to be burned is covered with a fireproof gel. The fireproof gel (hydrogel) has a cooling effect on the skin and delays the ability for heat to get to the skin. Next, the performer will usually cover themselves with a "long john" type suit that has been soaked in fireproof gel. This "long john" type fire-proof suit is used due to the special fibers it is made of that expand when heated, which shields the skin from burns. A fire suit then will be worn over the "long john" type suit and then the performer's costume. If necessary, a helmet, face shield and mask may be worn to protect the performer's face. Some performers choose to hold their breath, others use a respirator or if needed, a hidden air tank so that they can breathe for the short time that the burn is occurring.

After being all suited up, the performer is then covered in pyrogel which burns at a low temperature but still is visually appealing.

Body Burn material disposal

To dispose of material used for a body burn, a metal container like oily rag disposal must be used.

k. **Theatrical Torches**

There are many items used as fuel in torch performances:

- Butane
- Camp fuel
- Liquid tiki
- Lantern style(candle)
- Beeswax
- Lamp oil
- Propane
- Alcohol (denatured, isopropyl)

To ignite, the COF holder must use a permittable item such as a lighter or a match. Torches must always be held upright for safety purposes. The safest way to extinguish a torch is with the use of a snuffer or a Kevlar blanket.

15. Simulated Explosions

a. Propane cannons:

LPG is a fuel source that is regulated to a relatively low pressure and fed into accumulator tanks. These accumulators allow several cannons to be fed from LPG source. The solenoid valve at the end of the accumulator is opened allowing the accumulator to empty through the barrel and be ignited by the pilot light to produce various size fireballs. They may use an ignition source such as a spark bag instead of a pilot light.

b. Propane poppers:

Propane can poppers are a handheld device that can be placed in tighter spaces to create a fireball effect by quickly releasing one pound of propane or map gas. The poppers use a standard US 14.1-ounce cylinder to produce a repeatable, predictable effect that dissipates in a few seconds with no residues. The popper will create a fireball about 15' in diameter.

Safety with Minor Pyro and Fire Effects

- **Always** make sure that all permits and certificate of fitness' are current.
- **Always** inform everyone involved in production in advance when there will be use of fire and flame effects.
- **Always** discuss the hazards and safety precautions that will be taken while the hazards are in use.
- **Always** conduct a dry run with all of production including emergency escape routes.
- **Never** allow smoking around any pyrotechnics
- **Always** remove unnecessary personnel from the "danger area."
- **Always** have a minimum of a fire guard present if a pyrotechnician is not available.
- **Always** make sure costumes, and all material in the vicinity of the flame/fire effects are **noncombustible, removed or have been flame-proofed.**
- **Always** maintain adequate ventilation, quickly exhaust excess smoke.
- **Always** make sure that performers close to flames wear proper protective clothing.
- **Always** keep combustible materials at a *safe distance* when using products that require oxygen for combustion.
- **Always** keep hair spray and hair extensions away from fire/flame effects.
- **Never** spray any type of aerosol product in the vicinity of minor pyro, fire/flame effects.
- **Always** properly use a fire extinguisher to help prevent spreading of the fire associated with the fire effect.
- **Never** use water to extinguish a torch.

- **Never** pour any other flammable liquid products in the vicinity of a fire effect.

16. Vehicles on Stage

- No driving of vehicle indoors unless authorized by FDNY
- Responsible person: COF holder must be responsible for keeping keys/key fobs
- No exterior power sources are allowed to be hooked up to the vehicle
- Vehicle must be pushed in unless otherwise directed by FDNY
- Keep in mind: disconnecting batteries may not be required and may cause other issues with vehicle

Gas/Diesel powered.
Locking gas cap no longer needed
Minimal amount of gas (tank on reserve fuel)

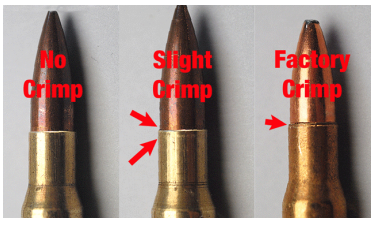
EVs
No indoor or overnight charging
Required to use only manufacturer approved charging cords/cables

17. Blank Ammunition

Using Blank Ammunition requires a certified armorist and may require other permits and permissions.

Theatrical firearms have been specifically modified for blank fire. The firearm is created to look real in its appearance as well as its function, but its only purpose is blank fire.

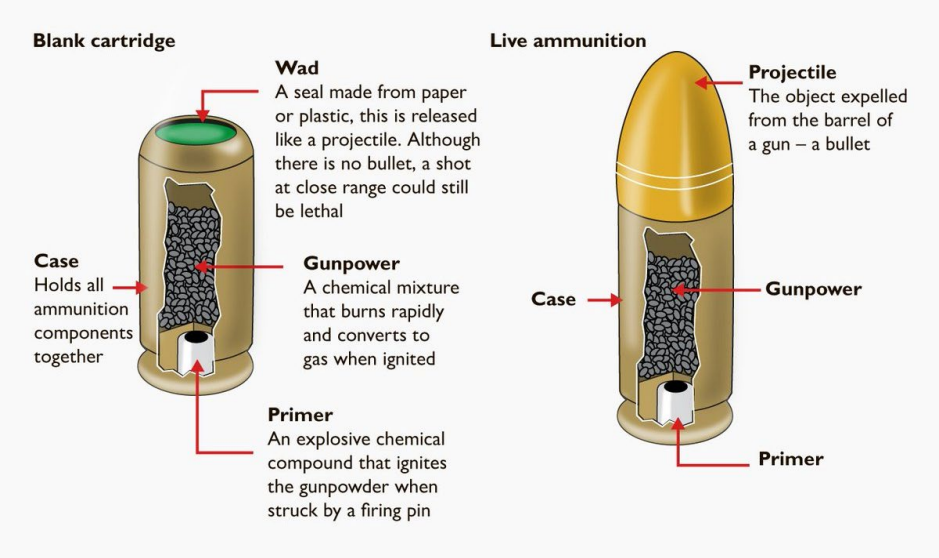
Blank cartridges may contain gun powder but no projectile. Blanks use paper, plastic wadding or crimped bullets in the cartridge to seal in the gunpowder. When blanks are fired, the wadding is propelled from the barrel of the gun, and it makes a flash and an explosive sound (to imitate the sound of real gun fire).



Often, there is a false sense of safety when using blank cartridges. Even though they do not contain a real bullet, the amount of force exerted when blank

cartridges are fired, especially at close range, can cause severe injury and even death.

Blank ammunition should not be purchased from a traditional ammunition shop. In order to ensure proper loads, this type of ammunition must be purchased from a theatrical ammunition distributor. These shops specialize in the design of firearms and load of ammunition used in special effects.



Safety with Firearms

- **Always** treat firearms as though they are loaded. Blanks can kill.
- **Never** load any firearm until you are ready to use it.
- **Never** point a firearm (loaded or unloaded) at anyone, including yourself
- **Never** interchange blanks. Only use appropriate blanks for the firearm you are handling.
- **Never** engage in "horseplay" with any weapons.
- **Always** wait at least 15 seconds after a misfire before clearing the unfired blank. Keep the firearm pointed in a safe direction during the "waiting period" as well as when clearing the unfired blank and loading a new one.
- **Always** clean the firearm after every use. Leaving firearms un-cleaned even for a short period of time can be dangerous and cause serious damage.
- **Always** protect your eyes and ears.
- **Never** leave a firearm unattended.
- **Never** bring live ammunition into any studio, lot, stage, or location.

Appendix

A. Sample Letters and Site Diagram

Company Letterhead

incl

Property Owner and Address

Date: _____

Attn: NYC Fire Department Explosives Unit

I grant permission to Production Name to use my facility for special effects.

The special effect(s) will consists of

_____

_____

_____

_____

I am aware that the fire alarm panel may have to be taken offline for smoke/haze effects and I will make sure that there is the appropriate COF present (S-95, F-53, F-89, T-89) and proper notification is made to FDNY Explosives Unit of Out of Service condition.

Thank you.

Signature _____

Title _____

Print Name _____

B. Request for a Permit

Fires.fdnycloud.org

Instructions:
https://www.nyc.gov/assets/fdny/downloads/pdf/business/request-an-explosives-and-entertainment-unit-inspection.pdf

C. Letter of recommendation (on Company Letterhead)

To Whom This May Concern:

I am pleased to recommend _____ for the Certificate
(name of individual)
of Fitness E- _____, _____. (S)he has _____ years
(COF type) (Certificate of Fitness Title) (number of years)
of experience with _____ working with SPFX.
(Company name)

_____ is of good character and is physically able to perform the
(name of individual)
duties required of a Certificate of Fitness E-_____ holder. (S)he is
(COF type)
experienced in the notification and safety guidelines of FDNY Explosive Unit

as prescribed by the NYC Fire Code.

Notary

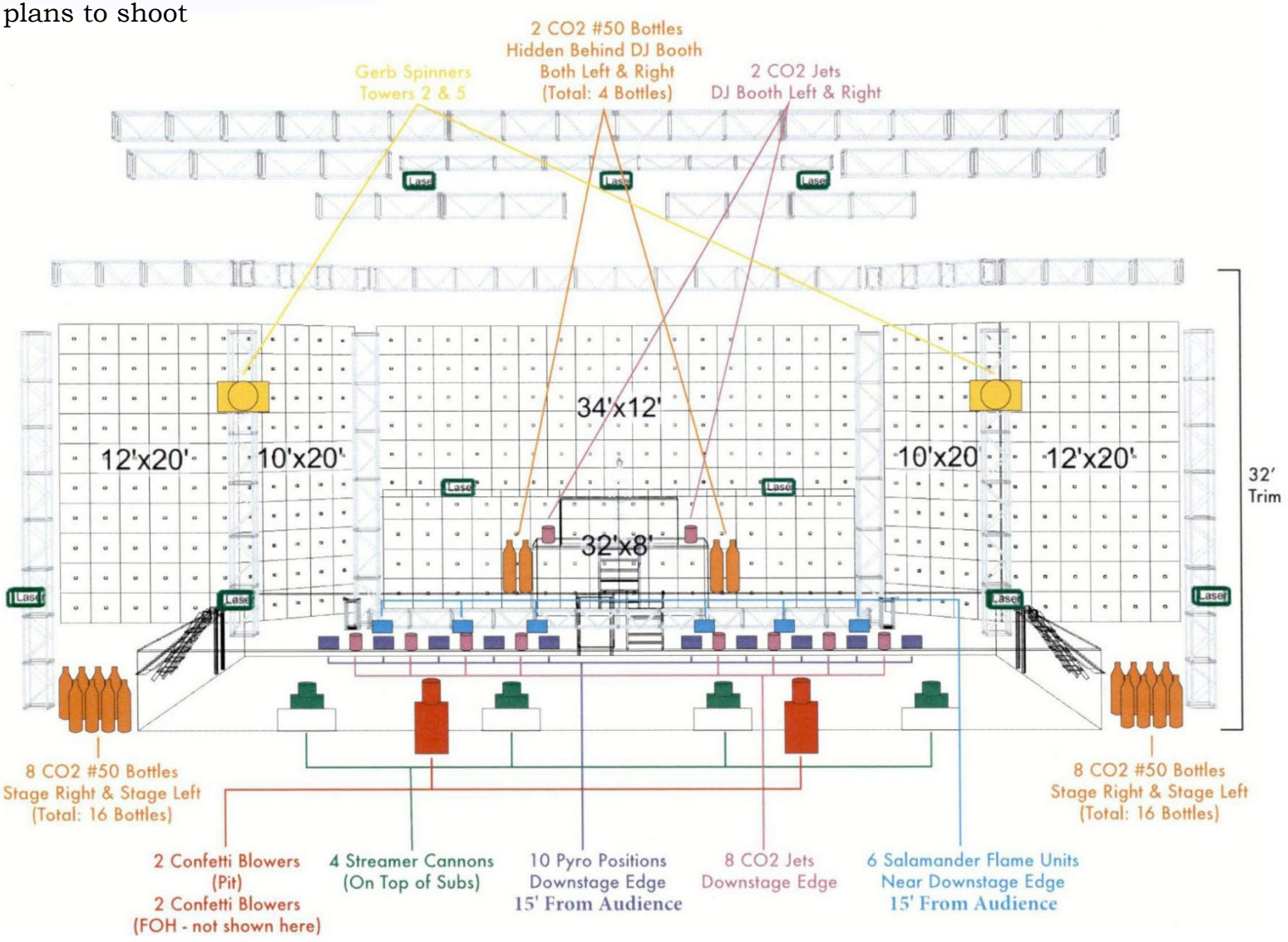
Respectfully,

_____
(Recommender's Signature)

_____
(Print name, Certificate of Fitness #)

D. Sample Site Diagram
(submit with description below)

Include Notation of where the pyrotechnician plans to shoot



DESCRIPTIONS

Product List per Show:

Qty	Description
23	30' Mine - red
10	30' Mine - gold glitter
20	30' Mine - white
12	30' Mine - green
2	30' Mine - amber
2	30' Mine - purple
2	30' Mine - blue
10	30' Mine - blue & white
10	30' Mine - crackle
10	30' Mine - pink
21	1 x 25' Gerbs
11	30' Comet w/ tail - amber
11	Mortar Hit w/ report
33	30 x 10' Gerbs

Flame Effects:

Qty	Description
6	Salamander Flame Units

Other Effects:

Qty	Description
9	Full Color Laser Projection system
10	CO2 Cryo Jet
4	Single Head Confetti Blower
4	Double Barrel Confetti Blower

[redacted]