

GUIDELINE 5. CLASSES OF FIRE, TYPES OF PORTABLE FIRE EXTINGUISHERS, INSPECTION & MAINTENANCE OF FIRE EXTINGUISHERS IN UNIVERSITY BUILDINGS

1.0 PURPOSE

- 1.1 To provide an overview of fire extinguisher use and maintenance.

2.0 DEFINITIONS

2.1 **Fire:** Fire is the rapid oxidation of any combustible material. It is a chemical reaction involving fuel, heat, and oxygen. These three elements, commonly referred to as the fire triangle, in the right proportions, will always produce a fire. Remove any one side of the triangle and the fire will be extinguished. Scholars have also introduced a 4th element in the equation, known as the uninhibited chain reaction, thereby giving the fire chemical reaction an additional side. This is referred to as the fire tetrahedron.

2.2 **Classes of Fire:** The classification of fire depends mainly upon the fuel involved. There are five classes of fire.

2.2.1 **CLASS "A"** - These fires are fueled by ordinary combustible materials, such as wood, cloth, paper, and many plastics. This type of fire burns with an ember, leaves an ash, and is best extinguished by removing the heat side of the triangle. Extinguishers suitable for Class "A" fires should be identified by a triangle containing the letter "A"; if color-coded, the triangle will be green.*



2.2.2 **CLASS "B"** - These fires are fueled by flammable liquids, combustible liquids, petroleum greases, tars, oils, oil-based paints, solvents, lacquers, alcohols and flammable gases. This type of fire burns on the surface of the fuels, and is best extinguished by a blanketing or smothering action. A fire of this type is fast-spreading and capable of engulfing a large area in a very short time. Extinguishers suitable for Class "B" fires should be identified by a square containing the letter "B". If color-coded, the square is red.*



2.2.3 **CLASS "C"** - These fires occur in energized electrical equipment, where the electrical non-conductivity of the extinguishing media is of importance. Blanketing or smothering this type of fire with a non-conducting extinguishing agent is of prime importance. Water, or solutions

Date: March, 2014

<http://www.publicsafety.upenn.edu>

containing water, is never to be used on a Class "C" fire. Extinguishers suitable for Class "C" fires should be identified by a circle containing the letter "C"; if color-coded, the circle is blue.



NOTE: If possible, shut off the source of electricity as soon as possible.

* Extinguishers suitable for more than one of the three classes of fire defined above may be identified by multiple symbols (ABC).

Generally the extinguishing agent is referred to as DRY CHEMICAL.

2.2.4 CLASS "D" – These fires involve combustible metals, such as magnesium, titanium, zirconium, sodium, lithium and potassium. Generally the extinguishing agent is referred to as DRY POWDER. These extinguishers should be identified by a star containing the letter "D", if color-coded, the star is yellow.



2.2.5 CLASS "K" –These are fires in cooking appliances that involve combustible cooking media such as vegetable or animal oils and fats. The extinguishing agent is referred to as WET CHEMICAL. These extinguishers should be identified by the letter "K."



2.3 TYPES AND OPERATIONS OF EXTINGUISHERS:

2.3.1 Pressurized Water Extinguishers, 2 ½ Gallon:

- **FOR USE ON:** Class "A" fires
- **EFFECTIVE RANGE** - APPROX. 30 to 40 FT.
- **DURATION** - APPROX. ONE (1) MINUTE
- **TO OPERATE:**
 - Pull out the pin or push the lever on top of the extinguisher handle to the rear.
 - Grasp the hose, squeeze the handles together and direct the stream at the base of the fire.
 - Turn on or off at will by squeezing or releasing the handles.

2.3.2 Carbon Dioxide Extinguishers:

- **FOR USE ON:** Class "B" and "C" fires
- **EFFECTIVE RANGE** - APPROX. 8 FT.
- **DURATION** - APPROX. 15 SECONDS
- **TO OPERATE:**
 - Carry the extinguisher to the fire.

- Remove the safety pin or locking device, point the horn at the base of the fire, and discharge by squeezing the handles together. Be sure not to place your hand on the horn when discharging the contents of the extinguisher or you could get a freezer burn.
- Discharge at the base of the fire and move the horn from side to side at a moderate speed. Too rapid a movement will dissipate the vapor, and too slow a movement may discharge more than is needed at one time.
- Continue to apply contents for a short time after the fire has been extinguished to prevent possible re-ignition.

2.3.3 Dry Chemical Extinguishers:

- **FOR USE ON:** Class "A", "B", "C" and "K" fires
- **EFFECTIVE RANGE:** 10 TO 14 FT.
- **DURATION:** APPROX. 30 SECONDS
- **TO OPERATE:**
 - Carry the extinguisher to the fire by its handle and operate according to the instructions on it (instructions usually read: remove safety pin or locking device, grasp nozzle and squeeze handles).
 - To reduce the intensity of the flames, direct the stream at the base of the flames and move rapidly from side to side to gain full coverage.
 - In small spill fires, where the entire width can be covered by the sweep of the dry chemical stream, attack the fire from the front. The stream will discharge over the entire spill area.
 - Work with any wind or breeze at your back.

2.3.4 Halon 1211/1301 Extinguishers:

- **FOR USE ON:** Class "B" and "C" fires
- **EFFECTIVE RANGE** - APPROX. 10 TO 13 FT.
- **DURATION** - APPROX. 14 SECONDS
- **TO OPERATE:**
 - Carry the extinguisher to the scene of the fire in an upright position.
 - Pull the ring lock pin and aim the nozzle at the base of the fire. Squeeze the carrying handle and the trigger together.
 - Sweep the extinguisher from side to side.

2.3.5 Wet Chemical:

- **FOR USE ON:** Class "K" fires
- **EFFECTIVE RANGE:** 2 ½ GALLON CAPACITY - APPROX. 8 TO 12 FT.
- **DURATION:** APPROX. 35 – 45 SECONDS
- **TO OPERATE:**
 - Carry the extinguisher to the fire by its handle and operate according to the instructions on it (instructions usually read: remove safety pin or locking device, grasp nozzle and squeeze handles).
 - The agent is discharged as a fine spray, which reduces the possibility of splashing hot grease.
 - In addition to offering rapid-fire extinguishments, a thick foam blanket is formed to prevent re-ignition, while cooling both the appliance and the hot cooking oil.

3.0 PROCEDURES

3.1 MONTHLY VISUAL INSPECTION

- 3.1.1** In accordance with the Philadelphia Fire Code, National Fire Protection Association Standard #10, and to comply with OSHA Standards, a monthly visual check of all portable fire

extinguishers is required. The Building Emergency Coordinator (BEC) will perform this function in the common areas and mechanical rooms. The BEC will inform FES that the visual checks have been performed and if there are any deficiencies to be corrected.

- 3.1.2** Extinguishers in laboratories and private areas are to be checked at least once a month by the location's occupants. All problems will be reported immediately to the Department of Fire & Emergency Services at 215-573-7857 for corrective action.
- 3.1.3** The intent and purpose of fire extinguishers require that they be visible at all times for use in an emergency. In the University environment, Safety Inspectors, Building Preparedness Planners and their staff, Facilities Services personnel, housekeepers, etc. make visual checks on a daily basis while performing their routine functions.
- 3.1.4** Visual checks shall determine that the extinguishers are conspicuous and in their designated places, access is not obstructed, the extinguisher has not been tampered with or sustained physical damage, the sight gauge is in the proper range and the seal has not been broken. All University employees are required to notify FES of any problems.

3.2 ANNUAL MAINTENANCE INSPECTION

- 3.2.1** The Department of Fire and Emergency Services, in accordance with the Philadelphia Fire Code, will coordinate the requirement for an annual maintenance check of all portable fire extinguishers. Additionally, Fire & Emergency Services will continue to conduct and record quarterly inspections and coordinate hydrostatic testing as required.

3.3 OPERATION OF EXTINGUISHERS:

- 3.3.1** Portable Fire Extinguishers are an integral part of any fire safety program. They are designed to combat fires in their early stages. Anyone who attempts to utilize an extinguisher should be properly trained. For these reasons, the use of portable fire extinguishers to combat well-established fires is not recommended. See Section 3.3.

3.3.2 In Case of Fire:

- Notify occupants to clear the area immediately and sound the building alarm.
- Call PennComm at 215-573-7333 or 511 from any campus phone.
- If a fire extinguisher must be used it is crucial that the operator be familiar with the proper operation and contents of the extinguisher. Check name plate if in doubt. Stay low to avoid heat and smoke and do not get trapped in a corner. Leave an escape route. Never attempt to fight fire alone; get help. See Section 3.3.

3.3.3 Routine Checks of Extinguishers should be noted:

- The extinguishers have been charged/tagged within the prescribed period of time (1yr).
- The extinguisher location is clearly visible from a distance.
- The extinguisher has not been tampered with or removed from its designated place.

4.0 RESPONSIBILITY

- 4.1** Employees and supervisors should execute their appropriate roles, explained herein, to ensure a fire-safe environment on campus. Use fire extinguisher only if you are able to identify the class of fire and have confirmed that the extinguisher is appropriate for fighting that type of fire. Fight a fire only if and only so long as you have a safe means of escape to a protected exit route.

6.0 GENERAL REFERENCES

- 6.1 The Philadelphia Fire Code, Chapter 900 - Fire Protections Systems**
- 6.2 29 CFR 1910.157**
- 6.3 Fire Protection Handbook, 19th edition**
- 6.4 NFPA 10 – Portable Fire Extinguishers**

7.0 CONTACT INFORMATION

- 7.1 For question regarding this guideline contact Fire and Emergency Services at (215) 573-7857.**