

FIRE SAFETY – GENERAL PREVENTION AND EXTINGUISHERS

This SOP provides general information on fire prevention, as well as detailed information regarding fire extinguisher classification, type, size, location, and use. Other EHS SOPs provide information regarding fire safety related to specific materials, such as flammable liquids, compressed gases, pyrophoric chemicals, etc.

Fire Prevention

- Keep hallways, corridors, and exit areas clear of items that impede egress in an emergency (i.e., chairs, tables, boxes, equipment, etc).
- Properly store combustible items. Do not accumulate unnecessary cardboard boxes, chemicals, and paper products.
- When stacking or storing items on shelves, the top of the items must be a minimum of 18" below sprinkler head deflectors.
- Properly store compressed gas cylinders. See EHS SOPs, **Gases Under Pressure Hazards & Risk Minimization** and **Liquefied Petroleum Gas (LPG) Portable Cylinders** for more information.
- Segregate chemicals by hazard class. See EHS SOP, **General Guidance for Chemical Storage** for more information.
- Purchase equipment that is approved by a testing organization, such as Underwriters Laboratories (UL).
- Keep electrical equipment, cords, and plugs in good condition. Arrange for an authorized factory representative or electrician to replace electrical cords or plugs that are in poor condition (i.e., frayed, cracked insulation, loose prongs, etc.).
- Do not overload electrical outlets.
- Report loose electrical wall receptacles, missing outlet faceplates, and exposed wires to the Building Maintenance Reporter (BMR).
- Disconnect electrical equipment that could possibly overheat when unattended.
- Keep fire extinguishers charged, stored in their designated location, and ensure annual inspection.
- When using a space heater, allow a minimum of three (3) feet between the heater and combustible materials.
- Turn off the electrical and heat-producing appliances at the end of the day.
- Immediately report a suspected natural gas leak. For emergencies, see the Safety at UNL website at <https://safety.unl.edu/>.
- Complete a Hot Work Permit when conducting hot work outside of a welding shop. See EHS SOP, **Hot Work Permit Operations** for more information.
- Refrain from open flames (i.e. candles, sterno burner, incense burner, etc.) unless they are an integral part of the work activity (i.e., Bunsen burners in laboratories, torches in welding shops, etc.). Do not leave open flames unattended. Do not store or use ordinary combustibles (i.e., papers, napkins, cloths, etc.) or flammable/combustible solvents (e.g., aerosols, paints, etc.) in the vicinity of open flames or hot surfaces.
- Do not let cooking oil or grease overheat. Use cooking aids that limit grease splattering. In commercial type kitchens, ensure regular inspection and servicing of the grease exhaust/fire

extinguishing system. For small grease fires, attempt to extinguish by smothering with a pot lid. Do not use water on grease fires.

- Know how to safely exit the work area if a fire should occur. Have at least two (2) exit routes in mind and walk through them to assure your safe response. Always observe a fire alarm. Convene in the predetermined safe gathering location.
- Use appropriately designed tools for handling hot equipment or surfaces (don't improvise with dish towels, rags, etc.).

Classes of Fires

The National Fire Protection Association (NFPA) categorizes fires by class. Newer fire extinguishers use a picture/labeling system to designate which types of fires they are to be used on. Older fire extinguishers are labeled with colored geometrical shapes with letter designations. Icons for both are shown below. Many extinguishers are designed for more than one type of fire and will therefore be labeled with more than one designator.



Class A – Trash, Wood, Paper

Class A fires involve ordinary combustible materials--paper, wood, fabrics, rubber, and many plastics. Quenching by water or insulating by a multipurpose (ABC) dry chemical agent is effective.



Class B - Liquids, Grease

Class B fires occur in flammable liquids--gasoline, oils, greases, tars, paints, lacquers, and flammable gases. Dry chemicals and carbon dioxide agents extinguish these fires.



Class C - Electrical Equipment

Class C fires take place in live electrical equipment--motors, generators, switches, and appliances. Nonconducting extinguishing agents such as dry chemicals or carbon dioxide are required to extinguish them. Fire extinguishers for the protection of delicate electronic equipment shall be selected from types specifically listed and labeled for Class C.



Class D - Combustible Metals

Class D fires occur in combustible metals such as magnesium, titanium, zirconium, sodium, lithium, and potassium. Sodium carbonate, graphite, bicarbonate, sodium chloride, and salt-based chemicals extinguish these fires. There is no picture designator for Class D extinguishers.



Class K - Cooking Oil Fires.

Class K fires occur in cooking appliances that use combustible cooking media (vegetable or animal oils and fats).



Types of Fire Extinguishers

- **Multipurpose Dry Chemical for Class A, B, and C Fires.** The monoammonium phosphate agent is inexpensive and electrically nonconductive but leaves a powdery residue that can damage equipment. This type of extinguishing agent is not good for hidden fires.
- **Water for Class A Fires.** This type of extinguishing agent is not appropriate for areas with Class C hazard potential because water will conduct electricity.
- **CO₂ for Class B and C Fires.** Carbon dioxide is a colorless, odorless gas that leaves no messy residue to damage equipment. This type of extinguishing agent is good for reaching hidden fires, however, the heavy vapor settles out, limiting the total discharge range to approximately 8 ft. (2.4 m). Carbon dioxide may also cause thermal (cold) and static (shock) damage.
- **Dry Chemical for Class B and C Fires.** The potassium bicarbonate and sodium bicarbonate extinguishing agents are extremely effective against Class B fires and are electrically nonconductive. They are considered non-toxic and cleanup may be accomplished with a vacuum cleaner or broom and dustpan.
- **Dry Chemical for Class D Fires.** Extinguishing agents include sodium carbonate, salt, graphite, bicarbonate- and sodium chloride-based chemicals. These agents are not equally effective on all combustible metal fires. Be sure the extinguishing agent chosen will be effective on the combustible metal present, as using the wrong extinguishing agent can increase or spread the fire.
- **Wet Chemical for Class K Fires.** Potassium acetate is the agent specifically listed and labeled for use on Class K fires. Portable Class K fire extinguishers are intended to supplement automatic fire extinguishing systems.

Ratings of Fire Extinguishers

The fire rating of an extinguisher provides a guide to its extinguishing ability. As a result of fire testing by Underwriters Laboratories, Inc., Class A and Class B fire extinguishers carry a classification on their nameplates that consists of a numeral followed by a letter. The numeral indicates the approximate relative fire extinguishing capacity of the extinguisher on the class of fire, which is identified by a letter. For example, a 4-A extinguisher has approximately twice the extinguishing capacity as 2-A extinguisher. The actual fire suppression capacity is related to the experience of the operator.

Class C and D extinguishers carry only the symbol and have no numerical rating. Fire extinguishers and extinguishing agents for use with Class D hazards shall be of types approved for use on the specific combustible metal hazard. This should be detailed on the fire extinguisher nameplate.

Location of Fire Extinguishers

Fire extinguishers are required to be conspicuously located where they will be readily accessible and immediately available in the event of fire. Preferably, they shall be located along normal paths of travel, including exits from areas. Extinguisher placement must fulfill both distribution and travel distance requirements. Fire extinguishers must not be obstructed or obscured from view. In large rooms, and in certain locations where visual obstructions cannot be completely avoided, means shall be provided to indicate the extinguisher location.



Scattered or widely separated hazards must be individually protected. A fire extinguisher in the proximity of a hazard shall be carefully located to be accessible in the presence of a fire without undue danger to the operator. Portable fire extinguishers must be installed securely on the hanger, or in the bracket supplied by the extinguisher manufacturer, or in a listed bracket approved for such purpose, or placed in cabinets or wall recesses.

Only non-magnetic fire extinguishers are appropriate in areas with extremely high magnetic fields, such as magnetic resonance imaging (MRI) machines or nuclear magnetic resonance spectrometers (NMR's).

Number of Fire Extinguishers

The number of extinguishers needed is determined by the authority having jurisdiction (usually the local or state fire marshal). This determination is based on the rapidity with which a fire may spread, the intensity of the heat that may develop, the travel distance (actual walking distance) from any point to the nearest fire extinguisher, and the accessibility of the fire.

Use of Fire Extinguishers

Any person who is designated or intends to use a fire extinguisher must be trained in its use. EHS offers a web-based training module accessible through the EHS website <https://ehs.unl.edu/web-based-training/>. Course titled Fire Extinguisher Training. Upon request, EHS will supplement this web-based training with hands-on training.