Fire Prevention and Emergency Action

Policy 303.19

1 Introduction

2 Scope

2.1 The primary goal of the Emergency Action & Fire Prevention Plan is to provide basic emergency response procedures to members of the University community. The plan is also intended to help reduce or eliminate potential fires in the workplace by heightening the fire safety awareness of all employees by recognizing, reporting and controlling potential fire hazards.

3 Definitions

3.1 Shop or Laboratory Unit

is defined as a room, or suite of rooms, separated from adjacent areas by walls and doors having at least a ONE HOUR fire rating.

3.2 Flammable liquid

is any liquid having a flashpoint below 100 degrees F (37.8 degrees C). Flammable liquids are also known as Class I liquids and subdivided according to flashpoint and boiling point as indicated below. Note: Unstable liquids are to be treated as Class IA liquids:

4 Policy and Procedure Statements

4.1 Plan Elements

1. Identifies common types of potential emergency situations that may necessitate a building evacuation or emergency action.
2. Describes procedures for initiating/conducting a building evacuation.
3. Provides information for physically disabled occupants in emergency evacuation situations.
4. Identifies potential fire hazards and their proper handing and storage procedures.
5. Identifies departments/areas responsible for the control and accumulation of flammable or combustible material.
6. Describes fire safety and general housekeeping procedures necessary to insure the control of fire hazards and the accumulation of flammable and combustible waste materials.
7. Describes fire protection equipment and/or systems commonly found in University Buildings.
8. Identifies departments/areas responsible for maintaining fire protection equipment and systems.
9. Identifies training/materials provided to employees with regard to evacuation procedures, fire drills and services offered by the Safety & Workers' Compensation Office related to fire safety.

4.2 Building Evacuation

4.2.1 The primary concern in the event of any emergency situation will be protecting the life and safety of the building occupants, with the secondary concern being preservation of property.

4.2.2 Several types of potential emergency situations may necessitate a building evacuation, including fire, explosion, chemical spill, gas leak, terrorist threats, etc. University Police should be notified (262-8000) of any emergency situation. The building fire alarm is primarily intended for initiating a general evacuation during fire emergencies. Emergencies other than fire, such as chemical spills in exit paths, incendiary device(s) present, or possible exposure to armed persons, etc., should be evaluated before initiating a general evacuation via the fire alarm.

4.2.3 In those instances where a general evacuation alarm is not appropriate, a room by room evacuation may be conducted by University Police or other emergency personnel. Evacuation instructions may be provided via a public address system (in buildings with such systems) providing that it will not cause further danger to the occupants.

4.2.4 Each occupant should become familiar with the location of emergency escape routes which are marked on posted evacuation plans in each building. Occupants also should be familiar with the location of fire alarm pull stations and fire extinguishers in their building. Each building should have an established evacuation meeting point. An alternate evacuation point

should be designated for inclement weather. Evacuation points should be located at least fifty feet from the building and should not block the flow of emergency vehicles or personnel (i.e. , fire department, police, ambulance).

4.3 Evacuation Of Mobility Impaired Occupants

4.3.1 It is the responsibility of faculty to notify students in each class of the need to identify themselves (privately if appropriate) if they will need assistance during a building evacuation. Employees are responsible for identifying themselves to their supervisor (privately if appropriate) if they will need assistance during a building evacuation. Department chairpersons, and/or area supervisors should assist any student or employee who may be mobility impaired in preplanning their evacuation for an emergency situation. This may include enlisting the aid of other faculty/staff or students to provide assistance in evacuating mobility impaired persons from the building . Some buildings are equipped with Areas of Rescue Assistance. These are areas, typically located at or near exit stairwells, where mobility impaired persons may await evacuation by emergency personnel. Mobility impaired occupants who are unable to exit a building due to stairs or other architectural features should not attempt to use elevators and should go to an Area of Rescue Assistance and await evacuation by fire department personnel.

4.4 Fire Evacuation

4.4.1 As a rule, if you discover any type of fire/smoke or hear an audible alarm (bell, horn, etc.) in your area, treat the situation as an emergency. If the alarm system has not been activated, do so immediately. Contact University Police (262-8000) or Boone Fire Department (9-911) and evacuate the building. If time permits, warn others as you leave. If remaining in the area long enough to activate the alarm, contact emergency response personnel or warn others, would place you in danger. EVACUATE THE BUILDING IMMEDIATELY. Move to a safe location such as an emergency blue light telephone or another building that is unaffected by the emergency. Continue with the following procedures:

1. Contact University Police (262-8000) or Boone Fire Department (9-911). Describe the nature, extent and location of the emergency situation (e.g. fire/smoke present or alarm sounding).
2. Await the arrival of Fire Department personnel and University Police at the pre-designated evacuation meeting point.
3. Inform arriving emergency personnel of any areas where occupants may still be located inside the building (e.g. , mobility impaired, trapped, or injured).
4. Remain outside the building while emergency personnel inspect the premises, extinguish fires, remove trapped individuals and restore the alarm system.
5. Do not re-enter the building until Fire Department Officials, University Police, or other designated safety personnel communicate that it is safe to return.

4.5 Medical Emergencies

1. Before approaching injured persons, evaluate the immediate area for potential safety hazards that may require moving the injured to a safe location (e.g., fire, toxic or explosive gas vapors, etc.). Otherwise, do not move the injured except as necessary to avoid exposure to hazards.
2. Contact University Police (262-8000) to request first aid assistance or make arrangements for an ambulance or medical transportation.
3. Provide emergency first aid as needed, if you have been trained to do so.
4. If the injury involves exposure to a hazardous chemical, provide the Material Safety Data Sheet to the medical emergency responders. If the MSDS cannot be immediately located, call Student Health Services or the emergency room and provide the information as soon as possible.

4.6 Chemical Spills

The following procedures are to be used in responding to chemical spills that can not be safely contained by persons working in the area.

4.6.1 Indoor Spills

1. If the spill represents a hazard that is immediately dangerous to life or health (IDLH), evacuate the room/area, and, if in doubt, evacuate the building.
2. Contact University Police (262-8000) and request assistance. Describe the situation and indicate if there is a potential for fire or explosion, or if injuries exist. University Police will contact the Safety & Workers' Compensation Office and Physical Plant Hazardous Waste Office for assistance. Be prepared to provide a description of the spilled substance and a Material Safety Data Sheet, if possible.
3. The area of the spill should be sealed off or secured to prevent students or employees from entering the danger zone.
4. From a safe location, provide directions to and information about the spill zone to University Police and other emergency response personnel as needed.

4.6.2 Outdoor Spills

1. If the hazard is primarily restricted to the environment and the spill is too large to be cleaned up by onsite personnel, contact University Police (262-8000) for assistance. If there is a danger to people in the vicinity from fire or toxic vapors, request assistance from University Police (262-8000), Boone Fire Department (9-911) and the Safety & Workers' Compensation Office (262-4007).
2. Remain a safe distance away from the spill and warn passers-by to stay clear until help arrives. Be prepared to provide information about the substance spilled, including the material safety data sheet, to emergency responders.

4.7 Potential Fire Hazards: Identification and Control

Fires, like all other types of accidents, are largely preventable.

4.7.1 Common Causes of Fires

1. Overloaded electrical circuits, unsafe wiring and defective extension cords.
2. Appliances, such as coffee pots, hot plates and other heating devices, left on when not in use.
3. Unattended cooking.
4. Improper disposal of smoking material such as placing warm/hot ashes in trash cans.
5. Not using an ash tray - leaving a lighted cigarette on a combustible surface such as furniture.
6. Improper use of personal heating systems (space heaters) or non-electric (kerosene, propane, etc.) heating systems.
7. Improper use of candles, or incense, or other open flames.
8. Improper use of welding torches and equipment.
9. Improper use, handling, and storage of flammable material (gasoline, solvents, paints).
10. Overheated motors and other equipment not maintained properly.
11. Christmas tree lights and associated electrical cords.
12. Poor housekeeping which results in accumulation of combustibles such as paper, boxes, oil-soaked rags, etc.

4.8 Control of Flammable or Combustible Waste Materials

4.8.1 Ordinary Trash

4.8.1.1 Physical Plant (Building Services) is responsible for collecting ordinary combustibles, such as paper, plastic, or other items disposed in indoor trash receptacles. Physical Plant (Grounds Department) is responsible for the collection of ordinary combustibles such as paper, plastic in outdoor trash receptacles and dumpster areas. If you have any questions concerning the disposal of ordinary trash call 262-3190.

4.8.2 Recyclable Materials

4.8.2.1 Physical Plant (Recycling Office) is responsible for collecting materials, such as paper, glass or aluminum products placed in recycling containers. For questions concerning recycling or for special pick up needs contact the Physical Plant Department at 262-3190.

4.8.3 Hazardous Waste

4.8.3.1 Physical Plant (Recycling/Hazardous Waste Office) is responsible for collecting and disposing of hazardous waste, including chemical, bio-hazard, and other hazardous wastes. If you have any questions concerning the disposal of hazardous waste or special pick up needs contact the Physical Plant Department at 262-3190.

4.8.4 Building Safety/Housekeeping

4.8.4.1 Good building safety and housekeeping practices are basic to insuring fire safety and should be a major concern in every type of occupancy, from the simplest building to the most complex facility. The following general preventative measures apply.

4.8.5 Preventative Measures

1. Building occupants may not obstruct or tamper with any safety features such as exit signs, sprinkler systems, heat and smoke detectors, alarm pulls, horns, strobes, fire extinguishers, etc.
2. Fire doors may not be propped or wedged open except with approved electro-magnetic devices.
3. Hallways or other exit corridors may not be blocked, obstructed or have the required exit width reduced to less than the minimum specified by N.C. Building Codes.
4. Stairwells must be kept free of obstructions and can not be used for storage, recycling containers, vending machines, furniture, decorations, etc.

5. General work areas such as offices, labs, and shops must be kept orderly and clean.
6. Storage must be neat and orderly and maintained 2 feet or more below the ceiling in non-sprinkled areas of buildings or a minimum of 18 inches below sprinkler head deflectors in sprinkled areas of buildings.
7. Special events must be planned so that displays and refreshment tables do not obstruct exits or exit access routes.
8. Classrooms without fixed seating must be set up to allow access to the exit door from each row of seats. Seating may not exceed 49 in rooms with a single exit.
9. Posted occupancy limit numbers must be strictly observed.
10. Assembly occupancies must conduct and document pre-event inspection functions as specified by the Safety & Workers' Compensation Office.
11. Open flame devices may not be possessed or used except as specified in the ASU Open Flame Policy.
12. Personal space heaters are strongly discouraged. If their use is necessary, combustible materials must be at least 3 feet away from the heater. Space heaters cannot contain elements which are exposed or "glow" and must be equipped with safety features such as tip over shut off devices or thermostats equipped with overheating protection.
13. Coffee pots and other appliances should be turned off when empty and before employees leave for the day.
14. Halogen lamps are highly discouraged due to the high temperatures which the bulb produces. If utilized, appropriate "grill type" guards should be placed over the bulb and combustibles kept a safe distance away to prevent accidental ignition.
15. Extension cords are permitted for temporary use only and may not be used under rugs, through doorways, walls or above ceilings. Cords may not be placed where they will be stepped/walked on, have undue wear and tear, or present a tripping hazard. Cords necessary in high traffic areas should be protected with a rubberized cord cover protector.
16. Only UL approved, heavy duty, three prong (grounded) extension cords may be used. Power strips with circuit breakers and/or surge control devices may be utilized with computer equipment.
17. Outlets should not be overloaded and cube or multi-plug extenders should not be used.
18. Holiday decorations must be located so that they do not obstruct any exits, hallways, stairs or fire fighting equipment. Decorations may not be placed in stairwells and must be kept to a minimum in corridors.
19. The use of natural cut trees is permitted only in approved buildings. For a list of approved buildings, contact the Safety & Workers' Compensation Office at 262-4007.
20. Electric lights and lighted decorations must bear the Underwriter Laboratories seal and must be turned off when the room or space is unoccupied. Electric light sets should not be placed on or allowed to touch metallic surfaces.
21. Discarded packing material or scrap materials should not be accumulated.
22. A sufficient number of trash receptacles should be placed in each work area.
23. Floors should be swept or vacuumed to prevent accumulation of combustible materials.
24. Avoid using flammable cleaning solvents to clean floors, walls, furniture or equipment.
25. Clean up hazardous material spills immediately.
26. Place oil or chemical soaked rags in metal or other suitable containers.
27. Charcoal or lighter fluid should not be stored in any university building.
28. Charcoal or gas grills must be used at least 10 feet from buildings or combustible materials.

4.8.6 Chemical Handling And Storage

1. Leaks, spills, and overflows must be avoided. Storage of flammable and combustible liquids in open containers is not permitted.
2. Chemicals, specifically flammable and combustible liquids, should be stored in appropriate storage cabinets/control areas approved by the Safety Office & Workers' Compensation Office.
3. Incompatible materials in storage areas must be segregated. Specifically, separate ignitable material from oxidizers or sources of ignition. In general, do not store different types of incompatibles in the same area or cabinet.

4.8.7 Fire Protection Equipment

4.8.7.1 Fire protection systems installed in campus buildings are designed to emit an audible and/or visual alarm throughout the structure which will alert occupants to an emergency situation. The basic types of fire protection systems and equipment used at the University to detect, control or extinguish fires are:

1. Automatic Fire Alarm - An alarm system equipped with smoke/heat detectors, pull stations, and/or sprinkler system which, if any portion of the system is activated, will automatically notify University Policy of an alarm situation.
2. Manual Fire Alarm - An alarm system equipped only with pull stations, which, upon manual activation, will send the system into alarm and automatically contact University Police.
3. Automatic Sprinkler Systems - These systems are designed to activate when a fusible link or bulb located in the sprinkler head is heated beyond a specific temperature, allowing the link/bulb to melt/burst, releasing water from the sprinkler head.
4. Chemical Extinguishing Systems - These systems generally activate by either manual pull stations or by fusible links and are usually found in Food Service areas or computer equipment rooms.
5. Portable Fire Extinguishers - ABC, Carbon Dioxide, Halon and K type extinguishers are common types of extinguishers found in University Buildings.
6. Electro-Magnetic Door Closures - Magnetic devices which normally hold doors in the open position. However, upon activation of the fire alarm system, the magnetic devices will release and allow the doors to close and provide fire/smoke

protection.
7. Fire Shutters/Roll Down Doors - Devices which, upon activation of a smoke/heat detector or fusible link, will close automatically, providing separation/protection from fire/smoke.

4.8.8 Inspection/Maintenance

4.8.8.1 Fire protection equipment and systems are required to be routinely inspected/tested to ensure proper operation, as specified by National Fire Protection Association. Physical Plant performs/coordinates routine maintenance/testing of fire protection systems in academic buildings. Receipt supported departments or areas are responsible for insuring maintenance of fire protection equipment in their respective areas.

4.8.8.2 Any problems with fire alarm systems should be reported to University Police 262-2150 or Physical Plant Telecommunications 262-3190

4.8.9 Fire Extinguishers - Use/Training

4.8.9.1 Upon initial employment, employees will receive educational materials concerning the use of portable fire extinguishers on incipient stage fires. Additional educational materials will be provided at least annually in the form of brochures/flyers. Optional "hands on" demonstration(s) may be offered to employees wishing to participate in a "live burn" scenario.

4.8.10 Types of Fires

1. Class A Fires - Involves ordinary combustible materials such as wood, paper, cloth, rubbish and other solids.
2. Class B Fires - Involves flammable and combustible liquids such as gasoline, fuel oil, paint thinner, flammable cleaning solvents and oils.
3. Class C Fires - Involves "energized" electrical equipment.
4. Class D Fires - Involves combustible metals such as magnesium.
5. Class K Fires - Involves oils used in commercial deep fat fryer operations. Special extinguishing agents must be used to effectively cool and smother this type of fire due to the high temperatures which newer cooking oils utilize.

4.8.11 Maintenance

4.8.11.1 Any problems with portable fire extinguishers in academic or administrative buildings should be reported to Building Services at 262-4080. Problems with portable fire extinguishers in receipt-supported areas should be reported to the respective area.

4.8.12 Fire Prevention Training

4.8.12.1 The Safety & Workers' Compensation Office periodically distributes fire/emergency procedures to the campus community.

4.8.12.2 Department chairpersons and/or area supervisors are responsible for reviewing the University Emergency Action/Fire Prevention Plan with employees upon initial employment and at least annually thereafter.

4.8.12.3 Department chairpersons and/or area supervisors should inform employees of potential fire hazards in the workplace specific to their tasks. In addition, Department chairpersons and/or area supervisors should establish a plan of evacuation for their areas and should assist with the orderly evacuation of the building should an emergency situation occur. In some areas one or more persons may be designated to assist with the orderly evacuation of a building, floor or area.

4.8.12.4 In these cases, the names and position titles of such persons should be forwarded to the Safety & Workers' Compensation Office.

4.8.12.5 Safety Office personnel are available for customized fire prevention training upon request. Contact the Safety & Workers' Compensation Office at 262-4007 for more information.

4.8.13 Fire Drills

4.8.13.1 The North Carolina Fire Prevention Code requires that fire drills must be held monthly in educational occupancies (day care, educational under 12 th grade) and every three (3) months in assembly and specific residential occupancies. For buildings which do not fall into any of the above categories, an annual fire drill will be conducted in areas equipped with a fire alarm system.

4.8.13.2 During a fire drill, occupants should quickly evacuate the building, go to their pre-designated evacuation point, and remain outside until instructed to re-enter the building by Safety & Workers' Compensation personnel, University Police or other

designated safety personnel.

4.8.13.3 Fire drill reports will be completed and maintained by the Safety & Workers' Compensation Office.

4.8.14 Safety & Workers' Compensation Office Fire Prevention Services

4.8.14.1 The Safety & Workers' Compensation Office provides the following services to the University Community relevant to fire prevention:

1. Fire and emergency notification/action instructions
2. Fire prevention materials & information
3. Fire evacuation drills
4. Fire and Life Safety Evaluation (Safety Inspections)
5. Fire extinguisher education
6. Assistance in preparing and posting emergency evacuation route signage
7. NC Building Code compliance requirement information

4.8.14.2 This plan is provided as a general guide and does not cover all code compliance issues. If you have any questions or concerns, or need additional information, contact the Safety & Workers' Compensation Office at 262-4007 or email the Safety Inspector at clarkbs@appstate.edu.

4.9 Procedure Regarding Flammable and Combustible Materials

4.9.1 Appalachian State University is required to follow the recommendations contained in the National Fire Protection Association (NFPA) Codes as minimum requirements for acceptable storage and use practices of flammable and combustible liquids.

4.9.2 These requirements have been incorporated into the Department of Labor Occupational Safety and Health Standards (29 CFR part 1910), the North Carolina Building Codes or are required as a condition of insurance coverage by the North Carolina Department of Insurance.

4.9.3 This section does not incorporate all of the applicable standards, but represents those cited most frequently during inspections conducted by the University Occupational Safety and Health Office, the North Carolina Department of Labor, Occupational Safety and Health Division and the North Carolina Department of Insurance field inspector.

4.9.4 Flammable substances are among the most common of hazardous materials found in the work place. However, the ability to vaporize, ignite and burn or explode varies with the specific type or class of substance. Prevention of fires and explosions requires knowledge of the flammability characteristics (limits of flammability, ignition requirements and burning rates) of combustible materials likely to be encountered under various conditions of use and of the appropriate procedures to use in handling such substances.

4.9.1 Properties of Flammable Substances

4.9.1.1 A flammable liquid does not itself burn; it is the vapors from the liquid that burns. The rate at which different liquids produce flammable vapors depends on their vapor pressure. The degree of fire hazard depends also on the ability to form a combustible or explosive mixture with air.

4.9.1.2 The flash point is the lowest temperature, as determined by standard tests, at which a liquid gives off vapor in sufficient concentrations to form an ignitable mixture with air near the surface of the liquid. Many common solvents and chemicals have flash points that are lower than room temperature (e.g. gasoline, acetone, toluene, isopropyl alcohol).

4.9.1.3 The ignition temperature (auto ignition temperature) of a substance, whether solid, liquid, or gaseous, is the minimum temperature required to initiate or cause self sustained combustion independent of the heat source. For example: a steam line or a light bulb may ignite carbon disulfide (ignition temperature 80C).

4.9.1.4 Spontaneous ignition or combustion takes place when a substance reaches its ignition temperature without application of external heat. The possibility of spontaneous combustion should be considered, especially when materials are stored or handled as disposal items. Materials susceptible to spontaneous combustion include, but are not limited to, oily rags, dust/sawdust accumulations, organic materials mixed with strong oxidizing agents and alkali metals such as sodium and potassium.

4.9.2 Source of Ignition

4.9.2.1 There are a number of potential sources of sparks, flames or heat in the work place which can ignite flammable substances. These include open flames, static electricity and heated surfaces. When flammable materials are being used, close attention should be given to all potential sources of ignition in the vicinity. The vapors of all flammable liquids are heavier than air

and are capable of traveling considerable distances near ground level to reach a potential ignition source. This possibility should be realized and special note should be taken of ignition sources in work areas.

4.9.2.2 Flammable vapors from massive sources such as spills or leaks have been known to descend into stairwells and elevator shafts and ignite on a lower story. If the path of vapor within the flammable range is continuous, the flame will propagate itself from the point of ignition back to its source.

4.9.3 Use of Flammable Substances

4.9.3.1 The basic precautions for the safe handling of flammable materials include the following:

1. Flammable substances should only be handled in areas free of ignition sources.
2. Flammable substances should never be heated by using an open flame.
3. When transferring flammable liquids in metal equipment, static generated sparks should be avoided by bonding containers and use of ground straps.
4. Ventilation is one of the most effective ways to prevent the formation of flammable mixtures. A mechanical exhaust system should be used whenever appreciable quantities of flammable substances are transferred from one container to another, allowed to stand in opened containers, heated in open containers or handled in any other fashion.
5. Containers of flammable liquids shall not be drawn from or filled within buildings unless provisions are made to prevent the accumulation of vapors in hazardous concentrations.
6. Flammable materials should always be stored in safe, approved containers and storage in line with National Fire Protection Association (NFPA) guidelines. (Refer to other sections for specific practices).

4.9.3.2 **Table I**

Class I	Flashpoint below 73 F (22.8 C) Boiling point below 100 F (37.8 C)
Class IB	Flashpoint below 73 F (22.8 C) Boiling point at or above 100 F (37.8 C)
Class IC	Flashpoint at or above 73 F (22.8 C) and below 100 F (37.8 C)

4.9.3.3 Combustible liquid is any liquid having a flashpoint at or above 100 F (37.8 C). Combustible liquids are also known as Class II and III liquids and subdivided as indicated in Table II. Notes: When a combustible liquid is heated for use to within 30 F (16.7 C) of its flashpoint, it shall be handled in accordance with the requirements for the next lower class of liquids:

4.9.3.4 **Table II**

Class II	Flashpoint at or above 100 F (37.8 C) and below 140 F (60 C); exceptancy mixture having components with flashpoints of 200 F (93.3 C) or higher, the volume of which make up 99 percent or more of the total volume of the mixture.
Class IIIA	Flashpoint at or above 140 F (60 C) and below 200 F (93.3 C); exceptancy mixture having components with flashpoints of 200 F (93.3 C) or higher, the total volume of which make up 99 percent or more of the total volume of the mixture.
Class IIIB	Flashpoint at or above 200 F (93.3 C).

4.9.3.5 A Safety Can is a container, approved or listed by Underwriter's Laboratories or Factory Mutual Engineering Corp., of not more than five gallons capacity, designed with a spring closing lid and spout cover to safely relieve internal pressure when subjected to fire. Other approved safety containers are designed to hold greater than five gallons capacity for storage in specified areas (See below).

4.9.3.6 Storage Cabinets for flammable and combustible liquids may be metal or wood, constructed to limit the internal temperature to not more than 325 F when subjected to a ten minute fire test. This test uses the standard time temperature curve as set forth in "Standard Methods of Fire Tests of Building Construction and Materials", NFPA 251. Construction must be in accordance with OSHA Requirements, (1910-106 (d) (3)). Cabinets shall be labeled in conspicuous lettering, "FLAMMABLE-KEEP FIRE AWAY." Storage cabinets must be locked when unattended and are not permitted in the hallway. "No Smoking" signs must be prominently posted in the room and on entrance/exit doors.

4.9.3.7 Requirements: Storage cabinets for combustible and flammable liquids must be limited to the following maximum size capacities:

4.9.3.8 #Maximum 60 gallons (227 L) of Class IA, IB and IC flammable liquids and Class II combustible liquids may be stored in a single storage cabinet. Not more that 120 total gallons of flammable and combustible liquids may be stored in a single storage cabinet.

1. Maximum three (3) approved storage cabinets may be located in a single fire area; additional cabinets may be located in same fire area if additional cabinet, or group of three cabinets, is separated from other cabinets, or group of cabinets, by at least 100 feet (30 m).

4.9.3.9 Container shall refer to any vessel of 60 U.S. gallons (227 L) or less capacity used for transporting or storing liquids. The potential fire hazard in any area depends on the flammability of the liquid, total quantity of liquids used and type of containers in which the liquids are stored. The following table gives that maximum size container allowed for each class of liquid:

4.9.3.10 **Table III**

Flammable Liquids - IA, IB, IC Combustible Liquids - II, III

Container Type	**IA**	**IB**	**IC**	**II**	**III**
Glass	1pt	1pt	1gal	1gal	5gal
Metal* or Approved Plastic	1gal	5gal	5gal	5gal	5gal
Safety Cans	2gal	5gal	5gal	5gal	5gal
Metal Drums	60gal	60gal	60gal	60gal	60gal
Approved Metal Portable					
Tanks & Intermediate					
Bulk Containers (IBC's)	660gal	660gal	660gal	660gal	660gal
Polyethylene*	1gal	5gal	5gal		

4.9.3.11 Note : SI Units: 1 pt=0.473 L; 1 qt=0.95 L; 1 gal=3.8 L

1. Metal refers to containers other than DOT drums.
2. Metal Drums refers to DOT Spec. containers.
3. Polyethylene containers are DOT Spec. 34, or others as authorized by DOT Exemption.

4.9.4 Notes:

4.9.4.1 DOT Type III polyethylene non-reusable containers, constructed and tested in accordance with DOT specifications 2U, treated if necessary to prevent permeation, may be used for storage of Class II and Class III liquids, in all capacities not to exceed 2½ gallons (9.5 L).

4.9.4.2 Class IA and Class IB liquids may be stored in glass containers of not more than one (1) gallon capacity if the required liquid purity (such as ACS analytical reagent grade or higher) would be affected by storage in metal containers, or if the liquid would cause excessive corrosion of the metal container.

4.9.4.3 "NO SMOKING" signs must be observed at all times. Containers are to be labeled "DANGER - FLAMMABLE - KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAMES. KEEP CONTAINER CLOSED WHEN NOT IN USE."

4.9.4.4 Maximum Permitted Storage - Flammable, Combustible Liquids - Maximum permitted storage of Class I, Class II liquids on shelves or in open storage/use areas (e.g. educational, office settings) is as follows:

1. Glass, Plastic or Can Containers - 10 gal (37.8 L) max capacity Class I and Class II liquids combined when stored outside of inside storage area or storage cabinet
2. Safety Cans - 25 gal (94.6 L) maximum capacity Class I and Class II liquids combined when stored outside of inside storage area or storage cabinet

4.9.4.5 Notes :

1. Containers for Class I liquids placed outside of separate inside storage areas shall not exceed 1 gal (3.8 L). Exception: Safety cans may contain up to 2 gal (7.6 L) of Class I liquids.
2. Not more than 60 gal (227 L) of Class IIIA liquids shall be stored outside of a separate inside storage area or storage cabinet.

4.9.4.6 Maximum permitted storage inside storage rooms (meeting NFPA Code recommendations for walls, floors, shelving, wiring, HVAC and fire protective systems) shall be in accordance with Table IV:

4.9.4.7 **Table IV**

Automatic Fire Protection* Provided	Fire Resistance	Maximum Floor Area	Total Allowable Quantities Gal/Sq Ft/Floor Area
Yes	2 hr	500 sq ft	10
No	2 hr	500 sq ft	4**
Yes	1 hr	150 sq ft	5
No	1 hr	150 sq ft	2

4.9.4.8 SI Units: 1 sq ft = 0.09 m; 1 gal = 3.8 L

4.9.5 Notes :

1. Fire Protection system shall be sprinkler, water spray, carbon dioxide, dry chemical, halon or other approved system.
2. Total allowable quantities of Class IA and IB liquids are limited.

4.9.5.1 Where possible, establishing a central storage room is preferable to providing storage cabinets in each unit. This alternative is to be considered by departments which have centralized supply rooms that can be easily converted to comply with NFPA standards.

4.9.5.2 Domestic refrigerators are NOT to be used for storage of flammable liquids. "Safety" refrigerators are to be used. "Safety" refrigerators have the electrical contacts (door switch, light, thermostat, etc.) removed or exteriorized. "Explosion Proof" refrigerators are recommended for inside storage rooms (for flammables) or other potentially explosive atmospheres.

4.9.5.3 The quantity of flammables on hand in a unit must be kept to a minimum. Only in unusual circumstances will the maximum quantities be permitted. The following guidelines were adopted by the State of North Carolina for use in State agencies on the recommendation of the Deputy Commissioner of Insurance:

1. If a one (1) gallon quantity of one specific liquid represents more than a thirty (30) day supply of a Class IA and IB flammable liquid, smaller quantities should be purchased.
2. Multiple cans and/or bottles of any one specific flammable liquid will not be permitted in a unit in open storage or storage cabinet if it represents more than a five (5) day supply of the flammable product.
3. Quantities stored inside storage rooms are not to exceed a thirty (30) day supply for that building.
4. Suitable fire control devices are to be available at locations where flammable and combustible liquids are stored (kept). At least one (1) portable fire extinguisher with a rating of not less than 20-B shall be located near each space where flammable or combustible liquids are stored.

4.9.6 Disposal

4.9.6.1 No flammable or combustible liquids are to be poured into a sink or drain. Nonhazardous or water soluble liquids should be used with water, 50 parts to one (or consult manufacturer's label) to flush through the drain tap.

4.9.6.2 Laboratory quantities of flammable and combustible liquids should be disposed of according to State and Federal EPA regulations. These regulations and other information concerning the disposal of large (or small) quantities of liquids (or other products) may be obtained by contacting the Hazardous Waste Specialist, Appalachian State University Physical Plant, 262-3190.

4.9.7 Off-Campus Storage

The University has off-campus storage facilities for larger quantities of flammable and combustible liquids which cannot safely be stored in departments or other work areas. For information about this facility and the temporary storage of hazardous waste items, contact the University Physical Plant at 262-3190.

4.10 Compressed Gas

4.10.1 Purpose

4.10.1.1 The purpose of this safety requirement and procedure is to establish guidelines for the protection and safety of state employees who handle and use compressed gases.

4.10.2 Training

4.10.2.1 Employees who use and handle compressed gas cylinders will be trained before initial job assignment and/or job reassignment. Employees will be trained in the safe use, inspection, handling, and storage of compressed gas cylinders. Refresher training shall be provided at the discretion of the supervisor.

4.10.3 General Safe Handling Guidelines

4.10.3.1 Serious accidents can result from the misuse, abuse, or mishandling of compressed gas cylinders. Employees assigned to the handling of cylinders under pressure should follow general safe handling guidelines. These include:

1. Accept only cylinders approved for use in interstate commerce for transportation of compressed gases.
2. Do not remove or change the marks and numbers stamped on cylinders.
3. Cylinders must never be dragged, pushed, or pulled across the floor.
4. Transport cylinders weighing more than a total of 40 pounds (18.2kg) on a hand or motorized truck, secure them from falling.
5. Keep the cylinders clean and protect them from cuts or abrasions.
6. Do not lift compressed gas cylinders with an electromagnet. Where cylinders must be handled by a crane or derrick, as on construction jobs, carry them in a cradle or suitable platform and take extreme care that they are not dropped or bumped. Do not use slings.
7. Do not drop cylinders or allow them to strike each other violently.
8. Do not use cylinders for rollers, supports, or any purpose other than to contain gas.
9. Do not tamper with safety devices in valves or on cylinders.
10. Open valves by hand, rather than with a tool (unless the supplier recommends a specific tool.
11. Release the valves slowly.
12. If a special wrench is required to open the valve, leave it in position while in use so that the flow of gas can be stopped quickly in an emergency.
13. If a cylinder leaks or vlave is broken, tag the cylinder and contact the supplier.
14. Don't use the recessed top of the cylinder as a storage area for tools or material.
15. Never mix gases in a cylinder or try to refill a cylinder (contact the supplier).
16. Consult the supplier of the gas when in doubt about the proper handling of a compressed gas cylinder or its contents.
17. Clearly write EMPTY in chalk on empty cylinders that are to be returned to the vendor.
18. Close cylinder valves and replace valve protection caps, if the cylinder is designed to accept a cap.
19. Load cylinders to be transported to allow as little movement as possible. Secure them to prevent violent contact or upsetting.
20. Always consider cylinders to be full and handle them with corresponding care.
21. Securely support compressed gas cylinders at all times. Cylinders must NOT be left "free standing" at anytime, e.g. cylinders unloaded from truck to loading dock must me secured until placed on a hand truck for delivery within the building.
22. Compressed gas cylinders should never be subjected to a temperature above 125 degrees F.
23. Never place cylinders where they might become part of an electrical circuit.
24. Do no re-paint cylinders.
25. Never use a flame to detect flammable gas leaks. Always use soapy water.

4.10.4 Types

4.10.4.1 Compressed gas cylinders are used for a variety of gases. These gas cylinders fall into the following categrories:

1. Flammable
2. Toxic and Poison
3. Liquid

4.10.4.2 One flammable gas cylinder predominantly used is acetylene. Acetylene is used in torch heating, welding, and ferrous metal cutting operations.

4.10.4.3 Toxic and poison gas cylinders are used in a variety of applications. Methyl Bromide is the most common of these gas cylinders. These cylinders should be marked with a poison gas label.

4.10.5 Inspection

4.10.5.1 Compressed gas cylinders should be visually inspected daily for leaks, cracks, etc. This visual inspection will include the cylinder, safety relief devices, valves, protective caps and stems. If a cylinder is thought to be defective, it should be returned to the supplier for replacement. Under no circumstances should employees attempt to repair defective cylinders. Gages should be checked to ensure that the gas under pressure is not left in hoses when operations are completed.

4.10.6 Marking

4.10.6.1 For the purpose of identifying the gas content, compressed gas cylinders shall be legibly marked with either the chemical or trade name of the gas. Such marking shall be by means of stenciling, stamping, or labeling, and shall not be readily removable. Whenever practical, the marking shall be on the shoulder of the cylinder for easy identification. In addition, cylinders should bear the approved markings of the Department of Transportation stamped in metal at the top of the cylinder.

4.10.7 Transportation

4.10.7.1 Transporting gas cylinders requires careful consideration and appropriate precautions. These considerations and precautions include:

1. Motor vehicle transport of cylinders
2. Flammable gas and oxidizer cylinders transport
3. Hand truck (dolly) transport of cylinders
4. Cylinder transport precautions

4.10.7.2 Motor vehicle transport of cylinders shall only be done with vehicles equipped with racks or other means of securing the cylinders. Cylinders containing liquefied hydrogen or toxic gases shall be transported in open body vehicles.

4.10.7.3 Flammable gas and oxidizer cylinders transport must not be done together nor with poisons or corrosives. However, oxygen and acetylene cylinder joint transport is allowed if:

1. The cylinders are transported in the rear truck bed below the cab level
2. A roll bar is installed over the rear truck bed to prevent the cylinders from falling out of the truck bed in the event of the vehicle overturing

4.10.7.4 Red label, yellow label, white label, green label, or poison label materials are not to be transported on the same load. Poison label materials are not to be transported with food or other items intended for human consumption.

4.10.7.5 Hand truck (dolly) transport of cylinders shall be used for the transfer of compressed gas cylinders from loading area to shop or laboratory or other within-building transfers.

4.10.7.6 Cylinder transport precautions include:

1. Cylinders must have the valve protection cover in place while being transported (inter- and intra-building transport)
2. Cylinders must not be moved, rolled or lifted by the valve or valve cap
3. Cylinder valves must be shut off and valve caps in place during transit from location to location
4. Cylinders that are dropped during transit must be taken out of service, labeled (tagged) and returned to the supplier for inspection
5. Cylinders must be securelty supported at all times during transport
6. Smoking and other ignition sources are prohibited during loading, unloading, and hand transportation of flammable gas cylinders.

4.10.8 Storage

4.10.8.1 The storage of compressed gas cylinders requires some basic precautions and guidelines. These include:

1. General cylinder storage precautions
2. Specific gas cylinder storage guidelines
3. Cylinder storage room guidelines

4.10.8.2 General cylinder storage precautions include:

1. Valves and caps should be completely closed.
2. Cylinders must be secured in an upright position, in a safe, dry, well-ventilated place prepared and reserved for the purpose.
3. Cylinders must not be kept in unventilated enclosures such as lockers
4. Cylinders must not be stored in the same area as flammable substances, such as oil and volatile liquids, or near sources of heat, such as radiators or furnaces. Room temperature should remain constant.
5. Cylinders must not be stored near elevators, gangways, stairwells, or other places where they can easily be knocked down or damaged.
6. Cylinders must be stored on a level fireproof floor
7. Cylinders stored in the open must be protected from contact with the ground and against extreme weather conditions (e.g. direct sunlight, freezing conditions).
8. Cylinder storage must be planned so that cylinders are used in the order that they are received from the supplier.
9. Empty and full cylinders must be stored separately, with empty cylinders plainly marked to avoid confusion.

10. Empty cylinders must be grouped together that have held the same contents.

4.10.8.3 Specific gas cylinder storage guidelines include additional precautions and guidelines for oxygen, hydrogen, acetylene, and liquefied fuel gas (LP) gas cylinders. These inlcude:

4.10.8.4 *Oxygen* cylinders should not be stored within 20 feet (6 meters) of highly combustible materials, oil, grease, wood shavings, or cylinders containing flammable gases. However, for welding operations, oxygen and acetylene are typically paired on a common transfer cart for use. If stored closer than 20 feet, cylinders should be separated by a wall with a fire-resistant rating of at least 30 minutes.

4.10.8.5 *Hydrogen* cylinders storage locations shall be permanently placarded as follows: "HYDROGEN-FLAMMABLE GAS-NO SMOKING-NO OPEN FLAMES" or with equivalent wording.

4.10.8.6 *Acetylene and liquified fuel gas (LP)* cylinders should be stored with the valve end up. If storage is within 100 (30.5 meters) of each other and not protected by automatic sprinklers, the total capacity of acetylene cylinders stored and used inside the building should be limited to 2,500 cubic feet. Acetylene storage rooms must be well ventilated and open flames and other ignition sources must be prohibited. Acetylene storage rooms shall have no other compressed gases.

4.10.8.7 Cylinder storage room guidelines include:

1. Ventilate storage rooms for cylinders containing flammable gases to prevent the accumulation of explosive concentrations of gas
2. Eliminate and prohibit smoking and other ignition sources
3. All permanent wiring must be in conduit
4. Electric lights (portable and fixed) must be equipped with guards to prevent breakage
5. Electric switches must be located outside the room

4.10.9 Cylinder Protection

4.10.9.1 All gas cylinders with a water capacity over 30 pounds shall be equipped with a valve protection cap or with a collar or recess to protect the valve. In addition, cylinders shall be maintained with the protective cap in place at all times when not in use.

5 Additional References

Fire and Safety Exit Drill Report

6 Authority

7 Contact Information

8 Original Effective Date

9 Revision Dates