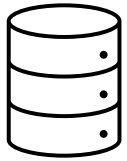
Safety Meeting
Fire Safety and Extinguishers

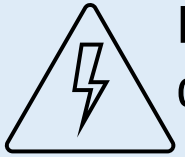
Kevin Turner
April 16th, 2025

Basic Laboratory Safety – Fire Hazards

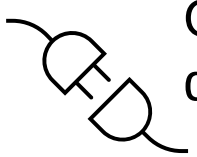
Common Fire Hazards



Improper storage or mishandling of flammable solvents



Poorly maintained electrical devices

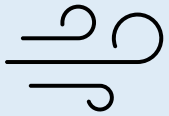


Overloaded power strips or damaged wiring

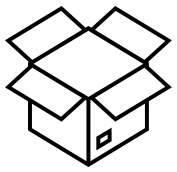
Heating devices and open flames

Reactive chemicals

Compressed Gases



Inadequate ventilation

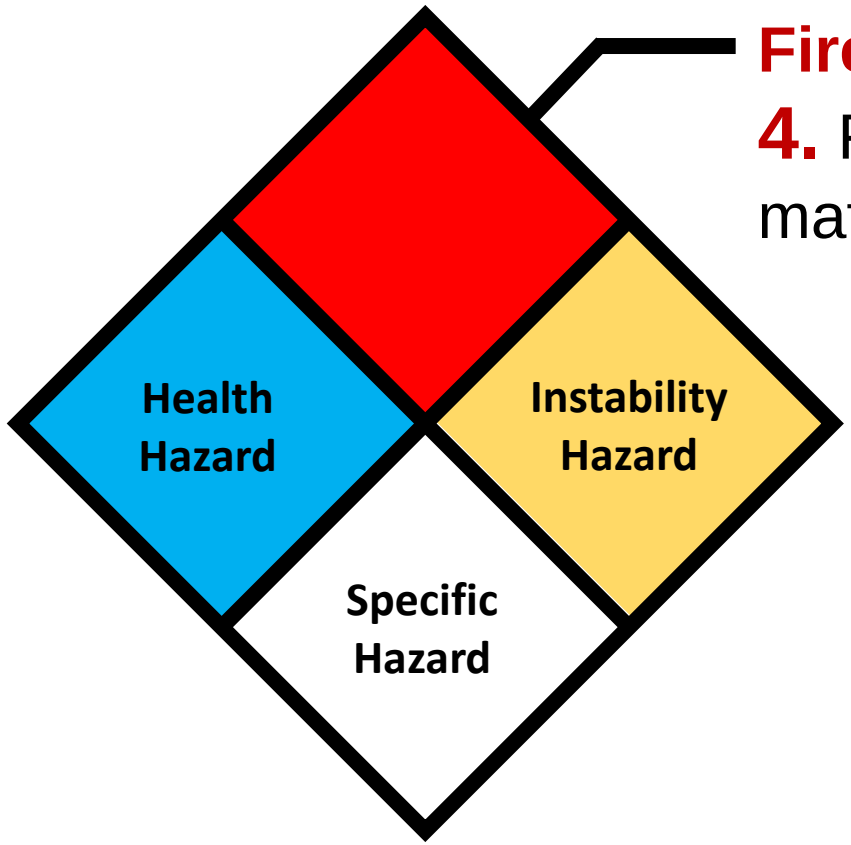


Unused boxes, papers, and other ordinary combustibles

Basic Laboratory Safety – Fire Hazards

NFPA Hazard Classifications

- Designed for quick, at-a-glance, risk assessment during an emergency
- Additional considerations may be necessary



Fire Hazard (Flammability)

4. Flammable liquids, volatile liquids, pyrophoric materials

3. Ignites at ambient temperatures

2. Ignites when moderately heated

1. Must be preheated to burn

0. Will not burn

Basic Laboratory Safety – Fire Hazards

GHS Hazard Classifications

- More detailed and intended for comprehensive chemical safety labeling

Category 1

Category 2

Category 3

Category 4

Severity

Flame

- Flammables, Pyrophoric, Self-Heating, Emits Flammable Gas, Self-Reactive, Organic Peroxides, Desensitized Explosives

Exploding Bomb

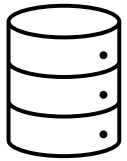
- Explosives, Self-Reactive, Organic Peroxides

Flame Over Circle

- Oxidizers

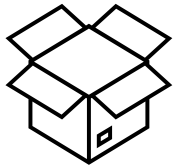
Basic Laboratory Safety – Fire Prevention

Fire Prevention Measures



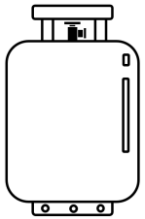
Proper Chemical Storage and Labeling

- Store flammable chemicals in designated flammable storage cabinets
- Ensure incompatible chemicals are segregated



Maintain a Clean Workspace

- Keep work areas clean and free of clutter
- This includes corridors and walkways
- Dispose of waste properly



Proper Gas Cylinder Storage and Labeling

- Keep gas cylinders upright and secured to prevent them from falling
- Store cylinders away from heat sources
- Regularly inspect for leaks and signs of wear or damage

Basic Laboratory Safety – Fire Prevention

Fire Prevention Measures

Fume Hoods

- When using flammable and/or volatile chemicals
- Contains vapors and minimizes the risk of ignition

Minimize Use of Open Flames

- Never leave an open flame unattended
- Keep flammable materials away

Maintain Electrical Equipment

- Regularly inspect for signs of wear or damage
- Avoid overloading power outlets
- Ensure that all electrical devices are properly grounded

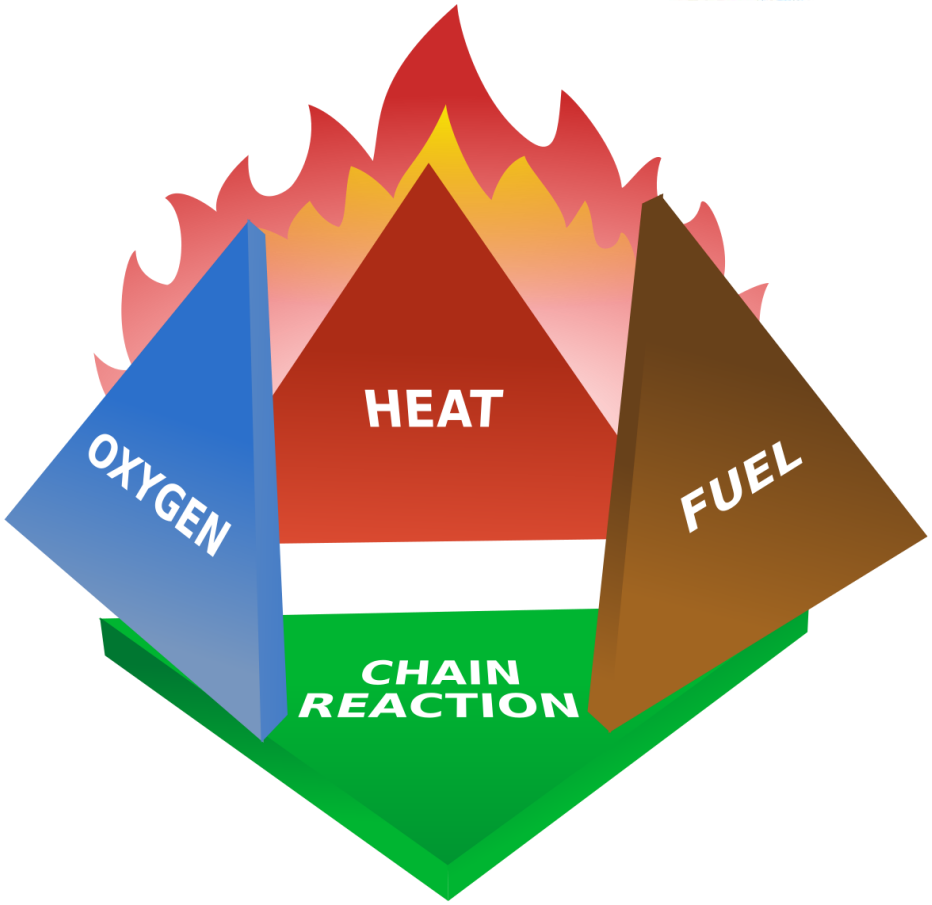
Basic Laboratory Safety – Fire Prevention

- Fire Safety Equipment
  - Flame-resistant lab coats
  - Fire extinguishers
  - Fire blankets
  - Fire alarms and sprinkler systems
  - Emergency showers

- Good Safety Practices
  - Maintain a clean workspace
  - Understand the different classes of fires and appropriate extinguishing methods
  - Know the location of your fire safety equipment
  - Familiarize yourself with emergency response procedures and evacuation routes
  - Participate in a hands-on fire extinguisher training
  - Chemical safety training and documentation
    - Consult MSDS for hazard classifications and fire-fighting measures

Fire Tetrahedron

- Fuel
  - any combustible solid, liquid, and/or gas
- Oxidizer
  - ozone, oxygen, hydrogen peroxide, nitric acid
- Ignition Source (Heat)
  - open flames, sparks, friction, hot surfaces, electrical arcs
- Chemical Chain Reaction
  - free radicals, chemically active intermediates



Fire Classifications

Ordinary Combustibles

- wood, paper, cloth

Flammable Liquids and Vapors

- gasoline, alcohols, oils, and solvents

Electrical Fires

- Caused by energized electrical sources
- May turn into a class A or B once de-energized

Combustible Metals

- magnesium, sodium, potassium, lithium, titanium

High Temperature Cooking Oils and Fats

- Occur in environments where grease or oil is heated

Extinguishing Agents

- Water
  - May contain additives (wetting agents, antifreeze)
  - Absorbs heat rapidly, soaks ordinary combustibles
  - Used ONLY for Class A fires
- Film-Forming Foams (AFFF, AR-AFFF, FFFP)
  - Aqueous surfactants or foaming agents
  - Expels a layer of foam
  - Conductive, vapor-sealing, absorbs heat
  - Many are being phased out
- Carbon Dioxide
  - Discharges as a cloud (relatively short range)
  - Displaces oxygen in the air
  - non-conductive, little residue

Extinguishing Agents

- Ordinary (BC) Dry Chemical
  - Sodium/potassium bicarbonate powder
  - Interferes with the chemical reaction
  - Non-conductive, minimal cooling effect

- Multipurpose (ABC) Dry Chemical
  - Contains an ammonium phosphate base (pale yellow powder)
  - Scavenges radicals, non-conductive
  - Forms a glassy surface-coating

Extinguishing Agents

- Wet Chemical (Class K)
  - Discharges a fine spray of aqueous potassium salts
  - Reacts with hot cooking oils to form a soapy foam layer
  - Prevents oil splatter
- Dry Powders
  - Suited for specific metals
  - Absorbs heat
  - Does not react with the burning metal
  - Provides a smothering blanket

Extinguisher Types

Ordinary Combustibles

- CO_2 and BC Dry Chemicals are less effective
- Use Water, Foam, or ABC Dry Chemical

Flammable Liquids and Vapors

- Water and CO_2 extinguishers may spread the burning liquid
- Use Foam, BC Dry Chemical, ABC Dry Chemical Extinguishers

Electrical Fires

- Do not attempt to shut off the power unless you can do so safely
- DO NOT USE water or foams (shock hazard)
- Use CO_2, Dry Chemical Extinguishers

Extinguisher Types

Combustible Metals

- DO NOT USE water, CO_2, and dry chemicals.
- Class D Extinguishers ONLY
- Dry powders are often material-specific

K

High Temperature Cooking Oils and Fats

- Class K Extinguishers ONLY
- Others are less effective and may cause splattering of hot oil

Always check the extinguisher label

Fire Extinguisher Inspection

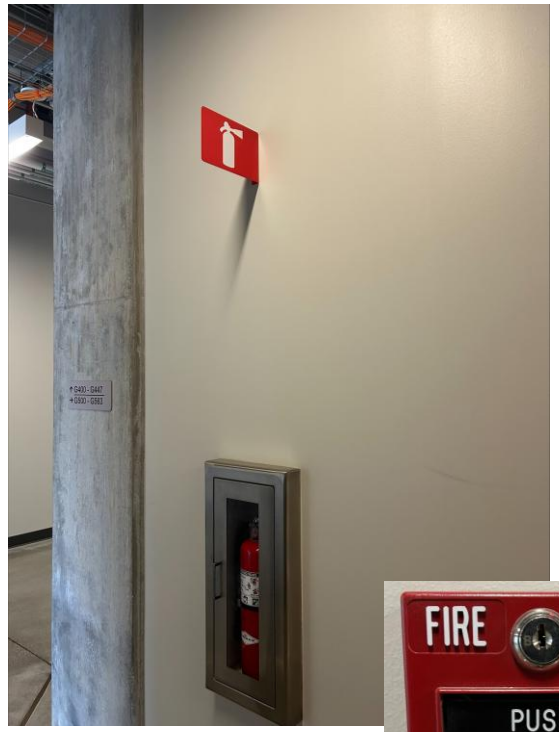
- Need to be serviced and maintained periodically to ensure they will operate properly when you need them most
- Servicing (annually)
  - Repaired, replaced, recharged by qualified service personnel
- Quick Check (monthly)
  - Is the extinguisher in the correct location?
  - Is the extinguisher visible and accessible?
  - Is the tamper seal intact?
  - Does the pressure gauge read the correct pressure?
- Questions or Concerns regarding your fire extinguisher(s)?
  - please contact KU Facilities Services: (785)-864-4770

Rules for Fighting Fires

- Assist any person in immediate danger to safety, if it can be accomplished without risk to yourself

- Immediately activate the building fire alarm system
  - notifies the fire department to get help on the way.
  - sounds the fire alarm bells
  - shuts down the air handling units to prevent the spread of smoke.
  - if you are in a building without a fire alarm system, dial 9-1-1 from a safe location to report the fire

- If the fire is small enough, use a nearby fire extinguisher to control and extinguish the fire



Rules for Fighting Fires

- Do not fight a fire under any of the following conditions…
  - You don’t know what is burning.
  - The fire is spreading rapidly.
  - You don’t have the proper equipment.
  - You can’t do so with your back to an exit.
  - The fire might block your means of escape
  - You might inhale toxic smoke.
  - Your instincts tell you not to do so

Remember **P.A.S.S**

- **P**ull the Pin
- **A**im low and point nozzle at the base of the fire
- **S**queeze the activating lever
- **S**weep from side-to-side

Do not fight a fire alone. Use a Buddy!

1. Monitor and help each other.
2. Buddy places a hand on your right or left shoulder, depending on which hand you use to fight the fire
3. Attack the fire by simultaneously moving forward. Never turn your back on the fire
4. If the fire flares or the situation worsens, your buddy's job is to pull you to safety
5. Once fire is out, assess the situation. Make sure the fire is completely extinguished. Back away from the fire without turning your back

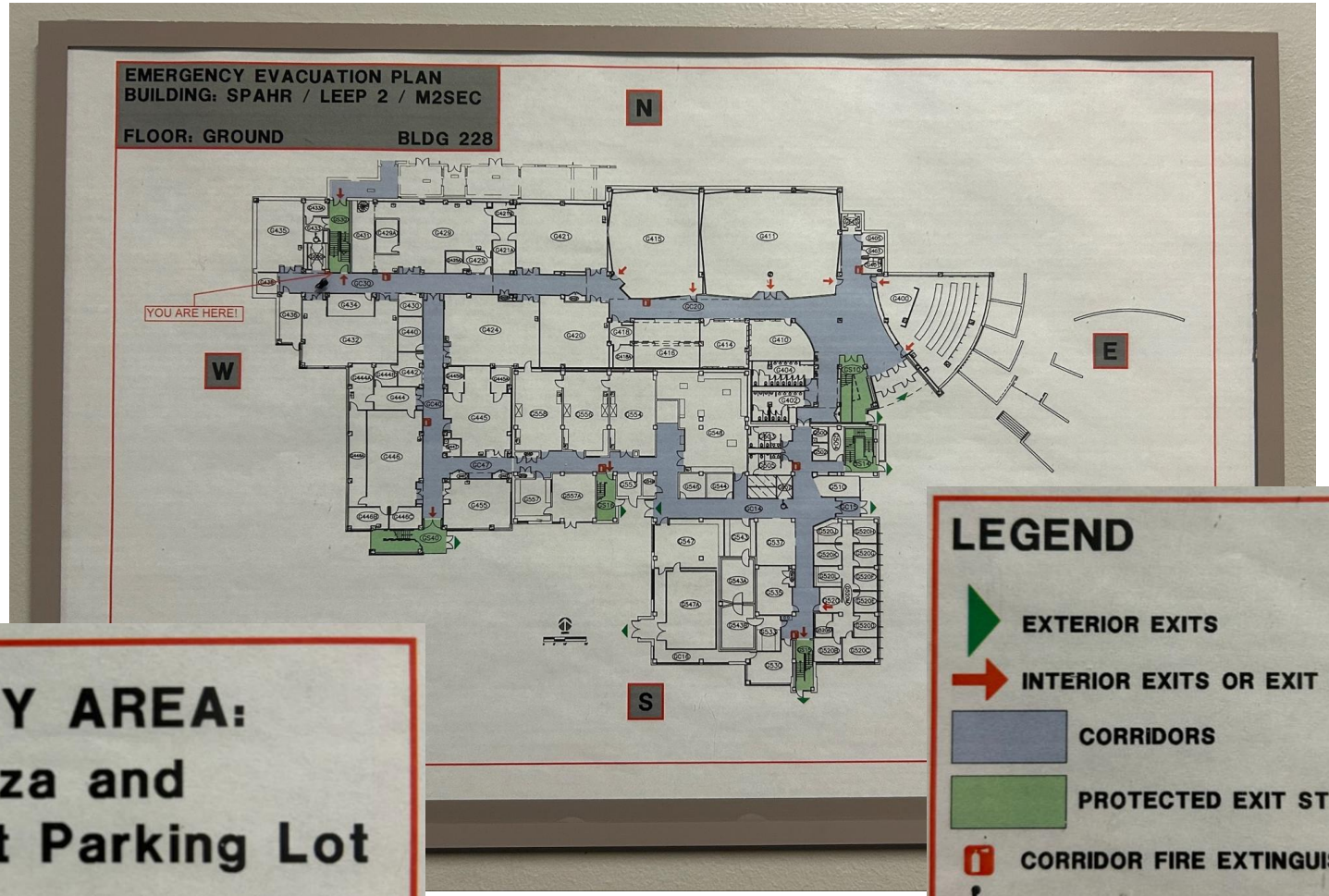
General Emergency Evacuation Procedure

1. Immediately obey evacuation alarms and orders to evacuate. Tell others to evacuate
   - Immediately shut down operations that could create additional hazards if unattended. Evacuate as soon as possible.
   - If you are the last to leave, close windows and doors as rooms are vacated
2. Proceed calmly but quickly to the nearest emergency exit
   - Use stairways to evacuate, if able to do so.
3. Utilize alternate evacuation routes directly to your designated assembly area where head counts can be taken
4. Do not re-enter the building
   - Wait until an authorized KU Public Safety, University Fire Marshal, or Lawrence Douglas County Fire and Medical personnel give the “All Clear”

General Evacuation Procedure

- Some KU facilities are equipped with accessible elevators that are specifically designed for emergency use
- “Emergency Exit Elevators” can be used by people with disabilities or other conditions needing assistance to evacuate
- In the event an elevator is shut down because it is affected by fire, utilize alternate routes designated by the emergency plan.
  - This may include staying in your office or room and contacting 9-1-1.
  - Some buildings on campus have a designated “Area of Refuge” or “Rescue Assistance Area” which includes communication devices to a monitored location.

Emergency Evacuation Plans

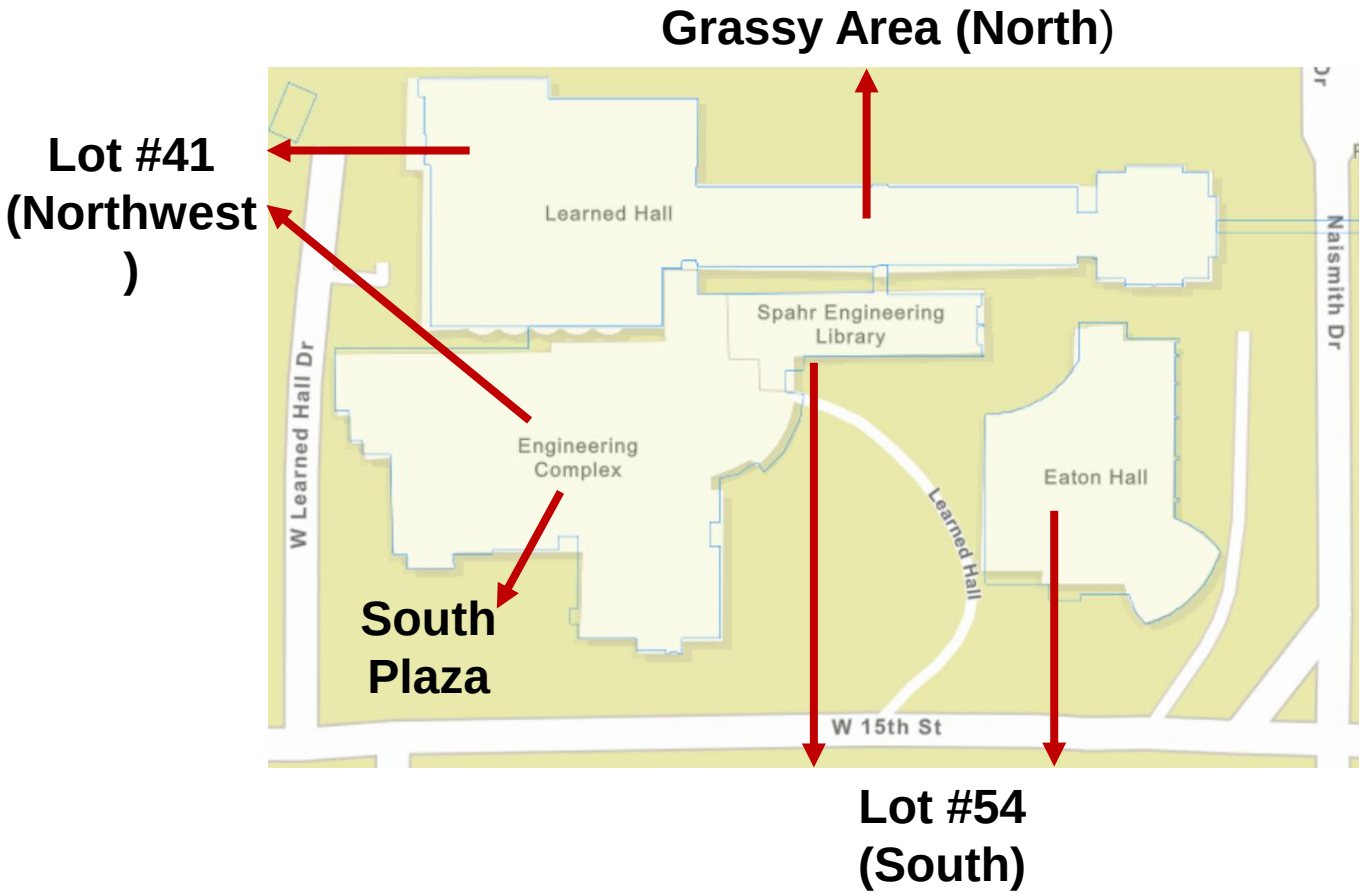


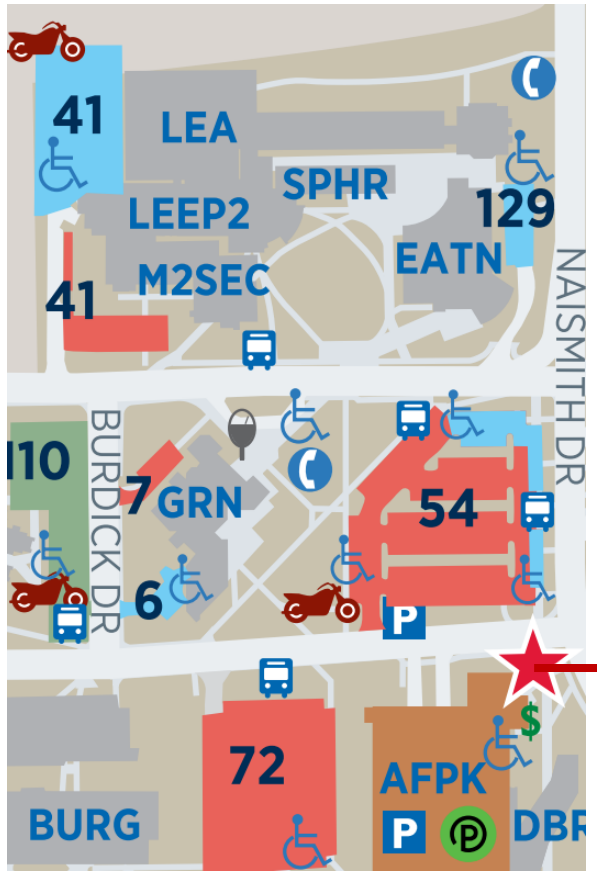
ASSEMBLY AREA:
South Plaza and Northwest Parking Lot

LEGEND

- EXTERIOR EXITS
- INTERIOR EXITS OR EXIT PATHS
- CORRIDORS
- PROTECTED EXIT STAIRS
- CORRIDOR FIRE EXTINGUISHERS
- ACCESSIBLE

Emergency Evacuation Plans





In inclement weather, report to the parking garage directly south of Lot #54

- For detailed information regarding emergency evacuation plans and maps please visit: https://engr.ku.edu/safety

Remember R.A.C.E

- **R**escue anyone in immediate danger or help them get to a safe area, if it can be accomplished without risk to yourself
- **A**lert others by activating any available alarm system
- **C**ontain the fire as much as possible by closing doors and windows behind you during evacuation
- **E**xtinguish/Evacuate: only attempt to put out the fire if it is safe to do so.

Helpful Links & Information

- For any event (active or potential) which is an immediate threat to health and safety: Dial 911
  - On campus, this will contact the KU Public Safety Emergency Communications Center. Appropriate emergency assistance will be immediately sent to the scene.
- For non-emergency safety concern reporting please contact KU-EHS via email (ehsdept@ku.edu) or telephone (785-864-4089)
- For routine assistance…
  - If you have any questions regarding your fire extinguishers, please contact KU-Facilities Services (785-864-4770)
  - Check with your building manager or contact KU-Fire Martial (785-864-3431) for more information about exits designated for emergency use and emergency evacuation plans

Helpful Links & Information

- School of Engineering Emergency Evacuation Plans and Maps
  - https://engr.ku.edu/safety
- Developing a Personal Action Plan
  - https://kupolice.ku.edu/accessibility-emergency
- Get Emergency Notifications
  - https://alerts.ku.edu/
- University Emergency Planning
  - emergencymgt@ku.edu
  - 785-864-5900