Preventing Laboratory Fires
Agenda

- Flash over Video
- Laboratory Fire Loss
- Lab Fire Regulations
- Fire Safety Equipment
- General Safety Guidelines
Tri-State Flash over Video
## Laboratory Fire Loss

### Structure Fires in Laboratories

### Annual Average

<table>
<thead>
<tr>
<th></th>
<th>Incidents</th>
<th>Fatalities</th>
<th>Injuries</th>
<th>Loss</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980-1994</td>
<td>532</td>
<td>1</td>
<td>24</td>
<td>$7.0M</td>
</tr>
<tr>
<td>1995-1999</td>
<td>279</td>
<td>0</td>
<td>17</td>
<td>$3.5M</td>
</tr>
</tbody>
</table>
## Extent of Flame Damage

- Confined to object of origin: 153 (55%)
- Confined to area of origin: 65 (23.3%)
- Confined to room of origin: 29 (10.2%)
- Confined to Fire-rated Compartment of origin: 4 (1.4%)
- Confined to floor of origin: 5 (2.0%)
- Confined to structure: 18 (6.5%)
- Extended beyond structure: 5 (1.6%)

Total: 279 (100%)
Laboratory Fire Loss

- **Sprinkler Performance**
  - Operated: 34 (12.3%)
  - Should have operated: 6 (2.1%)
  - Fire too small: 93 (33.4%)
  - None present: 142 (50.7%)
  - Other: 4 (1.6%)

Total: 279 (100%)
Laboratory Fire Loss

- **Sprinkler Performance**
  - Operated: 34, $0.46M, 9.5%
  - Should have operated: 6, $0.65M, 13.5%
  - Fire too small: 93, $0.45M, 9.4%
  - None present: 142, $3.2M, 65.7%
  - Other: 4, $0.96M, 2.0%

Total: 279, $4.82M, 100%
UNL Laboratory Fires

- Hamilton Hall
  September 1992

- Behlen Laboratory
  2002

- Manter Hall oven
  fire June 2006
Hamilton Hall

- September 1992
- Explosion Rm. 619
- 30 year old Graduate student
- Solvent Distillation
  - Tetrahydrofuran
  - Chloroform
  - Toluene
  - Acid
Behlen Explosion 2002

- Explosion in ventilation hood, no fire or damage to building
- Occurred about 5:30 p.m.
  - Nitric Acid
  - Sulfuric Acid
  - Acetone
Manter Hall

- Fire in baking oven
  5-30-06
- Fire limited to oven
- Cause:
  - Didn’t follow manufacture requirements.
  - Oven too hot for contents.
National Fire Protection Association (NFPA)

- NFPA 1 – General Protection against Fire
- NFPA 10 – Fire Extinguishers
- NFPA 30 – Flammable and Combustible Liquids
- NFPA 45 – Laboratories using Chemicals
- NFPA 70 – National Electrical Code
International Fire Code (IFC)

- International Fire Code is approximately the same as NFPA 1
Lab vs. Office
First Step

- Review of Current Chemicals.
- How much of these Chemicals do I have?
- What are the Hazards of these Chemicals?
Fire Safety Equipment

- Fire Sprinklers
- Fire Alarm Systems
- Fire Doors
- Fire Construction
- Emergency Lights
- Exit Paths
- Fire Extinguishers
Fire Sprinklers

- Serviced Annually.
- Storage 18 inches from ceiling.
- Non-Sprinklered buildings 24 inches from ceiling.
Fire Alarms

- Inspected each 6 months
- Keep unobstructed

Could Include:
- Manual Pull Stations
- Heat Detectors
- Smoke Detectors
Fire Doors: Close/Latch 703.2

- Fire doors and smoke barrier doors shall not be blocked or obstructed or otherwise made inoperable.

- Allowed to have a magnetic hold open device.
Fire Door Protection
Fire Doors at Work
Fire Construction

- Determined by the classification of the laboratory.
- Varies depending on Hazards.
- Penetrations must be repaired or replaced.
Emergency Lights

- Tested monthly.
- Illuminate path of egress.
- Report damaged equipment.
Exit Signs

- Operational and properly Illuminated
- Report damaged equipment
Exit Paths
Fire Protection
General Fire Safety

- Flammable Liquid Storage
- Compressed Gas Cylinders
- Heat Sources
- Electrical Safety
- Ventilation and Vent Hoods
- Combustible Storage
Flammable Liquid Storage

- Requirement is based on quantities and hazard ranking.
- Located away from use and Ignition sources.
- More is NOT better.
Compressed Gas Cylinder

Compatibility of Gases

Ignition Sources

Storage of Unused Cylinders
Heat Sources
Open Flames
Heat Sources
Vent Hoods

- General Ventilation
- Point Ventilation

VS.
Electrical Safety
Power Taps
Combustible Storage

Proper Storage

Ceiling Clearance

Electrical or Heat Sources
Additional Hazards
Fire Extinguisher
PASS Method
INSTRUCTIONS

1. HOLD UPRIGHT, PULL RING PIN

2. STAND BACK 10 FEET

3. AIM AT BASE OF FIRE
   SQUEEZ LEVER

4. SWEEP SIDE TO SIDE
Fire Extinguisher Service
Classes of Fire

- **Class A** – Fires are ordinary materials such as burning paper, lumber, cardboard, and plastics.

- **Class B** – Fires involve flammable or combustible liquids such as gasoline, kerosene, and common organic solvents used in the laboratory setting.
Classes of Fire

- **Class C** – Fires involve energized equipment such as appliances, switches, panel boxes, and power tools. Water can be a dangerous extinguishing medium for class c fires because of the risk of electrical shock.

- **Class D** – Fires involve combustible metals, such as magnesium or titanium.
Fight-or-Flight Checklist

- The building is being evacuated.
- The fire department is being called.
- The fire is small, contained and not spreading beyond its starting point.
- The exit is clear, and you can fight the fire with your back to the exit.
Fight-or-Flight Checklist

- You can stay low and avoid smoke.
- The proper extinguisher is immediately at hand.
- You have read the instructions and know how to use the extinguisher.
REVIEW

- Flash over Video
- Laboratory Fire Loss
- Lab Fire Regulations
- Fire Safety Equipment
- General Safety Guidelines
Additional Information

- Environmental Heath and Safety (EHS)  
  (402) 472-4925, ehs@unl.edu

- University of Nebraska Virtual Manual  
  http://ehs.unl.edu/vmanual/

- State Fire Marshal’s Office (402) 471-2027

- In Lincoln, Bureau of Fire Prevention  
  (402) 441-7791
Hazard of the Week
Questions