Rooftop Safety for the Space Research Building

UM Environment Health & Safety Dept
Climate and Space Sciences and Engineering Dept

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This Presentation

• Serves as basic safety training for anyone going onto the SRB roof
• Addresses Potential Hazards encountered on the roof
• Explains the responsibilities of roof users
• Tells how to get access to the roof (file a Research Plan and an SOP/training record for approval by the SRB Safety Committee)
The Roof Resource

• Roofs are generally off-limits
  – Domain of Plant Dept.
  – (like boiler rooms, steam tunnels, etc)

• With great effort, CLaSP convinced the U that our roof is also a laboratory
  – All labs are domain of Dept. of Environmental Health & Safety
  – EHS performs periodic inspections and monitoring.
  – Like any other lab, EHS has the power to shut down all operations if it finds unsafe conditions.

• The SRB roof situation is unique. As a roof user you can help maintain our continued access or you can screw everything up!
A Shared Laboratory

- Space Research Building rooftop is used by
  - Research groups
  - Classes

- For
  - In situ measurements (eg. weather station)
  - Remote measurements (eg. GPS signal delays)

- Coordination is essential to insure that these activities
  - do not pose a risk to others on the roof, or around the building.
  - do not interfere with the activities of another group.
  - are recorded so that First Responders know what to do in an emergency.
  - are conducted by properly trained personnel (the point of this presentation).
Hazards on the Roof

#1. **Inclement Weather** (wind, snow, ice, rain and lightning)

Never attempt to work on the roof during any conditions that might pose a risk to your traction and/or overall safety!
No guard rail on most of roof
Remain at least **15 feet** from the edge
Only 2 exceptions

Exception 1: to transit between a wing and the main building stay in the middle (impossible to be 15 feet away from the edges).
Hazards on the Roof

15 foot roof edge exception 2: Roof edges with railings

No climbing on, sitting on, or leaning over railings!
Hazards on the Roof

Footpath (small mats) on the roof

- Many years ago, mats were bonded to the roof to serve as walkways. Some mats were not placed at an adequate distance from the edge of the roof!

- This path along the courtyard edge is forbidden. “Do Not Use” and “X” markings have been painted on the lead-in mats.

- Paint may fade with weather.

DO NOT USE!
Hazards on the Roof

#3. Fume hood exhausts

Hazardous exhausts marked with **RED** tape

- Stay at least **20 feet** away from exhausts w/ solid red tape.

- If work must be performed within 20 feet of red taped exhaust, the fume hood must be shut down
  (See Bldg Mgr).
Hazards on the Roof
Other Exhaust Markings

All fume hood exhaust vents on the roof should be **marked with tape** signifying the nature of exhaust from that particular vent.

- **Green/White Stripes**: No hazardous constituents exhausted. **Safe to approach**, to work near, and work on system at any time.

- **Red/White Stripes**: Potentially hazardous exhaust, but system meets minimum safety and engineering requirements. These systems are **safe to approach** and work near.

- **Solid Red**: Hazardous exhaust. **Stay 20 feet away**.
Fumehood Exhaust Details

This info is posted on the door to the roof

Green and White Diagonal Stripes: Safe to approach and safe to work on system at any time. No hazardous constituents exhausted. An example would be general building exhaust.

Red and White Diagonal Stripes: Potentially hazardous exhaust system meeting minimum safety and engineering requirements. Exhaust systems meeting these requirements have sufficient exhaust stack height and velocity to eject potential hazards outside the building envelope. These systems are safe to approach and work around. Actual work on the system or over the exhaust stream will require a shutdown and compliance with this OSEH Guideline.

Typically, Strobic-type fan systems will be identified as Red and White Diagonal Stripes. These systems meet or exceed the minimum effluent flow standards established by UPE and OSEH. The minimum standard for any exhaust labeled Red/White stripes is that the physical stack height be no less than 10 feet high, the exit velocity from the stack is not less than 3000 fpm, and the system is equipped with a bleed-in damper to supply make-up air. The bleed-in damper will ensure a constant stack exit velocity regardless of hood sash heights, filter loading, or anything else that would normally reduce flow from a stack.

Solid Red: Potentially hazardous exhaust system that must be shutdown in order to approach within 20 feet of the exhaust stack. By default, all chemical fume hoods that are NOT part of a Strobic-type system will be designated as Solid Red regardless of what hazardous materials are in use.
Hazards on the Roof

#3. Radio Frequency Energy

- Lots of antennas on the roof
- Most receive, don’t transmit
- This one does transmit, sometimes
Antenna moves slowly to track a satellite. Duration: about 5 minutes
Transmit power high enough to warrant caution: long term exposure hazardous
If you see the antenna moving:
   stay on main roof; don’t climb stairs up to the mezzanine.
If already on the mezzanine:
   secure what you are working on, then
descend the stairs and wait for it to park. Don’t rush.
Antenna parked: Safe

Antenna horizontal and facing East-West: Transmitter is off.
Quick Quiz: Hazards on the Roof

How far should you be from the edge of the roof?
Hazards on the Roof

How far should you be from the edge of the roof?

FIFTEEN FEET! (4.6 m)
Hazards on the Roof
Is this experiment far enough away from the edge of the roof?
Hazards on the Roof

Is this the correct path to take?
Use of Ladders on the Roof

• Some activities may require the use of a ladder to install/maintain/remove equipment.

• **Faculty:** Please let SRB Safety Committee know about any ladder in your Roof Activity Plan.

• **Students:** Obtain ladders from your principal investigator who will be responsible for oversight of use.
Use of Ladders on the Roof

• All portable ladders shall be inspected before use.
  – Inspect rungs, side rails, locking devices, etc.

• Maintain a “three points of contact” when climbing or working unless fall protection system is in place.
  – This means that at least three points of your body - always two of these being your feet - are to be touching the ladder at all times - for safety purposes.

• Stepladders shall not be leaned against a wall and used as a straight ladder.

• Do not use the top two steps of a ladder; it may tip!

• Ladders may not be used near railings where a slip, tip or fall would be unprotected.
fixed stairs up to the mezzanine

Looking up – not so bad

looking down - very steep

Be careful if carrying anything. Stay off in icy conditions.
fixed stairs up to the mezzanine

Stairs are sheltered from prevailing wind

But not at the top

Be especially wary of strong gusts at the top of the stairs

Be careful if carrying anything. Stay off in icy conditions.
A group of students wanted to move a 160-pound six foot satellite dish from the top of the mezzanine to the main roof below. They did not attempt to belay the dish. Students had begun backing down the stairs under the dish when they were stopped by EHS.

An example of “What could have happened....”
An example of “What could have happened...”

Another investigator’s equipment could be damaged!

Inadequate clearance to carry the dish down the steps. Students could be injured.

Abandoned ladder could damage roof or other equipment in wind storm
The importance of filling out the Research Activity Form ...

• The students with the 160 pound satellite dish had filled out a Research Activity Form.

• Their Form stated that the satellite dish would have a circumference of 3 feet, but in reality it was much bigger.

• They did not amend the Form or notify the appropriate people of the changes so no one knew they would have the hazard of transporting a large dish on or off the mezzanine.

... AND revising it when research plans change
Responsibilities

The roof is covered by a rubber membrane which if punctured will allow water infiltration. Culprits are likely falling objects (heavy tools or equipment) or loose sharp objects (screws or tools) that are stepped on.
There are roof drains, but the roof is flat and uneven and water does pool in many spots after rains. A puncture in one of these areas could cause a lot of water damage, and moisture problems like mold, inside the building.
There is a large raised metal platform that should be used for roof activities unless the equipment or experiment requires otherwise.
• Likely roof travel paths have traction mats bonded in place that protect the membrane.

• Stay on these paths as much as possible unless a hazard exists.
• Repositionable mats are available from the Facilities Manager to protect the membrane around work areas
Domes, hatch covers, plywood sheets, etc. have blown off the roof in the past during strong winds. All items taken onto the roof that will be left unattended are to be secured with weights or tethers.
Roof Key

• The key is in a lock box next to the roof door. The lock box code is given to users who have completed training, documentation submittal, and have been approved by the SRB Safety Committee.

• Obviously, do not give out the code!

• Put the key back immediately and twirl the combination

• Do not block the door open as this may allow untrained persons onto the roof
STEPS TO TAKE BEFORE STARTING ANY ROOFTOP PROJECT OR ACTIVITY

1. Complete a Rooftop Research Activity Form found on CLaSP Internal web site

2. Submit this form to Safety Committee Chair John Eder (Rm 1113 SRB) for approval to proceed with project.

The committee meets once a month. Plan ahead!
3. All persons to go on the roof are to view this powerpoint training presentation!!

4. Download an SRB Rooftop Work Safety Procedures Form from the AOSS Internal web site. Customize it for your activity if other safety requirements apply.

   Read it! Sign it!
   The SRB Safety Committee must receive a copy (John Eder)

5. Place documentation that you have received this training in Section 8 of the Chemical Hygiene Plan Notebook.
Safe Project Designs

• Even if all of the above safety measures are followed, they will be inadequate if the instruments/experiments themselves are not designed safely.

• Insure that:
  – the experiment is adequately and safely anchored to the roof, so that it will not tip or become airborne in strong winds;
  – the experiment does not have exposed sharp edges that could damage roof in the event of a tip;
  – all electrical connections are weatherproofed; and
  – there are not any hanging wires or features that could become trip hazards.

• If the project must change, update and resubmit the Forms!
If you see a problem...

• If you see a problem, puncture the membrane, or find an unsafe facility condition on the roof, notify the Building Manager, Marti Moon
  – So we can get it fixed

• If you observe unsafe behavior, notify John Eder or a Safety Committee member
  – So we can make sure it doesn’t recur
SRB Safety Committee

• Will work with you to make your roof experience safe for everyone
  ➢ eg. obtaining safety equipment

• Will likely deny roof access for
  ➢ Observations of violations of
    • Training rules
    • Standard operating procedures
    • Approved safety plans
  ➢ Lack of cooperation with the Safety personnel
Questions?

• **Contact Names**

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