





Purpose of ESPL

- To enable engineering RSO teams to be competitive in *national* and/or *international* engineering *competitions*.
- To pioneer a *multi-disciplinary* learning environment that enhances understanding of engineering *theory with practice*.
- To provide training for students in basic shop *safety*, *machining welding*, and *team management* skills.





Eight main safety rules:

- 1. *Clean* work area and keep it that way.
- 2. Safety glasses to be worn in all work areas at all times.
- 3. *Hearing protection* used near loud equipment or activities.
- 4. *Respiratory* (inhalation) *protection* used for chemicals and fine debris.
- 5. *Appropriate dress* (closed toed shoes, no loose clothing, no jewelry, and no loose hair) in all work areas:
- 6. Use only *tools* and equipment you are *trained* on, in a safe manor.
- 7. Use the *buddy system* when using *power tools or chemicals*.
- 8. *Hazardous chemicals* should be used only in appropriate locations and only stored inside the yellow chemical storage lockers

Why being "Clean" is so important?

- The most common work injuries occur because of messy work areas.
- Teams must maintain a 32" wide aisle from the entrance to the back of every work room and in front of all fire-extinguishers and circuit boxes.
- No cardboard boxes on floors (put on shelves or under tables).
- Workbenches must have 1/3rd of the work surface clear.









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Sanding & cutting fiberglass and carbon fiber · Sanding can release fiber and resin particles that get in your eyes Normal adult mouth breather 1.2 m³/h or become lodged in your lungs or 0.8 skin pores and will not come out. 0.6 Health concerns: Deposition • Lung inflammation and difficulty 0.4breathing HIGH Bronc 0.2-• Rash and itchy or irritated skin Sever eye irritation and corneal abrasion when you rub your eyes 0.001 0.005 0.01 0.1 10 Diameter (um) Source: W.G. Kreyling, adapted from International Commission on Radiological Protection Bruce Flachsbart © 2019 University of Illinois at Urbana-Champaign, All Rights Reserved slide 12





Respirator usage & storage

- Respirators (w cartridges) and a sharpie pen are stored in zip-lock bags on the shelves above the drinking fountain.
- Each circle on a cartridges represent 1 hour of use
 - · Darken circles for time used when finished
 - Use 1/4 hour increments for filling in circles
- When done, wipe off the mask using an alcohol wipe and return the sealed zip-lock to the shelf.
- If all the circles are filled in, place the entire zip-lock bag in the "expired" container on the shelf.

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Respirator requirements to use It takes work to breathe through filters if you have any *physical impediment* (e.g. sickness or cough) you cannot use a respirator. You must be *clean shaven* to use a respirator (no *beard* or *mustache*) Know how to do a *negative pressure* -Norcat Education *fit-check"* as shown in the video (*v=nFTtfA730a4*) Only to be used for sanding *epoxy*, *paint*, or *bondo*. For other use with chemicals or if required by MSDS, see Director for certification & training.

Appropriate dress

- Closed toed shoes in work areas where you need safety glasses.
- No jewelry, loose clothing, or loose hair is permitted in work areas.
- If you are giving a tour, then jewelry and clothing restrictions can be waived, but no work should be done while tour is nearby.
- Long pants are recommended but not required.



Power tool safety

- 1. Dull power tools become very dangerous power tools
- 2. Use the *right tool* for the job "novel" uses for tools are often the causes of injuries.
- 3. Secure work-part major cause of injuries with power tools is something coming free.
- 4. Make sure you use the correct *PPE* (personal protection equipment)
 - safety-glasses, face-shield, ear-plugs, respirator, etc.
- 5. Keep others at a safe distance

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Power tool best practices:

- Always push power tools away from you don't pull it toward yourself
- Always keep a tool *safety guard* between you and the cutting edge
- *Never force* a tool turn it off if it becomes jammed.
- *Think* about possible Hazards when using the tool:
 - Eyes contaminated with debris, skin contact with a cutting surface, puncture wound potential, entanglement hazards, heavy object collision, etc.
- Secure work with vice or clamps freeing both hands for safer tool use.

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Buddy system

- You need to have another person with ESPL access working with you, not involved in another activity, when doing *any potential dangerous activity*, such as:
 - Any *power tool* electric or air-powered, in the machine shop or work rooms
 - Any *chemicals* epoxying, dispensing gasoline, spray painting, etc.
 - Use of a *respirator* sanding epoxy, paint, and/or bondo, or composite cutting
- In the event of an accident the other person needs to be able to:
 - Phone 911 for assistance
 - · Assist you to a safe area, the safety shower, and/or provide you with initial first aid
 - Be trained with the tool you are using to shut it down safely
- "Vicinity" defined as *hearing distance* and *in line of sight* of the person using the power tool, chemicals, or respirator. Assume within ~10 feet.

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Chemical spills & hazards

- In the event of a spill, notify nearby students, get the chemical spill kit (in hallway near bathrooms), and cover the spill with the absorbent material. When absorbed, sweep it up and dispose.
- If spill become life threatening (e.g. large, dangerous, etc.) then evacuate the building, call 911, and then call the ESPL Director.
- Paint ONLY inside paint booth in room 110 or outside.
- *Epoxy curing and mixing* is done only in well ventilated areas (i.e room 119 or 110). If the MSDS requires fumes to go outside, then cure either *inside the paint booth*, or if vacuum infusing, with the vacuum exhaust tube going outside under the garage door.
- No welding near a fuel source or trash can.

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Electrical hazards

- Never carry a tool by its cord cords can pull out of their connectors.
- Tools with exposed wires or frayed connections should never be used.
- Do not use electric tools in wet or damp environment, or near explosive chemicals or fire hazards.
- Never daisy-chain electrical cords







Engine testing

- 1. Running an IC engine means the *garage door* needs to be *open* and the engine located as close as possible to the open door (preferably right outside the garage door). Alternatively a sealed hose can be attached to the exhaust and extended outside.
- 2. Must have working *fire extinguisher present* (within 20 feet).
- 3. Must have at least 2 *people* present (do not start an engine by yourself).
- 4. Never leave a running engine *unattended*.

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Your responsibilities

The causes of most accidents:

- I didn't see Make sure the work environment is safe
- I didn't know Make sure you get the training you need
- I didn't think Don't rush things and get enough sleep



What to do if ...?

Spill:

- Water
 - Use mop to clean spill don't leave it to evaporate
- Oil / Petroleum Fluid / Fuel
 - Pour absorbent from chemical spill cart on it and let it absorb for a few minutes
 - Sweep and discard used powder in trash.
- Chemical from chemical cabinet
 - Use absorbent material to contain and follow MSDS instructions,
 - Contact lab Director and dispose of according to DRS procedures.

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What to do if ...?

Accident or Fire

- If someone is injured, get others to assist with medical help, calling 911, etc.
- Use fire extinguishers to contain small fires evacuate building if needed
- When you call 911 tell them briefly:
 - What happened: the nature and severity of the injury, fire, or chemical spill
 - *Your location*: 1203 West Western in Urbana or just south of the Advanced Computation Building at 1011 West Springfield in Urbana
- Any injury requiring more than a band aid MUST be reported to the ESPL Director (don't wait until the next day – call 217-778-7799)

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What to do if ... ?

Tool / Machine Breaks

- Email ESPL Director: <u>mems@Illinois.edu</u>. Describe what is wrong. If you believe you can fix it yourself, talk with the Director before attempting.
- Place a "Tool is Down" note on the tool, and your name and email, so someone can contact you if they have questions.
- Do not try to operate a machine if a "Tool is Down" note is attached.
- Your team could be charged to replace or fix a broken tool if negligence was determined to be the cause (but not for tool normal "wear and tear.")

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Handling of Infractions

- First Offense
 - Verbal warning and team Leaders will be notified
- Second Offense
 - Access to ESPL removed until an acceptable essay is written to the team leaders and ESPL Director explaining why the safety infraction happened, why the rule is important, and why it won't happen again.
- Third Offense
 - Access to ESPL will be removed until the Engineering Design Council can review each of the three safety infractions and talk with the student directly.

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Expectations of Students

Clean work area:

- Don't leave tools out or supplies on floor keep walkways clean & clear
- Keep clear a 32" aisle from workroom door to back of room at all times

Friendly and respectful attitude:

- Be considerate of others wanting to use machines
- Learn people's names from other groups be willing to help out.

Safety conscious: don't do anything FOOLISH

- If you see someone doing something they shouldn't TALK WITH THEM.
- Do not work when tired, take a break if you need it get enough sleep.

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Acknowledgement of training:

"I understand that the use of power tools, lathes, mills, bandsaws, welding equipment, grinders, and other shop tools are potentially hazardous activities, and I understand that by being at ESPL these activities may be going on around me. I understand that I should NOT use any shop tools unless I have been sufficiently trained and am medically able to safely handle and use such tools. I agree that I take responsibility to ensure that the training I have received has sufficiently prepared me with the knowledge to use the equipment appropriately, and if not, I will seek help and clarification before using such tools. I understand that serious injury and even loss of life can result when power tools are used improperly."

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Acknowledgement of safety responsibilities:

"I agree to wear all appropriate personal protective equipment and to follow all policies, procedures, and safety processes outlined in all of the ESPL shop training programs. I agree that my safety also depends upon me ensuring that others around me are following all policies and procedures. I agree to take responsibility for not only ensuring my own safe work environment but to help ensure the work environment around me is also safe."

Acknowledgement of inherent risks:

"I understand and acknowledge that my participation in activities at ESPL involves inherent risks such as, but are not limited to: risk of property damage, bodily injury, and possibly death. I understand and assume the risks that arise out of my use of the equipment or facilities at ESPL, the activities that occur in and around ESPL, the acts of others, or the unavailability of emergency care. I understand the risks I am voluntarily subjecting myself to."

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Acknowledgement of consent:

"I hereby consent to any publicity, including the use of my name and likeness, in connection with ESPL or participation in any activity that utilized or was aided by the ESPL facility. I consent to the collection by ESPL of personal information including: my name, phone number, major, year in college, and sex, and the publication of team demographics that may include team member's major, year in college, and sex."

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Final message:

ESPL is the place where engineering comes alive

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