Robotics Safety Guide

(Chemical Safety and specific tool safety is excluded from this guide. See the Robotics Safety Manual for more details on that information.)

Table of Contents

Personal Safety:

Guide for Safety Captain:

Safety Captain Responsibilities:
Competition Safety Checklist

Presentation's Commitment to Safety

At Presentation Robotics, safety is our number one concern for all team members, mentors, families and visitors. We take pride in our excellent safety record.

For us, safety education and monitoring is an ongoing process. We begin the season with a safety course given to all new and returning members of our crew. This includes a general overview of safety rules and procedures as well as training on each tool and machine in our shop.

Mentors and veteran members constantly monitor the activity in the shop and surrounding areas to ensure all safety procedures are being followed and to provide immediate, one-on-one training if needed.

To help us maintain our high standard of safety, we would value any suggestions you may have.

Personal Safety:

- Use common sense!
- Communicate. Teamwork IS key.
    - Communicate to your team members when the robot is enabled or disabled.
- Identify and report any unsafe or hazardous conditions to the student safety captain or mentor. This includes work practices that may cause an accident.
- In case of an accident, report all injuries to a mentor or the safety captain.

- No running and horseplay at any time; encourage a serious working environment.
- Do not engage in activity that may harm/damage anything or give the team a bad reputation.
- Wear goggles at all times. If a person has glasses, please use special goggles that go over the glasses.
- When a robot is being worked on, please make sure that it is disabled and will not harm anyone participating. Make sure everyone is clear before re-activating the robot.
- Use the buddy system when traveling, at the event, and when working.
- Do not throw anything under any circumstances.
- Cell phones must be switched off and put away during robotics hours. No cell phones are permitted in the workshop. Use cellphones only in emergencies.
- Always use the proper tool for the job.
- Do not use defective, dull, or broken tools.
- Cover the point or edges of sharp tools with shields when carrying.
- Do not overload electrical fixtures and/or receptacles.
- Obey the rules for maintaining an "exclusive zone" around the area.
- **All of the Safety rules must be followed whether you are in any area of the Jenvey House or at competition - You must always be prepared to work safely**

- **Working with machines:**
    - Notify a mentor or teacher advisor before working with a machine.
    - Never operate a machine unless all of the safety guards are in place.
    - Keep hands and foreign objects away from the moving parts of the machine when in use.
    - The machine must come to a full and complete stop before measuring, cleaning, or making adjustments. Unplug machine when not in use.
    - Never disturb a person who is actively working with an electrical tool or machine.
    - Keep loose objects away from machines to prevent the objects from getting snagged in the machine.
    - Make sure the material is safely fastened down in a vice or with clamps to a machine table.
    - Clean the area with a rag or a small brush after you are finished to remove all scraps.
- **Hand Protection**
    - Whenever you are in contact with heat, electrical, chemical, and mechanical hazards, please use proper gloves and mechanical tool guards.
    - Never wear gloves with cracks and holes and make sure that they have good flexibility and grip before you wear them.

- **Hearing Protection**
    - Whenever there is objectionable/questionable sound levels, hearing protection is available on the walls of our machine shop.
    - Blue and orange headphones and green ear plugs on the wall - if you cannot find them please ask the safety captain or any of the mentors.
- **Foot Protection**
    - You must wear shoes that completely cover the entire foot. Shoes must be sturdy and have closed-toes and heels to protect against foot injuries. No matter where you are working, whenever you come in for robotics wear proper shoes.
    - Flip-flops, sandals, mules, lightweight slippers, etc. are not acceptable when working on or near the robot.
    - Any spectators at competitions need to follow these rules as well whenever they are in the pit area.
- **Hair Protection**
    - Make sure that your hair is tied at all times - there are hair ties available in the office
    - If your hair is too long then you should not just tie up your hair in a ponytail, but you should make a bun or in any other style that keeps your hair out of the way!
        - We do not want your hair to get caught in any of the machinery

- **Clothing/Accessory Protection**
    - Please make sure that you or any other members or mentors are not wearing ties, loose clothing, jewelry, hanging key chains, etc. when near or working on moving or rotating machinery
    - No yoga pants or leggings

- **Hand Tools**
    - Hand tools are any hand-held tool or implement used to accomplish a task.
    - Before using any tool please check to see if it is in good condition.
        - Do not use defective, dull, or broken tools and if you see one please do not put them back on the shelf. Instead remove them from the shop and notify the Safety Captain and Mentor so the tool can be replaced or sent for repair.
        - When using any tool, place the work on a bench or hard surface rather than in the palm of your hand.
        - When using any tools that are sharp, direct your cutting strokes away from your hand and body and be aware of anyone next to you
    - Tool Storage

        - Keep sharp, dangerous tools properly covered and kept where it will not cause a safety hazard.
- **Stored Energy**
    - Electrical Energy: disconnect the power source and always de-energize the robot before working on it - unplug the battery and the main circuit breaker.
    - Pneumatic Energy: Release the compressed air and open the main vent valve and verify that all pressure gauges on the robot indicate zero pressure.
    - Miscellaneous Energy Sources: Lower all raised robot arms or devices that could drop down to a lower position on the robot.
- **Battery Safety**
    - BATTERIES HAVE ACID!!! - there is a corrosive, colorless liquid that will burn your eyes, skin, and clothing.
    - These rules are VERY important:
        - General Damaged Battery Information and Warnings
        - ANY battery that is visually damaged in ANY way is dangerous and unusable
            - Don't take a chance -- don't use it.
        - Why shouldn't you use it?
            - It contains stored electrical energy that could cause the battery to heat up really fast and could even explode! - this is because there is an electrical short circuit.
            - the batteries provided by FIRST contain sulfuric acid that WILL burn human tissue on contact.
        - Make sure you set aside the damaged battery and handle accordingly.
            - Immediately flush any contacted skin with a large quantity of water.
            - Seek medical treatment.
            - Periodically inspect your batteries for any signs of damage or leaking electrolyte. WHENEVER YOU DROP A BATTERY - there could be a crack that is not visible to the naked eye but it is there and it will leak electrolyte.
            - Again - DO NOT TAKE A CHANCE AND USE A DROPPED/DAMAGED BATTERY
        - Necessary Safety Materials
            - A box of sodium bicarbonate (baking soda) to neutralize any exposed acid.
            - A pair of acid resistant rubber or plastic leak-proof gloves to wear when handling a leaking battery.

            - A suitable non-metallic leak-proof container in which to place the defective battery.
    - Beware of battery acid. Report any possible colorless liquids that can burn eyes, skin, and clothing to a mentor or safety captain.
    - Immediately send a person in contact with acid to the First Aid Station/EMTs.
        - When an electrolyte leak occurs:
            - Neutralize it by pouring the sodium bicarbonate on all wetted surfaces - this will leave a safe residue that can be disposed of in a conventional manner (like rinsing with water).
            - Follow the instructions of the MSDS and notify a Mentor.
            - Put on gloves before handling the battery.
            - Place the battery in a leak-proof container for removal.
            - Make sure to neutralize any acid on the gloves before removing and storing them.
            - Seek medical attention if skin came in contact with any chemicals.
            - Dispose of the battery properly because it is hazardous material.
    - Charging and Handling
        - Keep the battery-charging area clean and orderly.
        - Place your battery charger in an area where cooling air can freely circulate since the chargers can fail without proper ventilation.
        - Do not short out the battery terminals. If any metals contact with the terminals simultaneously, it will create a direct short circuit. This will cause a high heat to develop in the battery could explode.
        - do not leave batteries plugged in longer than the manufacturer's maximum.
        - When a battery is neither connected to the robot nor the battery charger, use the battery protector safety plugs.
        - The robot must be switched off, and the battery must be disconnected before the robot is handled or loaded on/off the carrier.
    - Battery Inspection
        - Please keep inspect your battery for any evidence of damage - like any cracks or leaking electrolytes.
        - Bent terminals can also be a potential leak source.
        - Inspect the battery before and after each round of competition.
- **Chemical and Electrical Safety**
    - Keep chemical containers labelled legibly and in good condition.
    - If you are exposed to a chemical, notify your Safety Captain and Mentor immediately.
    - Do not use highly flammable materials, like cleaning solutions, at FIRST events.

    - Inspect equipment cords and extension cords routinely to make sure they are in good condition.
    - Please DO NOT overload electrical fixtures and receptacles and DO NOT plug a power strip into another power strip.
    - DO NOT
        - have an extension cord plugged into another extension cord.
        - have an extension cord plugged into a power strip.
        - have a multi-device receptacle plugged into a power strip or extension cord.

At Competition:

- Always have at least one person with you when traveling and while at the event.
- Travel safely and carefully between the pit and the playing field.
- You should follow all safety behaviors - even when things are heated in the middle of competition.
- Always use the planned, safe lifting procedure of the robot, including cart removal after the lift.
- Make sure that the robot is properly secured when you want to work underneath it.
- Never work on the robot on an unstable surface.
- **While lifting the robot:**
    - Wear gloves.
    - Have a minimum of three people to assist lifting a robot off a cart and make sure the robot is property secured when working underneath it.
    - Lift with your legs and keep your back straight so you do not lift with your back.
    - Do not twist your body; use your feet if you need to turn.
    - Keep the cart under control at all times, especially when removing or placing the robot.
- **Pit Station safety:**
    - Teams cannot build any structure to support people or items for storage above the work area in their team pit station.
    - No team station structures, signs, banners, or displays can be higher than 10 feet above the floor.
    - Cover all electronics before cutting or drilling to prevent electrical shorts.
    - Use a brush and a vacuum to remove any scraps or dirt. Never use unprotected hands to clean up. Clean oily surfaces with a cloth or rag.
    - Keep the work area neat and orderly.
    - Safety glasses/goggles must be worn at all times in the pit.
    - Righty Tighty, Lefty Loosy.

- **Pit Station Age Requirement**
    - Children twelve and under must have a person eighteen or older with them at all times. Make sure they are given the child safety glasses available. Child strollers and baby carriages are not allowed in the Pit Stations
- **Setting up the Team Pit Station:**
    - Bring and use work gloves for uncrating and re-crating.
    - Design and set up our Pit Station safely and properly use ladders – do not climb on items not meant for the task, such as tables and chairs.
    - Be mindful of the 10 foot height limit for all portions of the pit.
    - Banners must adhere to the 10 foot height limit.
- **Post Match:**
    - Release all stored energy and open the main circuit breaker on the robot.
    - Make sure the field is cleared of debris and help pick up foreign materials safely.
    - Use the gate opening to exit the playing field. Climbing over the railing is prohibited.

Guide for Safety Captain:

- Share important safety information with other peers.
- Always know where a mentor is located in case of emergencies or unknown circumstances.
- Use the safety checklists Appendix A to make sure safe practices are bused at the event and that each pit area remains safe.
- Be familiar with where things are located in the first aid kit and always keep a first aid kit nearby at all times in case of an emergency.
- Inspect the work areas, such as the robot construction area, on a routine basis.
- Use Personal Protective Equipment (PPE):
    - Make sure that all participants have goggles and eye protection at all times.
    - Check that all participants have long hair tied up and pulled back or covered to prevent possible jamming.
    - No ties, loose clothing, jewelry or hanging chains near or working on moving or rotating machinery.
    - Shoes must cover the entire foot, have closed toes, long pants, rolled up sleeves, and heels to protect against foot injuries regardless or work location.
    - Make sure that all electronics are unplugged or in safety mode when not in use. Do not use broken tools.

    - Use gloves when dealing with chemicals.
    - Use hearing protection devices where there are objectionable/questionable sound levels.
- Pit Station Safety:
    - Ensure that the space in and around the Pit Station is clean and safe of hazards.
    - Tools are properly stored along with tidy storage of personal belongings and other equipment and in a location where someone else might locate if needed.
    - Batteries and battery chargers are property taken care of.
- Stored Energy during repair activities:
    - Disconnect the electrical power source by unplugging the battery. Open the main circuit breaker ("reset" lever is released).
    - Always vent any compressed air into the atmosphere. Open the main vent valve and verify that all pressure gauges on the robot indicate zero pressure.
    - Lower all raised robot arms or devices that could drop down to a lower position on the robot.
- Periodically check that the battery is not damaged before and after each round, such as a cracked case or leaking electrolyte. Bent terminals can also be a potential leak source.
- Post match:
    - Make sure all stored energy is released safely.
    - While lifting the robot, make sure there are no dangling parts.
- Make sure the cart is stable and will not roll when not in motion.
- Ensure that all participants are encouraging a safe work environment.
- Look over an possible dangers while the robot is transitioning from the enabled to disabled or vice versa.
- Always know the escape plan in case of emergencies.
- Ensure that no one is using their cellphones while in the workshop or in the pit area.
- Be available if a person working with a machine needs a working partner.
- Warn people who use their cellphone when they are not supposed to.
- Make sure tools are being used safely and for the right reasons.
- Check that the robot is property protected from debris when cutting or drilling to prevent electrical shorts.
- Remind others to return tools where they belong and keep the pit area clean and tidy.
- Be prepared in case of a battery leak and make sure an unused battery is safely put away.
- Check that all tools are safe for use.
    - Never use hammers that are chipped, cracked, or damaged in any way.
- Know the location of all fire extinguishers and how to use them.

Safety Captain Responsibilities

1. Collect Materials Safety Data Sheet logs.
2. Encourage Team 2135 and other Robotics teams to follow FIRST safety procedures.
3. Give out warnings and consequences for safety violations.
4. Set up emergency meeting point in case of emergency at competitions.
5. Give out and keep copies of the Safety Manual.
6. Lead Tool Certification Seminars for Team 2135.
7. Collect list of names and cell phone numbers.
8. Bring all materials on the competition safety checklist.

Competition Safety Checklist

1. First aid kit
2. Copies of all permission slips
3. Emergency contact information
4. List of cell phones for contact purposes
5. Waterless hand sanitizer
6. Extra safety goggles
7. Safety manual
8. Hair ties box
9. Gloves
10. Small broom

Safety Captain Meeting

- Be Safe, Be Kind, Be Gracious. Instilling a culture of safety throughout the build season, at Regional and District events, and the FIRST Championship is a fundamental goal of FIRST. The UL Safety Advisors are here to help promote safety during these events and in the heat of competition. They are wearing green shirts. They want to get to know about your team.
- Report all injuries and illnesses to the EMT stationed near the Pit Administration Desk.
- Gracious Professionalism + Demonstrated Safety = Industrial Safety Award. One winner of the Industrial Safety Award will be selected by the Safety Advisors based on their safety observations throughout the contest.
- Pit Station = your individual pit and all adjacent aisles. The Pit area begins when you enter the designated area.
- Safety glasses are required at all times in the Pit Area and on the competition field. Please ask guests and visitors to wear safety glasses.

- Children 12 and under must have a person 18 or older with them at all times.
- Wear shoes that completely cover the entire foot. Shoes must be substantial and have closed-toed shoes and heels to protect against foot injuries - regardless of work location. Flip flops, Sandals, Mules, Crocs, lightweight slippers, etc. are not acceptable.
- No open flames in the venue except by authorized personnel and in approved locations (Machine Shop).
- 10- foot height limit for equipment and displays in the Pits.
- Highlighting Safety input cards are to be filled out by each team and turned in each day after practice day to Pit Administration.
- Safety Advisors will be reviewing the safe condition/design of pits after closing each night. A “#1 in Pit Safety” will be awarded to a team during the two primary competition days at each event. The Team Pit Station should demonstrate safety at all times.