FRC 2135 - Presentation Invasion

Team Safety Manual 2025-26

September 20, 2025

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1. Introduction

1.1. Team 2135 Safety Mission

The Team 2135 Safety Mission is to educate all team members and visitors on the correct safety procedures so we can operate in a safe, secure, and friendly environment to eliminate the risk of danger or injury. The mission is also to share our safety practices with others while learning from them to achieve "best practices."

1.2. Commitment to Safety

Safety is the number one concern for all team members, mentors, families and visitors. We take pride in maintaining an excellent safety record.

Our safety education and monitoring is an ongoing process. We begin the season with a safety course given to all new and returning members of the team. This includes a general overview of safety rules and procedures as well as safety training on each tool and machine in the 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 a high standard of safety, we would value any suggestions you may have.

2. Personal Safety

This section describes the preparedness and expectations to ensure personal safety during all activities including those: within the robotics lab, engineering space, practice field, and at competitions.

2.1. Arrive Prepared

Each team member must be personally ready for robotics, whether in the Robotics Center or at team events.

- Safe and protective clothing at all times/EVERYWHERE–prevents cuts by sharp objects
    - Wear long, durable pants that cover the whole leg–strongly recommend jeans
        - No yoga pants or leggings–these are too thin to protect skin
        - No holes, rips, tears or frayed edges in pants
        - Thicker sweatpants are ok if not too baggy
    - Shirts must not be sleeveless or leave the midriff uncovered
        - A short sleeve T-shirt is strongly recommended to cover exposed skin sufficiently
    - No loose items or clothing at any time
        - Wearing drawstring ties, loose clothing, jewelry, hanging key chains, etc. are a danger for entanglement and should be removed before all activities

- Maintain hair safety at all times/EVERYWHERE
    - Hair must be tied up such that it cannot obstruct your visibility
    - Hair must not be at risk of entanglement in any machinery or hand tools
        - Tie back all hair such that it is fully above the shoulders and away from the face–including when leaning forward
        - Ponytails that are not fully above the shoulders require a bun to keep it back

- Foot protection at all times/EVERYWHERE
    - Closed-toe and durable shoes are required
        - Shoes must completely cover the entire foot: closed-toes and heels
        - Flip-flops, sandals, mules, lightweight slippers, etc. are not acceptable

- Eye protection is required in shop areas and around ANY robot
    - Never touch eyes or face without washing hands first.
    - Eye protection is required at all times within the machine shop.
    - Eye protection is required around any robot even when disabled.
        - Wear only ANSI-approved safety glasses or goggles

    - Over-the-frame safety glasses are available for those who wear glasses
    - Goggles are available for those who wear larger eyeglass frames
    - Some work may require using a full face shield when chips are excessive or debris is thrown

- Hearing protection (when needed)
    - Wear hearing protection for extended exposure to noise at 85 decibels or above - most power tools are louder than that.
        - When working on the mill, router, miter saw and jigsaw
        - When working within 10 feet of these tools while they are in operation
    - Hearing protection is available
        - Blue over-the-ear headphone available on router enclosure frame–ensure that safety glasses do not break the seal
        - Pink/yellow/green in-ear plugs available in storage cabinet
        - Both types provide similar protection when properly worn
        - For additional hearing protection both can be used at the same time
    - Additional info on hearing protection
        - Each exposure to excessive noise does some damage
        - Damage is cumulative over an individual's lifetime
        - Even a one time encounter can result in some loss of hearing
        - Earmuffs and earplugs work when worn properly

- Hand Safety (when needed)
    - Gloves are required when in contact with heat, electrical, chemical or mechanical hazards
        - Always make sure that they have good fit, flexibility, and grip before using
        - Never wear gloves with cracks and holes
        - Handling sheet metal is a mechanical hazard and requires gloves
        - Machine tool work that has sharp edges or chips is a mechanical hazard
    - Always use proper tool guards and clamps when using machine tools
        - Never disable or remove any tool guards
    - Always wash hands after working in the shop
        - Metal shavings and machine oil contain bacteria that can be harmful
        - Remove chips or filings before they can be embedded in the skin
        - Never touch eyes or face without washing hands first
    - Never direct compressed air toward skin–this can cause painful skin damage

- Breathing safety (as needed)
    - Always wear a dust mask when the cutting produces visible dust or particles
        - Typical uses are around the router, table saw, jigsaw, dremel, etc.

- No cell phones during team activities (always EVERYWHERE)
    - Cell phones are forbidden during team activities and should remain in backpacks
        - If a call or text is required, always get your cell phone from your cubby, step outside of the Plummer House and away from any tools/team activities to handle it–this should be reserved exclusively for parent communications–do not disturb any teammates
        - There will be a few students authorized for cell phone use for very specific reasons related to taking photos/video of team activities, or when a photo/video of the work is used for documentation or analysis of a problem

- No personal headphones (always EVERYWHERE)
    - Personal headphones are forbidden during team activities
        - Robotics is a team activity that requires awareness of the work, interaction with teammates, and the environment that precludes wearing personal headphones of any kind.

- No medications (legal or otherwise)
    - No medications shall be taken/administered during team activities unless stated on a medical form with parent authorization and communicated to a mentor beforehand

2.2. Be Vigilant, Observant, and Aware

Each team member should be constantly aware and on task

- Look for broken tools
- Look for broken protective gear
- Watch for unsafe conditions
- Report unsafe conditions
- Maintain a safe workspace around robots/work areas
- Clean up and put away tools/parts
- NEVER touch eyes while working in shop
- No running or horseplay
- Do not throw anything under any circumstances

2.3. COVID-19 Safety

All team members and mentors are expected to follow the latest school requirements for COVID-19 safety and compliance to the county health guidelines at all times.

3. Robotics Center Safety

This section describes safety expectations in all spaces within the Robotics Center.

3.1. General Information

- Students:
  - Must only use the pedestrian gate from the parking lot to the Robotics Center.
    - On weekend days when the Pres parking lot is locked, then students can enter through the Plummer house driveway gate.
  - Are to be in the Robotics Center spaces if there is a mentor or adult present.
  - Must sign in/out at each Robotics meeting.
- Drop off/pick up
  - Drop off/pick up at the school is ONLY during scheduled meeting times.
  - Drop off/pickup should always be done in the Presentation parking lot.
  - Students must not arrive before the scheduled meeting starting time.
  - Students must always be picked up within 10 minutes of the scheduled meeting end time.
  - Students are not allowed to wait in front of the school after meetings beyond this 10 minute window unless the school is open.
- First Aid information/location
  - The First Aid Kit is located on top of the tall metal cabinet in the robotics lab.
  - The nearest Automated External Defibrillator (AED) is at the back of the Basile (Advancement) house at 2276 Plummer Ave.
- Fire extinguisher locations (5 total)
  - In the robotics lab: there are 3, mounted on the wall by each pedestrian doorway.
  - In the robotics field: there is 1 just inside the main double door.
  - In the Plummer kitchen: 1 mounted on the south wall near the backpack cubbies.
- The school safety procedures are in effect and to be followed at all times. This includes:
  - Evacuating as needed to the Athletic field with our sign-in/sign-out book.
  - Following the RUN, HIDE, DEFEND procedures with the clarifications below.

3.2. Run, Hide, Defend

- Given the openness and size of the Robotics Center, when there is any announcement or warning of a threat that does not require you to immediately RUN, but may require a Hide or Defend decision: QUICKLY close any doors, windows, blinds, that are open in your immediate room.
- IMMEDIATELY AND AT THE SAME TIME, send someone to the Lead Mentor/Coach to make them aware of the situation.
- The Lead Mentor/Coach will continue to secure the Robotics Center spaces while evaluating the situation along the following guidelines. Follow their instructions.

3.2.1. RUN

- If the intruder is far away, we will be following the run protocol as follows:
  - If possible, the PA Speaker will announce the intruder's location.
  - Listen for possible shots fired or other activity.
  - There are 4 potential exits to the property:
    - Pedestrian gate to parking lot (this is likely to be toward the threat!)
    - Driveway gate (if open)
    - Plummer house front door
    - Fence gate in front of house (best and farthest exit from school)
  - Follow the mentors' instructions on where to run. If a decision must be made immediately, run down Minardi to Cherry, or Plummer up to Curtner–DO NOT run down Plummer in front of campus if the threat is on campus.

3.2.2. HIDE

- If the intruder is on the front of the campus or in the neighborhood, lockdown the Robotics Center as quickly and quietly as possible:
  - Close and lock all doors and close any and all blinds, including the lab doors, practice field doors, design room doors, and house blinds–with priority on the garage doors that can take extra time to close.
  - Depending on where you are, barricade the doors and windows in your proximity using benches and tables.
  - Turn off all lights.
  - Stay quiet and calm, and remain in your hiding spot until the "all clear" signal is given.
  - Places to Hide:
    - Plummer house will be the best place to hide. The design room (with uncovered windows) should be avoided. Kitchen, front rooms, and offices all have closable blinds. The basement or interior hallway offers the best hiding locations.
    - Lab: Not a preferred hiding place–move to the Plummer house if

there is time. If not, stay near or behind machine tools near the wall where metal is stored. Avoid windows in front and facing the garden.

- Practice field: Not a preferred hiding place–move to the Plummer house if possible. If hiding here, stay low to avoid windows. Currently there are no blinds installed on any windows.

3.2.3. DEFEND

- Grab any objects that would deter the intruder:
  - Metal or wood pieces, robot parts, wheels, motors, etc.
  - Tools: Hammers, mallets, saws, drills, batteries, etc.
  - Parts: Organizer bins (bolts, nuts)
- Attack the intruder, be loud, and try to disorient them

4. Tool Safety

This section describes the general expectations for safely using hand and machine tools within the shop area at the Robotics Center, at demonstrations, and at competitions.

4.1. Hand Tools

- Always use the proper tool for the job–don't hammer on screwdrivers, etc.
- Check tool condition before use–electrical cords, blades, housings, no loose parts. Never use defective, dull or broken tools.
    - Any defective tool found should be removed from use and shown to a mentor for repair or replacement.
- Job procedure
    - Start with a clean workspace
    - Secure the work
    - Periodically clean away chips, saw dust or debris
    - Clean up at end of job
    - Put away tools and clamps
- Securing the work
    - Use a vise or clamps: C-clamps or compression clamps
    - Secure on a hard surface such as a bench–not in the palm of a hand.
    - Use scrap wood under the work when there is potential for cut-through
    - Once clamped, do a pull-test to check if secure
- When using cutting or shaping tools
    - Ensure blades or bits are sharp
    - Ensure that clamps/vise do not interfere with a cut
    - Sawing jobs should be secured such the blades is pointed down during the cut
    - Have a balanced standing position on both feet when drilling, sawing, etc.
    - Direct all cutting strokes away from hand and body parts
    - Filing/deburring jobs should be directed downward and preferably over a trash can
    - Be aware of anyone in the cutting path or moving through it
    - Monitor the blade during the cut in case the teeth fill with raw material
    - Always close/cover blades when not in use
    - Cover the tip or edges with shields when carrying
    - Keep saws and knives pointed down when not in use
- When using tools that are hot
    - Plugin/turn on only while the tool is actively in use
    - Ensure tools are unplugged immediately when not in use
    - Allow several minutes for cooling after use
    - Put away only after completely cooled

    - Note that fumes can be given off when heat is used–a small fan or face mask should be used to protect from breathing in fumes:
        - Bending polycarbonate or ABS
        - Joining poly cord belts
        - Soldering electrical connections
        - Welding metal

4.2. Machine Tools - CNC Mill, CNC Router, Miter and Table Saws, Drill Presses

- Notify a mentor before working with a machine tool
- Never operate a machine tool unless all the safety guards are in place
- Keep hands and foreign objects away from the moving parts of the machine when in use
- Keep loose objects away from machines to prevent them from getting entangled in the machine
- CNC Mill
    - Know and use the E-STOP button whenever unsure of safe operation
    - Always work with the doors closed
    - Always clamp/vise materials securely-have a mentor check tightness
    - Always tighten bits into collets securely-have a mentor check tightness
    - Keep hands and arms outside of the enclosure when running
    - Beware of aluminum flash during cutting which can be razor sharp
    - Use nitrile gloves to protect hands from shavings/coolant
    - Don’t touch cutting edges of end mills, drill bits, etc.
    - Never drop end mills, drill bits, etc.
    - Never use damaged tools
- CNC Router
    - Know and use the E-STOP button whenever unsure of safe operation
    - Always hold down materials flat and securely-have a mentor check tightness
    - Always tighten collets securely-have a mentor check tightness
    - Keep hands and arms away from the spindle when running
    - Beware of aluminum flash during cutting which can be razor sharp
    - Don’t touch cutting edges of end mills, drill bits, etc.
    - Never drop end mills, drill bits, etc.
    - Never use damaged tools
    - Some cuts may require using a wooden hold-down “finger” to prevent debris from jamming the bit–this should be done only when absolutely needed
- Table and Miter Saw
    - Ensure saw is on its stand on a level and stable surface
    - Check blade for missing or bent teeth
    - Check the blade guard for correct operation

    - Miter saw: Always clamp raw material prior to cutting
    - Set blade miter angles
    - Plug in right before cutting
    - Unplug immediately after cutting
- Drill press
    - Always clamp the workpiece securely to the table before cutting
    - Ensure the drill bit is tight in the collet
    - Set the table at the proper height
    - Check for drill bit cut-thru to make sure it does not hit the table or vise

4.3. Electrical Cord Safety

- Inspect equipment cords and extension cords routinely to make sure they are in good condition
    - The plug must be securely attached with no bare wires or loose contacts
    - There should be no kinks, bare wire, or knicks in the insulation
- DO NOT overload electrical fixtures and receptacles
- DO NOT plug a power strip into another power strip
- Extension cords
    - DO NOT have an extension cord plugged into another extension cord–get a longer cord
    - DO NOT have an extension cord plugged into a power strip–power strip should always be last
- Place cords flat and minimize any potential trip hazards

4.4. Tool Certification

Certification requirements and expectations for team members.

- Within the Shop
    - All sections of tool certifications must be completed to fully work in the shop.
    - Tool certification training must be done by an already qualified team member.
    - Machine tools require proper training from mentors or technical leads.
    - The Handbook Quiz, Tool Certification Quiz and the Safety Quiz must be completed to complete the entire tool certification process.
- During Competition
    - Anyone who has not completed tool certification may not be part of the pit crew

5. Robot Safety

This section describes the additional safety requirements when working around the robot in any location.

5.1. General

- Ensure the robot is disabled when it is being worked on.
- Make sure everyone is clear before enabling/reactivating the robot.
- Communicate to those nearby when the robot is being enabled or disabled.
    - Turned off–the robot may still have stored energy like springs or bungees
    - Disabled–the robot may have stored energy or could be enabled
    - Enabled–the robot can move at any time
    - When operating on blocks–ensure all wheels are clear of floor and blocks
    - When driving/operating–always ensure a minimum 10’ clear space around the robot.

5.2. Lifting/Moving the Robot

- Wearing gloves is recommended.
- Have a minimum of three people equally spaced around the robot to assist lifting.
- Have one person dedicated to managing the cart.
- Make sure the robot is properly secured when working underneath it.
- Space feet shoulder width apart and flat on floor when lifting.
- Lift by pushing 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.

5.3. Transporting the Robot

- **The rules about Robotics Center Safety also apply during robot transportation**
- When transporting the robot, have a minimum of 3 people, one to push the cart, one to guide from the front, and one to watch surroundings.
- Make sure that the robot is secure on the cart with one person placing a hand on the robot while transporting it on the cart.
- Make sure nothing is dangling off the cart or is loose and could fall off the cart.
- Create a clear walkway before moving the robot in that direction and let others know the robot will be moving

5.4. Stored Energy

- After matches, always release all stored energy and open the main circuit breaker on the robot.
    - Electrical energy: disconnect the power source and always de-energize the robot

before working on it–unplug the battery and turn off the main circuit breaker
    - Pneumatic Energy: release all compressed air and open the main vent valve and verify that all pressure gauges on the robot indicate zero pressure
    - Potential Energy Sources: lower all raised robot arms or devices that could drop down to a lower position on the robot
    - Move mechanisms to the position where any elastic devices such as springs or surgical tubing are under minimum tension

5.5. Battery Safety

- Inspect battery condition
    - Periodically inspect batteries for any signs of damage, cracks, leaking electrolytes, or bent terminals.
    - Beware of battery acid. Report any possible colorless liquids that can burn eyes, skin, and clothing to a mentor or safety captain.
    - ANY battery that is visually damaged in ANY way is dangerous and unusable. DO NOT TAKE A CHANCE BY USING A DROPPED/DAMAGED BATTERY.
- How to handle batteries
    - Always hold and carry a battery by its body–NEVER by the cables or connector
    - Always pull on the SB50 battery cable connectors to disconnect–NEVER by the cables
    - Any extra pulling or movement on the cables can loosen them or break their crimp connections which could cause a failure during a match
        - Moderately tug on the cables to verify that battery terminal connections do not slide/spin/ or move
        - Moderately tug on the connector/cable junction to ensure the connectors are secure and the crimps are still holding
    - Never drop a battery–dropped batteries are immediately unusable in competition!
        - Dropped batteries can develop cracks that are not visible but leak electrolytes.
        - Dropped batteries are likely to have internal damage to cells that prevents full charge/discharge and a loss of capacity.
        - Dropped batteries will be pulled from competition rotation and will no longer be useful to the team.
- How to charge batteries
    - Keep the battery-charging area clean and orderly.
    - Keep all batteries on the charger.
    - Use the Battery Beak to measure charge state and battery health
    - Battery chargers should be in a properly ventilated area to prevent overheating.
    - NEVER short out the battery terminals. Simultaneous contact of the positive and negative terminals will create a short circuit, a spark, and a high current situation.

This will cause high heat, arcing, and can damage the battery.

- Handling battery spills
    - BATTERIES CONTAIN ACID!!!–a corrosive, colorless liquid that can burn eyes, skin, and clothing.
    - Immediately flush any contacted skin with a large quantity of water.
    - Seek medical treatment.
    - Necessary battery safety materials
        - Box of sodium bicarbonate (baking soda) to neutralize any exposed acid.
        - Acid-resistant rubber or plastic leak-proof gloves for handling a leaking battery.
        - Non-metallic leak-proof container in which to place the leaking battery.

6. Pit Station Safety

This section describes the safety requirements when working in the team pit at competitions.

6.1. General

- Safety glasses/goggles must be worn at all times in the pit.
- Keep the work area neat and orderly.
- Never use unprotected hands to clean up.
    - Use a brush or a vacuum to remove any scraps or dirt.
    - Clean oily surfaces with a cloth or rag.
- Cover all electronics before cutting or drilling to prevent electrical shorts.

6.2. Setup and construction

- No team station structures, signs, banners, or displays can be higher than 10 feet above the floor.
- No team structures to support people or items for storage above the work area in the pit station.
- Design and set up the pit safely and properly use ladders – do not climb on items not meant for the task, such as tables and chairs.
- No daisy chaining in electrical cords i.e., connected multiple battery charging cords to one extension cord which is then connected to another extension cord

6.3. During Competition

- 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.
- Never work on the robot on an unstable surface.
- Make sure that the robot is properly secured before working underneath it.
- After each match, release all stored energy and open the main circuit breaker on the robot.
- After leaving the pit, ensure everything is safely tucked away and all the electrical cords (i.e. battery charger cords) are unplugged.

6.4. Pit Station Age Requirement

- Children twelve and under must have a person eighteen or older with them at all times.
- Make sure children are given the child safety glasses available.
- Child strollers and baby carriages are not allowed in the pit.

7. Travel Safety

This section describes the expectations for students attending an away event with the team.

- Permission slip is required
- Planned Absence Form is required
- Everyone on the trip is on the team Slack channel for the event WITH notifications ON
- Buddy system is in force at all times
    - Always have at least one person with you while at the venue or when outside of your room at the hotel
- Keep hotel room doors locked
- NEVER open hotel door for strangers
- NEVER leave your hotel room after bed check
- NEVER enter the hotel room of ANYONE that is not with our team
- NEVER leave the venue without a mentor or approval
- Leaving the event early is not allowed–even with parents

7.1. Event Venue Safety Procedures

When an emergency situation arises:

- Immediately take steps to follow site specific emergency procedures such as evacuation routes while ensuring your personal safety.
    - E.g. If a fire alarm goes off, exit the building using the site specific emergency pathways while following instructions from emergency personnel.
- Communicate with the rest of your team. Contact AND locate all of your hotel roommates to identify whether each of them is safe and secure. Gather with other team members/chaperones. If you don't have a phone, find someone that can make the call for you–call another team member or mentor.
    - Emergency procedures at a site may separate you physically from the rest of the team.
        - E.g. Fire routes may empty on opposite sides of a building.
    - If you feel that someone is still inside a dangerous situation, talk to the on site emergency personnel immediately–don't wait to contact our team representatives.
- Do not wait for a response from your hotel roommates, contact AND locate the team mentors, chaperones, and/or other team supervisors to give an accounting of:
    - Personal situations (include the names and status of all team members gathered with you).
    - A list of any non-responding team members.
- While obeying emergency personnel instructions, try to move to a location where the team mentors are located.
    - Some site evacuation procedures can split the team between two different locations.

The goal is to 1) safely exit any emergency or dangerous situation, 2) group together with other team members, and 3) identify any missing team members to the mentors and chaperones at the event.

8. Safety Captain Position

This position is assigned for competitions. Every team member should already be following the team's safety rules. The Safety Captain's role is to help ensure team and pit safety, and to communicate the team safety program to the judges and other teams.

8.1. Help Ensure Team Safety

- Make sure to pack the items listed in the Appendix A packing list for competitions.
- Be familiar with where things are located in the first aid kit
- Ensure the first aid kit is nearby in case of an emergency.
- Always know where a mentor is located in case of emergencies or unexpected circumstances.
- Always know the venue escape plan in case of emergencies, and communicate it to the team at the start of the event.
    - Set up an emergency meeting point in case of emergency at competitions.

8.2. Help Ensure Pit Safety

- Ensure that the space in and around the Pit Station is clean and safe from hazards.
- Make sure 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.
- Make sure that all electronics are unplugged or in safety mode when not in use.
- Make sure batteries and battery chargers are property taken care of.

8.3. Communicate Our Safety Program at Events

- Meet with other teams and collaborate on team safety procedures.
    - Pass out any safety-related handouts (if available).
    - Communicate the team safety processes.
    - Listen and learn about other team safety programs.
    - Identify and incorporate good practices into our team safety program.
- Attend and represent the team at event safety meetings.
    - Explain our team safety program to the judges during award reviews.
    - Explain our team safety program to UL Safety Advisors (wearing green shirts).

Appendix - Competition Safety Pack List

- First Aid kit (includes baking soda and burn gel)
- Tool certification documentation
- Materials Safety Data Sheets (if available)
- Team Safety Handbook (hardcopy)
- Extra safety glasses/goggles
- Extra hair ties
- Gloves