



# ***FIRST* Robotics Competition**

## **Team Safety Manual**

### **2008**

*In collaboration with the Bruce Power Company*



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# **SAFETY AND THE *FIRST* ROBOTICS COMPETITION (FRC)**

Instilling a culture of safety is a value that every facet of the *FIRST* community must embrace as it pursues its mission and vision. We encourage the whole *FIRST* Robotics Competition (FRC) to adopt safety as a core value and establish the right framework for safety leadership in all aspects of our endeavors.

*FIRST* believes that the teams that take the lead in developing safety programs and policies have a positive and lasting impact on each team member, mentor, their communities, and their present and future work places. *FIRST* recognizes the teams who “get it,” those who demonstrate safety throughout their program and are truly committed to developing and nurturing a safety culture.

## **PURPOSE**

This safety manual is an easy-to-use guide to important safety information and has been compiled to provide FRC participants with a basic set of requirements to maintain a safe environment at the home-based work environment and at competition events.

## **SCOPE**

This manual applies to anyone involved with the *FIRST* Robotics Competition including all student team members, mentors, and support personnel.

## **RESPONSIBILITIES**

Everyone is responsible for safety during team meetings and the design and build, travel, and event phases of the competition. Please read below for some specifics.

### **Participants**

As an FRC participant, you are expected to:

- Be familiar with this manual as well as the safety-related requirements applicable to your work area.
- Be familiar with any site restrictions listed in the “Site Info” listed on the web regarding your event(s).
- Work in a safe and responsible manner.
- Understand and follow established safety requirements.
- Use personal protective equipment (PPE), safe guards, and other safety equipment when needed or as required.
- Identify and report any unsafe or hazardous conditions to the student safety captain. This includes work practices that may cause an accident.

### **Student Safety Captain**

- Coordinate, deliver, and track training for the team.
- Provide support for any safety questions or concerns that may arise. Seek guidance, as appropriate, from your team mentors.

- Conduct safety inspections of the general work site, especially the robot construction area. This also applies to the Pit Station during competition events.
- Encourage your team to display positive safety behaviors at all times.
- Know where to find, and become familiar with the MSDS contents.

### **Mentor**

- Provide guidance on the safe working requirements associated with the various tasks and tools involved with constructing a robot.
- Offer safety design considerations to the team so the robot itself is designed to eliminate or minimize hazards to an acceptable level.
- Familiarize yourself with relevant event safety and restrictions by reading the web-posted “At the Events” section of the FRC Manual and “Site Info” for your event(s), go over it with the team, and work with the safety captain to monitor safety behaviors.
- Coach the student safety captain to ensure that he/she understands and adequately fulfills the position’s responsibilities.
- Collect MSD sheets for any chemicals the team uses. Inform the safety captain of their whereabouts.

## **INJURY REPORTING REQUIREMENT**

Regardless of severity, report all accidents, injuries, and near misses to your team’s mentor and your team’s safety captain. Even injuries that you determine as minor may become serious if proper medical attention is not rendered in a timely manner. Remember, each minor event is usually a precursor to a major event.

When at *FIRST* events, report any injuries to the Pit Administration supervisor. He or she will document the injury or illness on an Incident Report sheet.

## **SAFETY INSPECTIONS**

The safety captain should inspect the work areas on a routine basis. Determine and document the frequency of inspections by the potential risk in the work. Refer to Appendix A and B of this Manual for a sample checklist and corrective actions page. Where applicable, develop and close out corrective actions for identified deficiencies in a timely manner.

## **PERSONAL PROTECTIVE EQUIPMENT (PPE)**

The proper use of personal protective equipment (PPE) is an important element to help ensure FRC Participants are protected from hazards in the work area. The following describes the common PPE that you are required to wear as part of constructing a robot.

### **Eye and Face Protection**

Eye and face protection is required when there is a risk of exposure to the following:

- Flying particles
- Chemical exposure such as splashes, splatters, and sprays)

Wear ANSI-approved eye protection in the following areas:

- Your team’s “at home” work stations when doing any work on the robot, grinding, drilling, soldering, cutting, welding, etc.

- In the Pit and of course within the team pit stations
- Playing Field
- Any area posted with signs requiring the use of eye protection

There are several forms of eye/face protection available to provide protection from these hazards, including safety glasses with side shields, goggles, and face shields. Inspect equipment for damage each time it is worn. If you wear prescription glasses, and they are not approved safety glasses, you must wear approved safety goggles over them to achieve adequate protection.

### **Hand Protection**

Hand protection is designed to protect against heat, electrical, chemical, and mechanical hazards. Use proper gloves and mechanical tool guards.

#### **Gloves:**

- FRC participants should work with the team mentor to ensure the selected glove is the correct one to use for the project at hand. For example, chemical-resistant gloves afford some measure of chemical protection. Wear them when handling chemicals.
- Check your gloves for proper size, absence of cracks and holes, and good flexibility and grip before you wear them.

#### **Mechanical Guards:**

- Provide safety guards for power tools where required.
- Never use any equipment without safety guards in place.
- Notify your Safety captain and mentor of any broken or defective equipment and take it out of service until repairs are made.

### **Hearing Protection**

Make hearing protection devices available, such as earplugs and earmuffs, where there are objectionable/questionable sound levels. A team mentor can provide assistance in evaluating high-noise tasks and determining appropriate hearing protection devices.

### **Foot Protection**

When engaged in *FIRST* activities, all FRC participants must wear shoes that completely cover the entire foot. Shoes must have closed-toes and heels to protect against foot injuries, regardless of work location. Flip-Flops, Sandals, Mules, Crocs, etc. *are not acceptable* shoes when working on or near the robot or while attending *FIRST* competitions.

In some cases, safety shoes or toe guards are appropriate for areas where heavy objects can fall and strike your foot. Notify your team mentor if you encounter such situations and determine the safest way to perform the task.

### **Other Preventives**

Ensure that team members or mentors are not wearing ties, loose clothing, jewelry, or hanging key chains when near or working on moving or rotating machinery. Tie hair back or cover it.

# SAFETY REQUIREMENTS

The following are some areas, practices, and functions for which teams will be inspected/monitored for safety conformity and innovation. This list is not all-inclusive, and the Safety Advisors will constantly watch for any positive and negative safety practices or breaches. Horseplay is not permitted at any time.

## General Safety

- Follow safe work practices, safe use of all tools, and maintain a healthy attitude regarding safety.
- Always walk and work in a controlled and thoughtful manner.
- Take special care when working at higher-than-normal height.
- PPE use: Wear ANSI-approved non-shaded safety glasses, closed-toed shoes, gloves where needed, and use hearing protection if necessary.
- Keep full control of robot at all times with no one in the robot's path at anytime.
- Assist other teams with safety issues. Display Gracious Professionalism and care enough to act with good behavior at all times.
- Always fully open a ladder and never stand on the top step.

## Competition Safety

- Use the buddy system when traveling and while at the event.
- Travel safely and carefully between the Pit and the playing field.
- Demonstrate safe behaviors in the heat of competition.
- Exhibit a planned, safe lifting procedure of the robot, including cart removal after the lift.
- Make sure the robot is properly secured if you must work underneath it or if the robot is on an unstable surface.
- Assist other teams with safety issues.

## Pit Station Safety

- Control access to your Pit area; visitors are required to comply with PPE rules.
- Keep your aisle clear for pedestrians and robot transit.
- When transporting your robot, politely keep pedestrians alert to your movement.
- Adhere to the specifics in the FRC Manual, "At the Events" section
  - \* 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.
  - \* Securely mount team pit station signs, banners, and displays to the structure.
- Be aware of your neighbors. Alert them if there is a hazard in your station or near theirs.

- Maintain a clean, neat, and orderly Pit Station at all times. Remember, there are inspections after teams leave so be sure to include:
  - \* The floor in and around your Pit Station
  - \* Proper tool storage
  - \* Proper care of batteries and battery chargers
  - \* Tidy storage of personal belongings and equipment

## SOLDERING

Soldering can be dangerous because of the heat from the iron and the chemical fumes and vapors released from the solder and flux, respectively. When soldering, observe the following points:

- **NEW** - At *FIRST* events: Use lead-free solder only and solder with electrically heated soldering iron/gun only
- No torches or open flames of any kind are allowed in the buildings.
- Wear eye and face protection.
- Solder in well-ventilated areas.
- Never touch the iron/gun. It heats to extreme temperatures that will cause severe burns.
- Prevent burns: Wear cotton clothing that covers your arms and legs.
- Always wash your hands with soap and water after handling solder.
- Work on a fire resistant surface.
- Do not leave hot tools where someone can contact the hot element.

## HAND TOOLS

Constructing a robot will sometimes require the use of hand tools. Most people think of hand tools as wrenches, screwdrivers, chisels, and so forth, but the term also applies to any hand-held tool or implement used to accomplish a task. This includes all sorts of things used to grasp, lift, push, pull, carry, or clean. Always use the proper tool for the job.

Example: DO NOT use a wrench for a hammer or a screwdriver as a chisel.

### Tool Rules

- Before using any tool, check to see if it is in good condition. Don't use defective, dull, or broken tools. Don't put them back on the shelf; remove them from service and notify the Safety captain and mentor so they can be replaced or sent for repair.
- When using a screwdriver or other tools, place the work on the bench or hard surface rather than the palm of your hand.
- When using knives/blades, direct your cutting strokes away from your hand and body, and be aware of those around you.

### Tool Storage

- Store sharp-edged or pointed tools in a safe place. When carrying, cover the point or edges with shields. NEVER carry unshielded tools in your pocket.

- Don't leave tools on overhead work surfaces. They may fall and strike someone below.
- When not in use, store equipment in a location where it will not create a safety hazard or get damaged.

## STORED ENERGY

Plan out the required activities when servicing or making repairs to the robot. Make sure all of your teammates are aware that you are working on the robot. Address the following:

1. Ensure no one is working on the robot when it will be energized during repairs.
2. **Electrical Energy:** Disconnect the electric power source
  - \* Always de-energize the robot before working on it by unplugging the 12V and 7.2V batteries.
  - \* Also, open the main circuit breaker ("re-set" lever is released).
3. **Pneumatic Energy:** Always vent any compressed air to the atmosphere.
  - \* This applies to all parts of the pneumatic system.
  - \* Open the main vent valve and verify that all pressure gauges on the robot indicate zero pressure.
4. **Miscellaneous Energy Sources:**
  - \* Relieve any compressed or stretched springs.
  - \* Lower all raised robot arms or devices that could drop down to a lower position on the robot.

## BATTERY SAFETY

**CAUTION:** Batteries contain acid. This substance,  $H_2SO_4$ , is a corrosive, colorless liquid that will burn your eyes, skin, and clothing. The team mentor and safety captain should post the Material Safety Data Sheet (MSDS) and train all team members about battery safety. You can find Emergency handling and first aid on the MSDS, proper protection for handling cracked or damaged batteries, and disposal of same.

[http://www.mkbattery.com/images/MSDS\\_smallsealed\\_line.pdf](http://www.mkbattery.com/images/MSDS_smallsealed_line.pdf)

### General Damaged Battery Information/Warnings

Any battery that is visibly damaged in any way is dangerous and unusable, and should be set aside and handled accordingly because:

1. It contains stored electrical energy that could cause the battery to rapidly heat up due to an internal electrical short circuit, and possibly explode
2. The 12V batteries FIRST provided in your Kit contains sulfuric acid that will burn human tissue on contact.
  - 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. Remember that a dropped battery may be cracked, but the crack may not be visible and might eventually leak electrolyte.

- Don't take a chance and use it.
- Treat it as a hazardous material and process it in accordance with the battery's MSDS.

### **Necessary Safety Materials**

*FIRST* recommends that teams keep the following items readily available whenever working with batteries:

1. A box of bicarbonate of soda to neutralize any exposed acid electrolyte
2. A pair of acid-resistant rubber or plastic leak-proof gloves to wear when handling a leaking battery
3. A suitable non-metallic leak-proof container in which to place the defective battery

### **Procedure for Handling a Leaking Battery**

#### **When an electrolyte leak occurs:**

- Neutralize it by pouring the bicarbonate of soda on all wetted surfaces. The bicarbonate of soda itself is not dangerous, and will react with the acid in the electrolyte leaving a safe residue that can be disposed of in a conventional manner such as rinsing with water.
- Put on the gloves before handling the battery
- Place the battery in the leak-proof container for removal.
- Be sure to neutralize any acid on the gloves before removing and storing them.
- Follow emergency handling instructions of the MSDS, and notify mentor.
- Seek medical attention
- Properly dispose of the battery, which is now a hazardous material.

#### **At a *FIRST* event:**

- \* Immediately send the person in contact with acid to the First Aid Station/EMTs
- \* Report incident to the Pit Administration Supervisor so he/she can fill out an Incident Report. Provide team # and available information.
- \* Obtain sodium bicarbonate from the Pit Administration Supervisor and carefully sprinkle the sodium bicarbonate on the spill, then clean it and dispose of the now-neutralized cleanup materials in the trash.
- \* Dispose of the battery. Read below.

### **Battery Disposal**

The Interstate Batteries Company <http://www.interstatebatteries.com> has volunteered to accept and properly dispose of any *FIRST* team's batteries, and you can find a location near you from the above web site.

Most retailers of automotive batteries will also accept and properly dispose of them at no cost.

## Charging and Handling

- When a battery is neither connected to the robot nor the battery charger, use the battery protector safety plugs *FIRST* provides in the Kit of Parts.
- Keep the battery charging area clean and orderly.
- Place your battery charger in an area where cooling air can freely circulate around the charger. Battery chargers can fail without proper ventilation.
- Do not short out the battery terminals. If metal tools/parts contact the terminals simultaneously, it will create a direct short circuit, which will result high heat to develop in the battery terminal/part/tool area, and the battery could explode.
- If a quick disconnect is not available and you must use tools to disconnect the battery, make sure metal tools don't contact both terminals at the same time.

## Ongoing Battery Inspection

- Periodically inspect your battery for any evidence of damage, such as a cracked case or leaking electrolyte
- Bent terminals can also be a potential leak source
- After each competition round, inspect the battery
- Check your battery prior to competing in each round]

## CHEMICAL SAFETY

- Keep chemical containers in good condition.
- Make sure all chemical containers have labels placed by the manufacturer.
- Ensure all labels are legible.
- Become familiar with the chemicals you may use as part of the FRC. Read safety precautions and instructions for use located on the chemical's label.
- Store all chemicals in an orderly way. If possible, obtain Material Safety Data Sheets (MSDS) for the chemicals your team uses. These sheets provide information on the correct handling of a spill or injury.
- If you are exposed to a chemical, notify your safety captain and team mentor immediately and consult the MSDS if necessary.
- Do not use any highly flammable materials, such as cleaning solutions, etc., at *FIRST* events

## RESPECTING ELECTRICITY

Proper use and respect for electricity is paramount. The following are general guidelines for ensuring basic electrical safety requirements are met.

- Inspect your equipment cords and extension cords routinely to ensure they are in good condition.
- DO NOT overload electrical fixtures and/or receptacles.

- Avoid the following electrical / power supply setups to prevent overloading.
  1. Power strip plugged into another power strip
  2. Extension cord plugged into another extension cord.
  3. Extension cord plugged into a power strip.
  4. Multi-device receptacle plugged into a power strip or extension cord

## AT THE EVENTS:

### Registration

Follow the following safety considerations when constructing the Pit station at the FRC Event(s):

- **Registration:** An adult will register your team. He/she will be asked to verify and sign a statement that the team has enough safety glasses for all mentors, team members, and team guests who will be entering the Pit.
- **NEW: Safety glasses are required in the Pit.**
  1. To gain entrance to the Pit, every person will have to wear a pair of safety glasses. This is especially important for those uncrating the robot.
  2. Don't ship all glasses and goggles in the crate or you won't be able to enter the Pit.

### Setting up the Team Pit Station

- Bring and use work gloves for uncrating and re-crating.
- Design and set up your Pit Station safely - properly use a ladder - don't climb on tables.
- Observe the ten-foot height limit for any portion of your pit station.
- Use proper tools to safely hang banners. Banners must adhere to the ten-foot limit.

### Working in the Pit

- Properly use the power supplies; don't daisy chain, for example.
- Keep the work area neat and orderly.
- Participants should be wearing PPE in the Pit at all times, including:
  - \* ANSI-approved, non-shaded safety glasses with approved side shields
  - \* Safety goggles over prescription glasses
  - \* Appropriate footwear - no open-toed shoes or sandals

### Using the Practice Area/Field

If your event has a practice field/area, be sure to obey the rules for maintaining an "exclusion zone" around the area. This zone will help ensure that robots and moving parts will not exceed the practice area. It will help prevent accidents to those persons viewing the sessions or traveling nearby who may not be aware of the movement of the robots.

Of course, be sure to wear safety glasses and use safe lifting practices. Make sure the field is clear of debris, and be gracious by picking up any foreign materials. The designated volunteers are there to help maintain a safe area. Please cooperate with them.

## **Safe Robot Lifting, Handling, and Transporting Requirements**

Take a few moments to ensure your team knows how to lift your robot properly and safely. Practice the procedures prior to beginning the season so everyone has the same method and goals at the events.

### **Pre-Lift:**

- Ensure all transporters are wearing PPE.
- Make sure the robot is safe to move:
  - Are all parts of the robot secured?
  - Is the robot powered off?
  - Is anyone still working on the robot?
- Have a pre-lift briefing to determine direction and path.
- Ensure that the areas and paths are clear of debris and hazards.
- Are there enough people to perform the lift safely? Two to four people are preferred.

### **During the Lift:**

If using a lifting device to lift the robot, ensure participants know how to use it properly.

- Appoint a team member to control pedestrian traffic in the area.
- Appoint someone to coordinate the lift to make sure you are all ready to begin.
- Each lifter should place his/her feet close to the robot and adopt a balanced position.
- All persons should lift at the same time using proper body mechanics. These include:
  1. Lift with the legs, keeping your back straight
  2. Do not twist your body. Use your feet if you need to turn.
  3. Use proper hand holds to grasp the robot and make sure you have a safe, secure lift point before starting the lift.
- Bend your knees to a comfortable degree and get a good handhold. Maintain normal spinal curves.
- Tighten your stomach muscles and commence lifting the robot, using your leg muscles if you are lifting the robot up from the floor. Keep the robot close to your body, and coordinate lift speed with the others.
- Make sure the cart is stable and will not roll. Coordinate correct placement on the cart.

### **Post Match:**

- Relieve all stored energy and open the main circuit breaker on the robot.
- Ensure that the robot is made safe prior to lifting it off the playing field, no dangling parts, etc.
- Remove debris from the playing field.
- Use the above “Pre-lift” and “During the lift” procedures.
- Use the gate opening to exit the playing field. Don’t climb over the railing.

### **Transporting:**

- Make sure the robot is secured to the cart.
- Keep the cart under control at all times, especially when removing or placing the robot.

- Use Gracious Professionalism around others to prevent damage or injury. Do not include music on your robot transporter.
- Use patience and control when moving the robot, especially in crowded areas. Walk; don't run.
- Ensure that the cart will not roll away or pose a hazard, especially upon robot removal. Use a chock block if necessary.
- Use the gate opening when entering/exiting the playing field. Don't climb over the railing.

# **SAFETY AWARENESS AND RECOGNITION PROGRAM**

Bruce Power began working on this program in 2004 by developing key elements and a structure of safety within the *FIRST* environment. Underwriters Laboratories has agreed to sponsor the Safety Awareness and Recognition Program and provide professional Safety Advisors at the *FIRST* Robotics Competition Regionals and Championship events to continue developing greater safety awareness and consistency. *FIRST* thanks both organizations for their dedication to safety and safety education.

## **Key Objectives**

The key objectives of the Safety Awareness and Recognition Program are:

- a. Ensure participants, staff and the public have injury-free competitions
- b. Motivate participants to learn and follow safe individual and group practices as a life skill
- c. Select the winning team for the UL Industrial Safety Award

The Safety Advisors will rate safe performance in three key areas:

1. Safe Behaviors
2. Physical Conditions
3. PPE use (Personal Protective Equipment)

The Program uses coaching and positive reinforcement to meet its objectives. The Safety Advisors will have a structured assessment and scoring process as a guide to select the team that best meets the Program objectives. Please read below for a description of the expected “safe” activities that advisors will assess over the course of a typical regional competition or the Championship.

## **Safety Advisory Process**

The Safety Advisors will:

1. Provide positive verbal feedback for safe behaviors and conditions
2. Hand out safety “credits” – the 3 teams that earn the most safety tokens win an award. Teams earn safety tokens by other teams and Safety Advisors noticing safe practices and conditions and giving tokens as positive feedback. Teams collect the tokens, count them, and turn them in on the last day of the event.
3. Designate the “Star of the Day” person – can be mentor or student
4. Select the winner of the UL Industrial Safety Award

Prior to the competition, team mentors typically coach participants on working together. They also show the students how to use equipment and construct and operate the robot safely.

Throughout the competition, the easily recognizable, green-shirted Safety Advisors will continuously tour in pairs to observe activities in the Pit, practice field, queue line, and playing fields to critique the safety habits of the teams. This includes observing the uncrating of robots and transporting them between the Pit and playing fields. Safety Advisors will use plastic safety tokens, or credits, to recognize and encourage safe behaviors at the competition.

Do not hesitate to talk with the Safety Advisors and ask questions.

## **Safety Credits/Tokens**

The purpose of the safety tokens is to encourage teams to accumulate their safety credits through innovation and good safety performance. The tokens are a tangible count of their positive awareness.

### **Initial Tokens**

Each team will receive 10 safety credits/tokens in its registration packet. Each team should keep five of them and give the other five credits to other teams as “peer recognition” for good, safety performance. It is up to each team to decide whether to give one or two tokens to different teams, or all five to one team it determines to follow particularly safe practices. Refer below to “Top 3 Safe Teams.”

### **Earned Tokens**

Teams will earn additional credits whenever a Safety Advisor sees an individual or team demonstrating a safe behavior deserving recognition. Verbal feedback from the Safety Advisors will explain why credits were awarded and will strengthen the impact of using the credits/tokens by ensuring that participants understand how they are doing from a safety perspective and how this links to the number of credits they receive.

### **Token Storage**

We recommend that teams exhibit their support of safety by keeping a non-breakable container in their pit station to store the earned tokens and display them to the other FRC teams. Be creative!!

## **Safety Recognitions And Awards**

The Safety Awareness and Recognition program rewards teams and individuals for their exceptional dedication to safe working methods and considerations by providing the awards below.

### **Top 3 Safe Teams**

The 3 teams that collect the most safety credits will be recognized during the Awards Ceremony. They will also receive pins to acknowledge their accomplishment and should pick them up at the Pit Administration Station following the ceremony.

NOTE: The winner of the UL Industrial Safety Award is not eligible to receive these pins because that team will receive a separate pin during the awards ceremony.

### **Star of the Day Award**

The Safety Advisors select the “Star of the Day” on Thursday and Friday. On the following day(s), you will be able to see the winner’s name and team affiliation on a poster near the Pit Administration Station. This will be visible for the duration of that competition. This individual is presented with a small token of appreciation.

This award can go to any student or mentor, who in the opinion of the Safety Advisors has made a noteworthy contribution to promoting a culture of safety and is a person that the rest of the *FIRST* community should emulate.

## **UL Industrial Safety Award**

Excerpt from the *Awards* section of the Manual: “This award celebrates the team that progresses beyond safety fundamentals by using innovative ways to eliminate or protect against hazards. The winning team consistently demonstrates excellence in industrial safety performance that shines throughout the competition from uncrating to re-pack.”

Safety Advisors are volunteers who will observe all the teams and select the one that best meets the criteria for the UL Industrial Safety Award. As the Safety Advisors systematically tour through the Pit, practice and competition field areas, they record the performance of the teams and individual team members on the Safety Performance Score Sheet.

## **SAFETY AT YOUR HOME BASE**

We recommend that teams implement a safety program. You will find an inspection sheet in the Appendix, which will be a guideline at the events. Safety Advisors will be on site and will be monitoring safety and will be using a similar checklist for each team to help document strengths and weaknesses of event safety.

We recommend that teams implement a checklist of their own to monitor their unique work facility safety situations. The following are examples of things that may occur in a less than perfect area. Check for items such as:

- Are stacked items at least 18" below sprinkler heads?
- Are stacks stable and secure against sliding and collapse?
- Are heavy or bulky items stored below shoulder level?
- Are floors free of slipping and tripping hazards?
- Are all light fixtures functional? Bulbs good?
- Are illumination levels sufficient for the detail of work performed?
- 

Review your workspace and note and make any improvements to the safety of the environment and those working there. The safety captain should constantly monitor team safety and the conditions at the work facility so the area is secure from liability, injury, danger, or risk:

**Good Luck and Be Safe!!**



# APPENDIX A: SAFETY CHECKLIST



Date: \_\_\_\_\_ Location/Area: \_\_\_\_\_ Inspector(s): \_\_\_\_\_

Teams should review the condition of the inspected area per the criteria in the checklist below. Assess each item and answer the question by placing a “√” in the appropriate column. For any questions answered “no” below, complete a Corrective Action Plan (see next page).

Safety Advisors will use a similar checklist when they inspect the Pit and individual Pit Stations during competition events.

Key: Y = Yes N = No NA = Not applicable

NO.	ITEM	Y	N	NA	LOCATION/NOTES
<b>A</b>	<b><u>HAND &amp; PORTABLE TOOLS</u></b>				
1	Are powered tools in good condition with no evidence of damage?				
2	Are tools properly stored when not in use?				
3	Are guards and safety devices in place and operational?				
<b>B</b>	<b><u>CHEMICALS</u></b>				
1	Are chemical containers properly labeled and in good condition with no sign of damage?				
2	Are MSD Sheets posted/readily available and team members aware?				
<b>C</b>	<b><u>ELECTRICAL</u></b>				
1	Are cords and plugs free of broken insulation, exposed wiring, and provided with grounded connections where applicable?				
2	Are electrical outlets overloaded? (1 power strip used per outlet)				
3	Is the battery charger situated so there is air circulating around it?				
4	Do batteries not connected to the robot or charger have the battery protector safety plugs on the terminals?				
5	Are the batteries visibly ok?--Terminals not bent, no cracks in case?				
<b>D</b>	<b><u>THE TEAM PIT STATION</u></b>				
1	Is team equipment within the designated space? Aisle clear?				
2	Is the area free of slipping and tripping hazards?				
3	Is storage of materials orderly?				
4	Is floor clear and free of slipping/tripping hazards?				
5	Does the area conform to the 10' height restriction? This includes banners, signs, and all construction.				
6	Are the work surfaces neat?				
<b>E</b>	<b><u>PERSONAL PROTECTIVE EQUIPMENT (PPE)</u></b>				
1	Is PPE available for FRC Participants and their visitors?				
2	Is PPE worn by team members where required/posted?				
3	Is PPE properly maintained and stored?				
<b>F</b>	<b><u>RESPECT OF STORED ENERGY DANGERS</u></b>				
1.	After Competing: Does the team relieve electrical, pneumatic, and miscellaneous energy before moving the robot off the field?				
2	In the Pit: Does the team ensure no one is working on the robot when it will be energized during repairs?				

# APPENDIX B: CORRECTION ACTION PLAN

Use this Corrective Action Plan to monitor changes your mentor, safety captain, or the event Safety Advisor recommends.

ITEM NO.	DESCRIPTION AND CORRECTIVE ACTION	TARGET DATE	COMPLETION DATE	PERSON(S) RESPONSIBLE

**Positive Findings:**

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**Comments:**

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