



# 2017 Safety Manual

Jenks HS  
Jenks, Oklahoma

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# 1. PURPOSE

The purpose of the Safety Manual is to provide an easy, on-hand guide to educate the Prime Movers and their fellow competitors, parents, mentors and lab partners on the rules of safety, which are designed to keep them safe during their work time. With these guidelines in place, the Prime Movers will be able to have safe work environments that both enable and secure the successful completion of tasks.



## 2. RESPONSIBILITY

Safety is not left up to one person. While we do have a safety captain, it is the entire team's responsibility to know and understand all of the safety rules.

### **2.1 Mentors**

Mentor's responsibilities include, but are not limited to:

1. Practicing the same amount of safety that you would expect from the students
2. Leading by example
3. Helping educate and encourage a safe working environment
4. Staying up to date on relevant safety restrictions and make sure the students are also aware of the changes
5. Making sure robot designs are considered for safety

### **2.2 Safety Captain**

The Safety Captain's responsibilities include, but are not limited to:

1. Ensuring all students have undergone safety training and have passed their Safety Test
2. Keeping a training log and make comments about infractions and improvements
3. Conducting safety inspections of all work spaces being used
4. Encouraging the entire team to be safe at all times
5. Regularly inspecting the work space for any dangers or infractions and educate future Prime Movers on recognizing and handling potential problems

### **2.3 All Participants**

The participant's responsibilities include, but are not limited to:



1. Maintaining a safe work environment
2. Working safely and responsibly
3. Wearing the appropriate personal protective equipment (PPE) at all times
4. Knowing the different rules and regulations of any work space being used
5. Encouraging safe behavior for both our team and the teams around us
6. Undergoing and passing safety training
7. Providing feedback to the Safety Captain if an issue arises



# 3. GENERAL SAFETY RULES

## 3.1 Safety Procedures

Specific safety procedures that should be developed and implemented are:

1. General safety practices
2. Machine shop safety and hand tool safety
3. Proper use of electrical devices
4. Lifting or raising the robot
5. Safety practices with energy storing devices
6. Proper handling of batteries

## 3.2 Training

A student is prohibited from using items or participating in the above listed safety procedures until all proper training has been met. This applies to all students. Students undergo a safety class in the beginning of the school year and are required to pass a Safety Test.

## 3.3 General Rules

1. No horse play
2. Appropriate PPEs and attire should be worn at all times
3. Any infractions/incidents should be reported to a mentor and the safety captain
4. Make responsible judgement calls when working with any and all tools.
5. Use common sense at all times
6. Be careful around high speed components
7. Take care when working above normal height or ground
8. Never stand on unstable surfaces
9. When in doubt, ask a mentor



## 4. REPORTING

### **4.1 Incidents**

All incidents should be reported on an Incident Report Form (Appendix). Minor injuries may become more severe and should always be reported in a timely manner. Everyone should make sure a mentor, teacher, and Safety Captain know of the incident immediately and the appropriate measures are taken.

### **4.2 Infractions**

When a safety violation is noted, it should be reported and recorded on a Student Safety Form (Appendix). Each violation will be accompanied by the appropriate consequence given by a mentor, teacher, or Safety Captain.



# 5. PPE

PPE or personal protective equipment should be worn when necessary. While all work areas are kept safe, wearing PPEs is an important step to keeping every Prime Mover as safe as possible.

## 5.1 Safety Glasses

1. Non-tinted, ANSI approved Safety glasses should be worn at all times when at the pit, on the practice/playing field or when designated at competition
2. In the general workspace, safety glasses should be worn:
  - a. around the robot
  - b. whenever tools are being used
  - c. while sanding, soldering, sawing, drilling, grinding, cutting, or welding
  - d. if there is a risk of splashing, flying particles or chemical exposure

Note : If something does get in your eye, DO NOT RUB; go to the eye wash station located in the classroom and rinse it out.

## 5.2 Hand Protection

1. Gloves need to be worn when carrying/moving/handling the robot
2. Make sure to ask a mentor for specified gloves depending on the substance you are handling (heat, electrical, chemical or mechanical)
3. NEVER remove a safety or hand guard off of a power tool, and if the guard is missing DO NOT USE the tool
4. Note any broken tool and do not use until the necessary repairs are made
5. If latex gloves are used, make sure to check for allergies beforehand
6. All gloves should be checked for holes and cracks before use



### **5.3 Hearing Protection**

Earplugs should always be available, especially when noise levels get to a questionable/objectionable level (usually around 80 decibels, or the equivalent to a garbage disposal).

### **5.4 Clothes/Attire**

1. Long pants and closed-toed shoes must be worn in the workspace, around the robot, or wherever tools are being used
2. Long hair should be pulled back when working on/near the robot and/or power tools
3. Loose clothing, jewelry, neck ties or hanging objects should not be worn when working near moving machinery

## 6. SOLDERING

Soldering can be dangerous because of the heat from the iron and the chemical fumes that can be released when the solder is heated. When soldering, obey the following protocol:

1. Use lead-free solder and solder that works with electrically heated soldering iron/gun only
2. No open flames of any kind are allowed except by authorized personnel in specified areas (consult a mentor regarding more specific scenarios)
3. Wear face and eye protection
4. Solder in well-ventilated areas
5. Never touch the heated iron/gun
6. Prevent burns by wearing cotton clothing to protect your arms and legs
7. Always wash your hands with soap and water afterwards
8. Work on a fire-resistant surface
9. Keep your soldering iron in its protective holder when not actually being used
10. Do not leave any hot tools where someone can accidentally contact the hot element



# 7. HAND TOOLS

Constructing a robot usually requires the use of hand tools. Most hand tools include wrenches, screwdrivers, chisels, and so forth, but the term also applies to any hand-held tool or implement used to accomplish a task. Always use the right tool for the job.

## 7.1 Tool Rules

1. Check to see if it is in good condition
2. Do not use defective, dull, or broken tools
3. Do not return tools in poor condition
4. Report broken items to a safety captain or mentor
5. When using a tool, place the object on which you are working on a stable base rather than in the palm of your hand
6. When using knives/blades, cut **AWAY** from your body
7. Tools are **ONLY** allowed in build areas. All tools must be properly put away before leaving the build area

## 7.2 Tool Storage

1. Store sharp-edged or pointed tools in a secure and clearly labeled place
2. When carrying tools, cover the point or any sharp edges with shields
3. **NEVER** carry unshielded tools in your pocket
4. Do not leave tools on overhead work surfaces
5. Store equipment in a location where it will not create a safety hazard or be damaged



# 8. ENERGY

## 8.1 Electrical

1. Batteries and other power sources should be unplugged from the robot
2. It is best to power off the robot using the main breaker or to completely unplug the robot from its power source
3. Beware of any items that may fall or move when the robot is disabled

## 8.2 Pneumatics

1. Vent all compressed air inside tanks
2. Open the main vent valve and use gauges to check if the tanks are empty
3. All members not working directly on the pneumatic or robot should stand clear, as they are highly powerful

## 8.3 Misc.

1. Relieve all stressed springs and tubing
2. Lower all raised robot arms and devices that can be lowered before disabling the robot



## 9. BATTERIES

Caution should be used around batteries. Batteries contain  $H_2SO_4$  - a colorless liquid acid that will burn eyes, skin, and clothing. MSDS (Safety Data Sheets) for the batteries should be easily accessible to all team members. Emergency procedures and first aid information can be found inside, along with the proper handling procedures. Baking soda is also kept on hand to neutralize and properly clean up any spillage.

When working with batteries, it is recommended from the FIRST organization to keep these items close by:

1. Baking soda,  $NaHCO_3$ , to neutralize exposed acid electrolytes.
2. A pair of acid-resistant rubber or plastic leak-proof gloves for handling the battery.
3. A non-metallic, leak-proof container for placing a defective battery.

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

1. Use sodium bicarbonate (baking soda) to neutralize the acid. The sodium bicarbonate will turn the acid into a safe residue that can be cleaned using normal means such water
2. Follow handling instructions on the MSDS and notify a mentor
3. Use rubber gloves when handling a leaking battery
4. Place the battery in a leak-proof container
5. Neutralize any other acid that was exposed to gloves
6. Seek medical attention if your skin is exposed to the liquid
7. Properly dispose of the battery

### **9.2 At a FIRST event**

1. Immediately send someone who has been exposed to acid to the First Aid Station/EMTs

### **9.3 Charging and Handling**

1. Keep the battery-charging area clean and orderly
2. Place the battery charger in an area where cool air can freely circulate
3. Do not short out the battery terminals. If metal tools/parts contact the terminals at the same time it may result in high heat that can cause the battery to explode
4. Do not charge the battery at greater than the manufacturer's maximum recommended rate

### **9.4 Ongoing Battery Inspection**

1. Periodically inspect your battery for any damage such as a cracked case, leaking liquid or bent terminals
2. Inspect the battery before and after each round of competition



# 10. At Events

Make sure to know the different safety codes and laws that each event has and educate yourself and each other to the extra precautions you might have to take before you go.

## 10.1 At FRC Events

1. Wear necessary PPE
2. Use safe lifting technique
3. Be considerate of the well-being of your teammates and other teams

## 10.2 Pit Safety

People in the Pit, competition field, practice field, and other designated areas must follow all safety rules. Friendly reminders should be given to those who are not following safety guidelines. Any visitors, such as parents, must adhere to PPE requirements. Keep the aisle outside of your pit clear of people and objects so that traffic can get through. You should also clearly warn surrounding pedestrians when transporting your robot. Some other things you should keep note of are:

1. Teams are not allowed to build any structure to support people or objects for storage on top of the pit
2. Any team structures or objects such as signs, banners, or displays cannot be higher than 10 feet above the ground

Make sure all signs, banners, and displays are securely mounted. Be wary of pit teams near you, and alert them if there is a hazard nearby. Always keep a clean and orderly pit station at all times. Also remember that there are inspections for:

1. Clean floor in and around Pit
2. Proper storage of tools
3. Proper care of battery chargers and batteries
4. Organized storage of personal belongings and equipment



### **10.3 When in the Pit**

1. Properly use power strips
2. Keep the work area neat and clean
3. Participants should wear PPE in the Pit at all times
4. ANSI-approved, UL listed, or CSA rated, non-shaded safety glasses or safety rated prescription glasses with side shields

### **10.4 Using the Practice Field**

If an event has a practice field/arena, obey all rules for maintaining an “exclusive zone” around the area. This zone will ensure robots and moving parts do not exceed the practice area. It will also help prevent accidents to those persons viewing the sessions or travelling nearby who may not be aware of the movement of robots. Also wear appropriate PPE and use safe robot lifting techniques. Make sure the field is clear of debris and pick up any debris left-behind after it has been used. Volunteers are there to help maintain a safe area: cooperate with them.



# 11. OUR WORK SPACE

Make sure you take note of where the fire extinguisher, emergency exits and the first aid kit is. If you do not know, ask someone who does. Make sure all emergency items are easily accessible. This manual has many more rules that should be read. Mentors have the ability to make any/all judgement calls regarding safety and can add necessary rules as they see fit.

# 12. ROBOT TRANSPORTATION

To make sure all of our Prime Movers are safe when we move the robot, we need to make sure that all members wear gloves when moving it. The robot should always be transported on a cart and shouldn't be lifted by less than 2 people. The robot should never be on, and any or all moving parts should be secured before moving. Make sure correct lifting technique is used.

## 12.1 Lifting

1. Lift with legs, not your back
2. Do not twist your body; use your feet to turn your entire frame if you need to turn
3. Use proper hand holds to hold the robot. Do not hold the robot by a moving part or weak point
4. Bend your knees to a comfortable degree and have a good hold.
5. Do not bend your back too much
6. Tighten your stomach muscles and lift the robot. Use leg muscles when lifting the robot from the floor
7. Hold the robot close to your body
8. Make sure the cart is stable and won't roll
9. Use the gate opening to enter the playing field



## 13. FUTURE PLANS

In the future, we would like to allocate time, attention, and funding toward acquiring a better set of PPE. In anticipation of new members, we want to purchase a surplus of safety eye-shields (as a high percentage of our members wear glasses and wearing goggles over glasses can become uncomfortable and deter members from wearing PPE). We would also want to purchase individual ear plugs for each member and additional safety helmets for incoming members. Furthermore, we would like to provide a comprehensive set of classes and training for all members, including a talk from a safety or medical professional. We hope that our safety plan will not only improve the safety of our own team, but also inspire other teams to create, amend, and strengthen their own safety programs.



## **SAFETY CHECKLIST**

- Is there the appropriate emergency equipment? (First aid, fire extinguisher...etc)
- Is everyone wearing the appropriate amount of PPEs?
- Is there a supervising adult around?
- Is everyone practicing safety techniques when handling equipment?
- Are stacked items at least 18" below sprinkler heads?
- Are stacks stable and secure to prevent sliding and collapse?
- Is the floor free of slipping and tripping hazards?
- Are all light fixtures functional?
- Is the space well lit for the detail of work that is being done?



## Incident Report Form

Date:

Time:

Location:

Action Taken?

--

WITNESS

Name

What happened? (In witness's words)

--

INJURED

Name

What Happened? (In the injured words)

--

	Name	Initials
Injured		
Witness		
Reporter		



## Student Safety Reports

Name	
------	--

Infraction#


Infraction#


Infraction#


Infraction#
