Team Safety

CougarTech Team 2228's number one priority is safety and in order to make sure that everyone is helping to prevent accidents and practicing safe techniques, the Safety Team organizes certain programs:

1. Safety Training
2. Safety Checklists
3. Safety Star Awards
4. Incident Reporting

1. Safety Training

Because safety is CougarTech's number one priority, it is vital to ensure that everyone on our team is knowledgeable when it comes to being safe. In pursuit of this goal, Team 2228 has spent this year developing a new and improved training program. In past years, the team's training program has consisted of a digital presentation and a demonstration in the shop. While this did help to teach team members how to operate tools correctly, it lacked sufficient depth and required no certification of skill for individual students. In addition to this, people who were not in attendance during the presentation rarely received formal instruction on safe use of tools.

This year, 2228 has changed the format of safety training. Instead of being presented in a large, one-time presentation, safety topics have been split into small, informative modules. These modules cover the use of many tools, different subjects related to electrical safety and important general safety rules. Each lesson was created by the Safety Captain, reviewed by the technical mentors and edited accordingly. For each of these modules, students must:

1. Read one page of instructional text,
2. Watch a training video made by the team,
3. Answer 3 to 5 questions on the material presented to them and
4. Demonstrate their ability to act or use a tool safely in front of a mentor.

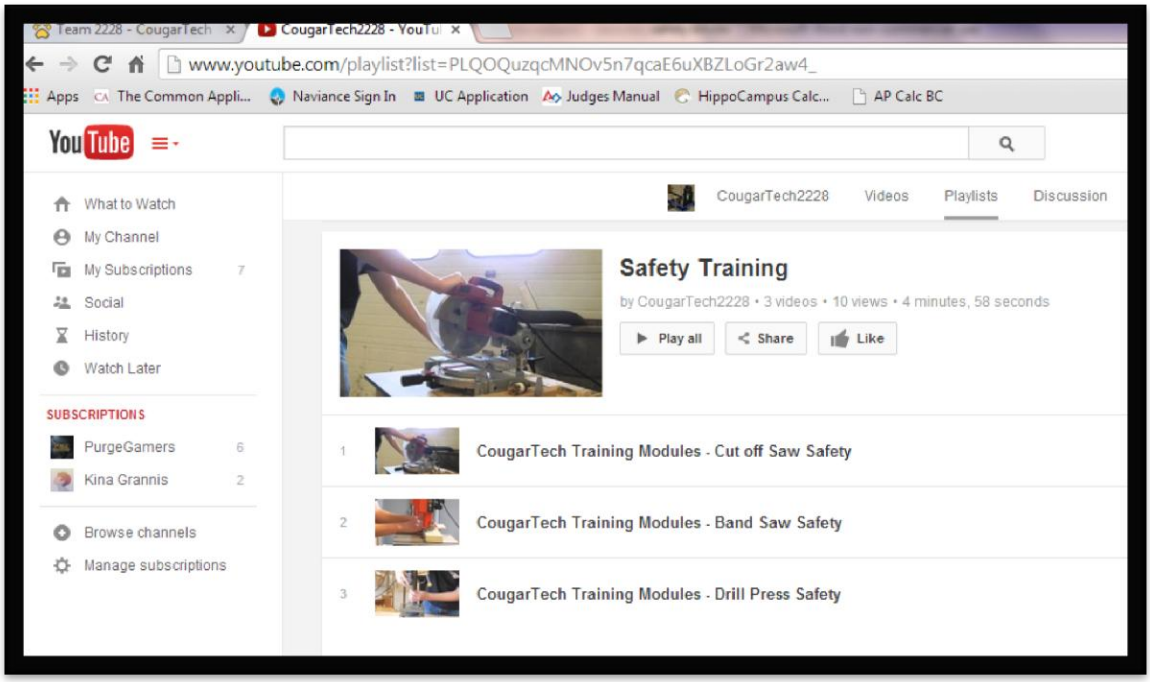
This not only offers a more in-depth exposure to the material, but also provides an assessment of knowledge and an opportunity for students to get helpful tips and feedback from mentors. The lessons that students can complete are:

- General Safety
- Mechanical Safety
    - Drill Press
    - Band Saw
    - Cut-off Saw
    - Hand Saw
    - Grinder
    - Hand Drill
- Electrical Safety
    - General Electrical Safety
    - Soldering

All students are required to complete the General Safety Module to participate in team events, and pit crew members must complete all modules in order to work on the robot during competitions. Sub team members must complete subject specific lessons as well. For those students not working on the pit crew, additional incentives (in the form of small prizes) are provided to complete the modules. Each student's progress through the training lessons is recorded.

The videos that are part of each lesson were created by the team and specifically designed for training purposes. However, they are also available to all FIRST teams on CougarTech's Youtube channel. In this way, both Team 2228 and the entire FIRST community can benefit from the instructional content.

Training Module	Document	Video
Band Saw Safety	PDF	YouTube
Cut-off Saw Safety	PDF	YouTube
Drill Press Safety	PDF	YouTube
Soldering Safety	PDF	
General Electrical Safety	PDF	



CougarTech Training Module

General Safety

Learning Material

Please read the following

Attire: In order to make any other safety precautions effective, people need to be dressed properly. This means that closed-toed shoes and fitted clothing need to be worn and long hair must be tied up. Closed-toed shoes do not include ballet flats or slippers, but does mean that sneakers and boots are acceptable. Skirts, dresses, extra-long sleeves and ties on sweatshirts are not permitted in the shop since they could get stuck in a machine and cause injuries.

Personal Protective Equipment: For each tool used in the shop, there are specific requirements for what equipment should be worn. Whenever you are in the shop, you must be wearing safety glasses. Regular eye glasses do not count as safety glasses, but there are safety glasses available that fit over eye glasses. At FIRST events only non-reflective lenses of amber, yellow, rose and blue tints are permitted. Other equipment sometimes needed while in the shop includes: work gloves, face shields, ear muffs and rubber gloves.

Appropriate Behavior: Along with attire, proper behavior must be observed in order to make any other safety precautions effective. Some important rules to remember include:

1. Walk when in the shop
2. Do not bring food or drink into the shop
3. Tomfoolery or shenanigans are not permitted
4. Do not touch tools you don't know how to use
5. If you are asked to do something but feel unsure or uncomfortable doing it, ask for help
6. Be aware of your surroundings.

In addition to this, it is important to turn off the robot when you are working on it and never get close to moving parts. Remember that in order to be qualified to use a tool, you must have completed the corresponding training module.

Lifting the Robot: Many injuries have occurred when people have incorrectly lifted the robot. The robot should be lifted by two or more people together who are all wearing gloves. Before lifting, the robot should be turned off and the path to the end location should be cleared. Someone should be in charge of telling the rest of the lifters when and where to lift and everyone should lift using their knees, not their back.

Material Quiz
Answer the following questions

1. What kinds of shoes are appropriate for the shop?

2. What tints are acceptable for lenses in safety glasses?

3. Are water bottles allowed in the shop?

4. What personal protective equipment is necessary to lift a robot?

Practice/Assessment
Find a qualified mentor or the Safety Captain and show them correct completion of the task.

Task: Come to a meeting properly dressed with your safety glasses.

Mentor name: _____

Signature: _____

Date: _____

CougarTech Training Module

Mechanical Safety – Drill Press

Learning Material

Please read and watch the following

Drill Press Procedure:

1. Put on safety glasses and make sure appropriate attire is being worn.
2. Select the correct drill bit, loosen the drill chuck, insert the bit completely and tighten the drill chuck until the bit is secure.
3. Place the piece to be drilled in a drill vice making sure that the area being drilled is over a hole in the vice. If the piece extends off the drill table, place it up against the column so the vice and the material will not spin away if the drill catches.
4. If the piece is too big to fit in the vice securely, clamp the piece to the table of the drill press.
5. Crank the drill bit down in order to line the material up correctly. Adjust the table height appropriately.
6. Be sure that the speed or rpm of the drill is appropriate for the task and adjust as necessary.
7. Turn the drill on and make sure the bit is in line and not wobbling.
8. Hold the vice or material securely in place and crank the drill down making sure to slow down when the bit comes in contact with the material. Be aware that the bit might grab and twist the material, especially if it is being drilled through too quickly.
9. After the drill penetrates the material, slowly raise it back up, still keeping a secure grip on the vice or material.
10. When the bit is all the way up, turn off the drill.
11. When removing the material from the vice or table, be aware that the friction caused by the drilling will cause the material to heat up.
12. Be sure to return the drill bit to the correct case.

The drill press can be used with wood, aluminum and nylon. If you would like to drill other materials, please ask a mentor about how to do so safely. If you experience any problems while using the drill press such as grabbing, be sure to turn off the drill and ask for help. After drilling metal pieces please use the deburring tool to make the edges of the holes smooth. When using a hole saw drill bit, be sure that material does not get stuck in the bit.

Watch the following instructional video:
http://www.youtube.com/watch?v=pNpekRqNoBw

Material Quiz
Answer the following questions

5. If you can't use a drill vice, how should use secure a piece to the drill table?

6. What materials can you drill with the drill press?

7. What is the first thing you should do if the drill bit grabs?

8. What personal protective equipment should you be wearing when using the drill press?

Practice/Assessment
Find a qualified mentor and follow the procedure under observation

Task: Safely demonstrate use of the drill press on a piece of wood.

Mentor name: _____

Signature: _____

Date: _____

CougarTech Training Module

Mechanical Safety – Band Saw

Learning Material

Please read and watch the following

Band saw procedure:

1. Put on safety glasses and make sure appropriate attire is being worn.
2. Before turning on the saw, adjust the blade guard to the height of the piece that is going to be cut.
3. Take the piece off the saw table and turn on the saw.
4. Put the piece on the saw table and slowly move it so that the line to be cut is in line with the blade.
5. Securely and slowly move the piece so that the blade is cutting through the material.
6. Make sure your hands always stay 6 inches away from the blade and use a pusher if necessary.
7. After cutting all the way through the piece, turn off the saw.
8. Before you leave the saw, make sure that the blade comes to a complete stop by using the break.
9. The piece that was cut may be hot, so be careful when picking it up.

Be sure to stand so that you are facing the sharp edge of the blade, not the flat side in case the band breaks. If it does break, it will snap perpendicular to the saw direction. Team 2228's band saw can cut aluminum and wood.

Watch the following instructional video:
http://www.youtube.com/watch?v=RcWk7_772_w

Material Quiz
Answer the following questions

1. If the piece your cutting requires your hand to be closer than 6 inches to the blade, how do you avoid this?

2. What materials can you cut with the band saw?

3. What should you do after you finish cutting your piece?

4. What personal protective equipment should you be wearing when using the band saw?

Practice/Assessment
Find a qualified mentor and follow the procedure under observation

Task: Safely demonstrate use of the band saw on a piece of wood.

Mentor name: _____

Signature: _____

Date: _____

CougarTech Training Module

Mechanical Safety – Cut-off Saw

Learning Material

Please read and watch the following

Cut-off Saw Procedure:

1. Put on safety glasses, a face shield, and ear muffs. Make sure appropriate attire is being worn.
2. Ensure that the space you will be working in is clear. This means that no one else is working on the same table and ideally, there is no one near you.
3. Place the piece to be cut, which should only be nonferrous material, securely against the back fence and hold it with your hand away from the blade.
4. Make sure the saw is up all the way so it does not kick. Push in the button with your thumb and pull the trigger in with your fingers to turn it on. Without pulling it down, line up the cut line with the laser.
5. Slowly pull the saw down until the blade is about to touch the material. Make sure that you are securely holding the piece to the back fence.
6. Proceed to move the saw slowly down, through the material as far as the saw will go.
7. Do not lift the saw up! Let go of the buttons and wait until the blade completely stops spinning, then lift the saw back up to the full up position.
8. Be careful when taking the cut material off the saw as it can be very hot.
9. Clean up any shavings afterwards.

Watch the following instructional video:
http://www.youtube.com/watch?v=vXxnju_rHLw

Material Quiz
Answer the following questions

5. In what position should the saw be when the blade starts spinning?

6. What materials can you cut with the cut-off saw?

7. In what position should the saw be when the blade comes to a complete stop?

8. What personal protective equipment should you wear when using the cut-off saw?

Practice/Assessment
Find a qualified mentor and follow the procedure under observation

Task: Safely demonstrate use of the cut-off saw on a piece of 80x20.

Mentor name: _____

Signature: _____

Date: _____

CougarTech Training Module

Electrical – General Safety

Learning Material

Please read the following

General Electrical Rules:

Always turn off the robot before working on it and never have your hands near moving parts. To check if the robot is on or off, look at the switch located on the electrical board. If you press the red button, it will release and turn off the robot. When connecting components, make sure that the ground (usually black) and hot (usually red) are connected properly. If they are not, this could cause the component to be damaged.

Battery Safety: In order to power our robots, we use high-current, 12V batteries. These contain sulfuric acid, which can burn through your skin and clothing. Therefore, it is very important to handle the batteries with care. Batteries are stored and charged on the battery cart. You should never connect the terminals or leads of a battery directly together or plug batteries into each other as this could cause them to explode.

Carrying: When carrying a battery, two hands should be used at all times and should not be held by the attached wires or plug. If the battery is dropped, it should be immediately reported to a mentor or the Safety Captain and taken out of service. Even if the battery that has been dropped does not have a visible crack and is not leaking, it could be damaged internally and should not be used.

Leaking battery: If the battery is leaking, baking soda ($NaHCO_3$), located in the battery cart, should be sprinkled over the spill to neutralize the acid. The neutralized spill can then be cleaned up with paper towels and water. The battery should be handled with thick rubber gloves and placed in a leak proof container. The MSDS (Material Safety Data Sheet) on the 12V batteries is available for reference in the shop and pit. The battery can be disposed of at FIRST events or at the Interstate Batteries Company. If skin comes in contact with the leaking acid, flush the area with a lot of water, more than you think is necessary and then seek medical attention.

Using a voltmeter: Before a robot is taken to the competition field, a new battery, measured with more than 12V, should be placed on it. In order to measure the voltage of a battery, a voltmeter is used. Take the voltmeter and turn the knob clockwise to the 20V scale, connect red to red and black to black and read the voltage displayed. The red wire should be in the volt plug and the black wire in the COM plug. Always be sure the battery is secure on the robot.

Material Quiz
Answer the following questions

1. Where should your hands be on the battery when carrying it?

2. What chemical do you pour on a battery spill?

3. Is it ok to directly connect the terminals of a battery together?

4. What voltage level is acceptable for a battery to be used in a match?

5. How can you turn off the robot?

Practice/Assessment
Find a qualified mentor and follow the procedure under observation.

Task: Show a mentor that you can use a voltmeter correctly to measure the voltage on a 12V battery.

Mentor name: _____

Signature: _____

Date: _____

CougarTech Training Module

Electrical Safety – Soldering

Note: This module provides a basic walkthrough, which does not instruct on soldering technique. Instead, please find a complimentary tutorial or work with a mentor to develop soldering skills.

Learning Material

Please read and watch the following

Soldering Procedure:

1. Put on safety glasses and make sure appropriate attire is being worn. In this case, all dangling sleeves and accessories should be avoided, while long hair should be put up.
2. Ensure the soldering iron and stand are in a safe location
    1. Must not be in contact with flammable materials
    2. Must not be likely to be bumped into or knocked over
    3. Must be in a well-ventilated area to disperse toxic fumes
3. Acquire and dampen a soldering sponge, used to clean the tip of the iron.
4. Turn on the soldering iron and allow several minutes for it to heat up. Solder will not melt effectively until an appropriate temperature is reached.
5. When connecting wires, it is likely that the finished connection will need to be covered with heatshrink. If so, slide heatshrink over one of the unconnected wires before connecting them.
6. If possible, clamp the wires being soldered in a pair of helping hands (pictured at right). This prevents the wires from moving during the soldering (resulting in a better connection) and allows focus to remain on using the iron safely.
7. After connecting the wires, use a heat gun to tighten the heatshrink over the exposed connection.
8. Use the soldering sponge to prevent excess solder from building up on the tip of the iron.
9. Most importantly, **always turn off the soldering iron** when finished and when leaving it unattended for more than a few minutes. Regardless of onboard switches, **unplug the soldering iron** when finished.

As an important and oft-used electrical tool, soldering irons must be well understood and used safely. Although not immediately alarming, the fumes released during soldering are toxic and should not be inhaled. For this reason, working in an open air space or alongside a ventilation fan is important. Many types of solder contain lead, a substance known to be highly toxic if inhaled or ingested (usually from its presence on skin). Regard the hand-washing step seriously. While cooling, solder has a tendency to "spit," resulting in the need for safety glasses.

Disposal of soldering waste requires some care and extra effort. Bits and pieces of solder should be collected in a container for recycling, while used solder sponges should be properly disposed of as hazardous waste.

If burned seriously by a soldering iron, run the burn under cold water for 15 minutes before applying a bandage.

Watch the following instructional video:
<link forthcoming>

Material Quiz
Answer the following questions

9. What accessory tools should be used to make the soldering process safer?

10. List the important location factors which should be considered when soldering.

11. What state must a soldering iron be when stored or left unattended?

12. What should be done with waste solder?

Practice/Assessment
Find a qualified mentor and follow the procedure under observation

Task: Work with someone who has experience in soldering to safely and securely connect two pieces of electrical wire.

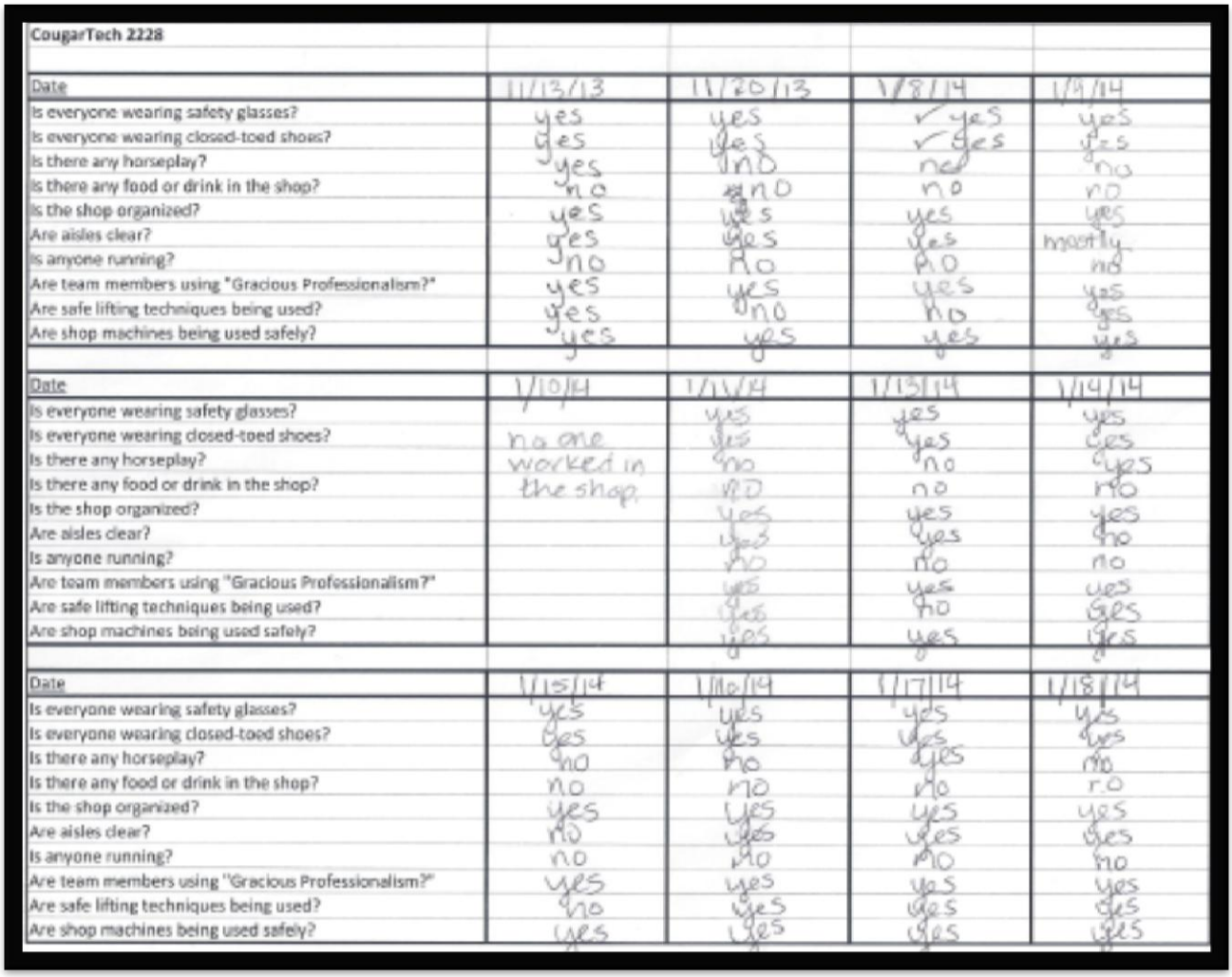
Mentor name: _____

Signature: _____

Date: _____

2. Safety Checklist

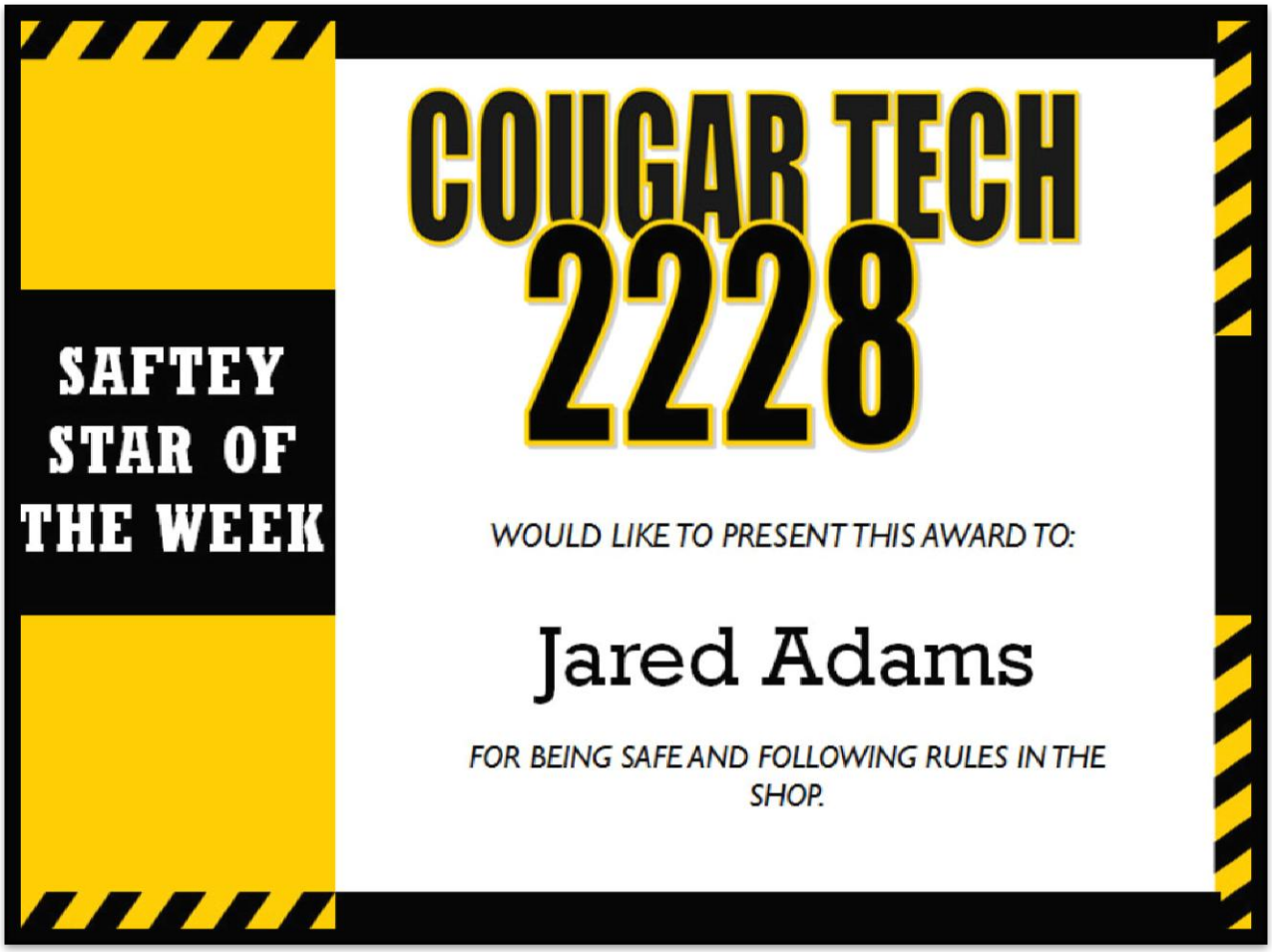
At the majority of meetings, the Safety Captain walks around the shop and records which safety policies are properly followed and which are not. This not only ensures that the Safety Captain is watching for many things that may be going wrong, but also provides insight into which policies need to be enforced more rigorously.



CougarTech 2228				
Date	11/13/13	11/20/13	1/8/14	1/9/14
Is everyone wearing safety glasses?	yes	yes	yes	yes
Is everyone wearing closed-toed shoes?	yes	yes	yes	yes
Is there any horseplay?	yes	no	no	no
Is there any food or drink in the shop?	no	no	no	no
Is the shop organized?	yes	yes	yes	yes
Are aisles clear?	yes	yes	yes	mostly
Is anyone running?	no	no	no	no
Are team members using "Gracious Professionalism?"	yes	yes	yes	yes
Are safe lifting techniques being used?	yes	no	no	yes
Are shop machines being used safely?	yes	yes	yes	yes
Date	1/10/14	1/11/14	1/13/14	1/14/14
Is everyone wearing safety glasses?		yes	yes	yes
Is everyone wearing closed-toed shoes?	no one worked in the shop	yes	yes	yes
Is there any horseplay?		no	no	yes
Is there any food or drink in the shop?		no	no	no
Is the shop organized?		yes	yes	yes
Are aisles clear?		yes	yes	no
Is anyone running?		no	no	no
Are team members using "Gracious Professionalism?"		yes	yes	yes
Are safe lifting techniques being used?		yes	no	yes
Are shop machines being used safely?		yes	yes	yes
Date	1/15/14	1/16/14	1/17/14	1/18/14
Is everyone wearing safety glasses?	yes	yes	yes	yes
Is everyone wearing closed-toed shoes?	yes	yes	yes	yes
Is there any horseplay?	no	no	yes	no
Is there any food or drink in the shop?	no	no	no	no
Is the shop organized?	yes	yes	yes	yes
Are aisles clear?	no	yes	yes	yes
Is anyone running?	no	no	no	no
Are team members using "Gracious Professionalism?"	yes	yes	yes	yes
Are safe lifting techniques being used?	no	yes	yes	yes
Are shop machines being used safely?	yes	yes	yes	yes

3. Team Safety Award

During every week of build season, CougarTech gives out a Safety Star Award to someone, a student or a mentor, who has demonstrated especially safe practices in the shop. This award uses positive reinforcement to encourage people to be aware of their surroundings and to take the time to do things correctly and safely.



4. Incident Reporting

In order to ensure that our team is consistently improving its safety, we have an incident reporting system in place. The purpose of this is to determine what causes any accidents or injuries in order to prevent such events from occurring in the future. Whenever there is an incident, the person who was injured and a witness must fill out a report form with the Safety Captain. This includes describing the situation, determining the cause and addressing the care for the injury.

Depending on the cause of the incident, different measures are taken. If it was an environmental danger, such as sharp edges on a tool or machine, it is filed down or covered in some way. If it was caused by a rule violation, such as not wearing the correct personal protective equipment, the guilty party is made aware of the rules and, depending on the severity, is required to redo the General Safety Module. Problems related to certain tools may require retraining in that particular area. Other incidents are handled on a case by case basis. In addition to the CougarTech Incident Report Form, severe injuries must be taken to the school district level.

FIRST Team 2228 CougarTech – Medical Incident Report Form

Injured Party Information	*Description of Injury (From Injured Party)*
Name: _____ Age: ____	Cause:
(If Non-Team Member) Address: _____ City: _____ State: _____ Zip Code: _____ Phone: _____	Injury:
Note: The witness may also be the filer of this form.	
Witness Information	*Description of Injury (From Witness)*
Name: _____ Age: ____	Cause:
(If Non-Team Member) Address: _____ City: _____ State: _____ Zip Code: _____ Phone: _____	Injury:
Event at which injury occurred: _____ _____ Date: _____ Time: _____ Location: _____ Specific location on premises: _____ _____ Activity during which injury occurred: __ _____	*Description of Care Given or Action Taken*
Analysis by Reporting Person □ Environmental hazard □ Rule violation Apparent Cause: _____ _____	

Reporter name: _____ Position: _____

Signature: _____ Date: _____

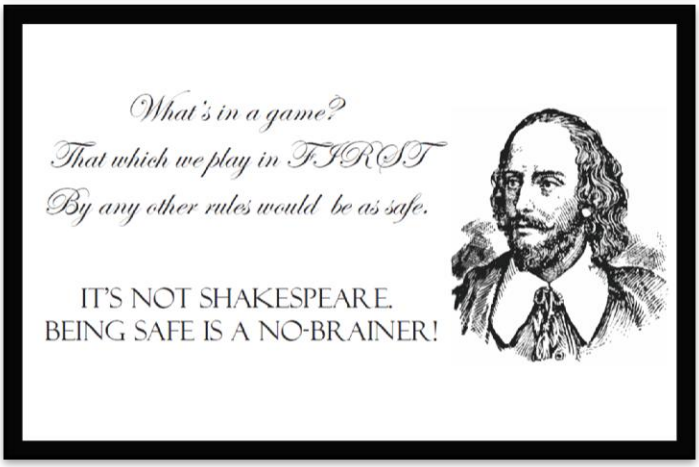
Promoting Safety

CougarTech Team 2228 not only creates a safe environment among its team members, but also within the community and other FIRST Teams. In order to do this, the Safety Team works to develop initiatives such as:

1. Posters
2. Brochures
3. Safety Quizzes
4. The Robot Transport Service
5. The Safety FIRST Webpage
6. Rookie Safety Kits
7. Garbage Bag Distribution

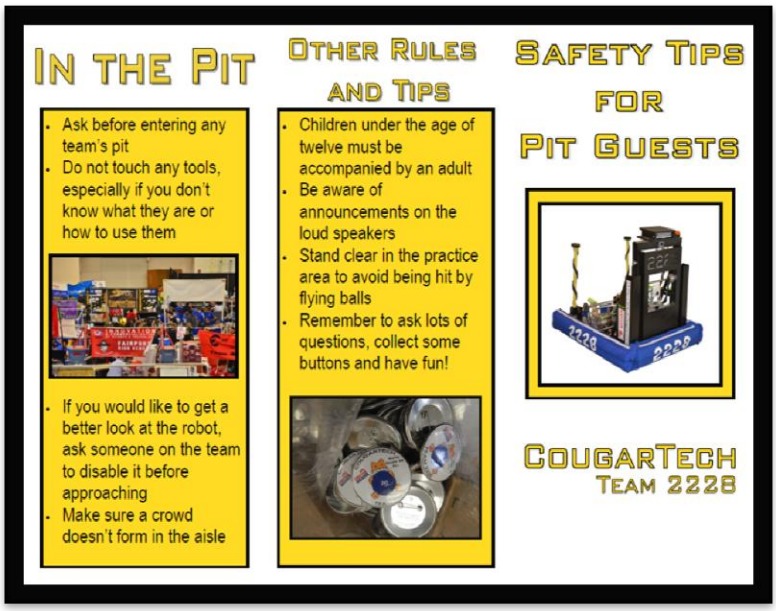
1. Posters

At every regional competition, Team 2228 hangs posters throughout the arena and the pit area. These posters remind people to wear their safety glasses, be aware of their surroundings and follow general safety rules.



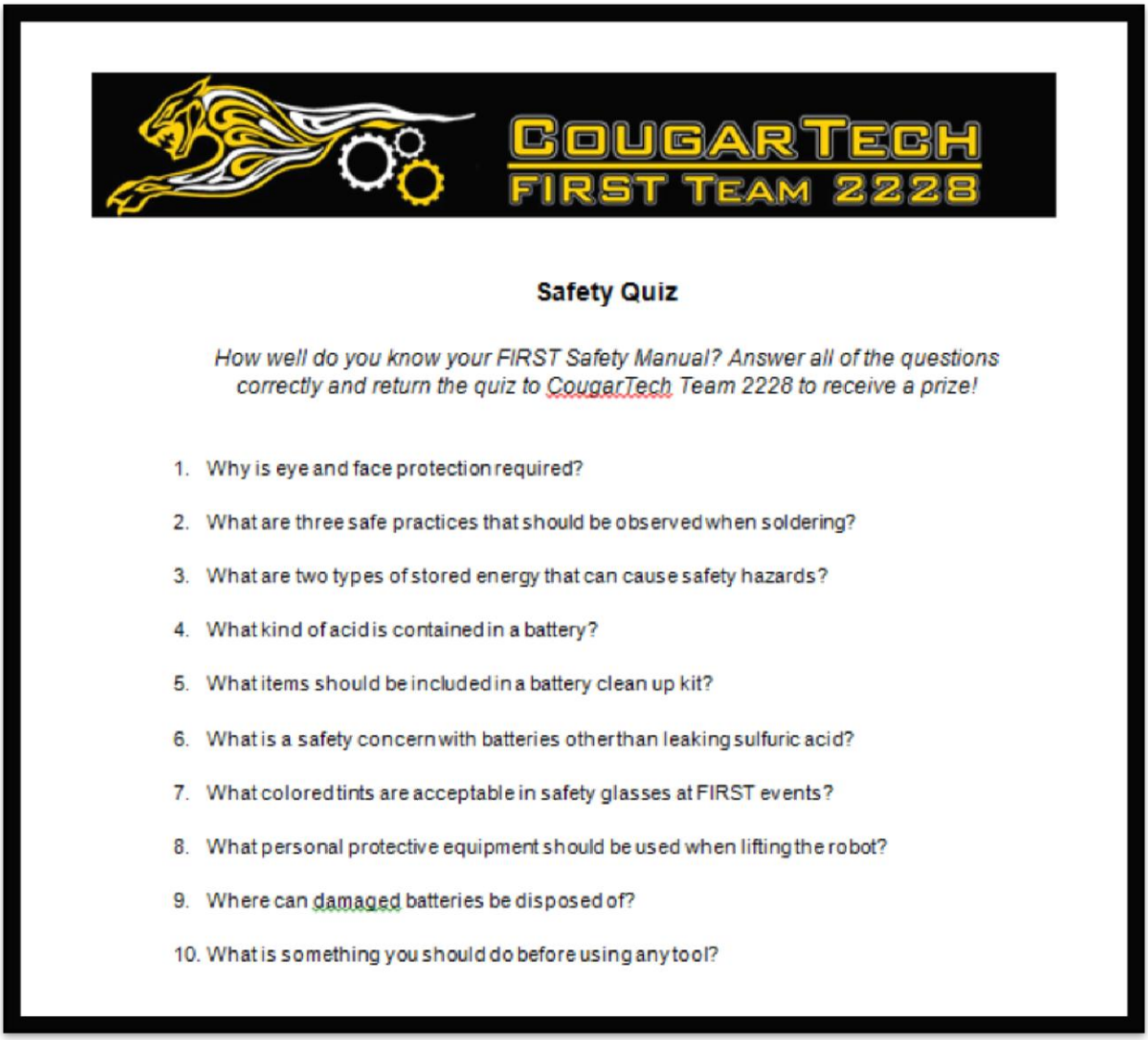
2. Brochure

During regional competitions, brochures created by Team 2228 are placed on a table at the pit entrance for guests visiting the pit. These brochures are meant to inform those who are not exposed to general FIRST safety procedures in the hope that they may be safe and enjoy visiting the teams in the pit.



3. Safety Quizzes

Quizzes based on the material in the FIRST Safety Manual are handed out to teams who can answer the questions and return them to the Team 2228 Safety Captain in return for ear plugs for hearing safety. This is meant to help people realize whether or not they know their Safety Manual and if not, cause them to read through the copy they should have in their pit.



COUGARTECH FIRST TEAM 2228

Safety Quiz

How well do you know your FIRST Safety Manual? Answer all of the questions correctly and return the quiz to CougarTech Team 2228 to receive a prize!

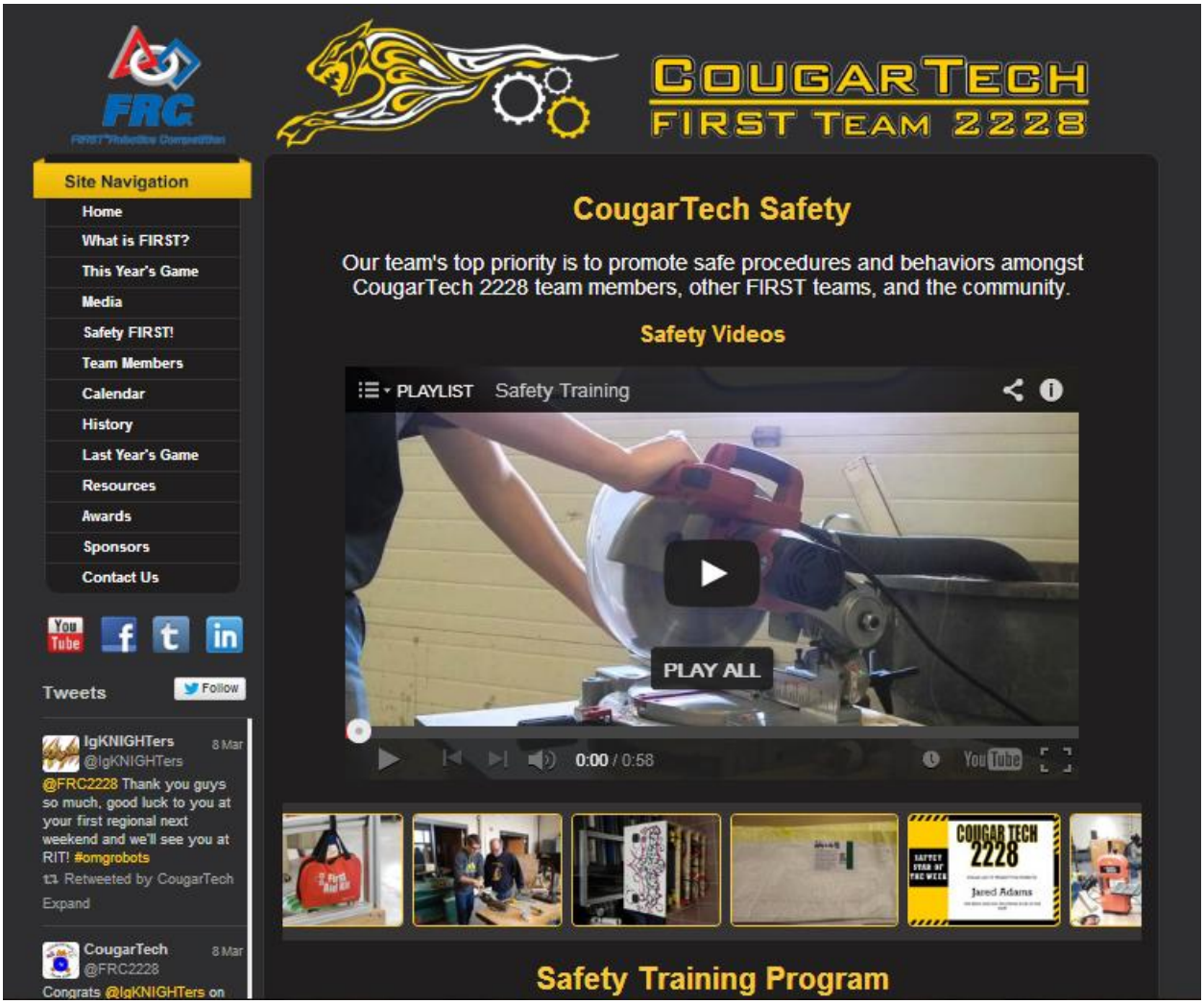
1. Why is eye and face protection required?
2. What are three safe practices that should be observed when soldering?
3. What are two types of stored energy that can cause safety hazards?
4. What kind of acid is contained in a battery?
5. What items should be included in a battery clean up kit?
6. What is a safety concern with batteries other than leaking sulfuric acid?
7. What colored tints are acceptable in safety glasses at FIRST events?
8. What personal protective equipment should be used when lifting the robot?
9. Where can damaged batteries be disposed of?
10. What is something you should do before using any tool?

4. Robot Transport Service

At competitions, Team 2228 helps other teams to safely transport robots from the field back to the corresponding pits. A team of CougarTech members in reflective vests wait by the field exit and offer to escort these robots. The Robot Transport Team stands to the front and to the sides of the robots, warning people in the aisle ahead in order to help return the robot safely. This makes the pit area safer for everyone, both by preventing collisions and smoothing traffic for those transporting their robots.

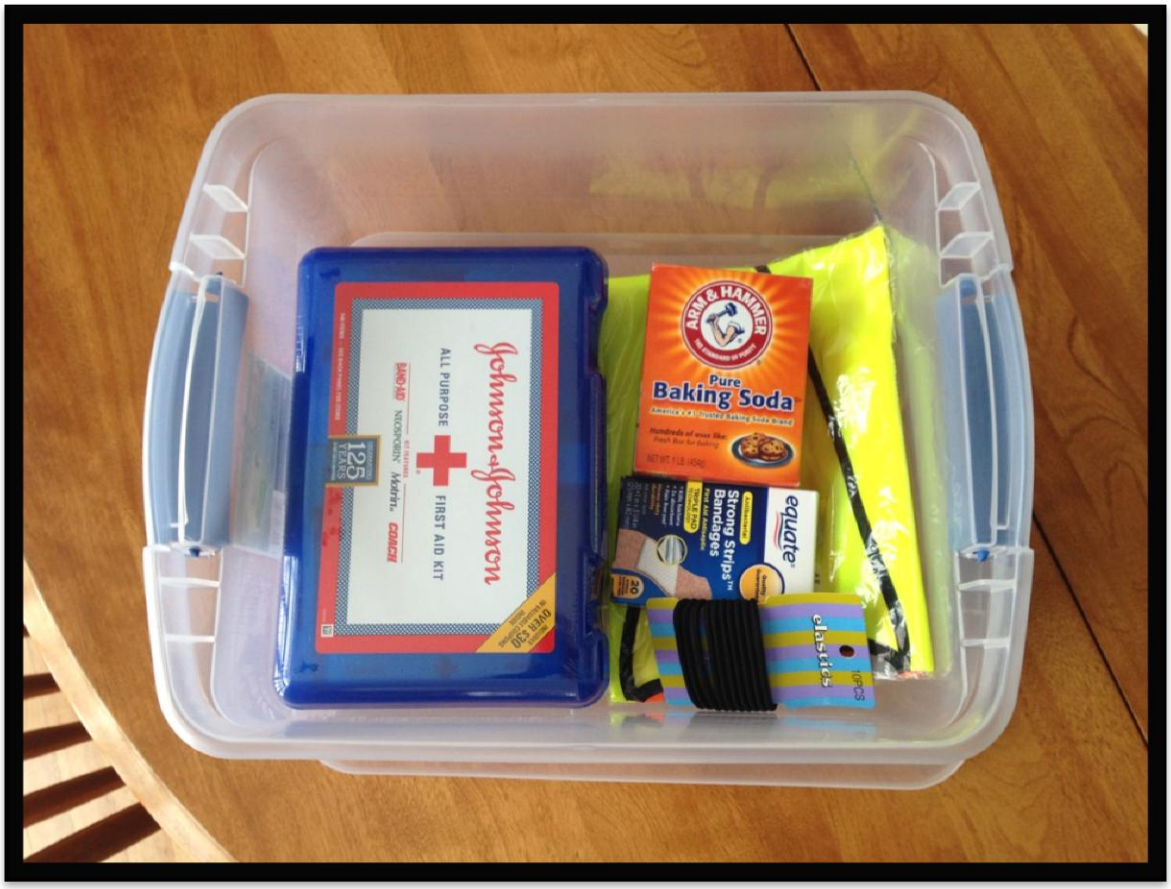
5. Webpage

This year, the Safety FIRST webpage was restructured to provide more interactive and informative content. The previous webpage consisted of a list of general safety tips, a summary of what Team 2228 does to promote safety and a collection of Material Safety Data Sheets. Now, the webpage contains embedded Youtube videos, a collection of scrolling, safety-related pictures, and the safety training resources for the team. This webpage can be viewed by visiting http://hflrobotics.com/safety.php.



6. Rookie Safety Kits

New to the safety program on Team 2228 is the distribution of Rookie Safety Kits. These are packages that contain safety materials to help the new Safety Captain including a vest, a first aid kit, baking soda, bandaids, hair ties, a poster and the FIRST Safety Manual.



7. Garbage Bag Distribution

In order to address the safety hazard trash build up creates, Team 2228 hands out garbage bags to all of the teams in the pits and in the stands. Each bag has a tag explaining why it is important to keep a clean work space.