



# SAFETY Manual



*2020-2021*

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## Goal

Safety is to be held in the utmost vital thing in our robotics team and we attempt to preserve everything secure and to prevent any endangerment as possible. The Safety crew is accountable for teaching all team individuals and developing a safe work surrounding at all conferences and events. Members of the Safety group will be trained in first aid and CPR certified... Members of



the Safety team may also be involved with any or all of these tasks:

- Building and organizing the work area at the building facility and the pit at competitions
- Arranging safety instruction classes
- Overseeing and ensuring all safety requirements are met during Robot repairs/modifications

## Scope

This security manual is an easy-to-use guide for necessary protection records for all college students and mentors within Team fifty-six however can be seen for all. This guide will define responsibilities for all crew members, security practices and responsibilities. This guide will constantly be up to date to comply with the latest security requirements or as recommended by using Mentors and Judges.

## Safe Behavior

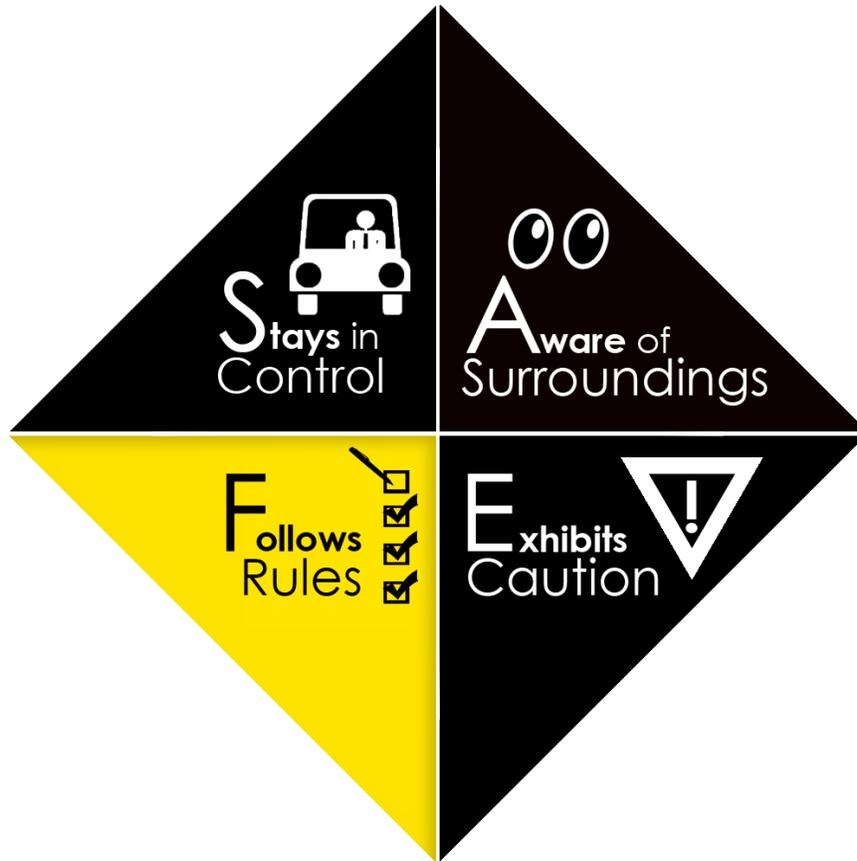
Unsafe situations can show up randomly at any given time. It's important to always stay focused and to have a superb mindset towards preserving yourself and others safely. Safe surroundings



can be performed by figuring out and putting off any possible hazards. It is necessary to Exhibit these Safe Behaviors

- Good safely habits
  - Avoid Loose Fitted clothing
  - Tie back long hair
- Aware of your surroundings
  - when holding an object watch were swinging
- Follow the rules
  - No horseplay or fooling around in the build area or around the robot
- Exhibit Caution
  - Take caution when undertaking a task such as: when using a tool, or around an unfamiliar area
  - Make sure to read the directions first





## Roles and Responsibilities

### Safety Mentor

The Safety Mentor shall oversee the assigned roles inside the Safety Team. The Safety Mentor will oversee all protection activities in conjunction with the Safety Captain and the appropriate team leaders, while imparting coaching and training



on standard protection issues, along with Personal Protective Equipment (PPE), safeguards, and other security tools as required. In addition to familiarizing themselves with applicable match security and restrictions, the Safety Mentor will make use of hazard-based security engineering concepts with the help of the Safety Captain and Safety Vice Captain to do away with or limit recognized risks to an appropriate level.

The Safety Captain is the Team Leader of the Safety Team. The Safety Captain is a student who is responsible for safety hazards, violations, and injuries. He/she will work in conjunction with other leaders and event staff to ensure that a safe environment is maintained at all times. In addition, the Safety Captain will conduct general safety inspections in the construction work area.

### **Safety Vice-Captain**

The Safety Vice Captain is a student who assists the Safety Captain in all their day-to-day activities and provides information. In the event that the Safety Captain is not available to perform his duties, the Safety Vice-Captain shall act on his behalf as a temporary Safety Captain.

### **Team 56 Students, Mentors, Participants**

- All participants will perform and maintain safe behaviors.



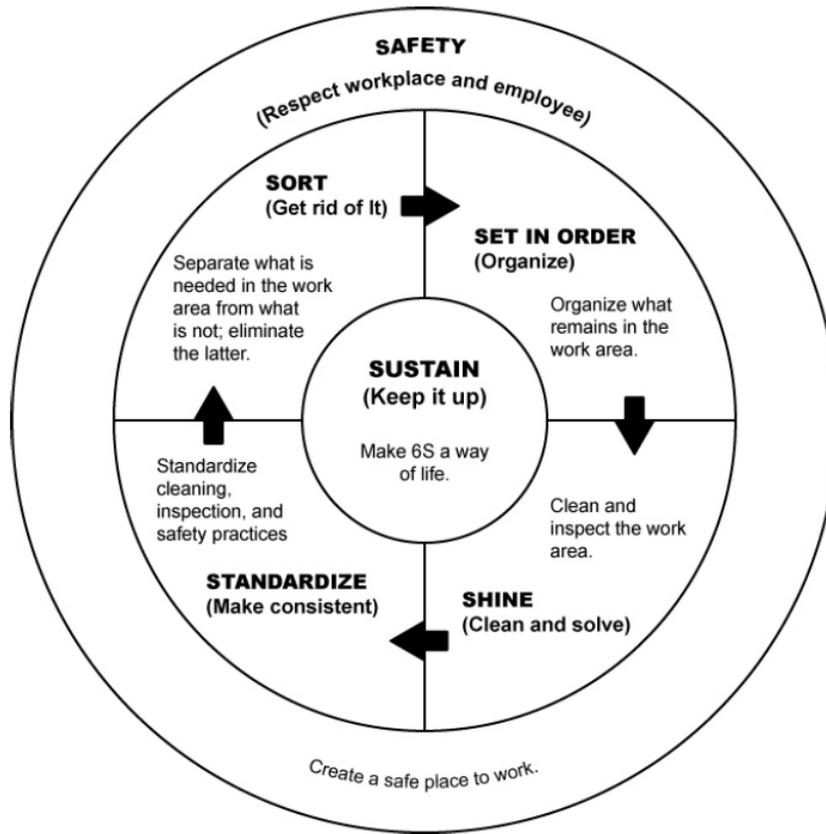
- All participants will adhere to any site restrictions identified at the participating event.
- Use Personal Protective Equipment (PPE), safeguards, and other safety requirements as required.
- All identified hazards shall be reported to the Safety Captain and Safety Mentor for appropriate corrections.
- All Participants, which include Mentors and Students, shall register for

**Safety is everyone's responsibility!**

## Principles

In order to consistently improve the safety program of Team 56, as of the Robotics Season of 2020, we apply the principles of 5S+ Safety, which are part of the team's safety philosophy, with the overall goal of continually striving for improvement. Pioneered by the Toyota Motor Company for manufacturing, the 5S principles will be used as a guideline for achieving a more organized and safer team environment.





## Sort

The safety initiative of Team 56 for 2020 started with the removal of outdated electronics and parts that were deemed unnecessary and obsolete. Items are collected and disposed of accordingly. Items include:

- o old electronics
- o motors
- o fans
- o wiring



## **Set in Order**

In order to ensure organization—the safety team has begun the gradual organization of the parts and the construction of the components into bins and shelves. This action identified additional unnecessary clusters while at the same time creating an efficient and effective storage method.

## **Shine**

As part of the safety program of ROBBE – Pre-season housekeeping tasks to eliminate waste have been implemented and the collection of robot parts and sub-team resources has been initiated. The housekeeping activity event will be carried out every year to gradually reduce the accumulated cluster within the Team Building Area.

## **Safety**

As part of the safety initiative of ROBBE, which included: safety demonstrations on the Build and Pit Safety Areas. Walkthrough how to identify hazards. bi-monthly safety training, etc.

## **Standardize**

In order to ensure the maintenance of an organized environment, visual cues, i.e. signs were introduced into the Build Area indicating that safety glasses were required at all times and any other thing they might've forgotten. The safety captain along with another safety member carried out a weekly inspection of the



construction area to ensure that the organization and safety were still maintained.

## Sustain

Team 56 works with internal cross-functional teams to ensure that the organization of the workplace is the key to success.

## General Safety Requirements

Safety practices will be adhered to at all times; consult with the Safety Captain and questions/concerns on safety practices.

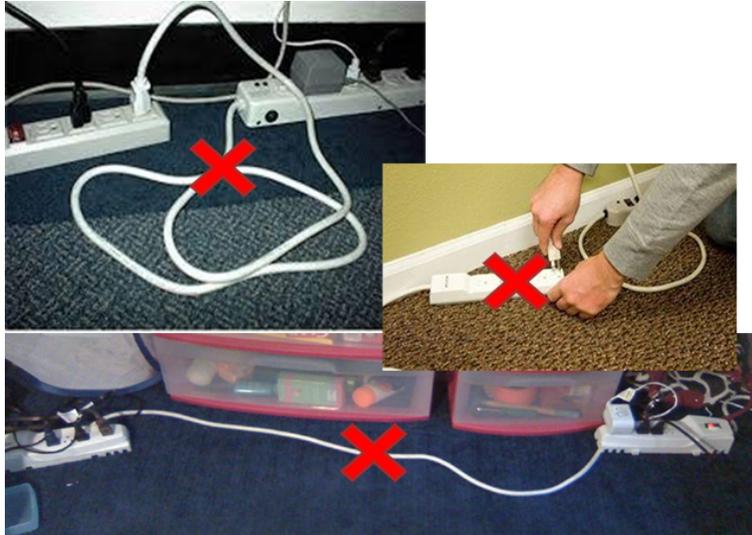
- Keep in mind of your surroundings and always be alert
- Follow safe work practices which include the safe use of all tools and Personal Protective Equipment.
- Ensure that tools/components/parts being used are designed for an appropriate purpose.
  - Identify the proper tool for the task
- Take precautions when working above normal height or ground level, incorporate the buddy system to assess potential hazards.
- Take precautions when utilizing tools that generate heat i.e. soldering irons. Ensure that the appropriate PPE is in use prior to using and with objects that may be susceptible to igniting are removed from the vicinity before use. It is also



important to take into consideration that these tools sometimes retain heat after being shut off; ensure that appropriate fire-resistant surface shall be incorporated to set down the tool to equilibrate to room temperature.

- Robot repairs/maintenance are common, and as a result, electrical and pneumatic components need to be de-energized prior to working.
  - Electrical
    - Unplugging batteries
  - Pneumatic
    - Vent any compressed air into the atmosphere
    - Open main vent valve and verify that all pressure gauge indicates zero pressure
  - Mechanical
    - Relieve any compressed or stretched springs or tubing
    - Ensure that all adjustable/movable components that may fall or cause harm are secured or placed in a neutral/nonadjustable position
- Use electricity appropriately: DO NOT “DAISY CHAIN” – Which is plugging a power strip into another power strip. - This could overload the circuit and potentially cause a fire





- Inspect all equipment cords – if the cord is damaged or is seen to be excessively worn – contact Safety Captain and/or a Mentor to solve this issue



## Personal Protective Equipment

Personal Protection Equipment or PPE, includes all equipment designed to grant safety to the wearer from conceivable hazards. The following describes the PPE required to put on as phase of constructing, use, maintenance, and transport a robot:

Note: All PPE tools used is ANSI-approved, UL-Listed, CE EN166 rated, AS/NZS licensed or CSA rated. Refer to Safety Captain or Safety Mentor on gear rating and acquirement.

### Eye and Face Protection

Safety Glasses and Protective Eyewear are designed to grant a defense around the complete eye to shield towards hazards; such as flying objects and chemical substances

Eye protection must be worn in the following but not limited to situations:

- Performing any work on the robot
- When there is a risk of exposure to flying particles or chemicals
- Anywhere in Pit Area, which includes walkways and team pits
- Vicinity of the area, which includes the playing field



- Practice Field
- Any areas with posted signs requiring the use of eye protection

An individual that wears Prescription Glasses, unless marked with a safety rating, must wear rated safety goggles over them to achieve the acceptable protection

## Hand Protection

Hand Protection is designed to protect against heat, electrical, chemical, mechanical hazards.

Hand Gloves are available in the robot Build Area and will be accessible to participants during competition at the team's pit area.

- Hand gloves will be used when constructing, use maintenance, and transporting the robot.
- If handling chemical i.e. battery spill, chemical-resistant gloves will be used



Note: Prior to using, ensure that the gloves are the proper size, are without cracks and holes, and have good flexibility and grip.

## Hearing Protection

Earplugs are available and should be available when there is a possibility of hearing damage or exposure to an abundance of noise.

## Foot Protection

All participants must wear shoes that completely cover the entire foot. Flip-flops, sandals, etc. are not acceptable when working on or near the robot nor within the Event Pit Area.



## Common Tool Guideline

- Hand tool injuries can be prevented! Stay Alert!
- Ensure the proper PPE is in place prior to the use of the corresponding tool
- Before tool use
  - Inspect tool for damage i.e. cracks, rust, excessive wear, handle surface is cracked or has splintered, etc....
    - Do not use tool/component that appears to be excessively damaged/worn



- Speak with a mentor/buddy if any concerns with regards to the inspection
- When handling a tool with other individual nearby, direct sharp points/cutting edges away from yourself and the other person
- Do not carry sharp or pointed tools in your pockets i.e. knives, files, chisels, etc.



- Do not initiate “make-shift” repairs to tools, if there are any discrepancies with the tool, advice a mentor and safety captain



- Do not throw tools from one location to another
- Do not use a tool that is too oily, greasy or heavy for you to handle.
- Firm grips must be utilized when handling a tool
- Don't use a tool while in an awkward position



- Remember to take a break, and avoid repetitive task over a prolonged period of time
- Always care and store tools appropriately



- o Transport hand tools in the appropriate toolbox or once the completion of a task utilizing that tool, store the tool in the appropriate location.
  - Stool tools in a dry, secure location. Don't pile them, or leave them around or place them where someone can get hurt or never find it.
- o Do not carry sharp or pointed tools in your pockets
- o Pass tools to other people by their handles



# Common Student Participant Power Tool Procedures

| Instrument: Drill  |                            |                                  |   |
|--|----------------------------|----------------------------------|---|
| Description of use: Drilling Holes / Securing Materials together |                            |                                  |   |
| Activities   | Hazards                    | PPE Required                     | Prior to Use Checklist Guidelines   |
| Preparing Drill for Use  | Pinching                   | Safety Goggles and Safety Gloves | <ul style="list-style-type: none"> <li>• Battery is charged</li> <li>• The trigger is working properly</li> <li>• Chuck is tight around bit</li> <li>• The bit is not dull</li> <li>• Gear is at the right speed</li> <li>• The drill is in the proper position</li> </ul>  |
| Drill Use  | Puncture, Laceration, Burn | Safety Goggles and Safety Gloves | <ul style="list-style-type: none"> <li>• Material/area is ready to be drilled or screwed down</li> <li>• Hands are in a proper position – away from the bit</li> <li>• Pull Trigger and proceed to push down on material that needs to be drilled</li> <li>• Remove drill bit from drill upon completion of a task</li> </ul> |



Instrument: Dremel



Description of use: Drilling, carving, engraving, sanding, cutting, etc.

| Activities               | Hazards                    | PPE Required                     | Prior to Use Checklist Guidelines   |
|--------------------------|----------------------------|----------------------------------|---|
| Preparing Dremel for Use | Pinching                   | Safety Goggles and Safety Gloves | <ul style="list-style-type: none"> <li>● Place appropriate accessory – power source should be disconnected or off and ensure accessory is not damaged prior to connecting</li> <li>● If using Cordless Dremel – ensure that it is charged, if cord required ensure that it plugged into an outlet – inspect cord for damage prior to use</li> <li>● Securely clamp material prior to cutting</li> </ul> |
| Dremel use               | Puncture, Laceration, Burn | Safety Goggles and Safety Gloves | <ul style="list-style-type: none"> <li>● Hold tool by the insulated grip when use</li> <li>● Do not reach in the area of the spinning accessory</li> <li>● During operations, always apply direction of the rotating accessory into the material</li> <li>● Always disconnect power before adjusting accessories</li> </ul>   |



Instrument: Soldering Iron



Description of use: Heats/Melts metals Materials together

| Activities                       | Hazards                        | PPE Required                     | Prior to Use Checklist Guidelines   |
|----------------------------------|--------------------------------|----------------------------------|---|
| Preparing Soldering Iron for use | Heat/Burns/Fire and Electrical | Safety Goggles and Safety Gloves | <ul style="list-style-type: none"> <li>• Insure cord is not damaged prior to plugging into an outlet</li> <li>• inspect iron tip for oxidation – if present – replace tip</li> <li>• Ensure the work area is well ventilated away from flammable materials – work must be done on a fire-resistant surface</li> </ul>   |
| Solder Iron use                  | Heat/Burns/Fire                | Safety Goggles and Safety Gloves | <ul style="list-style-type: none"> <li>• Grab Soldering iron by the handle – use caution – it’s extremely HOT!</li> <li>• Maintain hands in a proper position – away from metal components of the Soldering Iron</li> <li>• If not in use return soldering iron to its stand.</li> <li>• Take Caution when soldering materials together – use tweezers, pliers, or clamps to hold wires/materials</li> <li>• Let Soldering Iron Cool down in holder prior to putting it away</li> </ul> |



## Hand tool Guideline

Instrument: Hacksaw



Description: A C-shaped frame that holds a blade under tension.

| Activities                | Hazards      | PPE required             | Prior to use checklist Guidelines  |
|---------------------------|--------------|--------------------------|--|
| Preparing Hacksaw for use | cut/amputate | Safety glasses<br>Gloves | <ul style="list-style-type: none"> <li>• Check to see if the hacksaw is up to date</li> </ul>  |
| Using hack saw            | cut/amputate | Safety glasses<br>Gloves | <ul style="list-style-type: none"> <li>• Make sure to watch were aiming the saw</li> <li>• Properly place your hand on the side not too near your hand</li> <li>• Properly cut in the place you want and then put the saw back as instructed.</li> </ul> |



Instrument: Screwdriver



Description of usage: It is used to screw or unscrew screws into an object.

| Activities                         | Hazards               | PPE Required      | Prior to Use Checklist Guidelines  |
|------------------------------------|-----------------------|-------------------|--|
| Preparing the screwdriver for use. | Cutting and stabbing. | goggles<br>Gloves | <ul style="list-style-type: none"> <li>• Make sure that you are using the right screwdriver for the screw.</li> <li>• Make sure that electrical wires are turned off.</li> </ul>             |
| Using the screwdriver.             | Cutting and stabbing. | goggles<br>Gloves | <ul style="list-style-type: none"> <li>• Make sure that the screwdriver isn't magnet if you have to work around magnets.</li> <li>• Make sure that there is no extra force on it.</li> </ul> |



**Instrument: Monkeywrench**



Description: an adjustable wrench with large jaws that has its adjusting screw contained in the handle.

| Activities                      | Hazards   | PPE required              | Prior to use checklist  |
|---------------------------------|---|---------------------------|---|
| Preparing monkey wrench for use | Wrench could fall and cause bruising and damage bones | Safety goggles and gloves | <ul style="list-style-type: none"> <li>• Make sure that there are no makeshift repairs</li> <li>• Check for damages, cracks, rust, etc</li> <li>• Make sure you have a proper grip</li> </ul>   |
| Using monkey wrench             | Wrench could fall and cause bruising and damage bones | Safety goggles and gloves | <ul style="list-style-type: none"> <li>• Make sure you have the proper grip when using the monkeywrench</li> <li>• Don't hold the wrench in an awkward position</li> <li>• Make sure that the open end, or mouth is fully secured on the object.</li> </ul> |



## Safe Robot Lifting, Handling, and Transporting

Before lifting, all transporters must wear appropriate PPE glasses and must at least wear safety glasses.

Note: Robot must be safe to move before lifting, i.e. power off and secured parts. Ensure that the proper lifting technique is used when lifting the Robot or heavy objects, as shown in the image below.





While transporting on the cart, ensure that the robot is stable, under control, and cleared a path during travel.

## Safety Data Sheets

All available Safety Data Sheets (SDS) are located in the SDS which is currently a bright yellow book cover. All SDS will be periodically be updated with the latest revision.



## Handling Injuries

In the event of injury, notify the Mentor and Safety Captain so that the severity of the injury can be assessed.

Note: All injuries will be documented in the Injury Report Form. The Injury Report Form is used to provide the Safety Team and all Participants with information on how the injury occurred and how it could be prevented. Please refer to Appendix III

## Auditing/Inspection

Safety Inspection will be conducted periodically under the guide of Appendix II, Questions to ask to Ensure 5S + Safety Implementation.

## Event Safety

All participants must be mindful of their surroundings if they are wandering around the event area, it is best to use the Buddy System and inform others of your location. Consult with the Safety Captain for specific rules relating to Event Safety.



# Covid-19 Information

## Know how it spreads

COVID-19 spreads easily from person to person, mainly by the following routes:

Between people who are in close contact with one another (within 6 feet).

Through respiratory droplets produced when an infected person coughs, sneezes breathes, sings, or talks.

Respiratory droplets cause infection when they are inhaled or deposited on mucous membranes, such as those that line the inside of the nose and mouth.

People who are infected but do not have symptoms can also spread the virus to others.

## Less common ways COVID-19 can spread

Under certain circumstances (for example, when people are in enclosed spaces with poor ventilation), COVID-19 can sometimes be spread by airborne transmission.

COVID-19 spreads less commonly through contact with contaminated surfaces.

## Wash your hands often

Wash your hands often with soap and water for at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, or sneezing.

It's especially important to wash:

Before eating or preparing food

Before touching your face

After using the restroom

After leaving a public place

After blowing your nose, coughing, or sneezing

After handling your mask

Always try and carry hand sanitizer with you. Cover all surfaces of your hands and rub them together until they feel dry.

Avoid touching your eyes, nose, and mouth with unwashed hands.

Avoid close contact

Try and keep 6 feet between you and another person.

A mask is not a replacement for 6 feet and vice versa, always try to do both.

## Cover your mouth and nose with a mask when around others

You could spread COVID-19 to others even if you do not feel sick.



The mask is meant to protect other people in case you are infected.

Everyone should wear a mask in public settings and when around people who don't live in your household, especially when other social distancing measures are difficult to maintain.

Masks should not be placed on young children under age 2, anyone who has trouble breathing, or is unconscious, incapacitated or otherwise unable to remove the mask without assistance.

Do NOT use a mask meant for a healthcare worker. Currently, surgical masks and N95 respirators are critical supplies that should be reserved for healthcare workers and other first responders.

Continue to keep about 6 feet between yourself and others. The mask is not a substitute for social distancing.

## **Cover coughs and sneezes**

Always cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow and do not spit.

Throw used tissues in the trash.

Immediately wash your hands with soap and water for at least 20 seconds. If soap and water are not readily available, clean your hands with a hand sanitizer that contains at least 60% alcohol.

## **Clean and disinfect**

Clean AND disinfect frequently touched surfaces daily. This includes tables, doorknobs, light switches, countertops, handles, desks, phones, keyboards, toilets, faucets, and sinks.

If surfaces are dirty, clean them. Use detergent or soap and water prior to disinfection.

Then, use a household disinfectant. The most common EPA-registered household disinfectants will work.

## **Monitor Your Health Daily**

Be alert for symptoms. Watch for fever, cough, shortness of breath, or other symptoms of COVID-19.

Especially important if you are running essential errands, going into the office or workplace, and in settings where it may be difficult to keep a physical distance of 6 feet.

Take your temperature if symptoms develop.

Don't take your temperature within 30 minutes of exercising or after taking medications that could lower your temperature, like acetaminophen.

Follow CDC guidance if symptoms develop.



## Evacuation Plan

Prior to the event competition, the Safety Team will provide assistance and appoint a meeting point for the re-assembly of the team, in the case of an emergency.

## Corrective and Preventive Actions (CAPA)

In the case where a safety gap is identified or the principles of 5S + Safety is not maintained, a Corrective Action and Prevention Action will be implemented and documented in Appendix IV.

## References

- Lean and Environment Training Module Version 1.0 – January 2006
  - <https://www.osha.gov/Publications/osha3080.html>
    - <https://safetyculture.com/topics/5s-lean/>
- <https://www.osha.gov/SLTC/etools/electricalcontractors/materials/pushing.html>
  - <https://www.iteea.org/SaferSoldering.aspx>
- [https://www.dremel.com/en\\_US/support/product-safety](https://www.dremel.com/en_US/support/product-safety)



- <http://www.manualsdir.com/manuals/76668/dremel-3000-200-100.html?page=5>
- <https://www.cdc.gov/coronavirus/2019-ncov/index.html>

## Appendix I

| OFFICIAL R.O.B.B.E Safety Training Form |                          |                   |
|---|--------------------------|-------------------|
| Method of Training:                     |                          |                   |
| Safety Captain NAME (Print):            |                          |                   |
| Safety Captain SIGNATURE:               |                          |                   |
| COURSE TITLE                            | Training Date (mm/dd/yy) | Training Duration |
|   |                          |                   |





## Appendix II

### Questions to ask to ensure 5S + Safety Implementation:

Place an X in the appropriate column – For any questions answered “Yes”, complete a Corrective Action

| <b>Sort</b> | Yes                      | No                       | Distinguish between what is need vs what is not needed    |  |
|-------------|--------------------------|--------------------------|---|--|
|             | <input type="checkbox"/> | <input type="checkbox"/> | Are Hazards Present?                                      |  |
|             | <input type="checkbox"/> | <input type="checkbox"/> | Unneeded tools and equipment present?                     |  |
|             | <input type="checkbox"/> | <input type="checkbox"/> | Unneeded inventory supplies, materials, or parts present? |  |
| Notes:      |                          |                          |   |  |

Place an X in the appropriate column – For any questions answer “No”, complete a Corrective Action.

| <b>Straighten</b> | Yes                      | No                       | Does everything have the right place and everything is in the right place? |  |
|-------------------|--------------------------|--------------------------|--|--|
|                   | <input type="checkbox"/> | <input type="checkbox"/> | Is the correct place for items obvious?                                    |  |
|                   | <input type="checkbox"/> | <input type="checkbox"/> | Are items in the correct place?  |  |
|                   | <input type="checkbox"/> | <input type="checkbox"/> | Are items put away immediately after use?                                  |  |



Notes:

Place an X in the appropriate column – For any questions answer “No”, complete a Corrective Action.

|              | Yes | No | Is the area clean and kept Organized?                       |
|--------------|-----|----|---|
| <b>Shine</b> |     |    | Are garbage and recyclables collected and sorted correctly? |
|              |     |    | Are corresponding safety signs visible?                     |
|              |     |    | Is the area free of clutter?                                |

Notes:

Place an X in the appropriate column – For any questions answer “No”, complete a Corrective Action.

|                    | Yes | No | Maintain and monitor FIRST 3 S's                        |
|--------------------|-----|----|---|
| <b>Standardize</b> |     |    | Are expectations appropriately related to participants? |



|        |  |  |   |
|--------|--|--|---|
|        |  |  | Can items be located under 5 seconds?   |
|        |  |  | Are procedures and documents available? |
| Notes: |  |  |   |

Place an X in the appropriate column – For any questions answer “No”, complete a Corrective Action.

|                | Yes | No | Stick to the Rules                                      |
|----------------|-----|----|---|
| <b>Sustain</b> |     |    | Are safety inspections being conducted periodically?    |
|                |     |    | Is everyone's role clearly defined                      |
|                |     |    | Have there been improvements since the last inspection? |
| Notes:         |     |    |   |



Place an X in the appropriate column – For any questions answer “No”, complete a Corrective Action.

|               | Yes | No | <b>Incorporating a Safety Focused Mindset</b>                          |
|---------------|-----|----|--|
| <b>Safety</b> |     |    | Are participants using the proper PPE?                                 |
|               |     |    | Can participants identify hazards?                                     |
|               |     |    | Are participants aware of hazards while working in the Pit/Build Area? |
| Notes:        |     |    |  |



# Appendix III

## Injury Report Form

Name of Injured Individual: \_\_\_\_\_ Date: \_\_\_\_\_

Description of Incident:

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Description of Treatment/First Aid:

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Recommendations to Prevent Incident from Reoccurring:

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Safety Captain Signature \_\_\_\_\_ Date:

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Safety Mentor Signature \_\_\_\_\_ Date:

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# Appendix IV

## Corrective Action and Preventive Action Form

| Area of incident | Description of Incident | Corrective Action Taken | Preventive Action Initiated | Lesson Learned | Certified By | Date Corrected |
|------------------|-------------------------|-------------------------|-----------------------------|----------------|--------------|----------------|
|                  |                         |                         |                             |                |              |                |
|                  |                         |                         |                             |                |              |                |



