

SAFETY

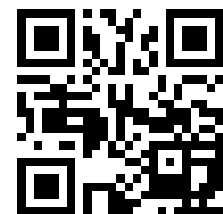


GUIDE



COURTESY OF

C.O.R.E. 2062



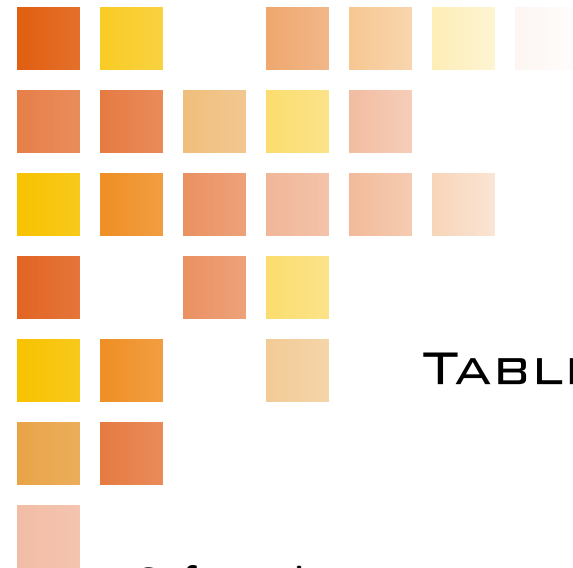


TABLE OF CONTENTS

Safety Ideas	1
Lock-Out Tag-Out	2
Material Safety Data	3
Sheets	4
Fire extiguishers	5
5S Principles	6
Pit Organization	7
Robot Inspection	8
Pit Inspection Form	9
Contact Us	10



SAFETY IDEAS

Have a test for shop safety and the Safety Manual.

- Everyone must pass before working in shop.
 - Passing is defined as getting all questions correct

During each meeting talk about one safety topic, such as:

- Types of fire extinguishers, First aid kits, Personal Protective Equipment (PPE) or MSDS

Safety items to put in pit:

- Pit Safety Rules for everyone to see
- Personal Protective Equipment including gloves, safety glasses, and earplugs
- MSDS (Material Safety Data Sheet) book available
- Team safety manual and FIRST safety manual
- Fire extinguisher
- First Aid kit

Have inspection forms:

- A robot inspection form to check before or after the robot goes out for a match
- A pit inspection form to ensure that your pit stays clean and organized

Our team uses the 5S principles to organize our pit.

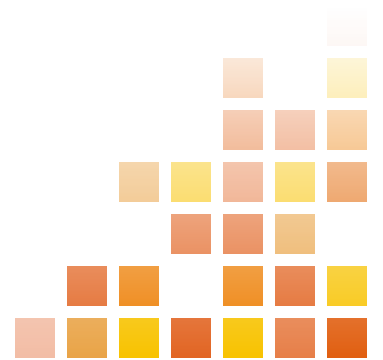
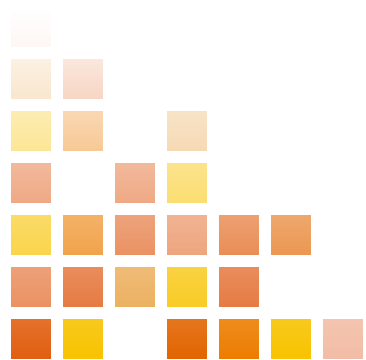
SAFETY FIRST



LOCK OUT TAG OUT

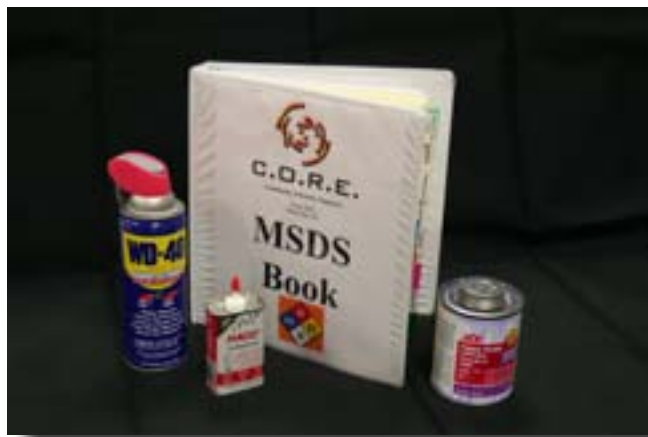
Lock Out Tag Out is a method used to ensure the robot is not powered up while receiving maintenance. There are many forms of energy to be cautious of, these include: electrical, pneumatic, hydraulic, and spring loaded. Because this energy can be hazardous, team members use LOTO to reduce the risk. Before doing any work on the robot, all these forms of energy must be released. After each competition, the drivers disconnect the battery cable and release any pressure in mechanical systems. When returning to the pits, all power sources are locked out before the pit team repairs or checks the robot. When it is time for the next match, the tag is removed by its owner.

A Lock Out/Tag Out consists of three parts, including a box to cover the power leads, tags, and a clip. The box cover encases the power leads and is secured by the clip. The clip has a tag with the name of one team member. All team members must understand the guidelines for this system to be effective. The system works with two categories of members on the team; authorized and affected. The authorized members are chosen because of their role on the pit crew or drive team. These members carry the Lock Out Tags, used secure the power leads on the robot. All other members of the team fall in the affected category. Affected members can never remove a tag. However, if an affected team member sees an unsafe condition on the robot he or she must report it to an authorized team member.



MATERIAL SAFETY DATA SHEET

MSDS or material safety data sheets are used in all business and industry and should be kept on hand for all FIRST robotics teams. There should be a MSDS sheet for every chemical used by your robotics team. These can usually be found on the retailers' website or by calling and requesting it from the retailer. All MSDS sheets will include the chemical name, common name, and all of the ingredients in the chemical. The MSDS also includes information on first aid for the chemical (ingestion, contact with eyes and/or skin), the flammability of the chemical, extinguishing any fires, and the proper disposal of the chemical.



FIRE EXTINGUISHERS

Fire Extinguishers are an essential part of each team, household and business. There are four classes of extinguishers namely A, B, C and ABC.

Class A extinguishers are for wood, paper, and other common combustibles.

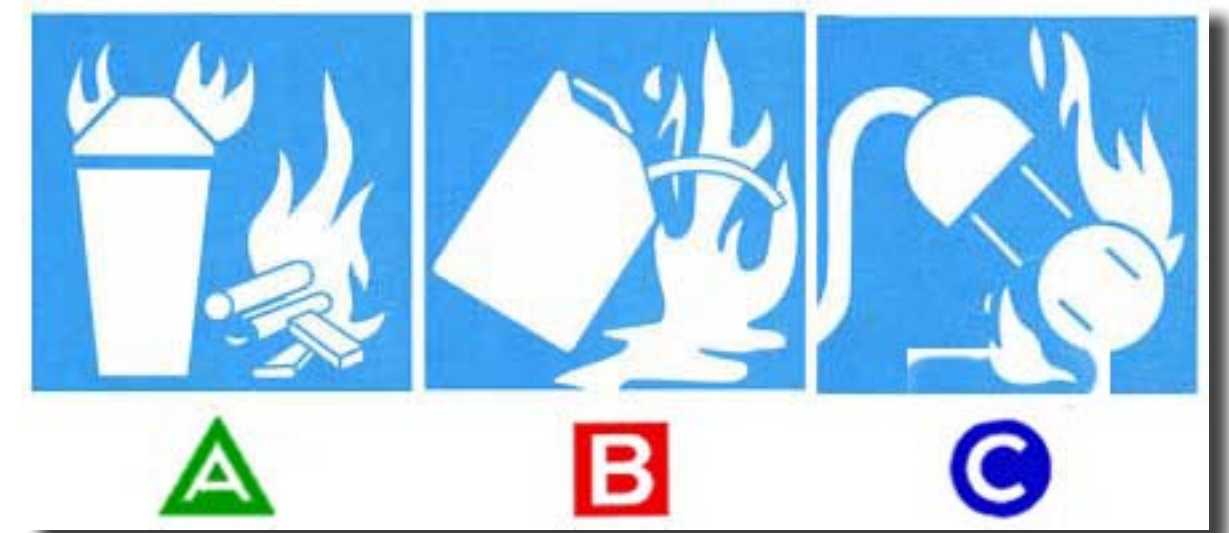
Class B extinguishers are used on grease, oil, gasoline, and other flammable liquids.

Class C is to be used on electrical fires.

ABC is a combination of the three.

Also remember to place extinguishers in easily accessible places such as near doors or exits. When using an extinguisher, always use the method PASS:

- P**ull out the safety pin
- A**im at the fire
- S**queeze the trigger
- S**weep the nozzle back and forth at the fire.



5

5S PRINCIPLE

By applying the 5S Principles your team can dramatically increase safety in the pits and in shops . The 5S's are a standard which are commonly used throughout industries to keep workspaces safe and efficient. In the space constraint for a pit of 10' by 10', maximizing space, being efficient, having a better appearance and being all around safer is important and achieved through the 5S's.

The 5S's are defined as; sort, straiten, shine, standardize and sustain.

Ways to **Sort**:

1. Decide on what things are needed and not needed in your pit and shop
2. Needed things include but are not limited to:
 - i. Tools
 - ii. Spare parts
 - iii. Robot
 - iv. First Aid kit
 - v. Fire extinguisher
3. Not needed things include but are not limited to:
 - i. Jackets
 - ii. Food and drinks
 - iii. Personal items
 - iv. Trash

Ways to **Straighten**:

1. Organize
2. Have a place for everything and keep everything in its place
3. Label bins and drawers
4. Tape off sections on the floor
 - i. This keeps everything out of the way and in its own place

Ways to **Shine**:

1. Sweep up the floor.
2. Clean off surface with a hand broom or vacuum.
3. Keep things looking straight and neat

Ways to **Standardize**:

1. Routinely clean up
2. Make a pit inspection form
3. An example can be found on page 9 of this booklet

Ways to **Sustain**:

1. Make sure the 5S's are understood and followed by everyone on the team
 - i. Give safety demos
 - ii. Teach members about pit inspection forms and encourage everyone to do it once
2. Develop a succession plan
 - i. Start training next safety captain a year before the current one leaves

6

PIT ORGANIZATION

We use the 5S Principles in the following ways:

- **Sorted** nuts and bolts in a container with drawers.
- To **set** everything in its proper taped off section of our pit.
- To make our pit **shine** by sweeping our pit almost every time the robot leaves.
- To **standardize** our pit by using inspection forms to keep our pit organized
- By **sustaining** the 5S principles by teaching everyone on the team the 5S principles

Our MSDS book, team safety manual, and FIRST Safety Manual are in the pit. They are always located in the same place in the pit and everyone knows where this place is.

The pit rules and 5S principles are posted in the pit.

Also located in our pit are: an eye wash station, first aid kit, fire extinguisher, earplugs, extra safety glasses and a binder for inspections forms.





ROBOT INSPECTION FORM (EXAMPLE)

SAFETY INSPECTION FOR PIT		
Date & Time: _____	Inspector(s): _____	
A. HAND & PORTABLE TOOLS	✓	NOTES
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?		
4. Are tools clean and free of oil or grease?		
5. Tools have no tape or homemade modifications / extensions.		
B. CHEMICALS	✓	NOTES
1. Is MSDS binder available to everyone and all aware of it?		
2. Is leaking battery kit available?		
C. ELECTRICAL	✓	NOTES
1. Are batteries visibly Ok, terminals not bent, no cracks in case?		
2. Do unconnected batteries have protector safety plugs?		
3. Do battery chargers have sufficient space for air circulation?		
4. Are battery chargers unplugged when not in use?		
5. Are cords and plugs in good condition with grounding connections		
6. Are electrical outlets overloaded? (Only one powerstrip per outlet)		
D. THE TEAM PIT STATION HOUSEKEEPING	✓	NOTES
1. Is team equipment within the designated space? Aisle clear?		
2. Is the area free of slipping and tripping hazards?		
3. Is the storage of materials orderly?		
4. Are work surfaces neat and uncluttered?		
5. Are 5S principles being followed?		
6. Is garbage can available and emptied regularly?		
7. Is broom and dustpan available and properly stored?		
E. EMERGENCY EQUIPMENT / EVACUATION	✓	NOTES
1. Are evacuation meeting points displayed?		
2. Is team roster up-to-date and easily accessible in emergency?		
3. Are all aisles to exit doors and exits unblocked?		
4. Is fire extinguishers unblocked and accessible?		
5. Is eyewash available and accessible.		
F. PERSONAL PROTECTIVE EQUIPMENT (PPE)	✓	NOTES
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?		
G. RESPECT OF STORED ENERGY DANGERS	✓	NOTES
1. Is checklist being used after each competition?		
2. Does the team ensure no one is working on the robot while energized?		



PIT INSPECTION FORM (EXAMPLE)

Robot Inspection Checklist

This Checklist Must be Completed After Each Match (2010 Season)

Date _____ Time ____:____AM / PM
File checklist

Controls

Notes Initials

_____ 1 – Change Battery with a fully charged battery.

_____ 2 – Battery connections on the removed battery checked for tightness.

_____ 3 – Removed Battery is put on charge.

_____ 4 – Connections on main breaker checked to be tight and secure.

_____ 5 – Victors:

All wires tight All PWM wires secure

Victors secure Platforms secure

Analog board with card in slot one secure

_____ 6 – CRIO:

Secure to board Both cartages secure (slots 1 and 4)

Wires secure

_____ 7 – Power Board:

Fuses secure All wires secure Power board secure

_____ 8 – Digital Sidecar:

Sidecar secure All wires secure Encoder is touching lift chain

_____ 9 – All control panels are secure

Mechanical

Notes Initials

_____ 10 – Chain Tension:

Left side Right side Lift

_____ 11 – Square gear boxes

_____ 12 – Check wheel sprockets to be tight and in line.

Drive train Lift

_____ 13 – Check Axle tension.

_____ 14 – Check for loose bolts:

Chassis Lift Lift hooks Mecanum wheels Kicker

_____ 15 – Check lift frame to be square.

_____ 16 – Put hooks in down position.

_____ 17 – Set spring locks with spacers in place.

_____ 18 – Adjust limit switches on lift.

_____ 22 – Check for and repair breaks in the netting.

_____ 23 – Make sure kicker is straight.

_____ 24 – Check for wear on:

bungee cord cam bumper other aluminum parts

_____ 25 – Make sure no wires are in the way of any part of the kicker.

_____ 26 – Check temperature of all motors.

_____ 27 – Check Bumpers for Damage

Power Up Test

_____ 27 – Kicker:

Kicking Encoder Limit switch optical sensor

_____ 27 – Drive train:

Forward Backward Slide left Slide Right

Personal Protection Equipment or PPE use is vital to ensure the safety of every team member. PPE includes safety glasses, gloves, earplugs and even closed toed shoes. Safety glasses are required when working on the robot, testing the robot, and operating any machines or when in the same room where machines are being operated. Earplugs should be worn anytime a normal speaking voice must be elevated. The use of gloves is imperative when dealing with sharp, hot or acidic objects, but may impair the wearer's ability to work with small pieces. Because of this, each situation must be evaluated to decide when to wear gloves.

The following are some rules our team enforces regarding PPE:

1. Gloves:

- Gloves are required when handling the robot and crate
- Gloves are also required when handling chemicals and electrical equipment
- Never wear gloves when working with power tools
- Use gloves when crating and uncrating the robot
- Use gloves when transporting or lifting the robot

2. Safety Glasses:

- Eye protection is required in the work shop, pit area, on the practice fields and during competition at all times
- They will protect your eyes from:
 - Flying objects
 - Sharp objects
 - Chemicals
 - Other hazardous materials

3. Shoes:

- Closed toe closed heal shoes are required in the pit area, work shop, practice fields, competition areas

4. Clothes:

- Long, non-baggy pants are required in the pit and work shop
- Baggy and loose clothes are not permitted in the pit and work shop
- Do not wear jewelry, necklaces, ties, etc.
- Long hair must be tied back
- Any clothing that could get caught in any type of machinery is not allowed in the pit and work shop

5. Hearing protection:

- Use ear plugs when there is a possibility of damage to hearing
- If you feel you need to raise your voice to talk to someone next to you than you should probably be wearing hearing protection when hearing protection



Even before build season starts, we ensure each team member is trained on every machine. All team members are tested and required to pass this test with a 100% in order to participate in team activities. A team member that does not pass will be re-instructed by the safety captain and then is allowed to take the test again. Safety training continues into build season with a weekly presentation from our safety captain or safety mentor. These presentations include different topics including MSDS, LOTO, PPE, the 5 'S' Principals, proper lifting and small reminders of previously learned safety guidelines. We do this all to guarantee that every member goes home uninjured at the end of the day.





CONTACT US

We would be delighted to answer any questions or help jumpstart your safety program

Please contact us at:
contact@core2062.com
or go to our website
<http://www.core2062.com/safety>