

TEAM 461



SAFETY MANUAL

Team 461 WBI Robotics Safety Manual

WBI Robotics is proactive as a leading FIRST robotics team in its safety observations and practices.

It is the goal of this manual to acquaint all team members with the proper safety practices and objectives in all areas of robotics provided by the Safety Team.

It is the responsibility of the Safety Captain and the Safety Team to educate all team members about the safety requirements of WBI Robotics.

The importance of safety should be recognized by all team members.

Accident prevention shall be an integral part of every team activity.



Table of Contents

SECTION 1: General Safety Rules	4
a. Key objectives	4
b. General requirements for members	4
SECTION 2: Personal Protective Equipment	5
a. Policy on PPE	5
b. Categories of PPE	5
SECTION 3: Safety Management Organization	7
a. Safety captain	7
b. Safety team	7
SECTION 4: Safe Behaviors and Practices	8
a. General safety rules	8
b. Robot repair rules	8
SECTION 5: Lifting	9
a. Rules of lifting	9
b. Proper body mechanics	9
SECTION 6: Battery and Power Rules	10
a. General power safety	10
b. Tips	10
c. Electrical cables, power surge protectors, extension cords	10
SECTION 7: Setting Up Marketing Displays	11
a. Indoor displays	11
b. Outdoor displays	11
c. Ladder safety	11
SECTION 8: Lockout Tagout	12
a. Tagout devices	12
b. Lockout devices	12
SECTION 9: Safety Emergencies	13
a. Battery spill	13
b. Fire	13
c. Minor medical emergency	14
d. Major medical emergency	15

SECTION 1: General Safety Rules

All members of Westside Boiler Invasion Team 461 are to uphold Purdue FIRST rules and stipulations. It is of utmost importance to follow the safety rules and guidelines that are laid out in this manual, as well as to follow OSHA guidelines.

1. All team members will recognize, appreciate, and respect Team 461's safety rules and guidelines.
2. All team members will wear personal protective equipment (PPE) whenever necessary or appropriate.
3. All team members will respect Team 461 Safety Program, Safety Manual, and its Safety Team.

The Key Objectives of Team 461's Safety Program are:

1. Ensure that every participant, staff member, Mentor, parent/legal guardian, visitor, and observer has a safe, enjoyable, and injury free preseason, build season, and competition season.
2. Motivate Team 461 members and other team's members to learn and follow safe group and individual practices as a life skill.

Members of Team 461 are required to:

1. Always listen and follow the Safety Captain's and Safety Team's instructions and tips
2. Perform and maintain safe behaviors
3. Maintain a clean, organized, and safe physical condition of their working environment
4. Always wear proper PPE

SAFETY IS EVERYONE'S RESPONSIBILITY!

SECTION 2: Personal Protective Equipment

Personal Protective Equipment (PPE) is intrinsically important in preventing and minimizing accidents and injuries. Each activity or machine requires a unique combination of PPE to ensure safety.

Appropriate Clothing

When working or observing within fifty feet of a machine or tool, pants (defined as an item of clothing which covers the legs and ankles with each leg having a separate tubular piece) must be worn at all times.

Loose, baggy clothing, hooded sweatshirts, and apparel with dangling strings or cords are not permitted within ten (10) feet of a machine or tool.

When working or observing within ten (10) feet of a machine or tool, jewelry of any kind is not allowed unless approved by the Safety Captain. Specifically, jewelry, such as items located around the wrist, fingers, and/or neck, can pose a significant danger and have the potential to cause harm to the wearer and others locally. Studded earrings are an exception as long as they have been approved by the Safety Captain.

Eye Protection

Based on OSHA 29 CFR 1910.133

1. Safety Glasses with side shields meeting ANSI Z87.1 are required within fifty feet or eyesight of a machine or tool and are to be worn at all times.
2. Only clear and yellow tinted safety glasses are allowed.
3. When gas welding and burning, burning goggles with plastic plates on both sides are required and must have a No. 3 density rating or higher.
4. Chemical splash goggles are required within 10 feet of exposed chemicals.
5. Safety Glasses are also required within fifteen (15) feet of any soldering, wire cutting, or work involving power and electricity.

Emergency Eyewash – Based on OSHA 29 CFR 1910.151(c)

Where the eyes or body of any person may be exposed to injurious corrosive materials such as battery acid, suitable equipment for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use.

Face Protection

Based on OSHA 29 CFR 1910.133

1. Full face shields are required for all power chipping, grinding, and sawing.
2. Full face shields are required when handling molten plastic, metal, tar, caustics, and other molten materials.

Hearing Protection

1. In any area where noise levels exceed 80 dBA, hearing protection is required.
2. In any area where exposure of 75-79 dBA exceeds 8 hours a day, hearing protection is required.
3. Hearing protection is required within twenty (20) feet of any chop saw, reciprocating saw, and circular saw.

Foot Protection

Team members are required to wear close-toed shoes (defined as an outer covering of the foot with a stiff sole) within fifty (50) feet of any tool or machinery.

Steel-toed boots are a good idea, but are not required.

Hand Protection

Based on OSHA 29 CFR 1910.138

1. Use appropriate hand protection when hands are exposed to hazards such as: from skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns, harmful temperature extremes, and sharp objects. Each affected person who faces possible bodily injury of any kind that cannot be completely eliminated through engineering, work practice or administrative controls must wear appropriate hand protection.
2. Latex gloves are required when working with an injured person or when working with bodily fluids.

Hair Protection

1. Long hair should be protected by a hair net or other means to prevent it from becoming entangled in moving parts.

SECTION 3: Safety Management Organization

Team 461 is known for going above and beyond the safety requirements of the FIRST program. The Team 461 safety structure is comprised of a Safety Captain and a Safety Team that works with the captain.

Safety Captain

During pre-season and build-season, this is the “go to person” for safety. The Safety Captain is responsible for managing the MSDS catalog. They are responsible for coordinating safety training sessions and ensuring that the entire team follows and understands the team safety rules. This person is also in charge of the other safety leads and keeps them organized.

During the competition, the Safety Captain becomes the **Pit Safety Manager**. He/she is in charge of safety practices, distribution of safety media, and promoting safety awareness to rookie teams and event onlookers. It is the Pit Safety Manager’s responsibility to ensure that everyone is working in a safe and controlled environment, even in the heat of competition.

Safety Team

The Safety Team is composed of 461 team members from the various groups. Ideally one person from each group is represented on the safety team as needed. The safety team will conduct educational sessions with the various groups or as a whole in order to ensure all 461 team members understand the safety requirements.

SECTION 4: Safe Behaviors and Practices

Unsafe situations can occur at any time. It's important to uphold a safe environment by eliminating possible hazards, staying focused, and maintaining safe behaviors and a positive attitude about safety.

General Safety Rules

1. Use safe work practices.
2. Have a positive attitude towards safety, projects, team members, and tools.
3. Thoroughly communicate actions and ideas to nearby persons.
4. Discourage horseplay.
5. Know the name, location, and proper usage of hand tools, power tools, machines, and guides.
6. Be mindful of your attitude, actions and feelings, as well as those of others.
7. Plan ahead to avoid unsafe situations when transporting materials in a working environment.
8. Assist other teams and team members with safety concerns or issues.
9. Request that visitors and observers follow these rules.

Robot Repair Rules

1. Always wear proper PPE.
2. Have control over the robot at all times.
3. Communicate with everyone about when the robot is on or about to move.
4. Never work on the robot when it is powered on, activated, or when there is stored potential energy.
5. Stay out of the path of the robot and its appendages.
6. Keep fingers, hair, tools, and wires out of gears, transmission boxes, wheels, sprockets, and out of the path of pneumatic devices, rotating devices, oscillating devices, chains, belts, and pinch points.
7. Frequently check the robot for sharp edges and pinch points and if found, ensure that they are properly labeled or remedied.

SECTION 5: Lifting

Based on OSHA Safety Recommendations.

Rules of Lifting

1. Always listen to the Lift Coordinator. Do not attempt to move the robot or a heavy object until they have given the command.
2. Plan ahead on what will be done with the robot or its carrier after it has been lifted.
3. Use proper body mechanics when lifting the robot or any heavy object.
4. Wear gloves when lifting objects with hard or sharp edges in order to prevent finger or hand damage.
5. Estimate the weight of the object by tilting it up slowly. If it is hard to move, it is too heavy to lift. Find someone to assist you in your lift, or use a lifting aid.
6. Keep the object you are lifting as close to your body as possible.
7. Avoid twisting your back as you lift. Instead, move your feet to turn.
8. Keep a firm footing and plan your route to avoid tripping hazards.
9. When possible, attach handles and caster wheels to heavy or awkward objects. Objects with lifting handles and caster wheels can reduce the strain on your back and make the job easier.

Proper Body Mechanics

“Lift with your legs, not with your back.” Keeping your back straight and placing the bend at the legs increases lift strength and reduces the chances of pulling back muscles. Failure to comply with this rule can result in long term injury.



SECTION 6: Battery and Power Rules

General Power Safety

Safe practices involving power and batteries can help to avoid serious injuries. Safe power procedures protect against the chance of electrocution which can lead to serious injury and/or death. Taking good care of batteries avoids acid spills. It is essential to know how to take care of all of your electrical equipment properly.

1. Keep an eye out for electrical problems or symptoms of poor electrical management. For example, dimming of lights, blown fuses, frequent circuit breaker trips, etc.
2. When supplying additional light to an area, be sure to use light bulbs that are of the proper wattage for the fixture. Keep flammable objects away from the appliance. Degraded wires in and around the fixture can be a telltale sign that the bulb wattage is too high.

Battery and Power Rules

1. Know the location and path of all wires and power cords that carry electrical current.
2. Have a set location for robot batteries and create an organized battery charging station.
3. Keep batteries in the battery box while charging. This keeps them out of the way and eliminates tripping hazards.
4. Keep a record of which batteries are charged and which are not. Use this record when determining which battery to use on the robot during a competition.
5. Insert plugs into a battery's connector after the battery is fully charged. The battery plug serves as a flag to easily show which batteries are charged and stops any electrical leaks that can sometimes occur when a battery has remained off of a charger for a long period of time. It also prevents unwanted contact and discharge of the battery. When it is ready to be used, simply pull the plug out of the connector before installing the charged battery into the robot.
6. Keep unused battery plugs near the battery chargers.
7. Make sure everyone carries the battery by the base and sides and are not carrying them by the lead wires or wire connectors. Carrying the battery improperly can result in loose connections.
8. Frequently inspect the batteries to check for loose connections at the battery posts and at the connector. Loose connections on battery lead wires lose FIRST matches and present an electrical danger to those handling the robot.

SECTION 7: Setting Up Marketing Displays

Setting up an Indoor Display

1. Ensure that the display does not block emergency exits or limit evacuation efficiency. The display should create a safe and enjoyable working atmosphere.
2. Verify that the display is stable on its own.
3. Anchor the display to the floor or attach it to a wall or support structure using appropriate hardware whenever possible.
4. Shelving and display edges should have no sharp corners or edges and must be rated to support the amount of weight intended for them.
5. Place objects, particularly heavy objects, as far back as possible from the front end and make sure that they are properly secured.
6. Place electrical cords in a safe and organized manner so that they will not cause tripping hazards, be accidentally snagged, and are out of the reach of children.
7. If leaving the display unattended, remove items that might tempt children to climb or tamper with the display.
8. All flammable or combustible items should not be in contact or close range of hot devices.
9. Make sure the display follows all rules listed under the power and battery rules section.

Setting up an Outdoor Display

1. Keep all of the following objects at a reasonable distance away from power lines at all times.
 - Banners
 - Ladders
 - Tools
 - Flags
 - Robots
 - Vehicles
2. Never assume that an overhead power line, power cable, or extension cord is electrically insulated. It is safer to assume that coming in contact with any power carrying device could be lethal.
3. Properly ground all metallic poles, masts, and support structures in accordance with electrical codes.

SECTION 8: Lockout Tagout

Based on OSHA 1910.147(c)



Lockout/Tagout is a program designed to protect people from hazardous energy sources on machines and equipment during service and maintenance.

Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, or other hardware are provided to those authorized to use equipment. All parts are meant for securing or blocking the use of machines or equipment from use during maintenance.

Lockout: Placing a locking device to prevent use of equipment until removal of the device itself

Tagout: The action of placing a lockout device on a piece of equipment

Tagout Devices

Tagout devices warn against hazardous conditions if the machine or equipment is “On” and includes a legend such as the following:

Do Not Start.

Do Not Open.

Do Not Close.

Do Not Energize.

Do Not Operate.

Tagout devices, including their means of attachment, are substantial enough to prevent accidental removal, and can only be removed by hand, self-locking, and therefore non-releasable.

Tagout devices are typically of nylon material and can withstand up to 50 pounds of force.

Lockout devices

Lockout devices are substantial enough to prevent removal (unless using unusual techniques, such as with the use of bolt cutters or other metal cutting tools).

Lockout/Tagout: Standardized

Lockout and tagout devices shall be standardized within the facility in at least one of the following criteria:

Color; shape; or size; and additionally, in the case of tagout devices, print and format are also standardized.

Picture Credit: Seton Signs, Labels, and Safety Solutions – A Brady Corp.

SECTION 9: Safety Emergencies

What to do in case of an electrical, chemical, or medical emergency.

Battery Spill

1. AVOID ALL PHYSICAL CONTACT WITH THE ACID. The acid is corrosive and can cause severe damage to skin.
2. Inform a Mentor or the Safety Captain.
3. The mentor or Safety Captain who cleans up the spill must wear rubber gloves and/or must have training in how to dispose of hazardous material and/or neutralize it
 - a. Neutralize the battery acid with baking soda.

Fire

1. Evacuate all non-necessary personal and spectators from the area/building
 - a. Notify a Mentor or Safety Captain so they may extinguish the fire
2. Mentors/Safety Captains: Use the correct type of fire extinguisher (see below), and if possible use an ABC fire extinguisher
 - a. Tell pit admin or local authorities
3. Disconnect the equipment from all power sources
4. After the fire is out, check for fire damage on the equipment and surrounding area

SAFETY HAZARD: Objects that survive the fire may be hot.

Types of Extinguishers:

A – ashes : used for wood fires

B – boiling : used for oil fires

C – circuits : used for electrical fires

Note

- There are several major sources of fires, including but not limited to: Wood; electrical; oil; plastic; kitchens; and etc.
- There are three components that make up a fire: oxygen, heat and fuel.

How to stop a fire:

- a. Remove oxygen by blocking the fire off (place a lid on a burning pan), remove heat by water or cold.
- b. Remove fuel by having the fire consume it all, or separating fuel source from mechanical/electrical fires.

- Water doesn't always extinguish fires and in some cases, may make it worse. Analyze the source of the fire and speak with a Mentor or Safety Captain before use of any materials to handle a fire.

All Medical Emergencies

For all Medical Emergencies, contact a team First Responder.

- Communicate with victim if they would like your assistance before assisting unless they are unconscious. If the victim is unconscious, you can assist them without their consent.
- Check the area that the victim is in to be sure that you or the victim will not be further injured. This is especially true of electrical hazards and/or moving equipment.
- Use personal protective equipment (PPE) to prevent disease transmission if in contact with bodily fluids

Minor Medical Emergencies

1. Small Cuts

- a. Clean the area and apply triple anti-biotic ointment if there is no chance of allergy
- b. Apply Band-Aid to prevent infection

2. Bumps and Bruises

- a. Stop working if necessary
- b. Ice if necessary for no more than 15 minutes

3. Mild Burn

- a. Remove source of heat
- b. Run cool - NOT COLD - water over the burn
- c. Dry gently and apply Aloe Vera if necessary
- d. Take medicine to reduce pain if permissible from Mentor, parent, or victim allows

4. Stress

- a. Practice relaxation breathing techniques
- b. Muscle Relaxation
- c. Shoulder Shrugs and Squeezes
- d. Physical Exercise
- e. Discuss improvements for time management

5. Strains, Sprains, Breaks

- a. Rest
- b. Splint (if necessary and with supervision of medical professional)
- c. Ice if necessary for no more than 10 minutes at a time
- d. Elevate injured area above heart level
- e. Seek further medical advice if pain doesn't cease

6. Conscious Choking

- a. Give back blows
 - i. Lean the person forward.
 - ii. Place the heel of the hand on the person's back between the shoulder blades.
 - iii. Give 5 back blows.

- b. Give abdominal thrusts
 - i. With one or two fingers of one hand, find the person's bellybutton.
 - ii. Make a fist with other hand and place the thumb side of your fist against the person right above your fingers at the bellybutton.
 - iii. Grasp your fist with your other hand.
 - iv. Give 5 abdominal thrusts.
- c. Repeat step a., then step b. until the object is dislodged or the victim becomes unconscious and contact EMS.



Abdominal Thrusts--hopkinsmedicine.org

Major Medical Emergencies

1. Allergic Reaction

- a. Contact local authorities (and Pit Admin if at a FIRST event)
- b. Ask the victim if they have known allergies
 - i. If they do, ask if they have an EpiPen®. If they need assistance with the EpiPen®, contact a first responder

2. Shock –

HAZARD! BE AWARE OF YOUR ENVIRONMENT. LIVE POWER SOURCES CAN PASS ENERGY THROUGH MULTIPLE PEOPLE

- a. Symptoms of shock
 - i. Restlessness or irritability
 - ii. Altered consciousness (e.g., drowsy, confused or dazed, or passing out)
 - iii. Nausea (sick to the stomach)
 - iv. Pale or ashen (gray), cool, moist skin
 - v. Fast breathing
 - vi. Fast pulse
- b. If shock is indicated, contact local authorities (and Pit Admin if at a FIRST event)
 - i. Have the person lie down, as this is often the most comfortable position
 - ii. Control any external bleeding with First Aid equipment
 - iii. Calm and reassure the victim
 - iv. Raise the victim's legs about 12 inches unless you suspect head, neck or back injuries, or a broken hip or leg
 - v. Help the victim maintain a normal body temperature; if the victim is cold, cover them with a blanket or warm clothing
 - vi. Do not give the victims anything to eat or drink, even though they may request it

- c. Keep the person warm
 - d. Try and keep them calm and awake
 - e. Seek the source of shock. Use a non-conductive object such as a broom handle to remove the source of shock if that can be accomplished in a safe manner
3. Severe Bleeding
- a. Follow standard precautions to prevent disease transmission (such as wearing non-latex disposable gloves and other PPE such as eyewear or masks, if available)
 - b. Cover the wound with a dressing and press firmly against the wound (this is called direct pressure) until the bleeding stops
 - c. Secure the dressing with a roller bandage. Tie knot directly over the wound
 - d. Check the fingers (or toes) for feeling, warmth and color to make sure the bandage is not excessively tight
 - e. If bleeding does not stop, apply additional dressings and bandages and continue to apply direct pressure.
 - f. Contact local authorities (and Pit Admin if at a FIRST event)
 - g. Care for shock victim and continue to monitor them until help arrives.
4. Moderate Burn
- a. Remove the source of heat
 - b. Cool the burn with cold water
 - c. Cover the burn loosely with a sterile dressing and care for shock
 - d. Do not break blisters; loosely cover blisters with a sterile dressing
 - e. For a serious burn, contact local authorities (and Pit Admin if at a FIRST event).
5. Heart Attack/Stroke
- a. Check for signs of a heart attack
 - i. Chest pain or discomfort lasting more than 3-5 minutes or that goes away and comes back
 - 1. Signs of pain are that it is not relieved by rest, changing position or medication and may spread to shoulder, arm, back, stomach, neck or jaw
 - ii. Trouble breathing
 - 1. Breathing is often faster than normal
 - 2. Person feels short of breath
 - iii. Nausea
 - iv. Sweating or changes in skin appearance
 - v. Dizziness or unconsciousness
 - vi. Victim may complain of heartburn or indigestion
 - vii. Victim may deny that anything serious is wrong
 - b. If heart attack is indicated, contact local authorities (and Pit Admin if at a FIRST event)
 - i. Communicate with victim to the importance of stopping activity and rest
 - ii. Try to obtain additional information about the victim's condition
 - iii. Comfort the victim
 - iv. Assist with medication, if prescribed and victim asks for assistance
 - v. Monitor the victims condition
 - vi. Be prepared to give CPR and to use an AED machine

- c. Check for signs of a stroke
 - i. Sudden body weakness or numbness, often on one side
 - ii. Sudden facial drooping or weakness on one side of the face
 - iii. Trouble speaking or being understood when speaking
 - iv. Trouble seeing in one or both eyes
 - v. Sudden severe headache
 - vi. Dizziness and/or loss of balance
 - vii. Looking or feeling ill, abnormal behavior or confusion
 - d. If stroke is indicated, contact local authorities (and Pit Admin if at a FIRST event)
 - i. If there is fluid or vomit in an unconscious person's mouth, position them on one side to allow any fluid to drain out of the mouth.
 - 1. May require removing material from the person's mouth
 - ii. If the victim is conscious, offer comfort and reassurance
 - iii. Have the victim rest in a comfortable position
 - iv. Do not give the victim anything to eat or drink – even when asked by the victim
6. Head, Neck, or Back Injury
- a. Contact local authorities (and Pit Admin if at a FIRST event)
 - b. Do not move the victim unless further injury will occur
 - c. Hold the victim's head and neck still.
 - d. If the victim is conscious, encourage them to remain calm and still
7. Poisoning
- a. Ingested Poison
 - i. Contact the Poison Control Center at 1-800-222-1222.
 - ii. If the person is unconscious, there is a change in the level of consciousness, or if another life threatening injury is present, contact local authorities (and Pit Admin if at a FIRST event)
 - b. Inhaled Poison
 - i. Move the victim to fresh air
 - ii. Monitor the victim's airway, breathing and circulation
 - iii. If conscious, keep the victim comfortable
 - c. Poisonous Plants
 - i. Remove exposed clothing and wash the exposed area thoroughly with soap and water as soon as possible after contact
 - ii. If rash or wet blisters develop, advise the victim to see their health care professional as soon as possible
 - iii. If the condition spreads to large areas of the body or face, have the victim seek medical attention and/or EMS
8. Seizure
- a. If the victim is known to have periodic seizures, there is no need to summon EMS
 - b. You do need to summon EMS personnel if –
 - i. The seizure lasts more than 5 minutes
 - ii. The victim has multiple seizures
 - iii. The victim appears to be injured
 - iv. The victim is pregnant

- v. The victim is a diabetic
- vi. The victim fails to regain consciousness
- vii. The seizure occurs in the water
- c. Remove any objects from near the victim so they cannot harm themselves
- d. When the seizure is over, check to be sure they have not injured themselves
- e. Stay with the victim until fully conscious and aware of their surroundings