Tech Fire

FIRST® ROBOTICS – TEAM #225

Y A L U

York-Adams-Lancaster United

TEAM SAFETY MANUAL

2011 Competition Season

Team Student Safety Co-Captains: Alec Bogart

Safety Mentor: Jim Bogart

Team President: Chuck Thomas

GOAL

The goal of this manual is to provide a foundation for FRC Team 225 to develop and maintain safe and enjoyable work environments both in its facilities and at competitions.

SCOPE

The responsibilities of all team members are described, safe work practices are reviewed, training and testing requirements are outlined, and record-keeping requirements are defined.

RESPONSIBILITIES

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

- Developing specific safety procedures
- Training the Student Safety Captain to be able to coordinate training of all participants
- Maintaining an up-to-date list of Material Safety Data Sheets (MSDS)
- Training the Student Safety Captain on emergency procedures for all items covered by the MSDS sheets.

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

- Performing and tracking safety training of all participants,
- Providing support to participants on safety questions
- Performing safety audits and maintain records of infractions and corrective actions
- Knowing where the MSDS binder is stored and having access to it at all times while the robot area is occupied.
- Learning the emergency procedures for all items coved by the MSDS system.

Participants
The participants' responsibilities include but are not limited to:

- Maintaining a safe work environment
- Following safety instructions
- Participating in all required safety training
- Reminding others when unsafe practices are witnessed
- Providing feedback to the Student Safety Captain on safety issues as they arise.

The entire team is responsible for ensuring the safety of all participants. Everyone is expected to behave in a respectful manner at all times, both at the home base and at competitions.

SAFETY PROCEDURES

Specific safety procedures to be developed and disseminated to the participants through the Student Safety Captain or other appropriate experts are:

1. General Safety Practices
2. Machine Shop Safety Practices and Proper Use of Hand-Held Tools
3. Proper Use of Electrical Devices
4. Lockout/Tagout Procedures
5. Techniques for Lifting or Raising the Robot
6. Safe Practices with Energy Storage Devices
7. Proper Handling of Wet-Cell Batteries

These procedures are given in Appendix A of this manual.

TRAINING

A student shall not be allowed to use items nor participate in procedures covered by the above-listed safety procedures until it has been certified and recorded that the student has been fully trained by either the Student Safety Captain or one of the mentors for the respective procedures. This applies to all participants. Training records for each participant are to be kept and maintained by the Student Safety Captain.

The Participant Training Record Form is given in Appendix B.

INSPECTION/AUDITING

Home Base Construction Area

The Home Base Construction areas should be inspected at least once during any day participants are using them. The areas include: robot build area, machine shop, team classroom area, practice field. The inspection must be logged on a *Team 225 Safety Inspection Form* and filed appropriately in the Safety Manual Binder.

A separate form shall be filled out for each area inspected and the inspector shall sign the bottom of each form.

Competition Pit Area

Competition Pit Areas shall be inspected each morning before the team starts working on the robot. The inspection must be logged on a *Team 225 Safety Inspection Form* and filed appropriately in the Safety Manual Binder.

Authorized Inspectors

Persons authorized to perform official safety inspections are, in order of preference:

1. Student Safety Co-Captains
2. Safety Mentor
3. Student participants specifically named by the Safety Mentor or Team President**
4. All other Mentors

**inspection form shall be initialed by a mentor or Team President

Safety Violation Reporting and Corrective Actions

When a safety violation is noted, whether during a regular inspection or during the normal course of the working time, it should be recorded on a *Team 225 Safety Inspection Form* and filed in chronological order with the form from the regularly scheduled safety inspections. Each violation should be accompanied by a corresponding Corrective Action report. The Corrective Action report should be either written on the inspection form on which the violation was reported, or written on a separate sheet and attached (stapled) to the respective inspection form.

APPENDIX A
SAFETY PROCEDURES

SAFETY PROCEDURE #1
General Safety Requirements

(Parts of this procedure are copied from the document *FIRST Robotics Competition TEAM SAFETY Manual)*

General Safety Guidelines

- Non-tinted, ANSI-approved safety glasses should be worn by all participants while in the robot build area and other areas where tools are used.
- Closed-toe shoes should be worn at all times while in build/work areas and at competitions.
- Work gloves should be worn whenever handling heavy or sharp items or when working with tools as appropriate.
- Always lift with your legs, not your back to prevent back strain/injury.
- Always walk and work in a thoughtful manner.

Basic Cleanliness and Organization

- Electrical cords should not be laid across walkways nor in other areas where team members may be walking, without being properly secured or covered. This is a possible tripping hazard.

NOT ACCEPTABLE ACCEPTABLE

(Photos from Los Alamos National Laboratory, EFCOG Electrical Improvement Project)

- Items that protrude into the workspace, such as boards, metal bars, pipes, etc. shall be properly marked with brightly colored flags, respectively, to alert participants who must walk or work around these items. This is a possible tripping and puncture hazard.

Example of Proper Flagging

- Loose items, such as tools, fasteners, and assorted parts should not be placed on the floor in the work area, except for areas specifically designated for such. This is a possible tripping hazard.

- When not in use, cutting tools such as box cutters, metal shears, knives, and saws should be either closed or sheathed. This is a possible laceration hazard.

- The build and work areas shall be kept free of trash and debris and should be swept daily.

SAFETY PROCEDURE #2
Machine Shop Safety Practices and Proper Use of Hand-Held Tools

(Sections of this Procedure are copied from OSHA 3080 and modified)

Participants should be trained in the proper use of all tools. They should be able to recognize the hazards associated with the different types of tools and the safety precautions necessary.

Five basic safety rules can help prevent hazards associated with the use of hand and power tools:

- Keep all tools in good condition with regular maintenance.
- Use the right tool for the job.
- Examine each tool for damage before use and do not use damaged tools.
- Operate tools according to the manufacturers' instructions.
- Provide and use properly the right personal protective equipment.

Participants and mentors should work together to establish safe working procedures. If a hazardous situation is encountered, it should be brought immediately to the attention of the proper individual for hazard abatement.

The following sections identify various types of hand and power tools and their potential hazards. They also identify ways to prevent participant injury through proper use of the tools and through the use of appropriate personal protective equipment (PPE).

HAND TOOLS

Hand tools are tools that are powered manually. Hand tools include anything from axes to wrenches. The greatest hazards posed by hand tools result from misuse and improper maintenance. Some examples include the following:

- If a chisel is used as a screwdriver, the tip of the chisel may break and fly off, hitting the user or other participants.
- If a wooden handle on a tool, such as a hammer or an axe, is loose, splintered, or cracked, the head of the tool may fly off and strike the user or other participants.
- If the jaws of a wrench are sprung, the wrench might slip.
- If impact tools such as chisels, wedges, or drift pins have mushroomed heads, the heads might shatter on impact, sending sharp fragments flying toward the user or other participants.
- The Safety Team is responsible for the safe condition of tools and equipment used by participants. Unsafe hand tools shall not be issued for use. Participants should be trained in the proper use and handling of tools and equipment.
- Participants, when using saw blades, knives, or other tools, should direct the tools away from aisle areas and away from other participants working in close proximity. Knives and scissors must be sharp; dull tools can cause more hazards than sharp ones.
- Cracked saw blades must be removed from service.
- Wrenches must not be used when jaws are sprung to the point that slippage occurs. Impact tools such as drift pins, wedges, and chisels must be kept free of mushroomed heads.
- The wooden handles of tools must not be splintered.
- Iron or steel hand tools may produce sparks that can be an ignition source around flammable substances. Where this hazard exists, spark-resistant tools made of non-ferrous materials should be used where flammable gases, highly volatile liquids, and other explosive substances are stored or used.

POWER TOOLS

Appropriate personal protective equipment such as safety goggles and gloves must be worn to protect against hazards that may be encountered while using hand tools. Workplace floors shall be kept as clean and dry as possible to prevent accidental slips with or around dangerous hand tools. Power tools must be fitted with guards and safety switches; they are extremely hazardous when used improperly. The types of power tools are determined by their power source: electric, pneumatic, liquid fuel, hydraulic, and powder-actuated.

To prevent hazards associated with the use of power tools, workers should observe the following general precautions:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords and hoses away from heat, oil, and sharp edges.
- Disconnect tools when not using them, before servicing and cleaning them, and when changing accessories such as blades, bits, and cutters.
- Keep all people not involved with the work at a safe distance from the work area.
- Secure work with clamps or a vise, freeing both hands to operate the tool.
- Avoid accidental starting. Do not hold fingers on the switch button while carrying a plugged-in tool.
- Maintain tools with care; keep them sharp and clean for best performance.
- Follow instructions in the user's manual for lubricating and changing accessories.
- Be sure to keep good footing and maintain good balance when operating power tools.
- Wear proper apparel for the task. Loose clothing, ties, or jewelry can become caught in moving parts.
- Remove all damaged portable electric tools from use and tag them: "Do Not Use."

GUARDS

The exposed moving parts of power tools need to be safeguarded.
Belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains, or other reciprocating, rotating, or moving parts of equipment must be guarded.
Machine guards, as appropriate, must be provided to protect the operator and others from the following:

- Point of operation.
- In-running nip points.
- Rotating parts.
- Flying chips and sparks.

Safety guards must never be removed when a tool is being used. Portable circular saws having a blade greater than 2 inches (5.08 centimeters) in diameter must be equipped at all times with guards. An upper guard must cover the entire blade of the saw. A retractable lower guard must cover the teeth of the saw, except where it makes contact with the work material. The lower guard must automatically return to the covering position when the tool is withdrawn from the work material.

OPERATING CONTROLS AND SWITCHES

The following hand-held power tools must be equipped with a constant-pressure switch or control that shuts off the power when pressure is released: drills; tappers; fastener drivers; horizontal, vertical, and angle grinders with wheels more than 2 inches (5.08 centimeters) in diameter; disc sanders with discs greater than 2 inches (5.08 centimeters); belt sanders; reciprocating saws; saber saws, scroll saws, and jigsaws with blade shanks greater than 1/4-inch (0.63 centimeters) wide; and other similar tools. These tools also may be equipped with a "lock-on" control, if it allows the worker to also shut off the control in a single motion using the same finger or fingers. The following hand-held power tools must be equipped with either a positive "on-off" control switch, a constant pressure switch, or a "lock-on" control: disc sanders with discs 2 inches (5.08 centimeters) or less in diameter; grinders with wheels 2 inches (5.08 centimeters) or less in diameter; platen sanders, routers, planers, laminate trimmers, nibblers, shears, and scroll saws; and jigsaws, saber and scroll saws with blade shanks a nominal 1/4-inch (6.35 millimeters) or less in diameter. It is recommended that the constant- pressure control switch be regarded as the preferred device. Other hand-held power tools such as circular saws having a blade diameter greater than 2 inches (5.08 centimeters), chain saws, and percussion tools with no means of holding accessories securely must be equipped with a constant-pressure switch.

ELECTRIC TOOLS

Participants using electric tools must be aware of several dangers. Among the most serious hazards are electrical burns and shocks. Electrical shocks, which can lead to injuries such as heart failure and burns, are among the major hazards associated with electric powered tools. Under certain conditions, even a small amount of electric current can result in fibrillation of the heart and death. An electric shock also can cause the user to fall off a ladder or other elevated work surface and be injured due to the fall. To protect the user from shock and burns, electric tools must have a three-wire cord with a ground and be plugged into a grounded receptacle, be double insulated, or be powered by a low voltage isolation transformer. Three-wire cords contain two current carrying conductors and a grounding conductor. Any time an

adapter is used to accommodate a two-hole receptacle, the adapter wire must be attached to a known ground. The third prong must never be removed from the plug. Double-insulated tools are available that provide protection against electrical shock without third-wire grounding. On double insulated tools, an internal layer of protective insulation completely isolates the external housing of the tool. The following general practices should be followed when using electric tools:

- Operate electric tools within their design limitations.
- Use gloves and appropriate safety footwear when using electric tools.
- Store electric tools in a dry place when not in use.
- Do not use electric tools in damp or wet locations unless they are approved for that purpose.
- Keep work areas well lighted when operating electric tools.
- Ensure that cords from electric tools do not present a tripping hazard.

PORTABLE ABRASIVE WHEEL TOOLS

Portable abrasive grinding, cutting, polishing, and wire buffing wheels create special safety problems because they may throw offflying fragments. Abrasive wheel tools must be equipped with guards that:

1. cover the spindle end, nut, and flange projections;
2. maintain proper alignment with the wheel;
3. do not exceed the strength of the fastenings.

Before an abrasive wheel is mounted, it must be inspected closely for damage and should be sound- or ring-tested to ensure that it is free from cracks or defects. To test, wheels should be tapped gently with a light, non-metallic instrument. If the wheels sound cracked or dead, they must not be used because they could fly apart in operation. A stable and undamaged wheel, when tapped, will give a clear metallic tone or “ring.” To prevent an abrasive wheel from cracking, it must fit freely on the spindle. The spindle nut must be tightened enough to hold the wheel in place without distorting the flange. Always follow the manufacturer’s recommendations. Take care to ensure that the spindle speed of the machine will not exceed the maximum operating speed marked on the wheel. An abrasive wheel may disintegrate or explode during start-up. Allow the tool to come up to operating speed prior to grinding or cutting. The employee should never stand in the plane of rotation of the wheel as it accelerates to full operating speed. Portable grinding tools need to be equipped with safety guards to protect workers not only from the moving wheel surface, but also from flying fragments in case of wheel breakage.

When using a powered grinder:

- Always use eye or face protection.
- Turn off the power when not in use.
- Never clamp a hand-held grinder in a vise.

PNEUMATIC TOOLS

Pneumatic tools are powered by compressed air and include chippers, drills, hammers, and sanders. There are several dangers associated with the use of pneumatic tools. First and foremost is the danger of getting hit by one of the tool's attachments or by some kind of fastener the worker is using with the tool. Pneumatic tools must be checked to see that the tools are fastened securely to the air hose to prevent them from becoming disconnected. A short wire or positive locking device attaching the air hose to the tool must also be used and will serve as an added safeguard. If an air hose is more than 1/2-inch (12.7 millimeters) in diameter, a safety excess flow valve must be installed at the source of the air supply to reduce pressure in case of hose failure. In general, the same precautions should be taken with an air hose that are recommended for electric cords, because the hose is subject to the same kind of damage or accidental striking, and because it also presents tripping hazards. When using pneumatic tools, a safety clip or retainer must be installed to prevent attachments such as chisels on a chipping hammer from being ejected during tool operation. Pneumatic tools that shoot nails, rivets, staples, or similar fasteners and operate at pressures more than 100 pounds per square inch (6,890 kPa), must be equipped with a special device to keep fasteners from being ejected, unless the muzzle is pressed against the work surface. Airless spray guns that atomize paints and fluids at pressures of 1,000 pounds or more per square inch (6,890 kPa) must be equipped with automatic or visible manual safety devices that will prevent pulling the trigger until the safety device is manually released.

HYDRAULIC POWER TOOLS

The fluid used in hydraulic power tools must be an approved fire resistant fluid and must retain its operating characteristics at the most extreme temperatures to which it will be exposed. The exception to fire-resistant fluid involves all hydraulic fluids used for the insulated sections of derrick trucks, aerial lifts, and hydraulic tools that are used on or around energized lines. This hydraulic fluid shall be of the insulating type.

The manufacturer's recommended safe operating pressure for hoses, valves, pipes, filters, and other fittings must not be exceeded. All jacks—including lever and ratchet jacks, screw jacks, and hydraulic jacks—must have a stop indicator, and the stop limit must not be exceeded. Also, the manufacturer's load limit must be permanently marked in a prominent place on the jack, and the load limit must not be exceeded. A jack should never be used to support a lifted load. Once the load has been lifted, it must immediately be blocked up. Put a block under the base of the jack when the foundation is not firm, and place a block between the jack cap and load if the cap might slip.

To set up a jack, make certain of the following:

- The base of the jack rests on a firm, level surface;
- The jack is correctly centered;
- The jack head bears against a level surface; and
- The lift force is applied evenly.

Proper maintenance of jacks is essential for safety. All jacks must be lubricated regularly. In addition, each jack must be inspected according to the following schedule:

1. for jacks used continuously or intermittently at one site—inspected at least once every 6 months,
2. for jacks sent out of the shop for special work— inspected when sent out and inspected when returned, and
3. for jacks subjected to abnormal loads or shock—inspected before use and immediately thereafter.

SAFETY PROCEDURE #3
Proper Use of Electrical Devices

(Parts of this procedure are copied from the document *FIRST Robotics Competition TEAM SAFETY MANUAL*, page 10.)

Proper use and respect for electricity is paramount. The following are general guidelines for ensuring basic electrical safety requirements are met.

- Only use appliances and cords that have been approved by recognized authorities such as Underwriters' Laboratories (UL) or ETL. Examples of the markings to look for are:

- Inspect your equipment cords and extension cords routinely to ensure they are in good condition. Conditions to look for include:
    - Cracked, torn, or worn insulation
    - Corroded prongs
    - Missing or damaged prongs

UNACCEPTABLE

- DO NOT overload electrical fixtures and/or receptacles.

UNACCEPTABLE

(photos from Grays Harbor PUD, Aberdeen, WA)

- Avoid the following electrical / power supply setups to prevent overloading:
    - Power strip plugged into another power strip.
    - Extension cord plugged into another extension cord.
    - Extension cord plugged into a power strip.
    - Multi-device receptacle plugged into a power strip or extension cord.
    - USE THE CORRECT SIZE EXTENSION CORD as detailed below.

Sizing an Extension Cord

(from: http://www.askthebuilder.com/B174_Extension_Cord_Size_Chart.shtml)

Step 1
Determine the amperage of the tool(s) being used. Here is a handy list of some common electric power tools. The average amperage is listed below the tool. Always check on your tool label for its specific amperage.

Circular saw – 12 to 15 amps
Power drill – 3 to 7 amps
Table saw – 15 to 20 amps
Reciprocating hand-held saw (Sawzall) – 6 to 8 amps

Step 2
Calculate the length of the cord you will need. Of course you want to determine the maximum distance you think you will be from a permanent electrical outlet.

Step 3
Use the following list to select the proper gauge extension cord. Remember, wire gauge refers to the thickness of the actual copper wire. As a wire gets thicker it can carry more electricity (amps). To confuse us, someone long ago decided that as a wire gets thicker (bigger) the gauge number should get smaller!

16 Gauge Cords - Any 16 gauge cord between 0 and 100 feet long will adequately handle tool loads up to 10 amps.

14 Gauge Cords - Any 14 gauge cord between 0 and 50 feet long will adequately handle loads between 10 and 15 amps.

12 Gauge Cords - If your tool load is between 10 and 15 amps and the length of the cord is 50 to 100 feet, you need a 12 gauge cord to safely power any tool.

SOLDERING

Soldering can be dangerous because of the heat from the iron and the chemical fumes and vapors released from the solder and flux, respectively. When soldering, observe the following points:

- **NEW** - **At *FIRST* events:** Use lead-free solder only and solder with electrically heated soldering iron/gun only.
- No torches or open flames of any kind are allowed in the buildings.
- Wear eye and face protection.
- Solder in well-ventilated areas.
- Never touch the iron/gun. It heats to extreme temperatures that will cause severe burns.
- Prevent burns: Wear cotton clothing that covers your arms and legs.
- Always wash your hands with soap and water after handling solder.
- Work on a fire resistant surface.
- Keep your soldering iron in its protective holder when not actually being used.
- Do not leave any hot tools, such as a hot drill bit, where someone can accidentally contact the hot element

SAFETY PROCEDURE #4
Tagout Procedure

Any device that is faulty such that it can cause injury to anyone if used in the faulty condition shall be removed from service. Items that cannot be removed immediately from the build areas require a Lockout tag to be installed. The Lockout tag is similar to that shown below:

The tag must be filled out by either a Student Safety Captain, mentor, or facility maintenance person. The information required is:

- Name of device being locked out
- Brief description of device fault
- Lockout date
- Name of person performing the Lockout

Each tag shall be numbered sequentially and the Lockout information must be kept in a log as part of the Team 225 Safety Manual.

The tag must be securely fastened to the faulty device, preferably with a nylon cable tie.

The only persons authorized to remove a Lockout tag are: Student Safety Captains, mentors, and facility maintenance personnel. Immediately upon removal, the person who removed the tag must sign it and also provide the date the tag was removed. The tag shall then be filed in the Team 225 Safety Manual and the log filled in to indicate the removal date.

SAFETY PROCEDURE #5
Techniques for Lifting or Raising the Robot

Communication and proper lifting techniques are necessary for safe lifting of the robot. The following requirements must be followed in order to accomplish this:

- A team of 3 persons is required – two to lift the robot and one to maneuver and operate the jack cart.
- One person will be designated as the lifting team leader. This person will direct the others on when to lift and when to lower the robot. This applies to both unloading and loading the robot from/to the jack cart and any other location as needed.
- The lifting points must be clearly marked on the robot. Team participants must use these locations exclusively in order to prevent personal injury and damage to the robot and jack cart.
- When the robot is being worked on in the competition pit area, it must be elevated on the jack cart to a reasonable height to prevent back strain. The jack must be in a locked/safety position or have a block placed such that the jack cannot be unintentionally lowered.

SAFETY PROCEDURE #6
Safe Practices with Energy Storage Devices

Communication is essential for safe operation around energy storage devices. Energy storage devices include:

- Springs / bands
- Air cylinders
- Capacitors
- Flywheels

The following requirements must be followed in order to accomplish this:

- All devices must have a respective indicator (examples: light, klaxon) to indicate that the device is energized. The signal should be appropriate for the purpose and should be chosen considering any team participants with disabilities.
- All devices should have either a guard or a lockout device to prevent unintentional deployment or energy release.

SAFETY PROCEDURE #7
Proper Handling of Wet-Cell Batteries

(This Procedure is copied from the document *FIRST Robotics Competition TEAM SAFETY MANUAL*, pages 7 – 9.)

CAUTION: Batteries contain acid. This substance, H_2SO_4, is a corrosive, colorless liquid that will burn your eyes, skin, and clothing. The team mentor and safety captain should post the Material Safety Data Sheet (MSDS) and train all team members about battery safety. You can find Emergency handling and first aid on the MSDS, proper protection for handling cracked or damaged batteries, and information on disposal of the battery.

http://www.mkbattery.com/images/MSDS_smallsealed_line.pdf

General Damaged Battery Information/Warnings

Any battery that is visibly damaged in any way is dangerous and unusable, and should be set aside and handled accordingly because:

1. It contains stored electrical energy that could cause the battery to rapidly heat up due to an internal electrical short circuit, and possibly explode.
2. The 12V batteries *FIRST* provided in your Kit contain sulfuric acid that will burn human tissue on contact.

* Immediately flush any contacted skin with a large quantity of water
* Seek medical treatment

Periodically inspect your batteries for any signs of damage or leaking electrolyte. Remember that a dropped battery may be cracked, but the crack may not be visible and might eventually leak electrolyte.

* Don't take a chance. Don’t use it.
* Treat it as a hazardous material and process it in accordance with the battery's MSDS.

Necessary Safety Materials

FIRST recommends that teams keep the following items readily available whenever working with batteries:

1. A box of bicarbonate of soda to neutralize any exposed acid electrolyte.

2. A pair of acid-resistant rubber or plastic leak-proof gloves to wear when handling a leaking battery.

3. A suitable non-metallic leak-proof container in which to place the defective battery.

Procedure for Handling a Leaking Battery

When an electrolyte leak occurs:

- Neutralize it by pouring the bicarbonate of soda on all wetted surfaces. The bicarbonate of soda itself is not dangerous, and will react with the acid in the electrolyte leaving a safe residue that can be disposed of in a conventional manner such as rinsing with water.

- Put on the gloves before handling the battery.

- Place the battery in the leak-proof container for removal.

- Be sure to neutralize any acid on the gloves before removing and storing them.

- Follow emergency handling instructions of the MSDS, and notify mentor.

- Seek medical attention.

- Properly dispose of the battery, which is now a hazardous material.

At a *FIRST* event:

- Immediately send the person in contact with acid to the First Aid Station/EMTs

- Report incident to the Pit Administration Supervisor so he/she can fill out an Incident Report. Provide team number and available information.

- Obtain sodium bicarbonate from the Pit Administration Supervisor and carefully sprinkle the sodium bicarbonate on the spill, then clean it and dispose of the now-neutralized cleanup materials in the trash.

- Dispose of the battery properly. Read below.

Battery Disposal

The Interstate Batteries Company http://www.interstatebatteries.com has volunteered to accept and properly dispose of any *FIRST* team's batteries, and you can find a location near you from the above web site. Most retailers of automotive batteries will accept and properly dispose of them at no cost.

Charging and Handling

- When a battery is neither connected to the robot nor the battery charger, use the battery protector safety plugs *FIRST* provides in the Kit of Parts.

- Keep the battery charging area clean and orderly.

- Place your battery charger in an area where cooling air can freely circulate around the
- charger. Battery chargers can fail without proper ventilation.

- Do not short out the battery terminals. If metal tools/parts contact the terminals
- simultaneously, it will create a direct short circuit. This may cause high heat to develop
- in the battery terminal/part/tool area and the battery could explode.

- If a quick disconnect is not available and you must use tools to disconnect the battery,
- make sure metal tools don't contact both terminals at the same time.

Ongoing Battery Inspection

- Periodically inspect your battery for any evidence of damage, such as a cracked case or leaking electrolyte.

- Bent terminals can also be a potential leak source.

- After each competition round, inspect the battery.

- Check your battery prior to competing in each round.

APPENDIX B

FORMS

PARTICIPANT TRAINING RECORD FORM
FIRST FRC Team 225

Participant name: Season: 2011

Initial Training

Procedure #	Description	Training Date	Certified by	Title
1				
2				
3				
4				
5				
6				
7				

Re-Training

Procedure #	Reason for Re-training	Training Date	Certified by	Title

SAFETY INSPECTION FORM
FIRST FRC Team 225

Inspector:

Inspection Date: Season: 2011

Build Area

Procedure #	Safety Violations	Corrective Actions Taken	Certified by	Date Corrected
1				
2				
3				
4				
5				
6				
7				

EQUIPMENT LOCKOUT FORM
FIRST FRC Team 225

Season: 2011

Date Tag Installed	Item Locked Out	Item Location	Lockout Inspector	Date Tag Removed	Removal Inspector