



# Combotics Robobrawl 2017

The goal of the Robobrawl competition is to provide a safe and exciting public display of robotic combat for iRobotics teams, iRobotics alumni, and hopefully teams from other universities. It will take place during Engineering Open House (EOH) on March 10th-11th, 2017, at a location to be announced. The following sections describe the format of the competition and the rules. Please contact Tor Shepherd at [tshephe2@illinois.edu](mailto:tshephe2@illinois.edu) with questions or for registration.

This event uses the standard RFL Tech Regs (listed later in the document) with modifications.

1. Structure of the Robobrawl
  - 1.1. The 2 tournaments in the Robobrawl are as follows: a double-elimination 30lb weight limit bracket (60lb for walkers, see RFL Tech Regs listed later) and a single-elimination 3lb weight limit bracket with rumbles.
  - 1.2. Matches will be 3 minutes in length unless a robot is deemed "inoperable" (cannot demonstrate translational movement) for 10 seconds.
  - 1.3. The winner of the match can be decided upon in 2 ways.
    - 1.3.1. The opposing robot is "knocked out" by ceasing all motion for 10 seconds.
    - 1.3.2. The match reaches the 3 minute time limit and the judges decide the winner (described in section 4)
  - 1.4. Bracket structure differs for the 30lb and 3lb tournaments.
    - 1.4.1. The 30lb competition is double elimination. Teams will be paired in the first round using a random number generating computer program. The winners will advance within the winners' bracket, and the losers will move to the losers' bracket. See [Wikipedia](#) for information on how double elimination brackets work.
    - 1.4.2. The 3lb competition is single elimination. Teams will similarly be paired randomly in the first round. The winners will progress, but

the losers will not be placed in an alternate bracket. Losers will be placed into rumbles.

- 1.5. Competitors will be allowed ample time on the first day between matches, but may be asked to compete more frequently as the number of teams still in the bracket decreases.
- 1.6. Rumble rules
  - 1.6.1. Rumbles do not count towards final standing in the main brackets, but winners will be declared.
  - 1.6.2. Rumbles will consist of more than two competitors in the arena. Regular rules apply, and safe preparation and shutdown are still required.
  - 1.6.3. The primary objective of the rumbles are to entertain the audience.
- 1.7. Each team will be allocated space in a "pit" area to perform repairs or preparation on their robot.
- 1.8. Testing of robots must ONLY occur in the test box prepared by iRobotics. Failure to comply will result in forfeiture of all future matches.
- 1.9. A maximum of 3 people may be in the arena at any time during preparation for a match (however, for multibots, you are allowed one additional person per additional bot).
2. Procedure for preparing robots in the arena for a match. Failure to comply with any of these rules could result in forfeiture of the match.
  - 2.1. The robot must NOT be operated for any reason prior to the beginning of the match except in the designated testing area.
  - 2.2. The competing robots will be placed in the arena with the manual disconnect switch(es) OFF.
  - 2.3. The drivers will set the controllers/transmitters in the designated area outside the arena with the power switched off.
  - 2.4. Once all robots have been correctly placed in their respective start areas with verification from the head referee, the competitors will turn on power to their robots with the controller remaining off.
  - 2.5. All competitors will then remove the manual weapon stop(s).
  - 2.6. All competitors will exit the arena.
  - 2.7. Once the head judge has verified that everything is safe to proceed, each driver will be instructed by the ref to pick up their controllers and turn on the power.
  - 2.8. Drivers may test that all systems are working properly for their robot while not leaving their starting square (or in the case of a rumble, while not engaging any opponent).

- 2.8.1. If any issues need to be addressed, each team is allowed one 15 minute delay during the course of the entire competition after following the power-down procedure (section 3).
- 2.8.2. If a team has already used their one delay, they must fight or forfeit the match.
- 2.9. If a delay is used, the next match may be asked to move up to the current time slot. If they are not able, another suitable match will be found.
- 2.10. After all motion of the robots from testing has ceased, the head referee will begin the countdown to begin the match. Each bot will be given a maximum of one warning per match for motion before countdown has finished. Any more infractions will result in forfeiture.
3. Procedure for powering down robots in the arena after a match has completed.
  - 3.1. The drivers will set the controllers/transmitters in the designated area outside the arena with the power switched off.
  - 3.2. Once they have received verification that it is safe to do so from the head referee, the competitors will enter the arena and insert the manual weapon stop(s).
  - 3.3. Competitors will then power down their robots using the manual disconnect switch(es).
4. Judge decisions.
  - 4.1. If both robots are still operable after the duration of the match, each robot will be scored based on the decisions of the judges
  - 4.2. Each judge will score a bot out of 11 based on the following criteria.
    - 4.2.1. 6 possible points can be awarded for damage inflicted.
    - 4.2.2. 5 possible points can be awarded for aggression.
  - 4.3. Based on these scores, each judge will select the bot they scored higher and “vote” for them.
  - 4.4. The bot that receives the most votes will be the winner for the match.

This competition uses a modified RFL (Robot Fighting League) ruleset. If any part of the next section contradicts the RFL rules outlined later, this section takes precedence. Additionally, some rules may be redundant to the RFL rules.

1. No weapons will be allowed to be pre-loaded prior to the start of the match. Springs must start in the free position, spinners must be completely stationary, etc. until the countdown to the match has finished. However, air tanks may be pre-compressed prior to the start of the match.
2. One robot may only “hold” another for 15 seconds.

- 2.1. Holding includes pinning, grasping, clamping, and immobilizing the bot in any way. This may be done by suspending a robot against the arena wall, one bot lifting another off the ground, or by other means.
- 2.2. One referee will begin a timer as soon as the “holding” action occurs and when 15 seconds is reached, the referee will instruct the driver of the holding bot to release the other.
- 2.3. The holding bot must then let go and back away enough to allow the other bot means of escape. The referees will use their discretion as to whether or not this has been met. If it has not been met, the driver of the holding bot will either be given a warning or forced to forfeit the match based on the blatancy of the driver’s actions.
3. If two bots become entangled with no means of untangling each other, the match will stop temporarily.
  - 3.1. Both drivers will turn off their controllers and place them in the designated area.
  - 3.2. When verified safe by the head referee, a member of each team will enter the arena and manually release the bots.
  - 3.3. The match will begin again with time resuming from when the entanglement occurred.
4. All competing robots must contain an active weapon system that makes offensive, articulated (independent of the drivetrain) contact with an opposing bot and comprises at least 20% of the robot’s weight. If you are unsure of whether or not your robot meets this requirement or if you have a unique weapon design that does not meet this requirement but is still capable of attacking an opposing robot and doing appreciable damage, please contact the event coordinator for approval.
5. Permanent magnets and electromagnets are permitted as long as they are not used offensively. Magnets inside of motors or magnets to grip the arena floor, for example, are permitted. Magnets to grip opponents or interfere with radio communication, for example, are not permitted. See section 12.1.4 of the tech regs (listed later) for clarification.
  - 5.1. If you plan to use magnets for non-standard purposes, please contact the event coordinator to verify that your bot meets this requirement.
6. Multibots are allowed if the sum of all of their weights do not exceed the weight limit of the tournament they are entered in.
  - 6.1. Multibots are defined as any number of separate robots.
  - 6.2. If one or more multibot(s) is a walker, the walker bonus will be applied for that bot ONLY. This means that if, for example, you have one 12lb

non-walking bot in the 30lb competition, you may build another walking one with a weight of up to  $(30-12)*2= 36$  lbs

7. All teams charging LiPoly batteries must have LiPoly sleeves or an equivalent fireproof solution in case of a battery fire.
8. No robot can ground any electric circuit off of its frame.
9. This competition will allow communication other than bound RC systems. In order to use an alternative remote communication system, the following requirements must be met.
  - 9.1. The communication system must properly failsafe whenever a loss of signal occurs (all remote systems must cease motion). This includes unintentional loss of signal and simply turning off your transmission device.
  - 9.2. Your transmission device must be capable of being turned off or otherwise disabled upon demand.
  - 9.3. If you plan on using a communication system based on a WiFi protocol, please be aware that the venue will likely have hundreds of active WiFi devices so please plan your systems accordingly.
  - 9.4. It is highly recommended that any robot using a communication system that is not a bound RC system contact the event manager before coming to the event to ensure that your communication system will be allowed. Please note that your robot will be disqualified if it is found that your communication system does not meet the standards of the event.

The next section is the RFL Technical Regs with modifications for this event. This is a more detailed list of rules. As noted, the previous rules take precedence over these if they are in conflict, but the RFL Tech Regs are more in-depth and explain many regulations more comprehensively.

1. General
  - 1.1. All participants build and operate robots at their own risk. Combat robotics is inherently dangerous. There is no amount of regulation that can encompass all the dangers involved. Please take care to not hurt yourself or others when building, testing and competing.
  - 1.2. This rule set is designed to for adjustment by each event depending on its safety concerns. Any parts of these rules [**bracketed in red**] are parts that may be changed or omitted from event to event. Text that is stricken (~~stricken~~) represents rules that are not applicable to this event.
  - 1.3. If you have a robot or weapon design that does not fit within the categories set forth in these rules or is in some way ambiguous or borderline, please

contact this event. Safe innovation is always encouraged, but surprising the event staff with your brilliant exploitation of a loophole may cause your robot to be disqualified before it ever competes.

- 1.4. Compliance with all event rules is mandatory. It is expected that competitors stay within the rules and procedures of their own accord and do not require constant policing.
- 1.5. Each event has safety inspections. It is at their sole discretion that your robot is allowed to compete. As a builder you are obligated to disclose all operating principles and potential dangers to the inspection staff.
- 1.6. Cardinal Safety Rules: Failure to comply with any of the following rules could result in expulsion or worse, injury and death.
  - 1.6.1. Radios may not be turned on at or near events for any purpose without obtaining the appropriate frequency clip or explicit permission from the event.
  - 1.6.2. Proper activation and deactivation of robots is critical. Robots must only be activated in the arena, testing areas, or with expressed consent of the event and its safety officials.
  - 1.6.3. All robots must be able to be FULLY deactivated, which includes power to drive and weaponry, in under 60 seconds by a manual disconnect .
  - 1.6.4. All robots not in an arena or official testing area must be raised or blocked up in a manner so that their wheels or legs cannot cause movement if the robot were turned on. Runaway bots are VERY dangerous.
  - 1.6.5. Locking devices: Moving weapons that can cause damage or injury must have a clearly visible locking device in place at all times when not in the arena. Locking devices must be painted in neon orange or another high-visibility color. Locking devices must be clearly capable to stopping, arresting or otherwise preventing harmful motion of the weapon.
  - 1.6.6. Weapon locking pins must be in place when weapon power is applied during a robot's power-on procedure. This includes all powered weapons regardless of the power source or weight class.
  - 1.6.7. It is expected that all builders will follow basic safety practices during work on the robot at your pit station. Please be alert and aware of your pit neighbors and people passing by.
2. Weight Classes. This event offers the listed weight classes in section 2.1. (Non-wheeled robots in the 340 class may receive a 35% bonus. There is no

weight bonus for shufflers or other forms of locomotion which are predicated on rolling - see 3.1.2 for a definition of a non-wheeled robot.)

2.1.

Rolling	Non-Wheeled
30 pounds	60 pounds
3 pounds	6 pounds

2.2- Sportsman Class [Omitted]

3. Mobility

3.1. All robots must have easily visible and controlled mobility in order to compete. Methods of mobility include:

- 3.1.1. Rolling (wheels, tracks or the whole robot)
- 3.1.2. Non-wheeled: non-wheeled robots have no rolling elements in contact with the floor and no continuous rolling or cam operated motion in contact with the floor, either directly or via a linkage. Motion is “continuous” if continuous operation of the drive motor(s) produces continuous motion of the robot. Linear-actuated legs and novel non-wheeled drive systems may qualify for this bonus. [If you have questions regarding whether or not your robot qualifies as walking, please contact this event] .
- 3.1.3. Shuffling (rotational cam operated legs)
- 3.1.4. Ground effect air cushions (hovercrafts)
- 3.1.5. Jumping and hopping
- 3.1.6. Flying (airfoil using, helium balloons, ornithopters, etc.) [any robot that leaves the ground above which the opposing robot cannot possibly reach it for more than 5 seconds will be disqualified.]

4. Robot control requirements:

- 4.1. Tele-operated robots must be radio controlled, or use an approved custom system as described in 4.4.3. Radio controlled robots must use approved ground frequencies [27/49/50/53/75/900/2400 for the United States ] .
- 4.2. Tethered control is not allowed
- 4.3. Pre 1991 non-narrow band radio systems are not allowed.
- 4.4. Radio system restrictions for this event with corresponding weight and or weapon restrictions:
  - 4.4.1. Radio systems that stop all motion in the robot (drive and weapons), when the transmitter loses power or signal, are required for all robots with active weapons or any robot over 12lbs. This may be inherent in the robots electrical system or be part of

- programmed fail-safes in the radio. Robots 1 lb and less []drive fail-safes.
- 4.4.2. All robot radio systems must have a way to change frequencies or coded channels to prevent radio conflicts. Having at least two frequencies or coded channels available is required . Lack of extra frequencies may result in a forfeit. Digital spread-spectrum radios that use frequency hopping or automatic channel selection qualify under this rule.
  - 4.4.3. If you are using a home built control system, or a control system not covered here, you must first clear it with this event.
  - 4.4.4. Toy radio systems [ not] allowed at this event for robots up to 12 lbs with no active weapons.
  - 4.4.5. RC systems on the AM band [ not] allowed at this event for robots up to 12 lbs with no active weapons.
  - 4.4.6. All robots that are either: a.) 30 lbs or above or b.) 12 lbs or above with an active weapon MUST use a radio systems on the FM band with [] coding, a digitally coded 900 MHz or 2.4GHz system (for example IFI, Spektrum, etc), or an approved custom control system.
- 4.5. This event does not require a separate power switch for the radio, but it is encouraged.
5. Autonomous/Semi-Autonomous Robots: Any robot that moves, seeks a target, or activates weapons without human control is considered autonomous. If your robot is autonomous, contact this event before registration.
- 5.1. Autonomous robots must have a clearly visible light for each autonomous subsystem that indicates whether or not it is in autonomous mode, e.g. if your robot has two autonomous weapons it should have two “autonomous mode” lights (this is separate from any power or radio indicator lights used).
  - 5.2. Robots in the 12 pound or under classes are exempt from the remaining rules below, but safe operation, arming, and disarming must be demonstrated in safety inspections.
  - 5.3. The autonomous functionality of a robot must have the capability of being remotely armed and disarmed. (This does not include internal sensors, drive gyros, or closed loop motor controls.)
    - 5.3.1. While disarmed, all autonomous functions must be disabled.
    - 5.3.2. When activated the robot must have no autonomous functions enabled, and all autonomous functions must failsafe to off if there is loss of power or radio signal.

- 5.3.3. In case of damage to components that remotely disarm the robot, the robots autonomous functions are required to automatically disarm within one minute of the match length time after being armed.
6. Batteries and Power
    - 6.1. The only permitted batteries are ones that cannot spill or spray any of their contents when damaged or inverted. This means that standard automotive and motorcycle wet cell batteries are prohibited. Examples of batteries that are permitted: gel cells, Hawkers, NiCads, NiMh, dry cells, AGM, Llon, LiPoly, etc. [If your robot uses a type of battery not listed here, please contact this event for approval]
    - 6.2. All onboard voltages above 48 Volts require prior approval from this event. (It is understood that a charged battery's initial voltage state is above their nominal rated value)
    - 6.3. All electrical power to weapons and drive systems (systems that could cause potential human bodily injury) must have a manual disconnect that can be activated within 15 seconds without endangering the person turning it off. (E.g. No body parts in the way of weapons or pinch points.) Shutdown must include a manually operated mechanical method of disconnecting the main battery power, such as a switch (Hella, Whyachi, etc) or removable link. Relays may be used to control power, but there must also be a mechanical disconnect. Please note that complete shutdown time is specified in section 1.6.
    - 6.4. All efforts must be made to protect battery terminals from a direct short and causing a battery fire.
    - 6.5. If your robot uses a grounded chassis you must have a switch capable of disconnecting this ground. ICE robots are excepted from this rule if there is no practical way to isolate their grounding components. It is [required] to contact this event for this exception.
    - 6.6. All Robots must have a light easily visible from the outside of the robot that shows its main power is activated.
  7. Pneumatics
    - 7.1. Example diagrams of typical pneumatic systems in robots over 30lbs:
      - 7.1.1. CO2 based systems  
<http://www.botleague.com/pdf/GeneralPneumaticsCO2.pdf>
      - 7.1.2. High Pressure Air (HPA) based systems  
<http://www.botleague.com/pdf/GeneralPneumaticsHPA.pdf>
    - 7.2. Pneumatic systems on board the robot must only employ non-flammable, nonreactive gases (CO2, Nitrogen and air are most common). It is not

permissible to use fiber wound pressure vessels with liquefied gasses like CO2 due to extreme temperature cycling.

- 7.3. You must have a safe and secure method of refilling your pneumatic system. [The RFL recommends the use of standard paintball fill fittings available at many retail outlets and online. For specs see Part#12MPS from Foster, <http://www.couplers.com>.]
- 7.4. Exemptions
  - 7.4.1. Robots 12 lbs and under and systems with gas storage of 2 fl oz or less are exempt from the remaining rules in this section provided that the maximum actuation pressure is 250 PSI or less and all components are used within the specifications provided by the manufacturer or supplier. If the specifications aren't available or reliable, then it will be up to the EO to decide if the component is being used in a sufficiently safe manner .
  - 7.4.2. Pneumatic systems with pressures below 100 PSI, small volumes (12-16g CO2 cartridges), single firing applications, or pneumatics used for internal actuation (as opposed to external weaponry) may also be exempted from the remaining pneumatic rules. You are to contact this event if you would like an exception.
- 7.5. All pneumatic components on board a robot must be securely mounted. Particular attention must be made to pressure vessel mounting and armor to ensure that if ruptured it will not escape the robot. (The terms 'pressure vessel, bottle, and source tank' are used interchangeably)
- 7.6. All pneumatic components within the robot must be rated or certified for AT LEAST the maximum pressure in that part of the system. You may be required to show rating or certification documentation on ANY component in your system.
- 7.7. All pressure vessels must be rated for at least 120% of the pressure they are used at and have a current hydro test date. (This is to give them a margin of safety if damaged during a fight.) If large actuators, lines, or other components are used at pressures above 250psi these will also need to be over-rated and are [] to be pre-approved for this event.
- 7.8. All primary pressure vessels must have an over pressure device (burst/rupture disk or over pressure 'pop off') set to no more than 130% of that pressure vessels rating. (Most commercially available bottles come with the correct burst assemblies, use of these is encouraged)
- 7.9. If regulators or compressors are used anywhere in the pneumatic system there must be an (additional) over pressure device downstream of the

regulator or compressor set for no more than 130% of the lowest rated component in that part of the pneumatic system.

- 7.10. All pneumatic systems must have a manual main shut off valve to isolate the rest of the system from the source tank. This valve must be easily accessed for robot deactivation and refilling.
- 7.11. All pneumatic systems must have a manual bleed valve downstream of the main shut off valve to depressurize the system. This bleed valve must be easily accessed for deactivation. This valve must be left OPEN whenever the robot is not in the arena to ensure the system cannot operate accidentally.
  - 7.11.1. It is required to be able to easily bleed all pressure in the robot before exiting the arena. (You may be required to bleed the entire system if it is believed that you have any damaged components.)
- 7.12. All regulated pneumatic systems must have an appropriate gauge scaled for maximum resolution of the pressure on the low-pressure side of the system. HPA (air, nitrogen, or inert gas) systems must have gauges on both the high AND low-pressure sides of regulators. A gauge or other clear visual indication that the system is charged is strongly recommended for all pneumatic systems. Whether specifically required or not.
- 7.13. If back check valves are used anywhere in the system you must ensure that any part of the system they isolate can be bled and has an over pressure device.
- 7.14. Any pneumatic system that does not use a regulator, or employs heaters or pressure boosters, or pressures above 2500psi **[must be pre qualified by this event.]**
8. Hydraulics
  - 8.1. Robots in the 12 lb class or lighter are exempt from the remaining rules in this section, but good engineering and best practices must be used in all hydraulic systems. However the pressure for 12 pound or less robots is limited to 250psi and there must be an easy way to determine this pressure. **[Contact this event with questions.]**
  - 8.2. All hydraulic components onboard a robot must be securely mounted. Particular attention must be made to pump and accumulator mounting and armor to ensure that if ruptured direct fluid streams will not escape the robot.
  - 8.3. All hydraulic components within the robot must be rated or certified for AT LEAST the maximum pressure in that part of the system. You may be required to show rating or certification documentation on ANY component in your system.

- 8.4. Any accumulators or large reservoir must be rated for at least 120% of the pressure they are used at. (This is to give them a margin of safety if damaged during a fight)
- 8.5. All hydraulic systems must have an over pressure by pass device set to no more than 130% of the lowest component rating. It must be rated to bypass the full volume of the hydraulic pump.
- 8.6. All hydraulic systems must have a(n) accessible manual by pass valve(s) to easily render the system harmless.
- 8.7. All hydraulic systems must have appropriate gauges scaled for maximum resolution of the pressures in that part of the system.
- 8.8. All hydraulic systems must use non-flammable, non-corrosive fluid and must be designed not to leak when inverted.
- 8.9. Any hydraulic system using pressure boosters, or pressures above 5000psi (without accumulator) or pressures above 2000psi (with accumulator) **[must be pre qualified by this event.]**
- 8.10. Please note that some simple low pressure and volume hydraulic systems, like simple braking, may not need to adhere to all the rules above. You are [] to contact this event if you would like an exception.
9. Internal Combustion Engines (ICE) and liquid fuels. **[are not allowed]**
10. Rotational weapons or full body spinning robots [] :
  - 10.1. Spinning weapons that can contact the outer arena walls during normal operation must be pre-approved by the event. (Contact with an inner arena curb, or containment wall is allowed and does not require prior permission.)
  - 10.2. Spinning weapons must come to a full stop within 60 seconds of the power being removed using a self-contained braking system.
11. Springs and flywheels
  - 11.1. Springs used in robots in the 12 lbs class or smaller are excepted from the rules in this section. However safe operation and good engineering are always required.
  - 11.2. Any large springs used for drive or weapon power must have a way of loading and actuating the spring remotely under the robot's power.
    - 11.2.1. Under no circumstances must a large spring be loaded when the robot is out of the arena or testing area.
    - 11.2.2. Small springs like those used within switches or other small internal operations are excepted from this rule.
  - 11.3. Any flywheel or similar kinetic energy storing device must not be spinning or storing energy in any way unless inside the arena or testing area.

- 11.3.1. There must be a way of generating and dissipating the energy from the device remotely under the robots power.
- 11.4. All springs, flywheels, and similar kinetic energy storing devices must fail to a safe position on loss of radio contact or power.}
- 12. Forbidden Weapons and Materials. The following weapons and materials are absolutely forbidden from use:
  - 12.1. Weapons designed to cause invisible damage to the other robot. This includes but is not limited to:
    - 12.1.1. Electrical weapons
    - 12.1.2. RF jamming equipment, etc.
    - 12.1.3. RF noise generated by an IC engine. (Please use shielding around sparking components)
    - 12.1.4. EMF fields from permanent or electro-magnets that affect another robot's electronics.
    - 12.1.5. Entangling Weapons or defenses: these are weapons or defenses that can reasonably be expected to stop drive train and/or weapon motion by being wrapped around rotating parts. This includes nets, tapes, strings, and other entangling materials or devices.
    - 12.1.6. Weapons or defenses that that can reasonably be expected to stop combat completely of both (or more) robots.
  - 12.2. Weapons that require significant cleanup, or in some way damages the arena to require repair for further matches. This includes but is not limited to:
    - 12.2.1. Liquid weapons. Additionally a bot may not have liquid that can spill out when the robot is superficially damaged.
    - 12.2.2. Foams and liquefied gasses
    - 12.2.3. Powders, sand, ball bearings and other dry chaff weapons
  - 12.3. Un-tethered Projectiles (see tethered projectile description in Special Weapons section 13.5)
  - 12.4. Heat and fire are forbidden as weapons. This includes, but is not limited to the following:
    - 12.4.1. Heat or fire weapons not specifically allowed in the Special Weapons section (13.2)
    - 12.4.2. Flammable liquids or gases
    - 12.4.3. Explosives or flammable solids such as:
      - 12.4.3.1. DOT Class C devices
      - 12.4.3.2. Gunpowder / Cartridge Primers
      - 12.4.3.3. Military Explosives, etc.

- 12.5. Light and smoke based weapons that impair the viewing of robots by an Entrant, Judge, Official or Viewer. (You are allowed to physically engulf your opponent with your robot however.) This includes, but is not limited to the following:
  - 12.5.1. Smoke weapons not specifically allowed in the Special Weapons section (13.3)
  - 12.5.2. Lights such as external lasers above 'class I' and bright strobe lights which may blind the opponent.
- 12.6. Hazardous or dangerous materials are forbidden from use anywhere on a robot where they may contact humans, or by way of the robot being damaged (within reason) contact humans. **[Contact this event if you have a question.]**
13. Special weapon descriptions allowed at this event:
  - 13.1. Tethered Projectiles **[are]** allowed at this event.
    - 13.1.1. **[ Tethered projectiles must have a tether that can stop the projectile and be no longer than 8 feet. In addition, if the velocity of the projectile exceeds 75 feet/second prior approval must be given by the event.]**
  - 13.2. Heat and Fire **[are not]** allowed at this event. The subsequent rules in this section apply when heat and fire are allowed. Flame weapon rules are subject to change to comply with local fire regulations and fire officials.
  - 13.3. Smoke Effects **[are not]** allowed at this event.

\* If you plan on using the RFL rule set for your event you are welcome to. Our only requirement is that it not be changed other than in the extensible areas, and that it be referred to as the RFL Tech Regs.