SARL Design Rules for the event

Plastic Class Amendment to Rules

The purpose of the plastic class is to allow an easier entry point for those who may not have access to a full shop or just want to try something different. The plastic class is run as a separate class from the other robots, so they will only fight against other robots in the plastic class.

In general, all the normal rules apply to plastic class bots except the construction materials must be plastic as described below:

1. PET, PETG, ABS, PLA, and PLA+ are the only materials that can be used for the chassis and weapons. No other types of plastics or materials allowed (ie. metal, carbon fibre, UHMW, etc)
2. Motors, electronics, axles, fasteners and adhesives can be any material, but cannot be used in such a way to enhance the structural integrity, and armour of the robot, or enhance any weapon.
3. Not all weight classes will run a separate plastic class. The event organizer will specify if there will be a separate plastic class and if so for which weight class(es), i.e. "1lb (454g) plastic class"

A robot may be disqualified at the Event Organizer's discretion if it is deemed to violate the spirit of the class. Contact the event organizer ahead of time if you are not sure your robot meets the above definition.

Non-Destructive Class Amendment to Rules

The purpose of the non-destructive class is to allow an easier hosting point for organizers who may not yet have access to a full-sized, polycarbonate-encased arena and would like to host an event. The non-destructive class is run as a separate class from the other robots, so they will only fight against other robots in the non-destructive class.

In general, all the normal rules apply to plastic class bots except the Weapons Restrictions are as follows:

1. Your bot may not have a weapon that will cause the opponent to break into pieces.
2. Your bot may not have a weapon that could potentially break chunks off the other robot and/or send these chunks flying out of the arena.

3. Flipper and Lifter-style weapons are allowed so long as they do not exceed 130RPM.
4. Your approved weapon may not make use of non-plastic components (such as fastenings) to improve the functionality of the weapon in any way.

A robot may be disqualified at the Event Organizer's discretion if it is deemed to violate the spirit of the class. Contact the event organizer ahead of time if you are not sure your robot meets the above definition.

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 for adjustment by each event depending on its safety concerns. Any parts of these rules [bracketed] 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 disqualification.

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 the 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 neon orange or another high-visibility color. Locking devices must be clearly capable of stopping, arresting, or otherwise preventing harmful motion of the weapon.

1.6.6. 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 neighbours and people passing by.

1.7. This event does not require your robot to have an active weapon other than the driving force of the robot.

2. Weight Classes.

Our events offer the listed weight classes displayed in the table on the events page.

2.1. There is a 100% weight bonus for true walkers. There is a 50% bonus for shufflers (see 3.1.2 for a definition of a walker.)

2.2. At This point we are organising events in the 150g weight class (Fairyweight) and the 1lb/454g weight class (Antweight) we may go bigger in the future as we gain momentum.

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. Walking (linear actuated legs with no rolling or cam-operated motion) [Contact this event with questions on weight bonuses to see if your robot may qualify. Robots are classified as "walker" at the sole discretion of the Event Organizer, and are not subject to appeal.]

3.1.3. Shuffling (rotational cam operated legs)

3.1.4. Ground effect air cushions (hovercrafts)

3.1.5. Jumping and hopping

3.2. Flying (airfoil using, helium balloons, ornithopters, etc.) is not allowed at this time.

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 2.4GHz RC Control protocols or operate over wifi/Bluetooth in the phone division.

4.2. Tethered control is not allowed.

4.3. Radio system restrictions for this event with corresponding weight and or weapon restrictions:

4.3.1. 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 robot's electrical system or be part of programmed fail-safes in the radio.)

4.3.3. If you are using a home-built control system, or a control system not covered here, you must first clear it with this event.

4.3.4. Toy radio systems are allowed at this event for robots up to 12 lbs with no active weapons.

4.3.5. RC systems on the AM band are not allowed at this event for robots up to 12 lbs with no active weapons.

4.3.6. All robots that are either: a.) Larger than 12 lbs or b.) Have an active weapon, MUST use radio systems on the 2.4GHz with a failsafe or an approved custom control system.

4.4. 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 you are required to inform the event organizers 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 a loss of power or radio signal.

5.3.3. In case of damage to components that remotely disarm the robot, the robot's 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, LIon, LiPoly, etc. [If your design uses a new type of battery or one you are not sure about please contact this event]

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.) Shut down must include a manually operated mechanical method of disconnecting the main battery power, such as a switch (Hella, Wyachi, etc) or removable link. Relays may be used to control power, but there must also be a mechanical disconnect. Please note that the 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. Robots in the 12 lb class or lighter are exempt from the remaining rules in this section but must comply with the following:

7.2.1. You must have a safe way of refilling the system and determining the onboard pressure.

7.2.2. Pressures in the 12-pound or less robots are limited to 250psi.

7.2.3. 12-16g cartridges may be excepted, contact your event if you need this exception.

7.2.4. All components must be 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.

7.3. You must have a safe and secure method of refilling your pneumatic system. All pressure vessels must have the standard male quick disconnect for refilling or have an adapter to this fitting. (Standard paintball fill fitting available at many retail outlets and online. For specs see Part#12MPS from Foster, http://www.couplers.com.

7.4. Pneumatic systems on board the robot must only employ non-flammable, non-reactive gases (CO2, Nitrogen and air are most common). It is not permissible

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

7.5. All pneumatic components on board a robot must be securely mounted. Particular attention must be made to pressure vessel mounting and armour 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 required to be pre-approved for this event.

7.8. All primary pressure vessels must have an overpressure device (burst/rupture disk or overpressure 'pop off') set to no more than 130% of that pressure vessel's 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) overpressure 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 pneumatic systems must have appropriate gauges scaled for maximum resolution of the pressures in that part of the system. (There must be gauges on both the high AND low-pressure sides of regulators.)

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 overpressure device.

7.14. Any pneumatic system that does not use a regulator, employs heaters or pressure boosters, or pressures above 2500psi must be pre-qualified by this event.

7.15. Please note that some pneumatic systems with very low pressures (below 100 total PSI on board), small volumes (12-16g CO_2 cartridges), single firing applications, or pneumatics used for internal actuation (as opposed to external weaponry) may not need to comply with all the rules above. You are [required] to contact this event if you would like an exception.

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 armour 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 reservoirs 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 overpressure bypass 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 bypass 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 [required] to contact this event if you would like an exception.

9. Internal Combustion Engines (ICE) and liquid fuels.

Internal Combustion Engines (ICE) and liquid fuels are not allowed below the 30lb weight class

9.1. Fuel and Fuel Lines

9.1.1. All commercially available grades of automobile or RC hobby fuel are allowed. Alcohol, Nitro-methane, jet fuel and other speciality grades of fuel [require prior approval.]

9.1.2. Fuel lines and tanks must be made of high-quality materials and all ends must be clamped securely.

9.1.3. All fuel tanks and lines must be well protected and armored from all sides including moving parts and heat sources inside the robot.

9.2. Fuel tank volume, on any robot, shall not be greater than the amount required to operate the engine for more than 1 minute longer than the match time at combat power plus a reasonable pre-match warm-up period. This volume may not exceed 20 oz unless prior approval is granted for this event.

9.3. The output of any engines connected to weapons or drive systems must be coupled through a clutch which will decouple the motor when it is at idle. (This does not include motors used for generators and hydraulic pumps.)

9.4. All engines must turn off or return to idle at loss of radio signal and turn off at loss of radio receiver power.

9.5. All engines must have a method of remotely shutting off.

9.6. Any robot with liquid fuel and oil must be designed not to leak when inverted. (Minor oil leakage may be tolerated, however, if it affects the other robot or becomes a large cleanup issue you may be called and the leaking robot will forfeit.)

9.7. Use of engines other than standard piston engines (i.e. turbines etc.) [require prior approval] at this event.

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 robot's 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 not specifically allowed in the Special Weapons section 13.1

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 robots electronics.

12.1.5. Weapons or defences that stop combat completely of both (or more) robots. This includes nets, tapes, strings, and entanglement devices not specifically allowed in the Special Weapons section 13.2.

12.2. Weapons that require significant cleanup, or in some way damage the arena to require repair for further matches. This includes but is not limited to:

12.2.1. Liquid weapons are not specifically allowed in the Special Weapons section 13.3. (Additionally, a bot may not have a 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 not specifically allowed in the Special Weapons section 13.4

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 13.6

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 or dust weapons not specifically allowed in the Special Weapons section 13.7

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 disallowed at this event:

13.1. Electrical weapons are not allowed at this event.

13.2. Entangling weapons are not allowed at this event.

13.3. Liquid weapons are not allowed at this event.

13.4. Powdered material or chaff weapons are not allowed at this event.

13.4.1. Dry powder, metal shavings, ball bearings etc. are not allowed at this event in any form.

13.5. Tethered Projectiles are not allowed at this event.

13.6. Heat and Fire are not allowed at this event.

13.7. Smoke Effects are not allowed at this event.