



The Robot

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Section 4 – The Robot

4.1 – Overview

This section provides rules and requirements for the design and construction of your robot. A *Moto Math* robot is a remotely operated vehicle designed and built by a registered *Moto Math* team to perform specific tasks when competing in *Moto Math*. Prior to competing at each event, all robots will have to pass an inspection. Refer to Appendix A for the Robot Inspection Guidelines and the Inspection Checklist.

4.2 – Robot Rules

There are specific rules and limitations that apply to the design and construction of your robot. Please ensure that you are familiar with each of these robot rules before proceeding with robot design.

- <R1>** One robot will be allowed to compete per team. Though it is expected that teams will make changes to their *robot* at the competition, a team is limited to only ONE robot.
- It is against the intent of this rule to compete with one robot, while a second robot is being modified or assembled.
- <R2>** Every robot will be required to pass a full inspection before being cleared to compete. This inspection will ensure that all robot rules and regulations are met. Initial inspections will take place during team registration/practice time.
- If significant changes are made to a robot, it must be re-inspected before it will be allowed to compete.
 - All robot configurations must be inspected before being used in competition.
 - Teams may be requested to submit to random spot-inspections by event personnel. Refusal to submit will result in disqualification.
 - Referees or inspectors may decide that a robot is in violation of the rules. In this event, the team in violation will be disqualified and the robot will be barred from the playing field until it passes re-inspection.

For more information on the inspection process please refer to Appendix A, Robot Inspection Guidelines.

- <R3>** The following types of mechanisms and components are NOT allowed:
- Those that could potentially damage playing field components.
 - Those that pose an unnecessary risk of entanglement.
- <R4>** At the beginning of any match, the maximum allowed size of a robot is 14" x 14" x 14".
- During inspections, robots will be required to pass within the perimeter of a sizing tool. To pass inspection, a robot must fit within the sizing tool without exerting ANY force on the tool. The orientation of the robot when sized must be the same as its orientation when placed on the field.
 - Robots may expand beyond their starting size constraints after the start of a match.
 - Any restraints used to maintain starting size (i.e. zip ties, rubber bands, string, etc.) MUST remain attached to the robot for the duration of the match.
- <R5>** Two classes of robots may participate in CREATE JR. games. VEX IQ robots and Junior Open robots. Robot construction is constrained to the following:
- VEX IQ
 - All parts from the VEX IQ line or parts which are identical to the VEX IQ parts line are acceptable for use in the VEX IQ class. No other parts are allowed.

- b. CREATE Open
 - i. Only one control system may be used on a robot. The control system for the robot, which includes the motor controller and the remote control system, may be either:
 - i.i. A HOI Control System (HCS-UNO or HCS-Apollo) supplied by Higher-Order Innovation with the competition code (supplied by CREATE) downloaded
 - or
 - i.ii. A signal splitter / RF remote supplied by VEX **NOTE: 2016/2017 will be the last year the signal splitter / RF remote will be allowed.**
 - ii. For the construction of the robot, any official VEX component may be used except as limited below:
 - ii.i. Up to six(6) motors or servos. (Any combination up to six).
 - ii.ii. Only one (1) battery pack from the VEX Power Pack (VEX P/N: 230-0036) or the 7.2V battery packs that come with the kits. NOTE: HOI Control Systems sold after 6/1/2015 may (are required) have two battery packs.
 - ii.iii. One (1) RF receiver.
 - ii.iv. Electrical components found in the VEX-RC "Blue" product line are prohibited
 - ii.v. Any/all packaging, manual binders, Styrofoam, cardboard, plastic bags, etc. from the VEX or HCS kits are NOT included and CANNOT be used for robot construction. Only VEX or HCS parts themselves are allowed.
 - ii.vi. Parts identical to either legal HCS or legal VEX parts may also be used.
- c. The following additional components may also be used. (These rules apply to both the VEX IQ and CREATE Open classes of robots).
 - i. (10) elastic bands, #32 size only.
 - ii. 20" of 1/8" nylon rope.
 - iii. 6" of 3/4" wide Velcro
 - iv. 12" x 15" of non-slip pad
 - v. Teams may add non-functional decorations from parts not on the above list, provided that these parts do not affect the outcome of the match, and must be in the spirit of the competition.
 - vi. No additional components may be used.

<R6> All parts that are used must be tracked through a Bill of Materials (BOM).

<R7> During inspections if there is a question about whether something is an official Vex component, a team will be required to provide documentation to an inspector, which proves the component's source. Such types of documentation include receipts, part numbers, or other printed documentation.

<R8> No modification of the control system is allowed of ANY kind.

<R9> Parts may NOT be modified as follows:

- a. Motors, extension cords, sensors, controllers, battery packs, and any other electrical component of the Vex Robotics Design System may NOT be altered from their original state in ANY way.
- b. Welding, soldering, brazing, gluing, or attaching in any way that is not provided within the Vex System will NOT be allowed.
 - i. Mechanical fasteners may be secured using Loctite or a similar thread-locking product. This may be used for securing hardware ONLY.

<R10> Robots must display their team number (numerals/alpha only, i.e. "148" or "148-A").

- a. The judges, referees, and announcers must be able to easily identify robots by team number.
- b. Team number must be visible from each side.

- c. The numerals must each be at least three inches high, at least in 3/4-inch stroke width and in a contrasting color from their background.

<R11> If crystals are used then the robot receiver must be accessible by competition personnel.

- a. The radio crystal must be easily removed from the robot without any robot dis-assembly.
- b. The radio crystals will be provided to each team for each match. (If possible crystals may be given to teams at the beginning of a tournament and collected at the end.)
- c. 2016/2017 will be the last year the crystals will be allowed.

<R12> The robots are to be built by the students. Adults, coaches, parents, mentors are to be facilitators, offer suggestions, teach and guide. We understand that each student is unique and their learning facilitated by different styles which may benefit from varying levels of assistance. For instance, if a child cannot remove a stripped bolt it is perfectly acceptable for an adult to do that for the student. If a student has never seen a particular mechanism it is a great learning experience for the student to build it with an adult. However any mechanism that is in ANY significant way built by an adult should be dis-assembled and re-assembled by the student(s). It is very important that the students understand their robot and are able to fix it during the tournament as adults are not to assist in any capacity, except to help remove stripped bolts or where safety is involved. Teams with adults acting in discord with this rule will be removed from consideration for judged awards. Repeated and/or egregious infractions may result in a team being disqualified from the tournament.