



To inspire and prepare the youth of today to become the engineers and scientists of tomorrow.

Game Manual 2019-2020



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This document is considered DRAFT until October 1, 2019.

Section 1: Introduction

1.1 - Overview

This section provides background for the *CREATE Open Program*. The CREATE Open is a unique robotics challenge open to teams of any age or background. Although most events are geared toward 12th grade and younger, we welcome teams of professional engineers and anyone else from middle schools to universities willing to test their skills against the very best. Just be sure to check the event page of the event you are interested in to determine the target age group.

1.2 - CREATE Mission and Values

The mission of the CREATE Foundation is to inspire and prepare the youth of today to become the engineers and scientists of tomorrow.

This will be done via competitive robotics competitions that are...

Compelling - Competitions will include both sports-like (head-to-head) competitions as well as engaging social interaction through teamwork and alliances. A signature event will be held annually to reward and celebrate team's accomplishments.

Accessible - By use of re-usable robotic kits/components, low annual and tournament registration fees, and costs structured to reward schools/programs with multiple teams, we will help ensure cost is not a barrier to participation. Tiered events and activities will be offered that make hosting events accessible to any size school or group.

Inspiring - Robust challenges and tournaments that keep students engaged throughout the year, are educationally rich and give appropriate focus to mechanical and electrical engineering, and computer programming skills. All participants will be surrounded by others aspiring to live up to the Values of CREATE.

Safe - Careful selection of equipment and focusing on proper safety procedures will insure all participants have a safe environment to compete in.

The CREATE Open is an advanced robotics exhibition that has been specifically designed to fulfill the mission of the CREATE Foundation. We hope that students and coaches can work together to foster a sense of community within the CREATE Open Program and use educational robotics competitions to both inspire and prepare the youth of today.



The CREATE Foundation expects all participants (students, coaches, parents, spectators, etc.) to follow the CREATE Values and embody CREATE's core belief of **“Honor by Design”**:

Honest - Do "what's right" when no one is looking.

Competitive - Always give your best. Be humble in victory and gracious in defeat. Be respectful of your teammates, coaches, mentors, competitors, judges and spectators.

Collaborative - Act in the best interest of the team's goals and be supportive of each other. Share knowledge, tools and parts with other teams.

Leader - Encourage, praise, involve and constructively challenge your teammates.

Professional - Works hard and is determined. Overcomes obstacles. Is well trained and acts in a professional manner.

1.3 - Background of the CREATE Open

The CREATE Open Program is a robotics competition built on freedom of choice. Teams come from all over the world to compete with robots that are made with all types of technology. From machined metal to scrap wood and custom circuit boards to salvaged printer parts, the CREATE Open Program was built to allow teams the greatest ability to choose and explore technology and methods that are available and interesting. When you remove the constraint of a kit based system, there becomes several different routes that will lead to competitive robots, each route with its own opportunities for learning and improving.

The number one benefit of the CREATE Open Program is it removes the necessity of a singular robotics kit. Being constrained within the confines of a kit-based robotic system is both freeing and restricting at the same time. Kit-based systems can provide early learning opportunities, but creativity can only be taken so far when all teams have the exact same parts. The CREATE Open Program was created because building with a kit-based system for four or more years can severely limit the amount of learning available by the end. A team can be in the CREATE Open Program continuously and still find elements and methods to employ to improve their robot. As technology changes, so do the options available. As technology matures and reaches the larger market, its cost drops, enabling teams of all budgets to create competitive robots at prices that are significantly less than kit based options. The mission of the CREATE Foundation is to inspire and prepare the youth of today to become the engineers and scientists of tomorrow. The CREATE Open Program fosters creativity and out-of-the-box thinking that will be invaluable to all participants regardless of their future careers.

This year's challenge will be a modified version of the VEX Robotics Competition (VRC) game Tower Takeover. All VRC current season rules for the game and robot apply unless expressly stated otherwise in this game manual. The VRC current game can be found at the following link: <https://www.vexrobotics.com/vexedr/competition/vrc-current-game>



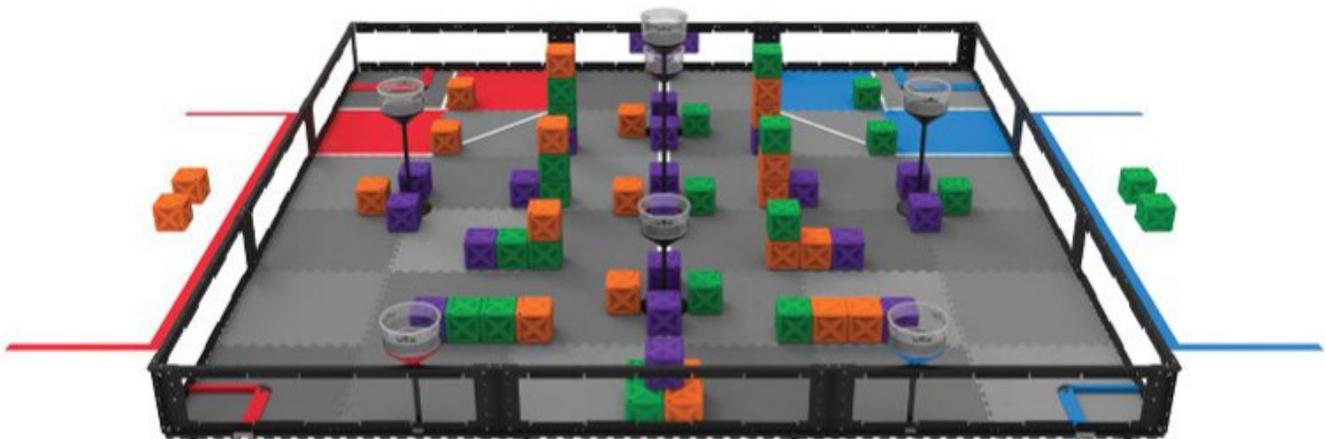
Section 2: The Game

2.1 - Overview

This section describes the CREATE Open game for 2019-2020 which is a modified version of the VRC game *Tower Takeover*. It also outlines the Open Program-specific *game rules* and the “In the Balance” *game twist*.

2.2 - VEX Robotics Competition

The following description is taken directly from the VEX Robotics website at <https://www.vexrobotics.com/vexedr/competition/vrc-current-game>:



The Game:

VEX Robotics Competition Tower Takeover is played on a 12'x12' square field configured as seen above. Two (2) Alliances - one (1) “red” and one (1) “blue” - composed of two (2) Teams each, compete in matches consisting of a fifteen (15) second Autonomous Period, followed by a one minute and forty-five second (1:45) Driver Controlled Period.

The object of the game is to attain a higher score than the opposing Alliance by placing **Cubes** in **Towers**, or scoring **Cubes** in **Goals**.

The Details:

There are sixty-six 66 **Cubes** on a Tower Takeover Field. Twenty-two (22) **Green**, twenty-two (22) **Orange** and, twenty-two (22) **Purple**. There are also seven



(7) Towers placed around the field. Five (5) of these are neutral, with the remaining two being alliance specific. Alliance specific Towers may only be utilized by robots of the same alliance.

Cubes can be **Placed in Towers**, or **Scored in Goals**. Cubes are worth at least 1 point when Placed in a Goal Zone. The exact value of each cube is determined by how many Cubes of that specific color have been Placed in Towers. When Cubes are Placed in or removed from Towers, **the new values apply to ALL cubes**. So the actions of one Robot will impact the potential score for both their own alliance, and their opponents.

For an in-depth description of the 2019-2020 VRC game Tower Takeover, including all game definitions and game rules, it is important to thoroughly read Section 2: The Game of the [VRC Tower Takeover Game Manual](#).

2.3 - CREATE Open Game-Specific Rules

One unique aspect of the CREATE Open is the requirement of a Reoff on each robot. The Reoff (remote on/off switch) is a competition-enabling module that controls the timing of a match. For more information regarding the Reoff, please see Section 5: The Open Control System of this game manual.

For the 2019-2020 season, the CREATE Open game is modified from the VRC game Tower Takeover by the following rules:

1. **All VRC current season rules for the game and robot apply for the CREATE Open unless expressly stated otherwise in this game manual.**
2. Matches will start with a 20 second autonomous mode, followed by a pause ending with a 100 second driver mode. Remotes must be placed on the ground to start the match. All team members must be standing upright when the ref launches a match. No buttons on the remote or robot may be touched once the match is launched.
3. No button on the remote, robot, or other device may be used to start the autonomous portion of the match. The proper way to start the autonomous portion of the match is to use data coming from the Reoff.
4. Remotes are to be placed on the ground and may not be touched until driver's mode has started.
5. There will be between a seven and a twenty second pause between autonomous and driver control. The exact duration of this pause will be made by the tournament Event Partner.



6. The Autonomous Bonus is worth 12 points. The Autonomous Bonus will be determined by specific tasks. The Alliance that successfully completes the most tasks will be awarded the Autonomous Bonus. All tasks are counted at the end of autonomous. A task completed but the reversed during autonomous will NOT be counted as a completed task. Each task is weighted the same. The tasks are as follows:
 1. Place a cube in or on the alliance's small goal zone. NOTE: It does not have to be officially "scored", but rather placed in or on the barrier of the goal zone such that no part of the cube touches the tile on the outside of the goal zone and is not touching an alliance robot.
 2. Place a cube in or on the alliance's large goal zone. NOTE: It does not have to be officially "scored", but rather placed in or on the barrier of the goal zone such that no part of the cube touches the tile on the outside of the goal zone and is not touching an alliance robot.
 3. Place a cube on a placed cube in either goal zone. NOTE: It does not have to be officially "scored", but rather on top of a placed cube such that it does not touch any foam tile or an alliance robot.
 4. Place a cube in or on the neutral tower on the alliance's side of the field. NOTE: It does not have to be officially "scored" , but rather on or in the tower such that no part of the cube is touching a floor tile, is in or above the tower and not touched by an alliance robot.
 5. Place a cube, of the alliance's pre-load color, in or on the high tower in the middle of the field. Each alliance will have access to this tower so be careful not to break the center barrier. NOTE: It does not have to be officially "scored", but rather on or in the tower such that no part of the cube is touching a floor tile, is in or above the tower and not touched by an alliance robot. In the event that both alliances successfully place cubes in this tower each alliance will receive a point.
7. Teams touching their remotes, or even bending down to pick up their remotes, outside of designated times may receive a 2 point penalty for their alliance. Egregious infractions may result in disqualification.
8. Starting autonomous early is an automatic 2 point penalty and forfeiture of autonomous bonus. The task count for the offending alliance will be set to zero.
9. Moving beyond the 20 second autonomous period is an automatic 2 point penalty and forfeiture of autonomous bonus.. The task count for the offending alliance will be set to zero.
10. Starting drivers mode early is an automatic 2 point penalty. Egregious/repeated infractions may result in disqualification. NOTE: If a team both touches their remote early AND starts the drivers mode early they will be assessed one 2 point penalty, not two.



11. Teams must have a license plate on each side of their robot which is clearly visible to the refs. The license plate must use the template found here: <http://create-found.org/CreateOpen.php>, and adhere to the rules found in Section 4: The Robot of this manual.

2.4 - “In the Balance” Game Twist

Teams will find the outcome of a match “in the balance” with the Open Program's unique twist in scoring. At the end of a match if a robot has been able to balance on a cube such that no part of the robot is touching a field tile, is not in contact with another field element, field wall or another robot of the same alliance, then 4 cubes of the color on which the robot is balanced will be scored for that alliance. The cubes will first come from the opposing alliance scored cubes. If there are not enough opposing alliance scored cubes of that color the remaining cubes will be taken from the floor. If there are not enough cubes that meet these two criteria then only those cubes that meet the criteria will be scored for that alliance. Clearly, this will put the outcome of the match “In the Balance”. If opposing alliance's each have balanced on the same color cube, those will cancel each other and no cubes will be moved.

Section 3: The Tournament

3.1 - Overview

The *CREATE Open game Tower Takeover* will be played in a tournament format. Most events are aimed at high school students and middle school students who are ready for this level of engineering challenge. Teams of professional engineers and college/university students, please see appendix C: College Level Teams of this game manual for additional information. Each tournament will include *qualification*, *elimination*, and *finals matches* with *practice matches* available at the Event Partner's discretion.

3.2 - VRC Tournament Definitions

For an in-depth description of VRC tournament definitions, it is important to thoroughly read Section 4: The Tournament of the [VRC Tower Takeover Game Manual](#).

3.3 - Registration

When your team arrives at the tournament, the first stop is the registration table. Here, your team will be checked in, drop off their Engineering Notebook (optional), get information on the schedule, including a judge's interview schedule, and find out where the pit is located.

3.3.1 - Inspection

The next step after registration is inspection. Your team cannot compete until your robot has passed inspection. The robot is checked for size, safety, and so on. If there is a problem, the team must return to your pit, correct the problem and be re-inspected. Don't worry. The judges, other volunteers, and even other teams will help you get your robot ready to pass inspection. See Appendix A of this document for more information on Inspection Guidelines.

3.3.2 - Pit Area

The Pit area is usually in a large room such as a cafeteria or gym. The team may be instructed to find a table to use or may be assigned a specific table for their use. Power outlets will be nearby. This is your team's 'home base' for the day.



This is where your team works on the robot, charges the batteries, and so on. The pit area is a great place to talk with other teams as well.

3.3.3 - Practice Matches

At the event, practice matches may be played during the team registration time until the Drivers Meeting begins. Check the event schedule.

3.4 - Judging

Judging takes place in a formal manner once the team is registered and inspected. You might be given a schedule of where and when to go for your team's judges interview or you might be asked to go to your team's interview after a match. Some events allow teams to be interviewed on a first come, first interviewed basis. The format chosen is at the discretion of the Event Partner. During the interview, your team explains their creative process, shows off their robot, answers questions, and generally gets the opportunity to shine. Informal judging takes place during the entire tournament. Judges and other tournament officials observe teams all day. Both the formal and informal judging is the basis for several awards at the end of the day. Always do your best, even when no one is watching. Please see Appendix B: Awards for more information.

3.5 - Drivers / Coaches Meeting

The Drivers / Coaches meeting is a short presentation about the competition and the venue. This is followed by a question and answer session. This is your opportunity to get all your questions answered. Do not hold back because you think the question may be a dumb question. Chances are that many other teams are wondering the same thing.

3.6 - Opening Ceremony

There will be an opening ceremony lasting 5 to 10 minutes. A welcome is extended to all teams, the schedule is reviewed, logistics are explained, and qualification match schedules will be passed out.

3.7 - Qualification Matches

- ◆ Find your team on the schedule and note which matches you will compete in. There are four robots on the field in each match, paired in two Alliances. The two





teams in an Alliance will work together to score a higher total of points than the other Alliance.

- ◆ You will note that your team will be partnered randomly throughout the qualification rounds. Be sure to have your team talk with their partners sometime prior to the match to determine strategy, strengths, weaknesses, etc. Teams work together to score points. The final score of the match is given to each team.
- ◆ Each team will be scored in the same number of qualification matches, usually between four and six rounds.
- ◆ At the end of the Qualification Rounds each team will have a point total from all of their qualifications matches combined. **Qualification Rankings** are published based on these scores. After each match, rankings of all teams will be posted.
- ◆ A thorough description of Qualification Rankings can be found in Section 4: The Tournament of the VRC Tower Takeover Game Manual.

3.8 - Alliance Selection

- ◆ After the Qualification Matches, the process of Alliance Selection begins to choose the permanent Alliances for the Elimination Matches as follows:
 1. The highest ranked Team at the end of Qualification Matches becomes the first Alliance Captain.
 2. The Alliance Captain invites another Team to join their Alliance.
 3. The invited Team Representative either accepts or declines as outlined in Section 4: The Tournament of the VRC Tower Takeover Game Manual.
 4. The next highest ranked Team at the end of Qualification Matches becomes the next Alliance Captain.
 5. Alliance Captains continue to select their Alliances in this order until all Alliances are formed for the Elimination Matches.
- ◆ A team may decline, and if they do they will be taken off the board and no other teams may select them. They may still act as an Alliance Captain and invite other teams to join them if they are ranked high enough. Teams should consider carefully before they decline because if they are not able to act as Alliance Captains they will be eliminated from further play.

3.9 - Elimination Matches and Finals

- ◆ The number of Elimination Matches is determined by the number of Alliances in the Elimination bracket, which is decided by the Event Partner (typically between eight and sixteen Alliances).
- ◆ Examples of Elimination Bracket sizes can be found in Section 4: The Tournament of the VRC Tower Takeover Game Manual.
- ◆ The final winning Alliance are the Tournament Champions.

3.10 - Awards Ceremony

At regular season events, awards are given to the Tournament Champions (two teams) and the Tournament Finalists (two teams). There is an award for Innovation and one for overall team performance as well, known as the Honor Award. At some tournaments a Skills Award is also given. Please see Appendix B: Awards for more information, as well as additional awards that are given at larger tournaments (i.e. State Championship Tournaments and the U.S. Open Tournament).

3.11 - Tournament Rules

All VRC current season rules for the tournament apply for the CREATE Open unless expressly stated otherwise in this game manual.

Section 4: The Robot

4.1 - Overview

This section provides rules and requirements for the design and construction of a **CREATE Open robot**. A CREATE Open robot is a remotely operated and/or autonomous vehicle designed and built by a registered CREATE Open team to perform specific tasks when competing in the CREATE Open game Tower Takeover. Prior to competing at each event, all robots will have to pass an **inspection**. Refer to Appendix A of this game manual for the Inspection Guidelines.

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.

4.2 - VRC Robot Rules

For an in-depth description of the rules and requirements for VRC robots, including all robot definitions and robot rules, it is important to thoroughly read Section 3: The Robot of the [VRC Tower Takeover Game Manual](#).

4.3 - CREATE Open Robot-Specific Rules

The purpose of the CREATE Open Program is to maximize learning potential while inspiring students. We encourage teams to use multiple types of motors, drivers, sensors, structural components, software platforms, etc. Leverage many different kinds of technologies. Try new techniques. Iterate, iterate, iterate. The following rules are not meant to stifle creativity, but rather keep everyone safe and the competition fair. Please reach out to us at the CREATE Foundation if you have any questions about what is allowed or not allowed on your robot.

1. **All VRC current season rules for the game and robot apply for the CREATE Open unless expressly stated otherwise in this game manual.**
2. Any control system or material may be used to build the robot. This includes all VEX parts, electronics, motors, etc., but also allows Arduino based control system (or any other) as well as 3D printed/laser cut parts, hand made parts, etc.
3. A maximum of 2 pneumatic tanks per robot may be used. (Again, this is a desire to keep the playing field level.) Also for this year only VEX pneumatics (pistons and tanks) are allowed.

4. A maximum of 10 motors, or 12 if pneumatics are not used, are allowed. This applies to ALL robots regardless of what control system or motors used.
5. Up to two of the batteries that meet the criteria below may be used to power your robot. (These are in addition to the internal battery of the Reoff.).
 1. These 2 batteries may be used for any purpose. Examples are: They can be used to protect wireless communication, or to power lights, or power your motors/sensors/sound.
 2. Electronics such as Go Pros that have their own internal batteries that are in no way connected to the robots electrical system are legal and do not count toward the two battery limit. Devices that fall into this category may be used for functions like recording video, but they may not be used to gain any advantage during a match.
 3. There are two types of batteries that can be used, those on the Specified list and those that meet the criteria for power tool batteries. Please note that no modifications may be made to any battery on either list.
 1. Specified list of approved batteries:
 1. Tenergy NiMH 9.6V 2000mAh High Capacity Battery Pack - Item No. 11401-01
 2. Tenergy NiHH 8.4V 1600mAh Flat Battery Pack - Item No. 11328
 3. Tenergy NiMH 7.2V Flat Battery Pack 3000mAh - Item No. 11204-01
 4. Tenergy NiMH 9.6V 3800 mAh battery - Item No. 11408
 5. VEX 9.6V Remote Battery NiMH - Discontinued
 6. Venom NiMH 9.6V 3000mAh Battery - Model 1532-8
 7. Venom NiMH 9.6V 4200mAh Battery - Model 1546-8
 8. Venom NiMH 9.6V 5000mAh Battery - Model 1548-8
 9. VEX 7.2V Robot Battery NiMH 2000mAh - P/N: 276-1456
 10. VEX 7.2V Robot Battery NiMH 3000mAh - P/N: 276-1491
 11. Tenergy Universal Smart Charger for HiMH/NiCd Battery Packs (6V - 12V) - Item No. 0102
 2. In addition to the specified batteries above, power tool batteries can be used that meet the following criteria:
 1. They are commercially available.
 2. Unmodified. No modifications may be made to these batteries.
 3. Only hard case batteries will be allowed.
 4. Batteries must be either NiMH, or Lithium chemistry.



5. They either have the rated voltage on them or spec sheets accompany the batteries at all times, and they are limited to 12V rated voltage.
6. Teams understand how to use a voltage meter and can use it to show tournament officials the current voltage of the battery when requested.
7. Teams have the battery specifications and voltage meter with them whenever they are getting inspected, or are participating in a match or skills.
8. At no time can any battery used exceed 15V when tested. Should any battery exhibit this behavior it will be taken by tournament officials and then returned at the end of the event. Should a robot come to a match or skills with a battery that tests over 15V it will result in immediate disqualification from a match and a zero on their skills attempt.
9. Here is an example of a legal power tool battery and charger:

Battery: https://www.amazon.com/Lasica-Lithium-48-11-2402-MilwaukeeCordless/dp/B0756BRJ6Z/ref=sr_1_11?keywords=power+tool+battery+12V&qid=1561866443&s=gateway&sr=8-11

Charger: https://www.amazon.com/Milwaukee-Genuine-48-59-2401-LithiumIndicating/dp/B0086AJFAM/ref=pd_bxgy_469_2/130-8308049-9166344?_encoding=UTF8&pd_rd_i=B0086AJFAM&pd_rd_r=c9e97b12-9ae9-11e9-99dadd5cbc43a5ca&pd_rd_w=FJDaz&pd_rd_wg=wKcYS&pf_rd_p=a2006322-0bc0-4db

6. All parts, EXCEPT pneumatics and Reoffs, may be modified from their original factory condition. This includes all motors and electronics. Please keep in mind however that safety is a primary concern. Any robot deemed unsafe by the inspectors/referees will not be allowed to compete until the safety issue is resolved or may be disqualified from the tournament.
7. No rare earth magnets or electromagnets, other than those used in shielded motors, may be used as these pose an interference hazard with both electronics and metal.
8. No control system, part, or set of parts can act in a fashion that inhibits the normal operation and/or communication of other robots is allowed.
9. No power sources other than pneumatics, batteries, or compression (rubber bands, springs, etc.) are allowed.
10. CREATE officials reserve the right to restrict any material or part that interferes with the normal operation of the field or another robot. If you are unsure, ask first.



11. Voltage may not be combined. (i.e. you cannot double your voltage and halve your current.)
12. Each robot must install a 2019-2020 Reoff. Reoffs purchased before October 1, 2019 are no longer considered legal for the CREATE Open. See Section 5: The Open Control System of this game manual for more information regarding Reoffs.
13. Any Reoff (Remote On/Off Switch) must be installed such that the Reoff LED lights are clearly visible from all 4 horizontal sides of the robot at the start of a match.
14. An Ethernet port is standard on the 2019-2020 Reoff. It is expected to be used ONLY rarely IF the Reoffs are not responding wirelessly. Here are the rules regarding the Ethernet port:
 1. Any Reoff must be installed such that the Ethernet port is accessible when placed on the field. The port should be positioned such that the driver can plug the Ethernet cord into the port directly, without bending the Ethernet cord. (In the case where an Ethernet cord is required.) Referees during inspections will determine if the port is properly positioned. After your robot passes inspection, should you change the position of the Ethernet port you will need to get re-inspected. It is permissible to use an Ethernet extension cord to allow easy access to the Ethernet port.
 2. Once the field Ethernet cable has been attached to the robot, it may not be touched again until the light bars on your robot indicate the match has been launched.
 3. The Ethernet cable must be pulled out within 3 seconds of the launch of a match. If the cable is not removed from the robot in a timely fashion, the enable signal may be delayed from the Reoff to the robot to ensure safe removal of students' hands from the field prior to the robot beginning to move. Matches will NOT be restarted if this happens. It is up to each team to pay attention and pull the cable out when the match is launched. Failure to do so will result in lost time.
15. A team license plate must be:
 1. Displayed on two opposite horizontal sides of their robot.
 2. White background with black lettering. (Some small decorations/color may be added to the edge of the license plate.)
 3. Must be easily identified by judges, referees and announcers.
 4. Must have numerals/letters that are at least 1.5" high, at least 1/2" stroke width.
 5. Must be strong enough to survive match play. I.E. if you use the CREATE license plate template and print your license plate, the paper must be protected by a clear plastic protective sleeve or placed behind plexiglass.



16. **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.

Section 5: Open Control System

5.1 - Overview

This section describes how the CREATE Open Program is able to run fair competition matches through the use of it's *Open Control System tournament hardware* and *Reoff robot hardware*.

5.2 - Open Control System

One hurdle in creating a fair robotics competition requires the control of how competition matches are run. Traditionally, in similar competitions based on kits, this control is completed through a software template. In the CREATE Open Program, due to the freedom of choice regarding the microcontroller, the creation and support for all of the required software templates is not feasible. That is why the Open Control System, including the Reoffs (Remote On/Off switch), is required for all CREATE Open competitions.

The *Open Control System* is the mobile-app driven, field control system of the CREATE Open Program. It allows the referee at the field level to control the launching of matches and associated displays both for the teams as well as the audience. The Open Control System communicates to all of the Reoffs on the field in order to trigger a match (or skills attempt) to begin.

Open Control Systems are specifically manufactured for the CREATE Foundation by Higher Order Innovation, LLC, under the brand-name Athena Field Controller. More information about Athena Field Controllers can be found at www.higherorderinnovation.com/Products.html. Athena Field Controllers can only be purchased through the CREATE Foundation. Please contact CREATE at support@create-found.org for purchasing information.

5.3 - Reoffs

One of the CREATE Open Program's greatest strengths is the ability to choose from hundreds of control systems and remote controller to drive your robot with. This means that creating, supporting, and communicating with each robot in order to fairly start and stop matches is impossible. The solution for the CREATE Open is known as a Reoff (Remote On/Off switch): a piece of standard hardware that allows the tournament to be run fairly.

The Reoff acts as an indicator to teams both visually and programmatically. Visual cues regarding the timing of a match can be taken from the multitude of LEDs that are synced to the match. Programmatically, the Reoff exposes a simple enable signal that allows a teams robot to begin and end at the correct times to avoid penalties. Practice modes may



be manually entered through the interface on the device, allowing your robot to practice like it is a real match. The device has an internal rechargeable battery that can be recharged with a standard USB micro charger.

5.3.1 - How to Purchase

Every team that competes at a CREATE Open Program event is required to have a Reoff installed on their robot. Reoffs are specifically manufactured for the CREATE Foundation by Higher Order Innovation, LLC, under the brand-name Hermes Reoff Switch. More information about Hermes Reoff Switches can be found at www.higherorderinnovation.com/Products.html. Hermes Reoff Switches can only be purchased through the CREATE Foundation. Please contact CREATE at support@create-found.org for purchasing information.

5.3.2 - How to Install

The Reoff unit must be installed with the LEDs pointed upward and near the top of the robot. An ethernet port is present opposite the LEDs and must be accessible by the teams without removal of the Reoff from their robot. It is recommended that the Reoff be bolted rigidly to the frame of the robot, but in some instances velcro may be used.

There are several different features of the Reoff that should be considered when installing in onto your robot.

1. **LED Display** - The Reoff must be installed on the robot such that the LED end of the device is vertical and is visible from the four sides of the robot.
2. **Ethernet Port** - Opposite the LED display is an Ethernet port. This port may be used during inspections and/or during matches. Access to this port must remain clear in the case that it must be used.
3. **Signal 3-wire Port** - Adjacent to the Ethernet port is a 3-wire connector. Nearest the Ethernet port is the ground connection and furthest away is the Signal line that indicates the autonomous and driver periods. It is recommended that this 3-wire cable be secured (potentially with zip-ties) once the connection is established.
4. **USB Charging Port** - On the front face of the device is a USB-micro port that can be used to recharge the internal battery. A standard 5V USB charger is expected, but not included
5. **3-wire Connector** - Exiting near the ethernet port is a 3-wire connector. These three wires (from nearest the ethernet port) are ground, N/C, and a signal. Connecting this signal and ground to your robots microcontroller will enable your program to sense the start and end of the autonomous and driver periods of the match.

Section 6: Skills Challenge

6.1 - Overview

CREATE Open Skills Challenge is the opportunity for a team to take the field alone and to score as many points as possible in 60 seconds. *Driving Skills Matches* consist of an entirely driver controlled period and *Programming Skills Matches* consist of an entirely autonomous period. *Skills Rankings* are based on their combined score in both Driving and Programming Matches.

6.2 - VRC Skills Rules

For an in-depth description of the VEX Robotics Competition Tower Takeover Robot Skills, including all Skills Challenge-specific definitions and rules, it is important to thoroughly read Appendix B: The Robot Skills Challenge of the VRC Tower Takeover Game Manual.

All VRC current season rules for the Skills Challenge apply for the CREATE Open unless expressly stated otherwise in this game manual.

6.3 - CREATE Open Skills-Specific Rules

The “In the Balance” scoring twist **does** apply for skills. Should a robot be balanced on a cube as specified in section 2.4 of this game manual then four floor cubes of that color will be scored for the skills match.

Section 7: CREATE Open Forum

7.1 - Overview

This section describes how the *CREATE Open Forum* can be used by students to work together with students from other teams, coaches can receive clarification on rules, CREATE staff will post news updates, and how it can be used for tech support. This section also describes how to *create an account* and *guidelines* for the forum.

7.2 - Background and Guidelines

The CREATE Open forum can be found at www.forum.create-found.org/Create-Open.

The mission of the CREATE Foundation is to inspire and prepare the youth of today to become the engineers and scientists of tomorrow. This does not just happen during the robotics tournaments but rather throughout the season and we want to help it extend beyond the classroom setting. By using the forum, we hope that students and coaches can work together to inspire and prepare each other. We want to foster a sense of community between CREATE Open teams from across the globe and give them a place to share ideas and knowledge regarding educational robotics competitions.

We expect all users to follow the *CREATE Values "Honor by Design"* as described at <http://create-found.org/Mission.php>. Any posts or comments that are deemed to be inappropriate or disrespectful will be deleted and the user will be contacted. Please contact us if you find any posts or comments to be against CREATE values and we will address it as soon as possible.

The forum is broken up into the following categories:

- ◆ **News** - CREATE staff will post announcements, news, and general updates.
 - Coaches: if you have questions please contact support@create-found.org
 - Students: if you have questions please contact your coach
- ◆ **Rules** - Coaches and CREATE staff can discuss the rules for the 2019-2020 competition "Tower Takeover".
 - Students: if you have questions please contact your coach
- ◆ **Community** - Discussions regarding the community-building aspects of the Open by fostering collaboration amongst teams and providing a place to connect. Includes a sub-forum specific to the 2020 U.S. Open Competition.

- ◆ **Technology** - Discussions regarding the technical and educational aspects of the Open. Includes sub-forums specific for Electronics, Mechanics, and Software.

Note: A Technical Moderator reads all posts and is available to offer technical support for the benefit of students and coaches, although we hope students will offer support to other students. A Higher Order Innovation advisor is also available to answer questions specific to Reoff installation/troubleshooting.

7.3 - Creating an Account

You will need to create an account before you will be able to post or comment. All users will be automatically added to the Students usergroup. Coaches, please send an email to support@create-found.org with your forum username so we can add you to the appropriate Coaches usergroup.

- ◆ **Students** - You will need to register before you are able to post or comment. You will be unable to post or comment in the News or Rules categories but you can view these categories, as well as post and comment in the rest of the categories. If you have questions regarding News or Rules, please contact your coach.
- ◆ **Coaches** - You will need to register before you are able to post or comment. Once you have registered, please send an email to support@create-found.org with your forum username so we can add you to the appropriate Coaches usergroup. You will be unable to post in the News category. You will be able to post in the Rules category, as well as post and comment in the rest of the categories. If you have questions regarding any News posts, please contact CREATE at support@create-found.org.

Appendix A: Inspection Guidelines

A.1 - Overview

This section describes Robot Inspection for the CREATE Open competition. It also lists the inspection *definitions* and inspection *rules*.

A.2 - Description

The *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. The official “*Competition Inspection Checklist*” is another important document which can be used by teams as a guide to pre-inspect their robot. The “Competition Inspection Checklist” can be found on the CREATE Open game page of the CREATE website: www.CREATE-Found.org.

A.3 - Definitions

- ◆ **Robot** - An operator controlled vehicle designed and built by a CREATE Open team to perform specific tasks while competing. The robot can be constructed using only approved components. No other parts will be allowed on the robot. Prior to participating in the competition, each robot will be required to pass an inspection.
- ◆ **Robot Sizing Tool** - A tool used during robot inspections which has interior dimensions 18 inches wide. The robot's height, width and length must fit within this tool without exerting ANY force on the edge of the tool.

A.4 - Inspection Rules

1. The team's robot must pass inspection before being allowed to compete. Noncompliance with any robot design or construction rule may result in disqualification of the robot at an event.
2. The Official Team Number must be displayed on the robot prior to inspection as defined in the Robot section of the manual.
3. Robot construction is constrained by the components a team may use as defined in the Robot section of the manual.
4. The maximum size of the robot for starting a Qualifying or Elimination Match is 18 inches wide by 18 inches long by 18 inches high. The robot must fit within a Robot Sizing Tool. The robot must be self-supporting while the Sizing Tool is passed over it. **Robot must be measured WITH Robot, Reoff & Team ID # Plates installed.**
5. The starting configuration of the robot at the beginning of a match must be the same as a robot configuration inspected for compliance, and within the maximum allowed size.
6. If Robot designs have more than one possible starting configuration, the largest possible configuration must be used during size inspection.
7. When a team makes a modification to improve performance or reliability of their robot, the team may request a re-inspection of their robot by an Inspector.
8. Inspectors evaluate robots to ensure each robot has been designed to operate and function safely. The robot must be designed for safe operation and handling. Specific safety rules and limitations apply to the design and construction of a robot.
9. A robot is deemed successfully inspected when all items listed on the "Competition Inspection Checklist" have been recorded as passed by an Inspector.

Appendix B: Awards

B.1 - Overview

This section describes the *awards* for the CREATE Open competitions. It also describes the format of *judging* and offers helpful hints for teams to be used in preparation.

B.2 - Types of Awards

There are three types of awards given to teams competing in the CREATE Open game:

On-Field Awards - Based solely on the scores obtained on the field.

Judged Award - Based solely upon the scores received in the judged portion of the competition.

Hybrid Award - Based on the combination of on-field performance, the judged portion of the competition, and social interaction throughout the tournament. Teams must do well in both the On-Field and Judged Award categories.

B.3 - Judging

Judging is done throughout the day. It is done informally by judges and event officials as they watch your team's interaction with event officials, referees, judges, other teams and fans, and how you relate to members within your team. Team judging is offered to every team attending a CREATE Open tournament, whether in the form of face-to-face judges interviews or video judging.

B.3.1 - Judges Interviews

Check the Tournament Schedule for the Judging Interview Schedule; judges interview tables are usually in the same area as the Pit Area. There are typically no individual scheduled times for teams to do their interviews. When a team is ready to be interviewed, they will get in line at the judging tables and when a judge's table is open, the next team in line will interview with that set of judges. Teams do not interview with every set of judges - they will only be interviewed once. A team will usually be interviewed by 2-3 judges during their interview.



The panel of judges may ask any question they would like but here are some sample questions:

1. What part of your robot are you most proud of? Why?
2. What makes your robot effective at playing this year's game?
3. What does your robot do in autonomous mode? Who programmed it?
4. What electrical safety features do you have on your robot?

B.3.2 - Video Judging

At various CREATE sponsored events, Event Partners may opt to do judging via video presentations. The larger the tournament the more likely this format will be adopted. These videos will be reviewed by Judges prior to the tournament and only those earning a superior score will be invited to a face-to-face interview at the tournament. Only teams invited to face-to-face interviews will be eligible for some of the judged awards. **NOTE:** This is not available at all CREATE Open Tournaments and will be communicated to you ahead of time whether or not it is an option for your team.

Teams will securely upload a 10 minute-max video that includes the following:

1. Introduction of the team and each team member
2. What was the most difficult task in building your robot?
3. What do you consider the strength of your robot?
4. What do you think you could do to improve your robot?
5. What community involvement related to robotics has your team had?
6. Anything else deemed important about your robot an/or your team's experience.
7. Review of the engineering notebook (if applicable)
8. For more information please see <http://create-found.org/CreateSupport.php>

B.3.3 - Engineering Notebook

Engineering notebooks are an optional part of the CREATE Open Program but are VERY helpful for the judges in team judging and necessary for some of the awards (see below). Teams are strongly encouraged to spend the time to write a first-class engineering notebook. A well-written engineering notebook, which details not only your designs, both rejected and accepted, but also your journey as a team, will be



looked on very favorably by the judges. The notebook is also an excellent way to prepare for your judges interview as it helps you remember things that happened throughout the year and organizes your thoughts. Please keep in mind that all elements of the notebook are to be done by the students.

B.4 - Helpful Hints

Awards are based upon each team's performance throughout the entire day. Please keep in mind that everything you do says something about you and your team. Judges and event officials will be with you in the pit area, playing field and all the common areas. The following are characteristics of winning teams:

- ◆ **Respectful** - Respectful of each other, other teams, officials and everyone at the tournament.
- ◆ **Enthusiastic** - Enthusiasm is contagious. Great teams have plenty of it and spread it around!
- ◆ **Focused** - Everyone on your team should have a role to play and should take their role seriously.
- ◆ **Knowledgeable** - Each member of your team should have a good understanding of your robot, how it was constructed, and what decisions were made in the final design of the different subsystems of the robot.
- ◆ **Equal contributions** - Each team member contributes to the presentation and to answering questions. It is perfectly acceptable to have one team member (student) lead the presentation. However the best teams are careful to make sure that every member of their team has a part in the presentation.
- ◆ **Student-led** - Well run teams have coaches and mentors that understand that their role is to be a facilitator. During the interview all questions should be answered by the students only, unless specifically directed to a coach/mentor.
- ◆ **Keep track of time** - There are many things to keep track of during the tournament: getting time on a practice field, inspections, skills challenges, qualification matches, adjusting your robot. Don't forget to attend a judges interview!

B.5 - Awards List / Descriptions

The following list of CREATE Open Program awards are not an exhaustive list of awards given out at all tournaments; most of these awards are reserved for large Signature events such as the U.S. Open Tournament.





Honor Award - *“Honesty, fairness and integrity in one's beliefs and actions.” “A source of credit or distinction.” “High respect, as for worth, merit or rank.”* This is the highest award presented in a CREATE Open tournament. The recipient of this award is a team that excels in all aspects of competitive robotics. On field performance, technical knowledge, interviews and interaction with all teams, fans and tournament officials will be taken into consideration in determining the winner of this award. The Honor Award is heavily weighted toward technical innovation, fair play and collaboration.

Innovate Award - *“To design or create, especially by introducing new methods, technique, or ideas.”* This award is given to the team with the most innovative solution to the current year's challenge. Innovation is judged at multiple levels: 1) Highest level - Building non-kit or predominantly non-kit based robots which address the challenge in an effective and innovative way, 2) Intermediate level - Introducing additional components, (structural parts, motors, controllers, sensors) to predominantly kit based robots in an effective and innovative way, and 3) Base level - Using kit based parts/equipment in an effective and innovative way. Custom built parts, effective performance and innovative design are key attributes assessed for this award. NOTE: This award may, or may not be given at a tournament. To earn the Innovate Award a team must have a robot that is effective (finish in the top ½ during qualifications, finish in the top ½ of skills) and not be built exclusively or predominantly from a kit. Whether the Innovate Award is given will be exclusively up to the judges.

Amaze Award - *“To fill with astonishment.”* This award will be presented to a team that has built a competition robot that clearly demonstrates overall quality. Solid mechanical design along with demonstrated robot strength, programming, robustness, performance and consistency are key attributes assessed for this award.

Build Award - *“The style or form of construction.”* This award will be given to a team that has built an impressive machine, with attention to features and safety. Judges will look for beautifully crafted and constructed robots that also show a clear dedication to safety and attention to detail. These robots will have a professional feel and quality look to them, with clear attention to quality in construction.

Design Award - *“To decide upon and plan the look and function by making a detailed drawing.”* This award is presented to a team that demonstrates an organized and professional approach to the design process, project management, time management and team organization. The winning team will be able to describe how they created and implemented an efficient and productive design process to effectively manage their time and resources to accomplish their project goals.

Key criteria include:

1. Engineering Notebook is a clear, complete document of the team's design and build process



2. Team is able to explain their design and strategy throughout the season
3. Team demonstrates personnel, time and resource management throughout the season
4. Teamwork and interview quality

Think Award - *“Having the freedom to direct one's own mind.”* This award will be presented to a team that has successfully utilized autonomous programming modes during competition. Quality, consistency, and success of autonomous programs as well as the ability of the students to explain the programming process will help to determine a winner of this award. This award may be judged by the referees, programming inspectors and/or members of the judge panel.

Energy Award - *“The strength and vitality required for sustained physical or mental activity.”* This award will be decided based on team enthusiasm at the event. The winning team will demonstrate enthusiasm throughout the competition - in the pit area, on the field, in the audience, when their robot is playing and when it's not. This award will be judged and decided by the volunteers and staff at the event.

Sportsmanship Award - *“Fair and generous behavior or treatment of others.”* This award will be presented to a team that has earned the respect and admiration of the volunteers and other teams at the event. This team is a model for all to follow and interacts with everyone in a positive, respectful and polite manner. This award is judged during the event by teams, referees and volunteers.

Bracket Buster Award - *“To unexpectedly defeat a high-ranking team.”* The “Bracket Buster” award will be given to the lowest seeded team to win in the first round. In the case of a tie the team that goes the furthest in its bracket will be awarded the bracket buster.

Tournament Champion - *“To defeat all opponents in a competition or series of competitions, so as to hold first place.”* This award is given to each team of the winning alliance.

Tournament Finalist - *“To defeat all opponents in a series of competitions except for the Champion, so as to hold second place.”* This award is given to each team of the second place alliance.

Skills Champion - *“To defeat all opponents in a competition or series of competitions, so as to hold first place.”* This award is given to the team ranked first in the Skills Challenge, combining both the driver and programming scores.

Skills Finalist - *“To defeat all opponents in a series of competitions except for the Champion, so as to hold second place.”* This award is given to the team ranked second in the Skills Challenge, combining both the driver and programming scores.



B.6 - “Honor by Design”

Honest - Follow the spirit of the rules of the competition. Do “what’s right” when no one is looking.

Competitive - Always give your best. Be humble in victory and gracious in defeat. Be respectful of your teammates, coaches and mentors, competitors, judges and spectators.

Collaborative - Act in the best interest of the team’s goals and be supportive of your fellow teammates. Share knowledge, tools, and parts with other teams.

Leader - Encourage, praise, involve and constructively challenge your teammates.

Professional - Works hard and is determined. Overcomes obstacles. Is well trained and acts in a professional manner.

Appendix C: College-Level Teams

C.1 - Overview

The CREATE Open program is open to students of all ages, including college / university teams. This section describes the additional restrictions that are placed upon college / university teams or any teams that has *members that have graduated high school*.

C.2 - College-Level Rules

1. University teams are welcome and encouraged to participate in regular season CREATE Open tournaments / events at the discretion of the event partner.
2. In regular season events college / university teams may not form an Alliance with another college / university team.
3. A University team is defined as a team that has one or more members that have graduated high school and attends a college or university. Please note that this allows for mixed teams of university and high school / middle school students.
4. University teams may participate in regular season tournaments but they may not participate in the China Cup. The China Cup and the trophies and partially sponsored trip that goes along with it is reserved for middle school and high school teams.
5. University teams may not participate at the Open Program State Championship. This is a state championship level event and will be restricted to middle school and high school teams only.
6. We welcome university teams to participate at the U.S. Open. They will not be able to participate in the regular Open Division, but if we get enough teams a smaller division will be created for them. There will be NO registration fee for University teams at the 2020 CREATE U.S. Open, instead they will be asked to a) run their division and b) volunteer during the tournament.