THE CRC ROBOTICS COMPETITION
RULEBOOK

Outlining the full rules for

2020 FLIP

A program of

AEST EAST

ALLIANCE POUR L'ENSEIGNEMENT DE LA SCIENCE ET DE LA TECHNOLOGIE
EDUCATIONAL ALLIANCE FOR SCIENCE AND TECHNOLOGY

Foreword

i. Welcome to the CRC Robotics Competition

On behalf of the Educational Alliance for Science and Technology (EAST) and CRC Robotics, welcome and congratulations to all the participants on joining your school's robotics team and embarking on the CRC Robotics Competition journey! Take it from the current leaders of CRC Robotics, who were all former student participants in the CRC Robotics Competition: you will remember this unparalleled experience for many years to come.

We wish to welcome and thank the many teachers, parents, and mentors for embarking on this journey and for all the hard work you will put in to enrich your students' lives throughout this activity. A big thank-you to all the volunteers involved in CRC Robotics, whose dedication has allowed us to hold Flip 2020, our 19th annual competition.

In addition, we wish to acknowledge all our partners, without whom CRC Robotics could not exist.

The 2019-2020 CRC Robotics season will have a lot to offer: a new interactive web platform for teams and a significant enhancement of our live streaming capabilities as well as the gradual introduction of the 9880A Arduino-based robot control platform that was fully developed in-house.

We wish to thank the Director General of Vanier College, Mr. John McMahon, and his team led by Mr. Haritos Kavallos for their warm welcome as the host school and for the time and energy they've put towards the success of this event.

Good luck to all and we will see you at Flip 2020 from February 13th to 15th, 2020 at Vanier College in Montreal.

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ii. About CRC Robotics

CRC Robotics was founded in 2001 by a group of young professionals and teachers, fueled by their passion for robotics and education. Unsatisfied with the robotics competitions available for high schools and CEGEPs in Canada, they created an annual competition linking science, technology, engineering and mathematics (STEM) with computers, arts and languages.

We've since grown into a non-profit organization run by former participants willing to give other students the chance to participate in the CRC Robotics adventure that has been so much fun for them. The Competition now welcomes teams from coast to coast in a 3-day, action-packed event held annually, in February.

We believe in providing exciting learning opportunities to students with various interests and goals. Under the umbrella of the Educational Alliance for Science and Technology (EAST), we hold events allowing tomorrow's leaders to find their passion and develop key skills that will serve as assets in an ever-changing, global world.

In essence, the CRC Robotics Competition is:

- A coherent body of several competitions, integrating different disciplines and unique challenges, including languages, computers, mathematics, science, art and much more;
- An experience that develops the qualities of a leader and teaches students about organization and teamwork, since everything is directed and performed by the students;
- An event that involves students from high schools, CEGEPs and professional vocational centres from all over Canada;
- A challenge that allows students to apply the theoretical knowledge gained in the classroom to a practical application in order to familiarize the students with technology outside of the classroom;
- A chance to take part in an extra-curricular activity and work with students and mentors from different backgrounds and domains (engineers, technicians, university professors, etc.).

The CRC Robotics Competition has seen an increasing number of female student participants over the years, who have also continued their studies in STEM fields! To further expand the participation of girls in STEM, CRC Robotics also organizes an annual networking event for high school and CEGEP girls and non-binary students, entitled *Aim Together*, with the goal of inspiring girls to consider a career in STEM. Our mission is to brand STEM fields, which are thought of primarily as masculine environments, as welcoming to women, in the hopes that girls will consider STEM as a viable career path. For more information on this event, happening in November, or for questions on how to register, please contact the organizers at conference@sciencetech.ca.

iii. Roles within the CRC Robotics Competition

In the CRC Robotics Competition, there are three different roles: students, teachers, and mentors. We have laid out the following responsibilities for each:

1. **Students are to do all the planning and building**. They should be creating the strategies, designing the critical paths, and controlling all aspects of the team. Any work done on any aspect of the Competition must be done entirely by the students.

2. **Teachers are available to provide the support that students may need, only if they need it.** They should not be directing the students, but instead, acting as an advisor. If a student has a question, the teacher may point the student toward the answer or show the student how to find the solution. If a student is unsure of how to accomplish a specific task, the teacher may demonstrate, but any pieces attached to the robot are to be touched only by the students. However, we do realize that there may be times when an educator must step in for academic reasons. We believe that every teacher is a competent professional that can differentiate between teaching and doing.

3. **Mentors are external professionals who may be consulted throughout the course of this activity.** Their job is to help with questions which exceed both the students' and teachers' knowledge. An engineer would have more practical experience; however, the engineer may not direct the students as he/she is acting only as an advisor.

We value the participation of your school, but always keep in mind that this is the students' project. Let them show you what they are made of and let them develop their own skills! Their own work is what truly matters and that is what makes the CRC Robotics Competition so unique and relevant.

iv. Participating Schools

Once again, teams from coast to coast have decided to take on this year's CRC Robotics challenge:

2020 Team Number	School Name	Division	Rookie
1	Lower Canada College	1	
2	École secondaire Curé-Antoine-Labelle	2	
3	École secondaire Monseigneur-Richard	2	✓
4	John Abbott College	1	
5	St. George's School of Montreal	1	
6	Dawson College	1	
7	West Island College	2	
8	Collège Sainte-Marcelline	1	
9	Marianopolis College	1	
10	Collège Montmorency	1	
11	Centennial Regional High School	1	
12	Rosemount Technology Center	2	
13	Collège Citoyen	2	
14	Lake of Two Mountains High School	2	
15	Collège de Bois-de-Boulogne	1	
16	Macdonald High School	1	
17	École secondaire Jules-Verne	2	
18	Cégep Vanier College	1	
19	Heritage Regional High School	2	✓
20	Collège Letendre	2	✓
21	Royal West Academy	2	
22	Cégep du Vieux-Montréal	2	
23	La Cité Collégiale	1	✓
24	Collège André-Grasset	2	
25	Saint Lambert International High School	2	
26	Kells Academy	2	✓
27	Champlain College	1	✓

v. Our Partners

One of the most important aspects of the CRC Robotics Competition is that it keeps registration fees for schools at a bare minimum to ensure an easy and equal access for schools from all socio-economic situations. This would not be possible without the help of our generous partners that, year after year, help us prepare this wonderful event for the students.

We are always seeking to establish new partnerships to achieve our goal of positively improving as many student lives as possible. If you or someone you know is willing to help us in any way, please contact our Partnerships Team at partnerships.crc@sciencetech.ca. On behalf of the students, a heartfelt thank-you!

vi. Season Calendar

Item	Date & Location	Description
Information Sessions	Year-Round	The CRC Robotics Organizing Committee is always available to meet you and present a detailed explanation of what the Competition is all about and what it entails for students, teachers and their school. Interested parties may contact us via info.crc@sciencetech.ca.
Registration Period	September 2, 2019 to October 11, 2019	Registration is opened to all high schools, CEGEPs and professional vocational centres in Canada. Late registration may be possible. Please contact info.crc@sciencetech.ca for more information.
Training Day	October 2019	The Training Day is a hands-on tutorial and training day for teachers and mentors who wish to familiarize themselves with the technology involved in the CRC Robotics Competition as well as with the Competition structure and dynamics. The Training Day is organized according to the demand. Interested parties may contact us via info.crc@sciencetech.ca.
Preliminary Rulebook Release	October 21, 2019	A partial version of the rulebook is made available to participants on www.robo-crc.ca/participant-portal/ one week prior to Kickoff. This way, participants can familiarize themselves with this year's game and prepare questions to be asked at Kickoff.
Kickoff	October 28, 2019 at 7pm *Doors open at 6:30pm* Vanier College 821 Sainte-Croix Avenue Montreal, QC, H4L 3X9	The Kickoff officially marks the beginning of the season for the participants. The complete rulebook and the playing field are revealed, and the participant kit (which includes the legal power motors and batteries) are distributed to the teams. For logistical reasons, a maximum of 10 individuals may attend.
CRC Workshops	November 4, 2019 December 2, 2019 January 13, 2020 February 3, 2020 (on demand) Vanier College 821 Sainte-Croix Avenue Montreal, QC, H4L 3X9	The CRC Robotics Workshops are events intended to provide specific training to participants in their field of interest. Multiple topics are covered simultaneously in multiple rooms on the same evening. All subjects covered and details related to the workshop will be made available at www.robo-crc.ca/participant-portal.

Aim Together Event	November 7, 2019 École de Technologie Supérieure 1220 Notre-Dame St. W. Videotron Room, Pavilion E Montréal, QC, H3C 1K3	A free event where many successful women from diverse cultural backgrounds and different STEM fields are present to speak to the girls and young women about their unique career path. No need to be a participant in the CRC Robotics Competition to attend. Invite all your friends! Interested parties may obtain information and register on www.robo-crc.ca/aim-together.
Website, Video, and Tutorial Submission, and Programming Component Opt-In Deadline	January 27, 2020 at 11:59:59pm EST Using the Participant Portal: www.robo-crc.ca/participant-portal	Having the website up and running and uploading the video to YouTube might take several hours. We therefore recommend you not to wait until the very last minute before starting the upload and going through the submission procedure. If you encounter any problems, send a detailed explanation to natasha.vitale@sciencetech.ca **before** the submission date and time. The Submission Form will be made available as of January 20, 2020.
Deadline to make Website, Video, and Tutorial Public	February 13, 2020 at 7:59:59am	Teams must make their website, video and tutorial available to the general public and the other teams prior to the start of the competition. For more information, refer to the specific sections outlining the details of these components.
19th Annual CRC Robotics Competition **Flip 2020**	February 13 to 15, 2020 Vanier College 821 Sainte-Croix Avenue Montreal, QC, H4L 3X9	Join us in the pinnacle of the 2019-2020 CRC Robotics season. After over three months of hard work and countless hours of design and construction, close to 30 teams will show off what their robot can do. Also, the students will be showcasing their school and accomplishments in their kiosk, on their website and in their video. An exciting, action-packed, 3-day event not to be missed!

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1. The Competition

The Competition is a three-day event that takes place annually, in the month of February, at one of the participating schools. The final Competition rules are made public at Kickoff, approximately 3 and a half months before the Competition.

The following presents the typical Competition schedule. The official and detailed schedule is made available a couple of weeks before the Competition at www.robo-crc.ca/participant-portal.

- Thursday Morning: Team Arrival and Kiosk Setup
- Thursday Afternoon: Kiosk Setup and Practice Presentations
- Thursday Night: Opening Ceremony and Preliminary Heat Block #1

- Friday Morning: Preliminary Heat Block #2 and Evaluations
- Friday Afternoon: Preliminary Heat Block #3 and Evaluations
- Friday Night: Preliminary Heat Block #4 and Evaluations

- Saturday Morning: Knock-Out Rounds
- Saturday Afternoon: Quarterfinals, Semi-Finals and Finals, Kiosk Dismantling
- Saturday Night: Closing Dinner and Awards Ceremony

1.1 Components

The Competition is divided into seven (7) distinct components, which allows students to demonstrate their strengths in different ways and across various disciplines. While not mandatory, teams may choose a theme that would be applicable to all components of the Competition.

1.1.01 Game

This year's game is named Flip 2020. The teams must participate in a tournament with their own radio-commanded robot and must ensure that they follow this game's specific rules and regulations. More information on the game can be found in Section 2 of this rulebook.

1.1.02 Robot

The design and construction of the robot primarily involve the application of engineering, science, technology and mathematics to ensure that the robot can participate in this year's game. Since the game changes from year to year, the students cannot reuse the exact same

robot from previous years; however, certain parts and mechanisms may be reused. More information on the robot can be found in Section 3 of this rulebook.

1.1.03 Kiosk

The kiosk acts as an information booth, which presents the team's hard work to judges, fellow participants, and visitors to the Competition. It also acts as a workshop for the team's robot between the heats. The kiosk often represents the team's theme for this year's Competition and essentially involves the application of art and communication. More information on the kiosk can be found in Section 4 of this rulebook.

1.1.04 Programming

The programming component is designed to foster and hone the skills and thinking process required to code professionally. In a truly unique way, participants will tackle various online programming challenges throughout the season in order to qualify for the final round, which will take place at the Competition. Each challenge will provide participants with the required tools to succeed, and challenges will become more complex as teams move forward. More information on the programming competition can be found in Section 5 of this rulebook.

1.1.05 Video

A fully bilingual video must be submitted and be publicly available prior to the Competition and must present the participating school's history as well as a description of this year's game. It must also, among others, demonstrate and elaborate on the construction of the robot, the challenges encountered during the build process and the solutions implemented by the students. This aspect involves the application of technology, computers and languages. More information on the video can be found in Section 6 of this rulebook.

1.1.06 Website

A fully bilingual website must be created and publicly published prior to the Competition, with the goal of demonstrating the hard work of the team to the public. The website must include, but is not limited to, the school's history, a list of participating students, a description of this year's game and the design and construction of the robot. This aspect involves the application of technology, computers and languages. More information on the website can be found in Section 7 of this rulebook.

1.1.07 Tutorial

The tutorial component allows teams to demonstrate their mechanical, electrical, programming, video and coding talents, among others, by providing a step-by-step explanation to achieve any particular task. The tutorial must be accessible on the team's website and can hold various media formats. More information on the tutorial can be found in Section 8 of this rulebook.

1.2 Divisions

With a goal of making the Competition as fair as possible to teams with less experience, the CRC Robotics Organizing Committee has introduced a two-division system for certain elements of the Competition.

1.2.01 Teams are divided among Division 1 and Division 2 for the following components:
   a. Robot Design;
   b. Robot Construction;
   c. Kiosk;
   d. Video;
   e. Website Content;
   f. Website Design.

1.2.02 This year's Division is based on the overall result obtained by the team in last year's Competition. The team's Division is the same for all previously mentioned components.

1.2.03 The top half of the overall ranking will be assigned to Division 1. If there is an odd number of teams, the median team will be in Division 2.

1.2.04 The divisions are re-assigned every year.

1.2.05 New high school teams are automatically placed in Division 2 while new CEGEP teams and vocational centres are automatically placed in Division 1.

1.2.06 A team in Division 2 can win the Overall Ranking award.

1.2.07 The best Division 1 and Division 2 teams will receive separate awards for the components based on the ranking for each component.

1.2.08 Teams will know their division on the night of the Competition Kickoff. However, if a team registers afterwards, these assignments can be modified. If it is the case, teams will be advised.

1.2.09 A Division 2 team can request to be upgraded into Division 1.

1.2.10 CRC Robotics has the final say in the division distribution.

1.3 Awards and Recognitions

Awards and recognitions are presented to the most performing team(s) in each component. If the division system is used for the ranking of a particular component, then awards are presented to the most performing team(s) in each division for the component. Refer to Section 1.2 for details on components for which teams will be ranked within their division only. In the event of a tie, both teams receive an award and/or recognition. In this section, an "award" is a prize that is presented for a component whose score counts towards the overall ranking and a "recognition" is a prize that is presented for a component whose score does not count towards the overall ranking.

1.3.01 Game

The Game award is presented to each team that was a finalist in this year's game. Finalists are the teams that participated in the final round of the game.

1.3.02 Robot Design

The Robot Design award is presented to the three teams that received the greatest scores from our engineering judges and that were deemed to have best designed their robot for the purpose of this year's game.

1.3.03 Robot Construction

The Robot Construction award is presented to the three teams that received the greatest scores from our engineering judges and that were deemed to have best constructed their robot for the purpose of this year's game.

1.3.04 Kiosk

The Kiosk award is presented to the three teams that received the greatest scores from our pedagogical judges and that were deemed to have the best designed, best constructed and best maintained kiosk.

1.3.05 Programming

The Programming award is presented to the three teams that achieved the highest scores in the programming component of the Competition and that were deemed to have the best executed code to accomplish the tasks at hand.

1.3.06 Video

The Video award is presented to the three teams that received the greatest scores from our professional/expert judges and that were deemed to have the best executed video.

1.3.07 Website Design

The Website Design award is presented to the three teams that received the greatest scores from our professional/expert judges and that were deemed to have the best website from a technical standpoint.

1.3.08 Website Content

The Website Content award is presented to the three teams that received the greatest scores from our professional/expert judges and that were deemed to have the best written content on their website.

1.3.09 Tutorial

The Tutorial recognition is presented to the team that was deemed to have the best explanation of the task selected. This winner is selected by the CRC Robotics Organizing Committee.

1.3.10 Never Say Die

The Never Say Die recognition is presented to the team that encountered many obstacles throughout the course of the Competition and that persevered to finally overcome those hurdles despite all hurdles. This winner is selected by the CRC Robotics Organizing Committee and receives a trophy that symbolizes all their hard work and perseverance.

1.3.11 Sportsmanship

The Sportsmanship recognition is presented to the three teams that are deemed the most respectful towards their peers and exhibit behavior based on values of respect and integrity that go beyond the Competition's rules and etiquette. The winning teams are selected by their peers and the team in first place also receives a trophy that symbolizes their sportsmanlike conduct: The Founders' Trophy.

1.4 Overall Ranking

1.4.01 Scoring Logic

1. For each component of the Competition, the number of points equal to the total number of teams is given to a first-place ranking. The score given to other ranks can be calculated using the following formula:

$$Score = Total\ Number\ of\ Teams - Rank + 1$$

2. Kiosk, Programming, Robot Design, Robot Construction, Website Design, Website Content, and Video components follow the formula mentioned above.
3. The game component counts for double the value of the formula mentioned above.
4. In the case of a tie, the teams receive the same score for that category.
5. The total number of points for all components determines the overall ranking.

1.4.02 Overall Ranking Award

The Overall Ranking award is presented to the three teams that receive the greatest score after combining the points in each component. They are deemed to be the best performing teams in the Competition as a whole. The team in first place also receives a trophy that symbolizes their success.

2. The Game

The game component requires robots to score the greatest number of points while working in teams. It is the main component of the CRC Robotics Competition, giving each school an equal opportunity to demonstrate their robot design, robot construction and strategic playing skills. Refer to the Survival Guide for tips and suggestions.

CRC Robotics reserves the right to modify any and all values outlined in the following sub-sections at any time throughout the season. All teams will be promptly notified if a modification is made.

2.1 Teams

2.1.01 Two teams, blue and yellow, composed of two robots each, are playing against each other during each heat.

2.1.02 Robots will change partners from heat to heat.

2.2 Playing Field

2.2.01 The playing field is a single-level rectangle, maneuverable by both teams.

2.2.02 Available starting zones are located at one end of the playing field and are represented by the colored tiles.

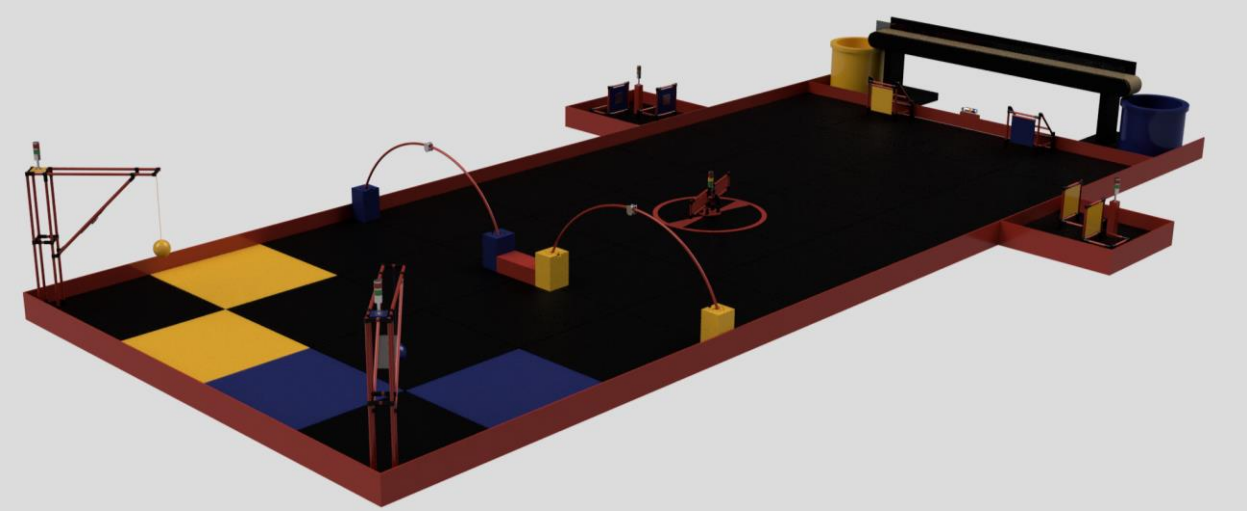
2.2.03 A conveyor belt is located opposite the starting zones and is not accessible to robots.

2.2.04 A perimeter is painted on the floor directly below the Twister actuator, identifying the area in which a robot may come into contact with the actuator while the actuator is in motion. Entering this zone is at the robot's risk. However, a deliberate attempt to hit another robot using the Twister actuator will be considered as unsportsmanlike behavior. See Section 2.9 for details on arbitration and penalties.

2.2.05 The floor area beneath the Mushrooms actuators is part of the playing field.

2.2.06 Unless otherwise communicated by the CRC Robotics Organizing Committee in the event of a modification, measurements of the playing field recorded at Kickoff will be considered accurate. Teams are allowed a certain period of time at Kickoff to measure the different elements of the playing field.

2.2.06 The image below shows a view (not to scale) of the playing field.



2.3 Game Pieces

2.3.01 This year's game pieces (GP) are bean bags.

2.3.02 Robots cannot touch the GPs as they are passive, not active, playing pieces.

2.3.03 There are two types of GPs: red ones, dropped into play at a certain rate during the heat and black ones, dropped into play as a result of a power-up activation.

2.3.04 There are no limits to the number of GPs put into play during the heat.

2.4 The Conveyor Belt

2.4.01 The conveyor speed and direction are two independent variables. These two variables can take different values depending on the power-ups activated during the game. They are represented by the following letter strings and can take the following values.

$$\begin{cases} speed = \{0; 0.5; 1; 1.5; 2\} \\ direction = \{yellow;\ blue\} \end{cases}$$

2.4.02 One bin is located at each end of the conveyor belt. The yellow bin located to the left of the conveyor belt belongs to the yellow team. The blue bin located to the right of the conveyor belt belongs to the blue team. When $direction = yellow$, the direction of the conveyor belt is toward the yellow bin. When $direction = blue$, the direction of the conveyor belt is toward the blue bin.

2.4.03 At the beginning of the heat, the conveyor does not move ($speed = 0$).

2.4.04 The conveyor belt can only be started when a robot triggers their Hinged Board actuator. This initial trigger starts the first conveyor period. If a robot from the blue team triggers its Hinged Board first, then $speed = 1$ and $direction = blue$. If a robot from the yellow team triggers its Hinged Board first, then $speed = 1$ and $direction = yellow$. This initial triggering of the Hinged Board actuator does not count as an activation of the team's single-use conveyor belt direction switch power-up.

2.4.05 A conveyor period is a 30-second period where the direction of the conveyor remains the same. When a period ends, the direction is switched ($direction$ is changed to the other possible value) and a new period begins.

2.4.06 For reference, when $speed = 1$, a GP takes around 45 seconds to go from one end to the other of the conveyor when the conveyor is empty.

2.5 Putting Game Pieces into Play

2.5.01 GPs are put into play via a dispenser. Red GPs are dispensed onto the middle of the conveyor at a certain rate. This drop rate is represented by the following letter strings and can take the following values depending on the power-ups activated during the game.

$$\{rate = \{0.5; 1; 2\}$$

2.5.02 At the beginning of the heat, $rate = 1$.

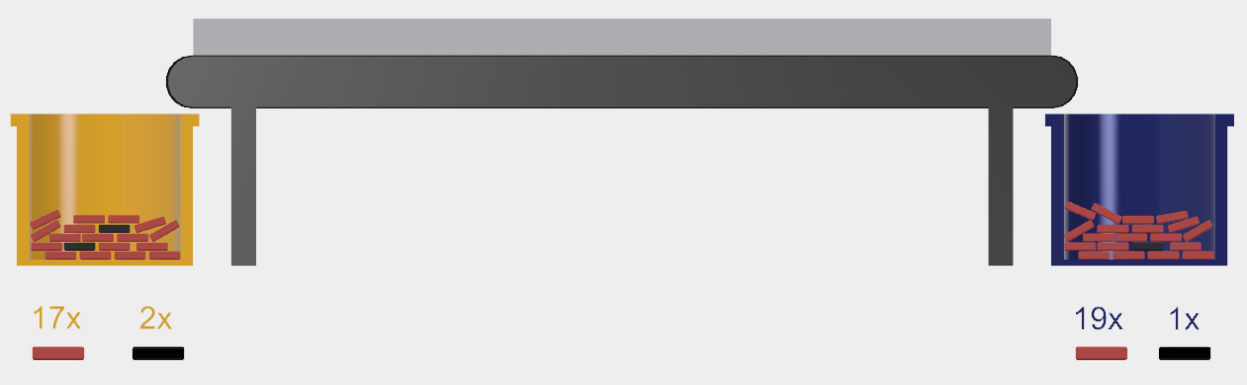
2.5.03 For reference, when $rate = 1$, a GP is dropped every 3 second.

2.6 Scoring Points

2.6.01 A team scores points every time a GP falls into its bin. Red GPs are worth 5 points each and black GPs are worth 30 points each.

GP Color	Points/GP
Red	5
Black	30

2.6.02 The following is a scoring example. It constitutes an integral part of the rules and acts as a reference for scoring disputes. Please note that this image does not represent the real playing field to scale, the various elements of the field, or the positioning of the starting zones. This image is simply to help understand the scoring system. The numbers represent the number of GPs of each color located in each bin at the end of a heat.



	Yellow Team	Blue Team
Black GPs (30 pts)	2 (60 pts)	1 (30 pts)
Red GPs (5 pts)	17 (85 pts)	19 (95 pts)
Total score	145	125

2.6.03 In order to share points with its teammate, a robot must trigger at least one actuator during the entirety of the heat. The robot will then be defined as a sharing robot and will share the team's points.

2.6.04 The total score for each team is assessed at the end of the heat, although an estimated score might appear as the heat is in progress. A robot's final score for a heat represents its total score, minus penalties.

2.7 Power-Ups

2.7.01 Each actuator has a single power-up tied to it. Triggering said actuator will activate the power-up.

2.7.02 While a power-up is active, the green LED located near the corresponding actuator blinks.

2.7.03 There are 4 power-ups that will remain the same for every heat and will be linked to the same actuators.

- The speed of the conveyor belt is now twice or one and a half times its normal speed for 20 seconds, depending on the Mushroom actuator pressed. The furthest Mushroom from the middle of the playing field changes the value of $speed$ to 2, while the closest one changes the value of $speed$ to 1.5.
- The drop rate of the GP dispenser is twice its normal rate ($rate = 2$) for 20 seconds.
- The current conveyor period is halted immediately. A new conveyor period is started, and the conveyor direction is switched ($direction$ changes to the other possible value). This power-up is only available after 1 minute has passed since the triggering of the Hinge Board that initially started the conveyor belt. Each team can use this power-up only once per heat.
- The conveyor is stopped ($speed = 0$) for 10 seconds.

2.7.04 The blue and yellow team are also allowed to choose a custom power-up from the following bank of power-ups prior to the start of each heat. This customizable power-up is always associated to the same actuator.

- The speed of the conveyor belt is now half its normal speed ($speed = 0.5$) for 20 seconds.

  or

- The drop rate of the GP dispenser is now half its normal speed ($rate = 0.5$) for 20 seconds.

  or

- A black GP is dropped in the middle of the conveyor.

2.7.05 Each power-up is linked to a certain actuator.

Actuator	Power-up	Duration
Chained Ball	The drop rate of the GP dispenser is twice its normal rate ($rate = 2$).	20 seconds
Arch	The speed of the conveyor is now half its normal speed ($speed = 0.5$).	20 seconds
	or	
	The drop rate of the GP dispenser is now half its normal speed ($rate = 0.5$).	20 seconds
	or	
	A black GP is dropped on the conveyor.	N/A
Twister	Conveyor belt freeze ($speed = 0$).	10 seconds
Mushrooms	1.5x conveyor speed for the mushroom nearest to the middle of the playing field ($speed = 1.5$).	20 seconds
	or	
	2x conveyor speed for the mushroom farthest from the middle of the playing field ($speed = 2$).	20 seconds
Hinged Board	Single-use conveyor direction flip.	N/A

2.7.06 The activation of the 0.5x conveyor speed power-up, the 1.5x conveyor speed power-up, the 2x conveyor speed power-up, or the conveyor freeze power-up terminates any ongoing power-ups affecting the speed of the conveyor. The new power-up then activates for its normal duration. Mathematically speaking, when the value of *speed* is changed, the ongoing power-up is terminated and replaced with the new power-up for its normal duration.

2.7.07 The activation of the 0.5x drop rate power-up or the 2x drop rate power-up terminates any ongoing power-ups affecting the drop rate of the GP dispenser. The new power-up then activates for its normal duration. Mathematically speaking, when the value of $rate$ is changed, the ongoing power-up is terminated and replaced with the new power-up for its normal duration.

2.7.08 The direction of the conveyor belt can change during the duration of power-ups as a result of the triggered of a Hinged Board actuator or due to the normal end of a conveyor period. The power-ups will continue to be active for the respective remaining time, but with the conveyor direction flipped. Mathematically speaking, because they are two independent variables, $direction$ can change without *speed* being affected, and vice-versa.

2.8 Actuators

2.8.01 During the heat, teams must trigger actuators in order to activate their corresponding power-up.

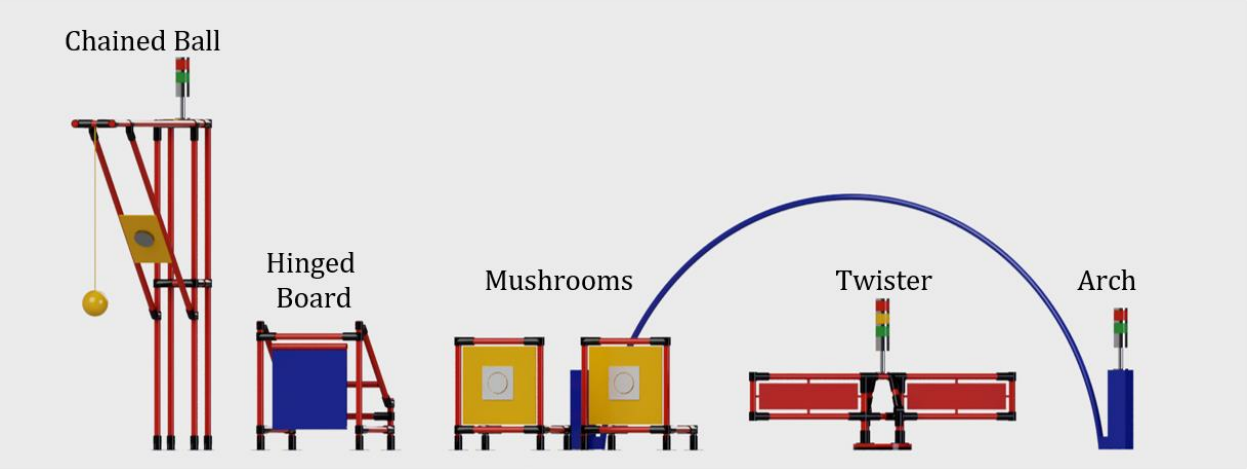
2.8.02 Teams can only trigger the common actuator or an actuator that is the same color as their team.

2.8.03 There are a total of 9 actuators on the playing field. Both teams have 4 actuators specific to their team's color:

- A Hinged Board actuator;
- A Chained Ball actuator;
- An Arch actuator;
- A set of two button actuator (referred to as the Mushrooms actuator);

And a common one:

- A Twister actuator.



2.8.04 The Hinged Board actuator is a rectangular board hinged at its top. The board must be pivoted so that it triggers a pressure plate, activating the corresponding power-up.

2.8.05 The Chained Ball actuator is a weighted ball attached to a chain. The ball must come in contact with a pressure plate to trigger the actuator, activating the corresponding power-up. Whether intentional or not, robot parts cannot touch the Chained Ball actuator pressure plate. See Section 2.9 for details on arbitration and penalties.

2.8.06 The Arch actuator is an arc that goes from one side of the playing field to the middle. Initially, bringing the carriage riding on the arc to the bottom of either side will activate the corresponding power-up. The carriage will activate the power-up by triggering a pressure plate. Afterwards, the carriage must be brought to the bottom of the other side of the arc for the corresponding power-up to be activated again. The carriage cannot be moved during the downtime of the actuator corresponding to the power-up. Whether intentional or not, robot parts cannot touch the Arch actuator pressure plate. See Section 2.9 for details on arbitration and penalties.

2.8.07 The Mushrooms actuator is a set of two pressure plates. The triggering of either pressure plate activates the corresponding power-up.

2.8.08 The common Twister actuator rotates around its vertical axis. Teams must keep it perpendicular to the conveyor belt for an uninterrupted duration of 3 seconds to activate the corresponding power-up. The actuator must be pushed, not hit. However, if right after its downtime, the Twister remains perpendicular to the conveyor for an uninterrupted 3 seconds, the corresponding power-up will reactivate again.

2.8.09 The red LED located near the corresponding actuator will light up during the 30 seconds following its triggering, indicating that it is in a downtime state. Power-ups cannot be activated while the corresponding actuator is in downtime. At the end of the downtime period, an actuator must be triggered again in order to activate its corresponding power-up once again, except for the common actuator. In other words, the actuator must read a rising-edge on its pressure plate outside of its downtime in order to activate its corresponding power-up.

2.8.10 Downtimes are actuator- and team-specific. For example, if the yellow team triggers the yellow Chained Ball actuator, the yellow Chained Ball actuator will be in a downtime state for 30 seconds. During this time, the blue Chained Ball actuator will still be available to be triggered by the blue team if not itself already in a downtime state from a previous triggering by the blue team.

2.8.11 The Twister actuator, being a common actuator, has a single downtime affecting both teams. Its corresponding power-up cannot be activated until the Twister downtime ends.

2.8.12 The following represents the LED light logic associated with the state of each actuator. Note that the yellow LED associated with the Twister actuator does not represent the yellow team.

Actuator	Green LED	Red LED	Yellow LED
Arch	Power-up available	Power-up in downtime	N/A
Chained Ball	Power-up available	Power-up in downtime	N/A
Mushrooms	Power-up available	Power-up in downtime	N/A
Twister	Power-up available	Power-up in downtime	Twister actuator is perpendicular to conveyor

	Blue LED	Yellow LED
Hinged Board	Blue team's single-use conveyor direction switch bonus available	Yellow team's single-use conveyor direction switch bonus available

2.8.13 To represent the fact that the initial Hinged Board actuator triggering (the one that starts the conveyor) doesn't count as an activation of the single-use conveyor direction switch power-up, both the yellow and blue LED will be turned off at the beginning of the heat. 1 minute after the initial triggering of the Hinged Board actuator, both LEDs will start flashing, representing the fact that both teams now have access to their single-use bonus. When the single-use bonus is activated, the LED associated to that team's color will turn off.

2.9 Arbitration and Penalties

2.9.01 Our referees are experts in calling and assessing penalties and always have the final word on the playing field. However, during the 15 minutes following the end of a heat, a team can challenge its final score if it has video evidence to support its claims. A team may be deprived by the referees of its right to challenge if they find it is unnecessarily abusing it.

2.9.02 The referees on the playing field have full authority to judge all aspects of the game. In particular, the referees will:

- Prevent robots, robot extensions and dropped robot parts from negatively blocking other robots;
- Prevent robots from damaging the playing field and GPs;
- Prevent robots from violating the air space on the edges of the playing field;

- Try their best to make sure the numbers displayed on the screens are accurate and updated as soon as possible; however, their ruling overrides whatever is displayed on the screens.

2.9.03 Any robot that is deemed dangerous (based on its design or behavior) by any of the referees runs the risk of being disqualified.

2.9.04 While we trust that all participants will provide clear intentions, certain conducts may occur that require sanctions, especially during the heat of battle. To avoid such penalties, remain courteous. These penalties are considered as Unsportsmanlike Conduct and have a series of escalating consequences, depending on the severity of the issue. The number of points deducted from the robot's total score for that heat will be at the discretion of the head referee and will be proportional to the severity of the action. Some examples of the types of behavior that signal a lapse of sportsmanlike behavior are:

- A deliberate attempt to disable or damage another robot;
- A deliberate attempt to hit another robot with a GP, robot part or playing field element;
- Inappropriate behavior directed at an official, another participant or a spectator;
- A deliberate attempt to block the triggering of team-specific actuators.

2.9.05 The minimum score that can be awarded for any given heat is 0 points; therefore, if a penalty brings a robot's total score to below 0, the final score awarded to the robot for the heat will be 0.

2.9.06 If liquid seeps from a robot onto the playing field, the robot's final score for the heat will be reduced to 0.

2.9.07 Various robot parts (items) may be placed, intentionally or not, on or around the playing field by a robot, on the condition that they are removed from the playing field or from its surroundings by the robot before the end of the heat. If items are no longer in contact with the robot by the end of the heat, the robot that released these items will be liable to an individual junk penalty of 4% of its total score for the heat for each item left on or around the playing field.

2.9.08 If a team judges that its robot needs assistance on the playing field during a heat, its pilot may ask the referee to assist their robot. The assisted robot will be liable to an assistance penalty of 20% of its total score for the heat. The referees reserve the right not to assist the robot even if asked to do so by the pilot.

2.9.09 Whether intentional or not, if a robot or one of its parts triggers an actuator belonging to the other team, or activates a power-up by touching the Chained Ball or Arch actuator pressure plate, it will be liable to an actuator penalty of 50% of its total score for the heat.

2.10 Heat Progress

2.10.01 Each blue robot starts the heat in one of the two blue starting zones on the playing field, while each yellow robot starts the heat in one of the two yellow starting zones on the playing field. Only one robot can start in each starting zone.

2.10.02 All heats are 5 minutes in duration. When the heat time is over, all parts of all robots must stop moving, and the conveyor is stopped ($speed = 0$). GPs will be considered only when they stop moving, even if that occurs after the heat time is over. All the points generated by a team due to the motion of their robots after the heat ends will be canceled. Although an estimate might appear on the screens near the playing field, the remaining time until the end of a heat is controlled by the head referee.

2.10.03 Team members may not interfere with or touch any element of the playing field, robots or GPs during the heat.

2.10.04 Robots may not damage the GPs or any playing field element.

2.10.05 All robots must be labelled with the school's name (either full or shortened) and number, as well as its assigned team color for the heat using the provided flags. These three elements must be clearly visible to the crowd and referees. If these elements are not all visible, the robot will not be allowed to participate in the heat. Adding the robot's name (if any) is optional.

2.10.06 If a robot is not able to fully exit its starting zone during the heat for whatever reason and is not actively trying to score points from its starting zone, or if it is simply absent, it will be considered as an inactive robot. A robot teaming up with an inactive robot will see its score multiplied by 1.25 to compensate for the disadvantage of playing alone. Inactive robots will be removed from the playing field after 30 seconds of inactivity to prevent them from blocking play.

2.10.07 If a robot makes it out of its starting zone and stops moving for whatever reason, it will be considered a broken robot. If the robot breaks before it meets the sharing requirements, then it will not share the team's score, but the other robot's score (from the same team) will not be multiplied by 1.25, because, initially, the broken robot was an active robot. Broken robots will be removed

from the playing field after 30 seconds of inactivity to prevent them from blocking play.

2.10.08 Following the buzzer signaling the end of play, team members are not allowed to enter the field, to touch any robot, or to touch the GPs before they are cleared to do so by the head referee. It is essential that the configuration of the GPs, at the end of the heat, remains intact for scoring purposes. The head referee will indicate when the team members are allowed to enter the playing field.

2.11 Pilot and Co-Pilot

2.11.01 Each team's pilot, co-pilot (spotter), and robot participating in the next heat must be in the "On Deck Area" when the buzzer sounds to end the previous heat. If not, a penalty is assessed to the offending robot. It is the team's responsibility to make sure the team is on time, even if the schedule is delayed.

2.11.02 If a robot, pilot, or co-pilot of a team is not ready to start, the heat will start without the team in question.

2.11.03 The pilot and co-pilot must remain seated during the entire game in their designated seats provided by CRC Robotics, which are placed within the designated areas surrounding the playing field.

2.11.04 Each person is responsible for taking all necessary precautions to ensure their own safety.

2.11.05 Before the start of the heat, the referees will ask each team for their choice of one of the 3 custom power-up options. The blue team will make their choice without knowing the choice made by the yellow team, and vice-versa. The custom power-ups are team-specific, and not robot-specific. If one team cannot agree on a power-up, a random one will be set as their choice.

2.12 Tournament Progress

2.12.01 The tournament consists of 5 stages:

a. **Preliminary Round:** These heats are played on Thursday night and throughout the day on Friday by all teams. After all the preliminary heats have been completed, each robot will cast out their two lowest-scoring heats. Heats affected by an unsportsmanlike penalty cannot be cast out. The total of all other heats will be summed to determine

each robot's final rank for the preliminary round. Depending on a team's rank, teams can advance directly to semi-finals or quarterfinals, or they will play in the knock-out round.

b. **Knock-Out Round:** These heats are played on Saturday morning by teams that did not directly advance to quarterfinals or semi-finals. This round provides teams with an opportunity to advance further in the tournament. The final score of all the heats played by a robot in the knock-out round will be added to determine its ranking in this round.

c. **Quarterfinals:** Top teams from the preliminary and knock-out rounds advance to this stage of the tournament. The final score of all the heats played by a robot in the quarterfinals will be added to determine its ranking in this round.

d. **Semi-Finals:** Top teams from the preliminary rounds and quarterfinals advance to this stage of the tournament. The final score of all the heats played by a robot in the semi-finals will be added to determine its ranking in this round.

e. **Finals:** Top teams from the semi-finals advance to this stage of the tournament. The final score of all the heats played by a robot in the finals will be added to determine its ranking in this round.

2.12.02 The schedule for the various rounds will be published at the beginning of the Competition at robo-crc.ca/participant-portal/.

3. Robot

This section outlines the robot design and construction constraints on which robots will be evaluated at the Competition. Non-compliance with the following rules will cause robots to fail certification. Uncertified robots are not allowed to compete. Refer to the Survival Guide for tips and suggestions. The evaluation rubrics used by the judges to evaluate the robot design and robot construction may be found in Appendix A and Appendix B of this rulebook, respectively. The Robot Certification Form may be found in Appendix C of this rulebook.

Certain rules in this section apply differently depending on the option for which the school has registered: Option #1 (VEX) or Option #2 (Arduino Beta).

3.1 Transmission and Controls

3.1.01 Authorized Controller and Functionality

For Option #1 (VEX) teams: The controller acts as the robot brain. All robot control signals must originate from a VEX ARM Cortex-based controller (VEX EDR Part Number: 276-2194), referred to as "the controller" in the rest of this document. It is forbidden to use more than 4 of the 8 analog inputs available on the controller.

For Option #2 (Arduino Beta) teams: The controller acts as the robot brain. All robot control signals must originate from a CRC 9880A or CRC 9880B controller, referred to as "the controller" in the rest of this document. It is forbidden to use the SPI and encoder ports and functionalities. It is forbidden to use more than 10 of the 12 PWM outputs available on the controller.

3.1.02 Remote Control

For Option #1 (VEX) teams: The robot may only be remotely controlled by a single VEXnet Joystick Remote Control (VEX EDR Part Number: 276-2192) using a VEXnet Key 2.0 (VEX EDR Part Number: 276-3245). VEXnet Key 1.0 is also permitted. The remote control must send all commands to the controller. However, the robot may perform autonomous actions.

For Option #2 (Arduino Beta) teams: The robot may only be remotely controlled by a single DF-Robot Wireless GamePad V2.0 using a 900Mhz XBee module pair provided by CRC Robotics to link the remote control to the controller. The remote control must send all commands to the controller. However, the robot may perform autonomous actions.

3.1.03 Other Transmitters

It is forbidden to use any transmission methods or any method disrupting other robots in any way.

3.1.04 Other Control Systems

Other onboard control systems are allowed if and only if a motor, a servo, any actuator type or a 12V motor controller is not connected to them.

3.1.05 Onboard Cameras

Cameras may be attached to robots, but live transmission of the images is prohibited during the heats.

3.2 Low-Voltage Control Circuit and Motorization

The low-voltage circuitry refers to the controller power source and all sensors and servos powered through a 5V controller port and the controller power source.

3.2.01 Low-Voltage Sensors

Usage of any onboard sensors to give feedback to the controller is allowed. Encoders using I2C communication are allowed.

3.2.02 Low-Voltage Continuous Rotation Servos

All "Radio-Controlled Hobby"-type continuous rotation servos are allowed. Low-voltage continuous servos must be powered through a 5V controller port. Standard partial-rotation servos that have been internally modified to run continuously are allowed and count as "low-voltage continuous rotation servos". For reference, the following are some examples of legal continuous rotation servos: VEX EDR 3-wire motors, VEX EDR 2-wire 393 motors, VEX EDR 2-wire 269 motors, POWER HD 1501MG, FEETECH FS0403 and HITEC HSR-1425CR. Thousands of different models are available on the market. When in doubt, contact CRC Robotics.

3.2.03 Low-Voltage Standard Servos

Standard servos are closed-loop systems that can only partially rotate. All "Radio-Controlled Hobby" type standard servos are allowed. Low-voltage standard servos must be powered through a 5V controller port. For reference, the following are some examples of legal partial-rotation servos: VEX EDR 3-wire servo, POWER HD DSP33, FEETECH FT5313M and HITEC HS-625MG. Thousands of different models are available on the market. When in doubt, contact CRC Robotics.

3.2.04 Low-Voltage Servo Controller

External motor controllers are permitted if and only if they are used to control a low-voltage servo (continuous or standard) that is not equipped with an internal motor

controller. For reference, the following are some examples of legal servos: VEX EDR 2-wire 393 motors and VEX EDR 2-wire 269 motors. Low-voltage servo controllers must be powered through a 5V robot controller port.

3.2.05 Power Expander

The use of VEX Power Expander (VEX EDR Part Number: 276-2271) is forbidden.

3.2.06 Controller Power Source

For Option #1 (VEX) teams: Any sub 12V battery may be used to power the controller. This battery can only power the controller. Refer to the Controller Specifications Sheets for nominal voltage and current needed.

For Option #2 (Arduino Beta) teams: The controller must be powered by the 12V power circuit.

3.3 Power Circuit and Motorization

The power circuitry refers to all motors powered by the 12V batteries.

3.3.01 Power Circuit Source

The power circuit must be fed by one 12V, maximum 4Ah lead-acid or Nickel-Cadmium sealed battery or two 12V, maximum 3Ah parallel-wired lead-acid or Nickel-Cadmium sealed batteries.

3.3.02 Kill Switch

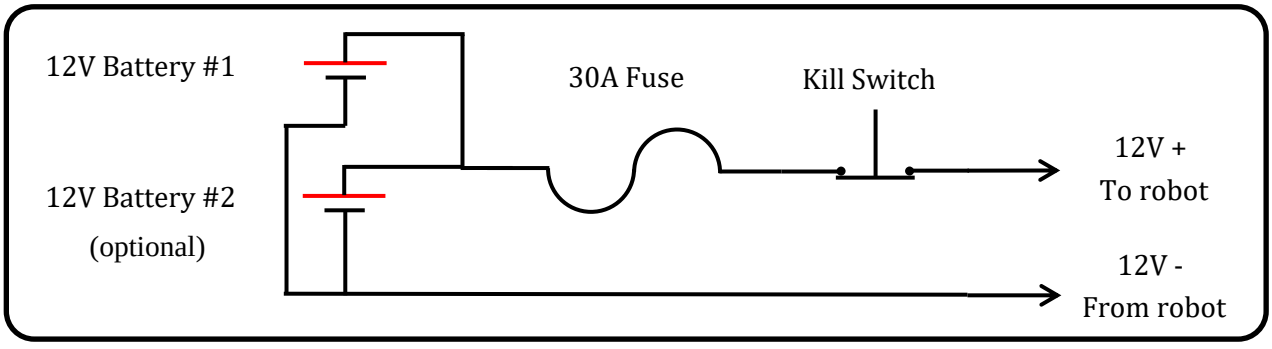
For safety reasons, the robot must have an easily identifiable and accessible ON/OFF kill switch. The kill switch must be connected to the circuit such that it kills the robot's 12V-circuit when the switch is pushed down, not pulled. The kill switch that must be used on all robots is the NPB22-J, or a switch deemed equivalent by CRC Robotics.

3.3.03 Fuse

All robots must have a fuse (single usage or reusable) between the 12V batteries and the power motors. The total 12V battery output must be limited to 30A.

3.3.04 Safety Specification Scheme

The power circuit must, at a minimum, adhere to the following safety schematic:



3.3.05 Power Motors

Only the following power motors can be used as part of the power circuit, with any or no gearbox attached:

Motor Type	Part Number
Banebot Motor	RS555 and/or RS550
Black Motor	200680 N and/or 200681 N
RobotZone Motor	RobotZone 12VDC Motor for heavy duty planetary gearbox

3.3.06 Power Motor Count

The maximum number of power motors allowed on the robot is 8, with a maximum of 4 power motors of the same type and gearbox combination. In all cases, the maximum number of motors of the same type, regardless of the coupled gearbox, is 6.

3.3.07 Power Motor Modifications

Any modification to the electrical components of the power motors is prohibited. Modifications may only be made to the mechanical components of the power motors, if desired. Therefore, the gearbox can be changed or removed completely.

3.3.08 Power Servos

Servos powered by the 12V power circuit are prohibited.

3.3.09 Power Motor Controller

Power motors may be controlled with relays, interrupts, switches and/or any motor controllers, such as the Victor SPX.

3.3.10 Capacitors

The addition of capacitors to the 12V power circuit of the robot is permitted. The role of these capacitors is to reduce the magnetic field emitted by the motors. However, no electrolytic capacitors are permitted for this task. The capacitor may not be used to accumulate charge. If the capacitor is polarized (if it contains only one direction for connection), it is considered illegal.

3.4 Pneumatics

There are many dangers to working with high pressure systems. Thus, the following regulations are put in place to emulate the same safety standards present with the power circuit.

3.4.01 Kill Switch

If the robot uses any pneumatics, it must have an easily identifiable and accessible ON/OFF manual pneumatic kill switch. All actuators/valves must be at the ambient pressure when turned to OFF.

3.4.02 Maximum Pressure

The pneumatic system of the robot must be divided into two parts. Their maximal pressures are the following:

- Tank section: 90 psi
- Low pressure section (actuators/valves): 55 psi

3.4.03 Pneumatic System Protection

In a similar fashion to the fuse in an electrical circuit, the pneumatic system must be equipped with an overflow valve that can be controlled to release any pressure greater than 90 psi.

3.4.04 Altered Pneumatic Parts

All pneumatic pieces (actuators, valves, cylinders, tanks, switches, etc.) must be unchanged from their original state, as purchased new. No altered parts will be accepted. All serial numbers must be visible for certification.

3.4.05 Actuator/Cylinder Control

Each actuator/cylinder must be controlled by no more than one valve.

3.4.06 Valve Control

All the valves must be controlled by the controller. It is permitted to add relays or power modules to the low-voltage or power-electrical circuit to control the valves if they are still controlled by the controller.

3.4.07 Maximum Input and Tube Diameters

The valves must have a maximal input hole of 1/8" (3mm). The tubes between valves and their actuators/cylinders must have a maximal diameter of 3/16" (5 mm).

3.4.08 Manometers

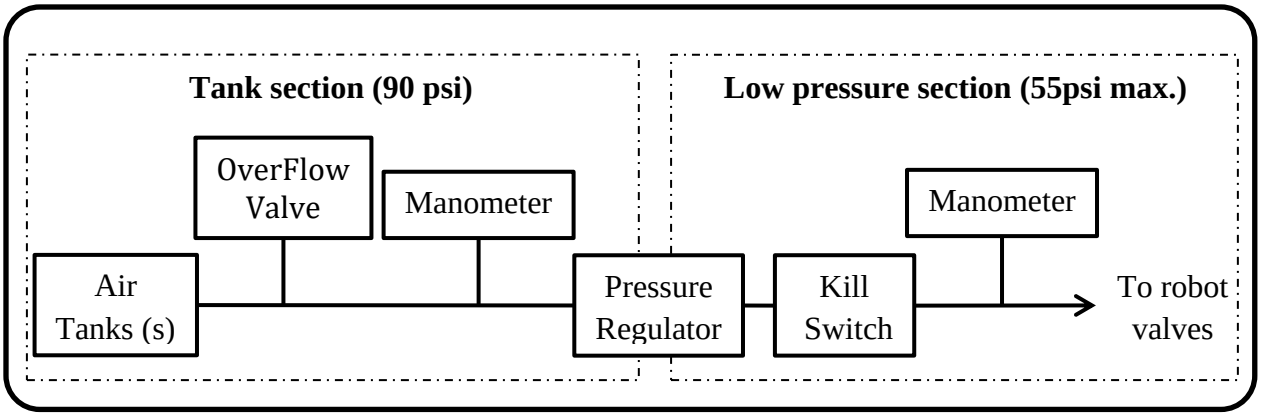
A manometer must be installed in both low- and high-pressure sections.

3.4.09 Series/Parallel Plugging

Plugging several tanks in series or in parallel is allowed if their pressure does not exceed 90 psi.

3.4.10 Safety Specification Scheme

The pneumatic system must, at a minimum, adhere to the following safety schematic:



3.5 Alternative Power and Energy Systems

3.5.01 Gravitational Energy

There is no restriction with regards to using gravity.

3.5.02 Single Decompression Springs

A spring that, after having started the heat in a compressed or stretched state, releases its energy during the heat, but cannot return to its original state without human intervention, will be deemed illegal.

3.5.03 Proper Spring Usage

If spring systems are used, they must be in relaxed states, or compressed or stretched by the same batteries and motors used during the heat, before the heat begins. Spring systems that function through oscillation are also allowed, given they conform to the above rules.

3.5.04 Fans

Fans can only be used to cool down motors or electrical components that can potentially overheat.

3.5.05 Lights

Lights can be used on robots, but they must draw their energy from the 12V power circuit. Blinding lights or other components deemed distracting or disruptive by the certification judge or the referees on the playing field must be disconnected.

3.5.06 Lasers

The use of lasers of any type is prohibited.

3.5.07 Other Electrical Sources

The only electrical power sources allowed are the ones stated in Sections 3.2 and 3.3.

3.6 Dimensions

3.6.01 Initial Size Limits

Robot dimensions are limited to an initial dimension limit of 91.44cm x 91.44cm (length x width) at the beginning of each heat. There is no initial height limit.

3.6.02 Extension Constraints

After a heat begins, robots can extend their dimensions over the initial size limit.

3.6.03 Moving Parts

Moving robot parts are allowed if they do not extend beyond the allowed dimensions and height limit at the beginning of and during a heat.

3.6.04 Robot Parts

A "robot part" is defined as the following: *All things that touch the robot at the beginning of the heat, except playing field elements and GPs.*

3.7 Certification

3.7.01 Safety Inspection

Robots will be required to pass a safety inspection (on site, at the Competition) in order to be judged and have access to the playing field. During the certification, the electrical power circuit will be inspected for its integrity. If parts are protected inside boxes, the boxes will need to be opened during certification. Should any part of the circuit be inaccessible, the robot will not be certified. Refer to Appendix C of this rulebook for the certification criteria and safety checklist.

3.7.02 Post-Certification Modifications

Teams may modify their robot between heats at their discretion. However, each electrical modification and each modification made to enlarge the robot's dimensions must be subsequently certified. Failure to recertify the robot will result in all points gained in subsequent heats to be void.

3.7.03 Safety

Any robot deemed to be dangerous for any reason can be disqualified until the necessary safety measures are put into place.

4. Kiosk

The kiosk component requires the organization of an information kiosk and presentation of accomplishments to visitors and judges. This component gives each school an equal opportunity to showcase their school, their team and their robot while also developing presentation and artistic skills. Refer to the Survival Guide for tips and suggestions. The evaluation rubric used by the judges to evaluate the kiosk may be found in Appendix D of this rulebook. The Kiosk Certification form may be found in Appendix E of this rulebook.

4.1 Constraints

4.1.01 Space Provided

A 12' by 12' space is available to each team.

4.1.02 Material Provided

Items provided by CRC Robotics: 1 folding table (if desired), 2 school chairs (if desired) and 1 electrical outlet with 2 plugs (120V, 15A total).

4.1.03 Layout

Each team's kiosk must have the following:

a) A distinct and delineated pit area for robot maintenance, modifications and repairs;
b) A school and robot demonstration and presentation area;
c) A clear and obvious identification of the team number and full school name.

4.1.04 Levels

It is not permitted to have any livable space on a second level due to safety concerns, including during set-up and dismantling time.

4.1.05 Respect for Neighbors

The surrounding kiosk areas must be respected; otherwise, the team at fault will be penalized for any behavior that has a negative impact on other kiosks (e.g. loud music, extending beyond the kiosk footprint, etc.).

4.1.06 Visual Appeal

Since kiosk spots are randomly assigned to teams, the outside walls of a kiosk will not be judged for reasons of equality. However, teams are encouraged to put an effort to make both the interior and exterior side of the walls of their kiosk visually appealing for the benefit of visitors and other participants.

4.1.07 Electrical Work Conformity

All electrical work within the kiosk must adhere to Québec's building safety standards.

4.1.08 Safety

If any CRC Robotics official feels that there is a risk of accident either with the kiosk or with the construction methodology (e.g. unsafe ladder, tools, etc.), CRC Robotics will consult the team and stop the building process until a safe approach or correction can be agreed upon.

4.1.09 Competition Readiness

In an effort to have the best experience possible for all teams, kiosk elements must be painted and cut before teams arrive at the Competition. Minor tweaks will be permitted, but if major parts of the kiosk are being built on site, a penalty will be sanctioned.

4.1.10 Safety Gear

Each kiosk must be equipped with at least one first aid kit, at least three pairs of safety glasses and at least 3 pairs of work gloves or mechanic's gloves. It is the responsibility of the participants and the adults in charge of each team to make sure proper safety gear is worn when necessary, both inside and outside the kiosk.

4.1.11 Access

There must be clear access for the robot and team members within the kiosk.

4.1.12 Assembly Time Limit

The kiosk must be fully mounted and ready for judging within 7 hours of a team's scheduled arrival time. The arrival schedule will be sent by email to all teams in the days prior to the Competition.

4.1.13 Dismantling Time

Kiosks may not be dismantled until instructed to do so by the CRC Robotics Organizing Committee.

4.1.14 Dismantling

A team's kiosk area must be cleared and cleaned by 6:00 p.m. on the Saturday night of the Competition. No damage can be done to the area. Any team leaving any debris will be subject to a $200 fine as well as any cleaning costs incurred by the host school. Repeat offenders may be subject to further penalties.

4.2 Certification

4.2.01 Safety Inspection

Each kiosk will be required to pass a safety inspection on the Thursday afternoon of the Competition in order to be judged. Refer to Appendix E of this rulebook for the certification criteria and safety checklist.

4.3 Judging

4.3.01 Multiple Teams per School

Kiosk spaces of teams from the same school will be placed beside each other. If the school decides to build one combined kiosk, judges will be informed to evaluate them separately, without considering the other space.

4.3.02 Language

Teams must ensure to always have at least 1 bilingual student speaker in the kiosk, giving presentations to and answering questions from the public.

4.3.03 Judges

Preliminary and final presentations will take place in the kiosk of the evaluated team, and the jury will be composed of teachers from the host school.

4.3.04 Schedule

There will not be a detailed schedule provided for the judging of the kiosks. Instead, time intervals will be provided during which the judges may visit the kiosks. This measure is necessary given the nature of this component of the Competition. However, a visual signal in the kiosk area will inform participants that the kiosk judging is in session.

4.3.05 Visual Support

Visual support is permitted.

4.3.06 Structure

The presentations must abide by the following structure:

Length	Action
5min	The team presents the kiosk (without the judges interrupting).
5min	The judges ask their questions to the evaluated team.
5min	The judges give feedback, rank teams, discuss and move toward the next team.

5. Programming

The programming component allows teams to develop and showcase their programming ability. Teams are evaluated based on their performance in the programming challenge. Refer to the Survival Guide for tips and suggestions.

5.1 Scope

5.1.01 Goal

The 2020 edition of the programming component is intended primarily as a learning experience. Based simply on analysis and problem solving through programming, it will allow participants to learn to solve simple and complex situations using programming. The objective is not to test the participants' knowledge of a programming language, but rather to test their knowledge of the principles and techniques required to design and implement a program according to the best practices.

5.1.02 Progress

Participants will face several online programming challenges during the season in a competition in the form of "Capture the Flag". These preliminary challenges, some more complex than others, will allow participants to gradually acquire the necessary skills to resolve the final challenge, which will be held at the Competition in February. The challenges will be available via the Participant Portal at www.robo-crc.ca/participant-portal as of December 1, 2019.

5.2 Rules

5.2.01 Characteristics of the Final Challenge

Elements from any preliminary challenge may be found in the final challenge.

5.2.02 Preliminary Score

The cumulative score from the preliminary challenges has no impact on the score obtained in the final challenge.

5.2.03 Final Score

The score obtained by a team in the final challenge determines the team's ranking in the Programming component of the Competition.

5.2.04 Tie-breaker Logic

The time taken to resolve the challenge in question will be the deciding factor in the event of equalities in the score. The advantage will go to the team that solved the challenge in the least amount of time.

5.2.05 Unsportsmanlike Conduct

Any team caught cheating or exhibiting unsportsmanlike conduct is subject to disqualification. Examples of cheating or unsportsmanlike conduct include, but are not limited to, any attempt to:

- Login to the account of opposing teams;
- Break the Capture the Flag application;
- Mislead another team.

6. Video

The following section outlines the rules and regulations of the video component. Refer to the Survival Guide for tips and suggestions. The evaluation rubric used by the judges to evaluate the video may be found in Appendix F of this rulebook.

6.1 Format

6.1.01 Run-time

The submitted video must be no less than 4 minutes long and no more than 5 minutes long, not including end credits.

6.1.02 Stylization/Style

The video submitted must have a fictional narrative or journalistic/documentary style.

6.2 Required Content

6.2.01 School Description

The video must outline the following details of the school:

a. Name
b. Location
c. Institution Type (High School, CEGEP, Professional Vocational Centre)

6.2.02 CRC Robotics Competition Description

The video must briefly describe the CRC Robotics Competition in such a way that the components are presented, and the goal of the Competition is mentioned. The video must visually show the time, place and name of this year's Competition during its run time.

6.2.03 Game Description

The video must explain the game rules in an original fashion and in enough detail such that the game can be understood from an outsider's perspective.

6.2.04 Robot Design and Construction

The video must detail the steps involved in designing and building the team's robot in enough detail such that the functionality of the robot can be understood from an outsider's perspective. The hardships encountered during the design and construction of the robot must also be included in the video.

6.2.05 Bilingualism

Both the English and French languages must be equally represented in the video, either through dialogue and/or subtitles. YouTube's closed-captioning tool is not permitted.

6.2.06 Copyright Law Adhesion

There must not contain copyrighted material in the video, unless the team has expressed permission from the content creator to use it in such a fashion. If the video is themed around an existing work, it must be clearly mentioned and credited. It is the responsibility of each team to ensure that the video does not violate YouTube's Copyrighted Content policy.

6.2.07 Forbidden Content

No vulgar, offensive, violent or inappropriate content is tolerated. When in doubt, contact CRC Robotics.

6.2.08 Asset Reuse

The reuse of content or assets from a previous submission is prohibited. Any attempt to submit a video containing the same content or assets from a previous submission may be subject to a penalty determined by CRC Robotics.

6.3 Submission

6.3.01 Deadline and Submission Platform

The video must be uploaded to YouTube in order to be judged. Refer to the Season Calendar in the Foreword of this document for the date and platform on which to submit the video. The specific URL pointing to the video's YouTube page must be provided at the time of submission. Video upload must be done by the deadline. A team that does not submit a video will receive a score of zero in the video component. A team that submits a video within a day after the deadline will be evaluated; however, this team will not be able to rank within the "Top 3" for the video component. Submissions received more than 24 hours after the deadline will not be judged.

6.3.02 Privacy Settings

The video's privacy setting must be switched to "Public" no later than the first day of the Competition. Refer to the Season Calendar in the Foreword of this document for the exact time and date.

6.3.03 Video Description Content

The video description on YouTube must mention the date and location of this year's CRC Robotics Competition, and show a hyperlink to the following URL: www.robo-crc.ca.

7. Website

The following section outlines the rules and regulations of the website content and design components. Refer to the Survival Guide for tips and suggestions. The evaluation rubrics used by the judges to evaluate the website design and the website content may be found in Appendix G and Appendix H of this rulebook, respectively.

7.1 Technical Requirements

7.1.01 Compatibility

The website must be functional in Google Chrome, Firefox, Microsoft Edge and Safari.

7.1.02 Quality Assurance

The website should be tested prior to submission. Any bugs found during evaluation will negatively affect the team's score in the website design component. Bugs include, but are not limited to, malformed links, missing images or actions that cause a "500 error".

7.1.03 HTML Standards Adhesion

The website should validate against HTML5 Standards (http://www.w3.org/TR/html5/), with little to no errors.

7.1.04 CSS Standards Adhesion

The website should validate against CSS 3.0 (https://www.w3.org/standards/techs/css#stds & https://jigsaw.w3.org/css-validator/) or better with little to no errors.

7.2 Website Content

7.2.01 Bilingualism

The website content must be fully bilingual. When the locale is changed to French, no English content should be displayed. When the locale is changed to English, no French content should be displayed.

7.2.02 Team Roster

The website must contain a browsable roster of every student, teacher and mentor on the team, which includes each member's:

a. Name
b. Photograph (optional)
c. Sub-team / Contribution

7.2.03 School Description

The website must include a page that outlines the following details of the team's school:

a. Name
b. Location
c. Institution Type (High School, CEGEP, Professional Vocational Centre)

7.2.04 CRC Robotics Competition Description

The website must contain a page that briefly describes the CRC Robotics Competition in such a way that the components are presented, and the goal of the Competition is mentioned. This page must also show the time, place and name of this year's Competition.

7.2.05 Game Description

The website must explain the game rules in an original fashion and in enough detail such that the game can be understood from an outsider's perspective.

7.2.06 Robot Design and Construction

The website must detail:

a. the steps in the design and construction of the robot;
b. the hardships that were encountered along the way;
c. the solutions to the aforementioned problems;
d. conception and prototype plans and drawings;
e. most recent design plans and drawings available at time of submission;
f. photos of the robot, at various stages of construction.

7.2.07 Student Experience Documentation

The experiences and lessons learned, as well as hardships encountered, must be documented on the website. The aforementioned documentation must contain:

a. what the team learned;
b. what the team enjoyed regarding the preparation for the Competition;
c. the concepts or aspects with which the team struggled;
d. the sacrifices made for the team.

7.2.08 Copyright Law Adhesion

There must not contain copyrighted material on the website, unless the team has expressed permission from the content creator to use it in such a fashion. If the website is themed around an existing work, it must be clearly mentioned and credited.

7.2.09 Asset Reuse

The reuse of content or assets from a previous submission is prohibited. Any attempt to submit a website containing the same content or assets from a previous submission may be subject to a penalty determined by CRC Robotics.

7.2.10 Forbidden Content

No vulgar, offensive, violent or inappropriate content is tolerated. When in doubt, contact the CRC Robotics Organizing Committee.

7.3 Submission

7.3.01 Online Accessibility

The website must be publicly accessible and hosted on the Internet under a domain name or IP address. Should the URL provided during submission be broken or mistargeted, the website will be considered as not submitted.

7.3.02 Post-Submission Changes

Once submitted, changes must not be made to the website. Should changes be discovered past the submission date, the website will be considered as not submitted.

7.3.03 Deadline and Submission Platform

Refer to the Season Calendar in the Foreword of this document for the exact date and platform on which to submit the website. The specific URL pointing to the website must be provided at the time of submission. A team that does not submit a website will receive a score of zero in the website design and website content components. A team that submits a website within a day after the deadline will be evaluated; however, this team will not be able to rank within the "Top 3" for the website design and website content components. Submissions received more than 24 hours after the deadline will not be judged.

7.3.04 Website Visibility

The entirety of the website must be made visible to the general public and, preferably, discoverable by search engines no later than the first day of the Competition. Refer to the Season Calendar in the Foreword of this document for the exact time and date. No points will be deducted if the website is not discoverable by search engines.

8. Tutorial

To promote the sharing of knowledge and to encourage a spirit of cooperation between the CRC Robotics Competition teams, the CRC Robotics Organizing Committee awards the team with the best tutorial each year. All tutorials of adequate quality will be added to the CRC Robotics website permanently, each with credit to the team that submitting it. The following section outlines the tutorial constraints on which all submitted tutorials will be evaluated. Refer to the Survival Guide for tips and suggestions. Tutorials are judged on the relevance of the subject and the quality of the submission.

8.1 Requirements

8.1.01 Topic

The tutorial should demonstrate knowledge directly related to any component of the Competition. Although it is strongly encouraged to cover new matter, it is tolerated to cover a subject already present in the tutorial section of CRC Robotics website.

8.1.02 Format

Tutorials can take many forms, and originality is greatly encouraged. For sharing purposes, only video and PDF formats are allowed. The tutorial must be available on the team's website.

8.1.03 Structure

The tutorial can be structured in one or more of the following ways:

- A theoretical and simplified explanation of a common system (e.g. internal functioning of DC motors);
- A step-by-step explanation to achieve a specific task;
- A practical demonstration of a complex system to perform a specific task.

8.1.04 Asset Reuse

The reuse of content or assets from a previous submission is prohibited. Any attempt to submit a tutorial containing the same content or assets from a previous submission may be subject to a penalty determined by CRC Robotics.

8.1.05 Bilingualism

As in every aspect of the Competition, both English and French languages must be equally represented in the tutorial.

8.2 Submission

8.2.01 Deadline and Submission Platform

Refer to the Season Calendar for the date and platform on which to submit the tutorial. The specific URL pointing to the tutorial page on the team's website must be provided at the time of submission.

8.2.02 Multiple Submissions

A team can submit multiple tutorials. If a team submits multiple tutorials, one will be chosen at random to be evaluated, but all of them may be added to the CRC Robotics website.

9. Appendices

Appendix A – Robot Design Evaluation Rubric

The evaluation of a team's robot design is divided into three levels of requirements: primary, secondary, and tertiary. Primary requirements serve as a foundation for the robot design. Secondary requirements serve as a creative steppingstone. Tertiary requirements will set a team apart from the rest. The evaluation of each requirement is not point-based. Rather, the preliminary evaluation of a team's robot design is subjective, and the robot design is ranked against the design of the other robots, based on the opinion of existing CRC Robotics teachers and mentors. Teams are divided into three pools, and each judge evaluates and ranks each robot design in their respective pool. The top four teams in each pool will advance to the final round of evaluations. Similarly, the final evaluation of a team's robot design is subjective, and the robot design is ranked against the other finalists, based on the opinion of industry professionals, that act as CRC Robotics judges, and a team's final rank for the Robot Design component will be the rank assigned by the set of CRC Robotics judges.

Topic	Requirement Level	Criterion
Design & Creativity	Primary	The robot is designed to play this year's game.
	Primary	The robot is designed to be able to move freely around the field in relation to the game.
	Secondary	The robot can adapt to different game strategies.
	Secondary	The robot suggests ingenious details that brings intelligent solutions to design problems.
	Tertiary	The robot is designed with creative concepts and "out-of-the-box" thinking.
	Tertiary	The robot is efficient in terms of concept; it uses minimal resources for a maximal output.
	Tertiary	The robot's intended mechanisms are compatible with speed, stability, and precision with regards to the given overall approach.
Presentation	Primary	The team can explain how it approached this year's game, highlighting their technical expertise, team size, and challenges.
	Secondary	The team can present their design in a professional and concise presentation.
	Secondary	The team can justify the thought process regarding the design of the robot and justify why they chose the final design.
	Tertiary	When faced with questions, the team can confidently answer them and defend their decisions.

Appendix B – Robot Construction Evaluation Rubric

The evaluation of a team's robot construction is divided into three levels of requirements: primary, secondary, and tertiary. Primary requirements serve as a foundation for the robot construction. Secondary requirements serve as a creative steppingstone. Tertiary requirements will set a team apart from the rest. The evaluation of each requirement is not point-based. Rather, the preliminary evaluation of a team's robot construction is subjective, and the robot construction is ranked against the construction of the other robots, based on the opinion of existing CRC Robotics teachers and mentors. Teams are divided into three pools, and each judge evaluates and ranks each robot construction in their respective pool. The top four teams in each pool will advance to the final round of evaluations. Similarly, the final evaluation of a team's robot construction is subjective, and the robot construction is ranked against the other finalists, based on the opinion of industry professionals, that act as CRC Robotics judges, and a team's final rank for the Robot Construction component will be the rank assigned by the set of CRC Robotics judges.

Topic	Requirement Level	Criterion
Robot Structure	Primary	Appropriate materials are used in their proper context.
	Primary	The robot is robustly assembled.
	Secondary	The robot has low mechanical tolerance and is well-calibrated.
	Tertiary	The robot is reliable/resilient and can withstand multiple heats without repair.
Robot Movement	Primary	The robot's driving mechanism operates smoothly.
	Primary	The robot's ancillary systems are stable and make precise movements.
	Secondary	Utilization of motors and mechanisms are logical and appropriate for the task at hand.
	Tertiary	The robot moves with intricacy and efficiency.
Robot Maintenance	Primary	All components are easy to access.
	Primary	The electrical system is protected and easy to access.
	Primary	The appropriate wire gage is used for the amperage run through the wire.
	Secondary	The wire management prevents accidental disconnect and impact.
	Secondary	The robot parts can be swapped easily.
	Tertiary	Maintenance required on the robot is minimal.
Presentation	Primary	The team can describe the build process and describe the tools that were available to them.
	Secondary	The team can justify the allocation of motors and choice of material and point out any outstanding qualities of their robot.
	Secondary	The team can present their robot in a professional and concise presentation.
	Tertiary	When faced with questions, the team can confidently answer them and defend their decisions.

Appendix C – Robot Certification Sheet and Safety Checklist

Certification: _____

School Name: _____

Component	Item	Certification		
		Acceptable	Unacceptable	Not Applicable
Electricity	Accessible Circuit			
	12V Batteries (type and wiring)			
	Visible Master Kill Switch			
	30A Fuse or Equivalent			
	Capacitors			
Motor count	Banebot Motor			
	Black Motor			
	GoBilda Motors			
	5V Servos			
	Integrity of the Motors			
Electronics	Speed Controller			
	Other Electronic Devices			
	Robot Controller Type and Port Limitations (if any)			
Pneumatics	Presence of Pneumatics			
	Visible Master Kill Switch			
	Pressure Valve			
	Number of Cylinders			
Robot	Dimension of the Robot			
	Visibility of School Name, Team Number, and Color (when playing)			
	Robot Safety (electric circuit, exposed screw, sharp edge, dangerous mechanism, etc.)			

Notes:

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CRC Robotics Signature Team Signature

Appendix D – Kiosk Evaluation Rubric

The evaluation of a team's kiosk is divided into three levels of requirements: primary, secondary, and tertiary. Primary requirements serve as a foundation for the kiosk. Secondary requirements serve as a creative steppingstone. Tertiary requirements will set teams apart from the rest. The evaluation of each requirement is not point-based. Rather, the preliminary evaluation of a team's kiosk is subjective, and the kiosk is ranked against the other kiosks, based on the opinion of CRC Robotics judges. Teams are divided into three pools, and each judge evaluates and ranks each kiosk in their respective pool. The top four teams in each pool will advance to the final round of evaluations. Again, the final evaluation of a team's kiosk is subjective, and the kiosk is ranked against the other finalists, based on the opinion of the CRC Robotics judges, and a team's final rank for the Kiosk component will be the rank assigned by the set of CRC Robotics judges.

Topic	Requirement Level	Criterion
Content	Primary	The information displayed and available on the interior or exterior of the kiosk must be fully bilingual.
	Primary	The kiosk is respectful of the neighboring kiosks.
	Primary	The school name and team number are properly showcased.
	Secondary	The kiosk is intriguing to the public.
	Secondary	Students interact with the public in a respectful and friendly way.
	Tertiary	A description of the school and the team is properly displayed or presented.
Technical	Primary	The kiosk must always be kept clean and safe.
	Primary	The kiosk is built sturdily and is structurally sound.
	Secondary	The kiosk demonstrates a good understanding in creating a functional workplace (i.e. tool placement and organization, functionality, etc.).
	Tertiary	The kiosk demonstrates excellence in detail and craftsmanship.
Presentation	Primary	The information presented is organized in a logical manner.
	Secondary	The kiosk is visually attractive to the public.
	Secondary	The kiosk uses lights, screens, sounds, and props in such a way that it augments the visitor's experience.
	Tertiary	The presentation of the kiosk is creative and interactive.

Appendix E – Kiosk Certification Sheet and Safety Checklist

Certification: _____

School Name: _____

Component	Item	Certification		
		Acceptable	Unacceptable	Not Applicable
Electrical: Wiring & Outlets	Wire Gauge			
	Layout			
	Protected			
	Grounded			
	Anchored			
Structural Integrity	Walls			
	Roof			
	Floor			
Safety	Tools properly stored			
	Proper fastening / anchoring (Accessories, equipment, shelves, objects, etc.)			
	Public access			
	Maneuverability inside kiosk (Ability to move around without hitting things)			
	Safety equipment (**First Aid Kit**, safety glasses, gloves, etc.)			
	No space on a second level			
Aesthetics	Respects neighboring kiosks (sound, paint, etc.)			
	Space does not exceed 12’ x 12’			

Notes:

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_____ _____

CRC Robotics Signature Team Signature

Appendix F – Video Evaluation Rubric

The evaluation of a team's video is divided into three levels of requirements: primary, secondary, and tertiary. Primary requirements serve as a foundation for a video. Secondary requirements serve as a creative steppingstone. Tertiary requirements will set teams apart from the rest. The evaluation of each requirement is not point-based. Rather, the evaluation of a team's video is subjective, and the video is ranked against the other submissions, based on the opinion of industry professionals, that act as CRC Robotics judges. Each judge evaluates and ranks each video, and a team's final rank for the Video component will be the average of the ranks obtained from all judges in this component. In the event of a tie, the head CRC Robotics judge will assign the final ranking to the tied teams.

Topic	Requirement Level	Criterion
Video	Primary	The video is between 4 and 5 minutes long (excluding credits).
	Primary	The video is posted on YouTube and the video description refers to the CRC Robotics Competition, with a link pointing to the CRC Robotics website.
	Primary	The video is fully bilingual (through dialogue or subtitles, excluding YouTube's closed-captioning feature).
Content	Primary	The video includes a description of the team's school.
	Primary	The video includes a description of the CRC Robotics Competition.
	Primary	The video includes a description of this year's game.
	Primary	The video includes a description of the team's robot design and building process.
	Primary	The video visually shows the time, place and name of this year's Competition.
	Secondary	Quality of the acting and narration.
	Secondary	Presence of a well-integrated central theme or storyline that presents the mandatory content.
	Tertiary	Entertainment value of the video based on the execution, creativity and originality of the concept as a whole.
Technical	Primary	Quality of the base picture.
	Primary	Quality of the audible voice, if any.
	Primary	Presence of a basic editing process.
	Secondary	Creativity and mastery of the camera usage (i.e. creative angle, multi-angle filming, etc.).
	Secondary	Creative usage of sound effects, music, and other auditive cues that enrich the viewer experience.
	Secondary	The editing process is seamless to the viewer and the flow of the video is remarkable.
	Tertiary	Creativity and mastery in the film-making process (i.e. quality of the image, original artwork, visual effects, unique music, mastery of the editing process, etc.).

Appendix G – Website Design Evaluation Rubric

The evaluation of a team's website design is divided into three levels of requirements: primary, secondary, and tertiary. Primary requirements serve as a foundation for the website design. Secondary requirements serve as a creative steppingstone. Tertiary requirements will set teams apart from the rest. The evaluation of each requirement is not point-based. Rather, the evaluation of a team's website design is subjective, and the website design is ranked against the other submissions, based on the opinion of industry professionals, that act as CRC Robotics judges. Each judge evaluates and ranks each website, and a team's final rank for the Website Design component will be the average of the ranks obtained from all judges in this component. In the event of a tie, the head CRC Robotics judge will assign the final ranking to the tied teams.

Topic	Requirement Level	Criterion
Aesthetics	Primary	The overall design, including choice and combination of colors, fonts, and layout are appealing and conducive of a pleasant user experience.
	Secondary	The site structure, page structure, and menu design allow the user to find information quickly and easily.
	Secondary	The website is constructed using valid CSS 3.0 or better.
	Secondary	The website is validated against HTML5 Standards.
	Tertiary	Presence of user/social interaction.
Technical	Primary	The website is publicly accessible and is hosted on the Internet under a domain name or IP address.
	Primary	There are no bugs, including, but not limited to, malformed links, missing images, or actions that cause a "500" error.
	Primary	The website is functional in Google Chrome, Firefox, Microsoft Edge, and Safari.
	Secondary	The site's code is well-formed and validated.
	Tertiary	The site demonstrates a grasp of underlying web technologies and indicates a proficient level of web programming (i.e. not solely relying a website template or content management system).

Appendix H – Website Content Evaluation Rubric

The evaluation of a team's website content is divided into three levels of requirements: primary, secondary, and tertiary. Primary requirements serve as a foundation for the website content. Secondary requirements serve as a creative steppingstone. Tertiary requirements will set teams apart from the rest. The evaluation of each requirement is not point-based. Rather, the evaluation of a team's website content is subjective, and the website content is ranked against the other submissions, based on the opinion of industry professionals, that act as CRC Robotics judges. Each judge evaluates and ranks each website, and a team's final rank for the Website Content component will be the average of the ranks obtained from all judges in this component. In the event of a tie, the head CRC Robotics judge will assign the final ranking to the tied teams.

Topic	Requirement Level	Criterion
Content	Primary	The website includes a description of the team's school.
	Primary	The website includes a browsable roster of each student, teacher and mentor on the team.
	Primary	The website includes a description of the CRC Robotics Competition.
	Primary	The website includes a description of this year's game.
	Primary	The website includes a description of the team's robot design and building process.
	Primary	The website is fully bilingual.
	Primary	No grammar, syntax, or spelling errors should be visible, including blatant translations performed using Google Translate or other similar services.
	Secondary	Experience-driven content should be present (i.e. student experience, challenges, tutorials, interviews, etc.).
	Secondary	Usage of pictures, schematics, or any other graphic communication tools are used in a logical and sound manner.
	Secondary	The content is creatively wrapped around a compelling theme that is carried throughout all sections in a linguistic and artistic fashion.
	Tertiary	The content conveys a story in which the reader gets invested while navigating from page to page.
	Tertiary	The content inspires people to know more about the school and robotics in general.
	Tertiary	The content is creative and entertaining for the reader.