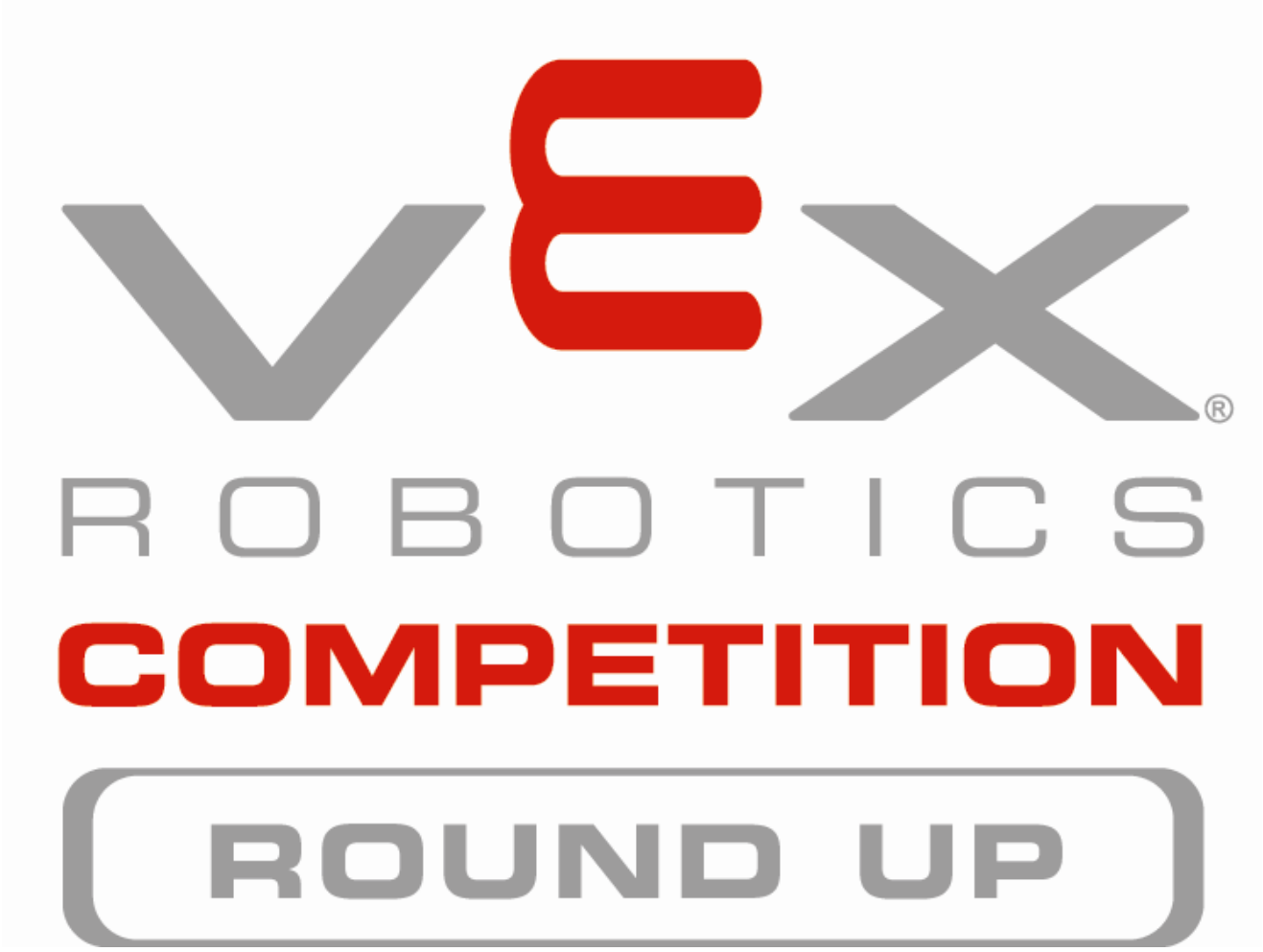


Table of Contents

SECTION 1

Introduction

Overview

This section provides an introduction to *VEX Round Up* and the VEX Robotics Competition.

The VEX Robotics Competition

The world needs the students of today to become the scientists, engineers, and problem solving leaders of tomorrow. The constant breakthroughs in chemistry, medicine, materials and physics reveal a new set of challenges and create an even greater opportunity for problem solving through technology. These problems are not academic; the solutions could help save the world and those technology problem solvers will be the ones to make it possible.

This underscores the dramatic challenge we face: there are not enough high school graduates choosing technology related disciplines in college. This does not reflect a lack of capacity for new students on the part of technical schools and universities, but a lack of interested and qualified applicants. In short, we will not have the people we require in the next generation to solve the problems of tomorrow unless the shortage is directly addressed today. Who will solve the world's next great crisis?

Recognizing this dilemma, scores of organizations are creating programs designed to attract and engage young students in the study of science and technology. Many have found that robotics is a very powerful platform to attract and hold the attention of today's multi-tasking, connected youths. Robotics has strong appeal to this intensely competitive generation and represents the perfect storm of applied physics, mathematics, computer programming, digital prototyping and design, integrated problem solving, teamwork and thought leadership. Students with a previously undiscovered aptitude for STEM (Science, Technology, Engineering, and Math) curriculum are flourishing in growing numbers due to the efforts of schools, volunteer organizations, corporations, and governments internationally.

The VEX Robotics Competition, run by the Robotics Education and Competition Foundation, is the next generation of educational robotics competitions. While there are many quality robotics competitions worldwide, the VEX Robotics user community has overwhelmingly demanded *new* challenges that are easy and economical to host and implement. VEX Robotics, Inc. strives to serve the needs of all VEX Robotics users in order to attract, nurture and grow new engineering candidates worldwide who will solve the problems of tomorrow.

The VEX Robotics Design System is a leading classroom robotics platform designed to nurture creative advancement in robotics and knowledge of STEM education. VEX provides teachers and students with an affordable, robust, and state-of-the-art robotics system suitable for classroom use and the playing field. VEX's innovative use of pre-manufactured and easily formed structural metal, intuitive mechanical parts combined with a powerful range of user-programmable microprocessors for control, leads to infinite design possibilities.

VEX Round Up – A Primer

VEX Round Up is played on a 12 ft x 12 ft foam-mat, surrounded by a sheet-metal and lexan perimeter. There are nine goalposts, five of which are attached to movable weighted bases, which teams can score tubes on. Alliances earn extra points for owning a goalpost by scoring more tubes on the goalpost than their opponents. At the center of the field is a 36" high structure known as the ladder that teams can climb or hang off of for additional points.

For more details and specific game-play rules, please see Section 2 – The Game.

While participating in the VRC *Round Up* season, teams will develop many new skills in response to the challenges and obstacles which stand before them. Some problems will be solved by individuals, while others will be handled through interaction with their student teammates and adult mentors. Teams will work together to build a VEX robot to compete in one of many tournaments, where they celebrate their accomplishments with other teams, family and friends. After the season, students come away not only with the accomplishment of building their own competition robot, but with an appreciation of science and technology and how they might use it to positively impact the world around them. In addition, they cultivate life skills such as planning, brainstorming, collaboration, teamwork, and leadership as well as research and technical skills.

SECTION 2

The Game

Overview

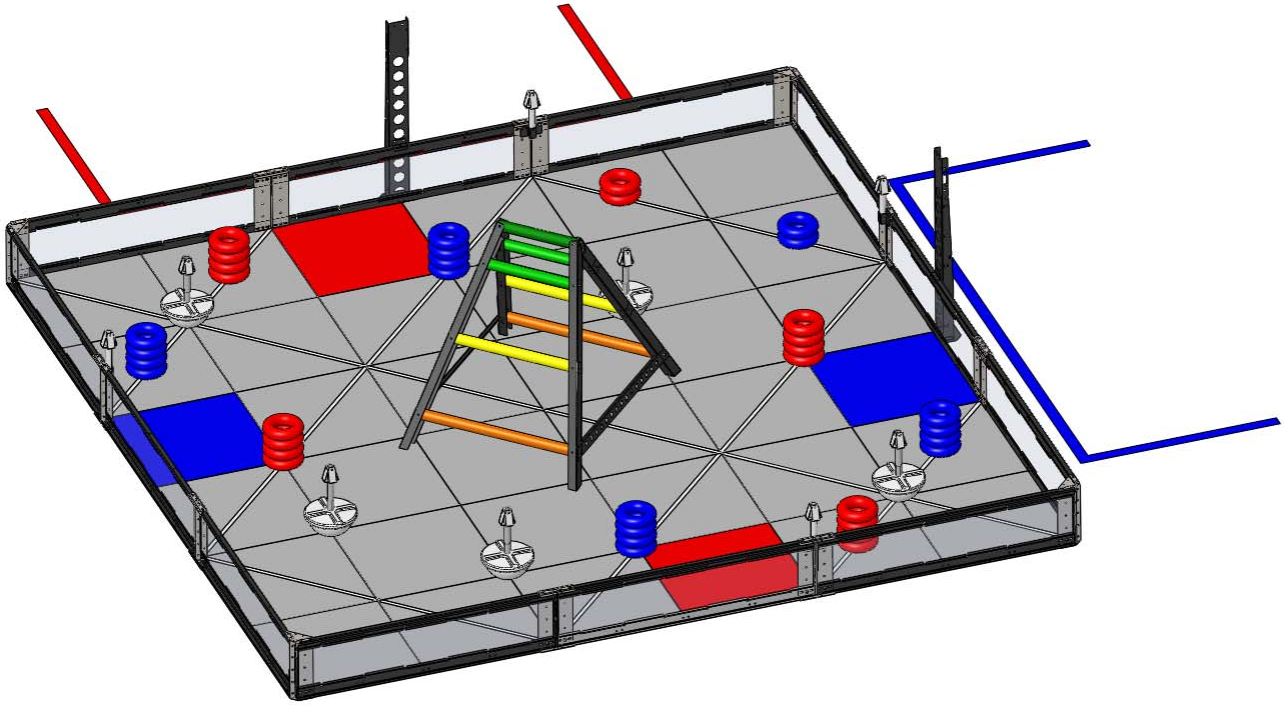
This section describes the VEX Robotics Competition game, called *VEX Round Up*. It also lists the game definitions and game rules.

Game Description

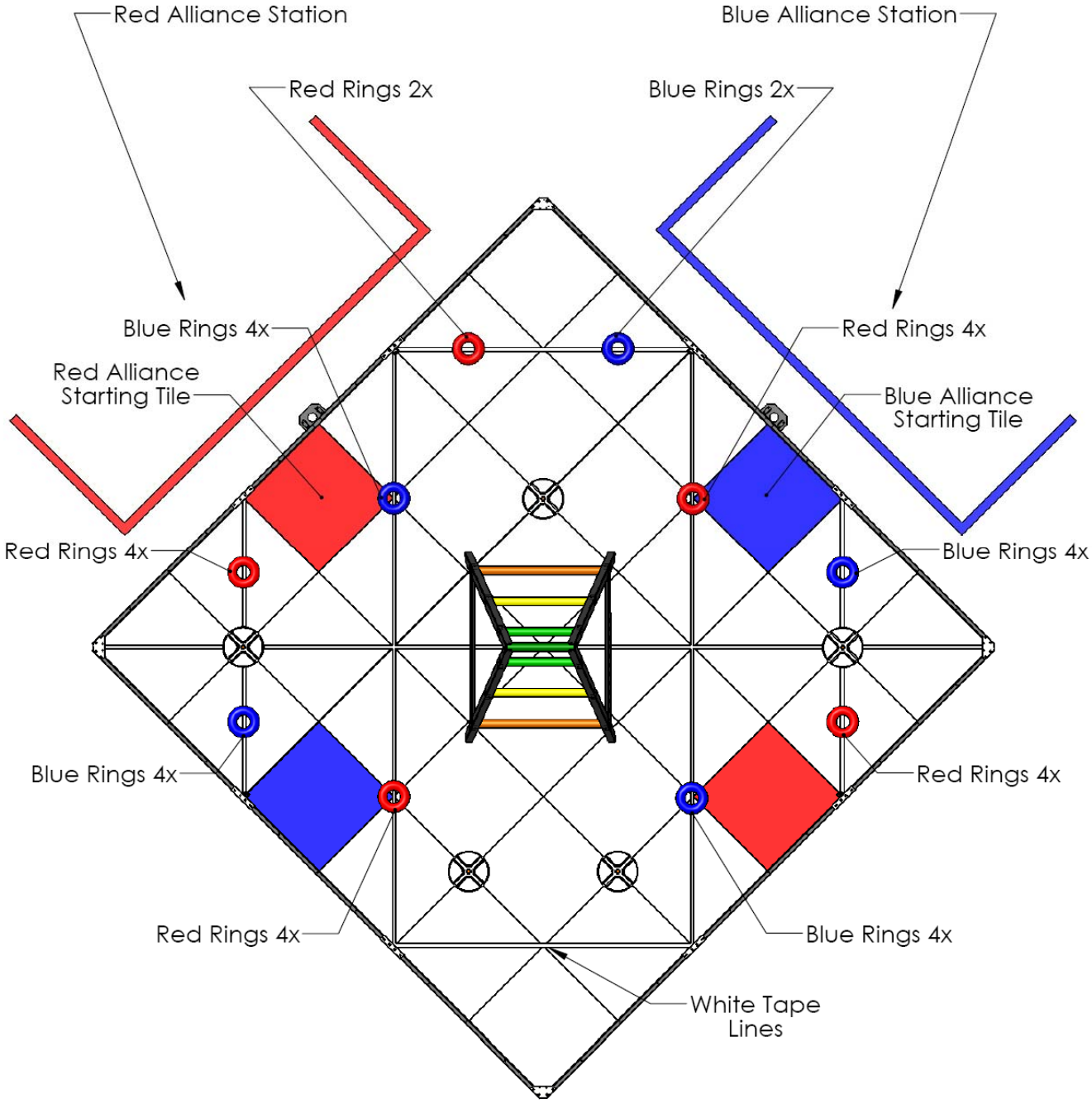
Matches are played on a field initially set up as illustrated in the figures below. Two *alliances* – one "red" and one "blue" – composed of two teams each, compete in each *match*. The object of the game is to attain a higher score than your opponent *alliance* by *scoring tubes* upon *goalposts*, *owning goalposts* and by *low hanging* or *high hanging* from the *ladder*.

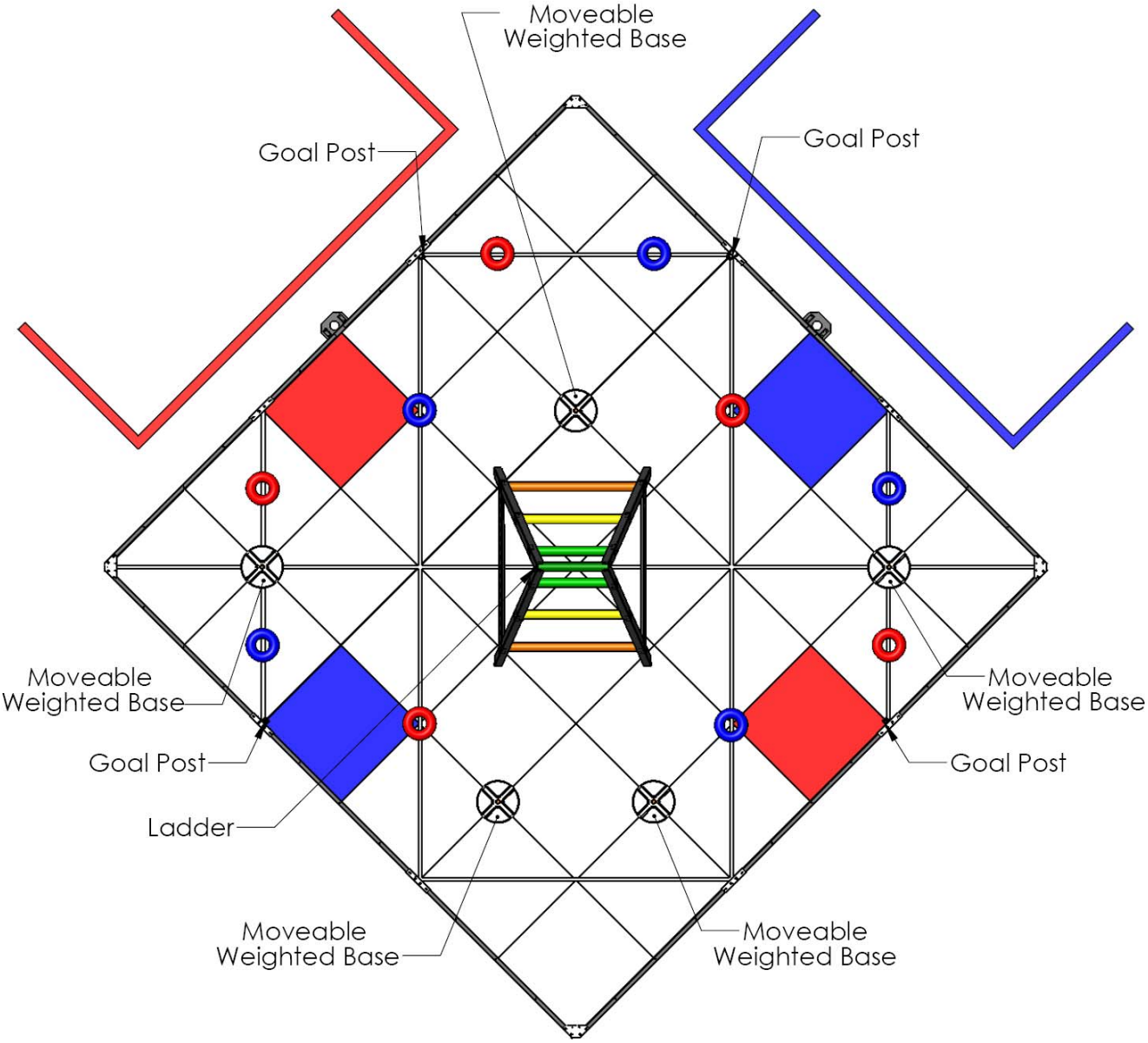
A bonus is awarded to the *alliance* that has the most total points at the end of the *Autonomous Period*.

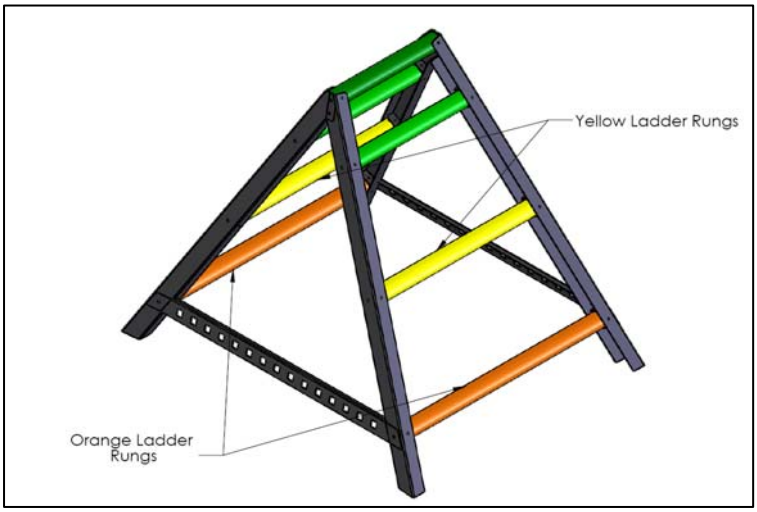
There are a total of forty (40), twenty (20) red and twenty (20) blue, *tubes* available as scoring objects in the game. Thirty-six (36) of the *tubes* will start at designated locations on the field, while two (2) will be available to each *alliance* prior to the *match.*



Note: *The illustrations in this section of the manual are only provided to give a general visual understanding of the game. Teams should refer to the official field specs available in Appendix A for exact field dimensions, a full field BOM, exact details of field construction, and lower cost field options.*







Game Definitions

Adult – Anyone not meeting the definition of "Student".

Alliance – A pre-assigned grouping of two teams that work together for a given *match*.

Alliance Starting Tile – A colored tile (red or blue) which designates the position in which robots must start the match.

Alliance Station – The designated region where the *drivers* and *coach* stand during any *match*.

Autonomous Period – A 20-second time period in which the *robots* operate and react only to sensor inputs and to commands pre-programmed by the team into the onboard *robot* control system. Human control of or interaction with the *robot* is not permitted during this time.

Coach **--** A student or adult mentor designated as the team advisor during the match. Only one (1) of these is allowed per team on the field at any given time.

Driver **-** A student team member responsible for operating and controlling the *Robot*. Only two (2) of these are allowed per team on the field at any given time.

Driver Controlled Period – The 2:00 (two minute) time period in which the *robots* are operated by the *drivers.*

Entanglement – A robot is considered to have *entangled* an opposing robot if it has grabbed or hooked the opponent robot.

Field Element – The foam field tiles, field perimeter, *ladder*, *goalposts* and *movable weighted bases*.

Goalpost – One of the nine (9) PVC posts on the field, which teams can *score tubes* upon. Five (5) of the *Goalposts* are located on *movable weighted bases* in the field interior while four (4) of them are mounted on the field perimeter.

High Hanging – A *robot* is considered to be *high hanging* if it is touching the *ladder* AND every part of the *robot* is entirely above the *yellow ladder rung*. A robot which is considered to be *high hanging* is not considered *low hanging*.

Ladder – The 36" tall sheet-metal and PVC structure located in the center of the field. The ladder has PVC rungs at 6", 18", 30" and 36" off the ground.

Low Hanging – A *robot* is considered to be *low hanging* if it is touching the *ladder* AND every part of the *robot* is entirely above the *orange ladder rung*. (A *high hanging* robot is not considered *low hanging*)

Match - A *match* consists of an *autonomous period* followed by a *driver controlled period* for a total time of 2:20 (two minutes, twenty seconds).

Movable Weighted Base – The five (5) approximate 9" diameter hemisphere like structures that five (5) of the *goalposts* are mounted to. The *movable weighted base* weights 9.8 lbs.

Orange Ladder Rung – An orange PVC pipe that acts as a ladder rung. The *Orange Ladder Rung* is 6" above the ground and signifies the height that needs to be surpassed by a robot for a robot to be considered *low hanging*.

Owned - A *goalpost* is said to be *owned* by the *alliance* that has the most *tubes scored* on that *goalpost*. If both alliances have the same number of *tubes scored* on the *goalpost*, neither alliance has *owned* the goal.

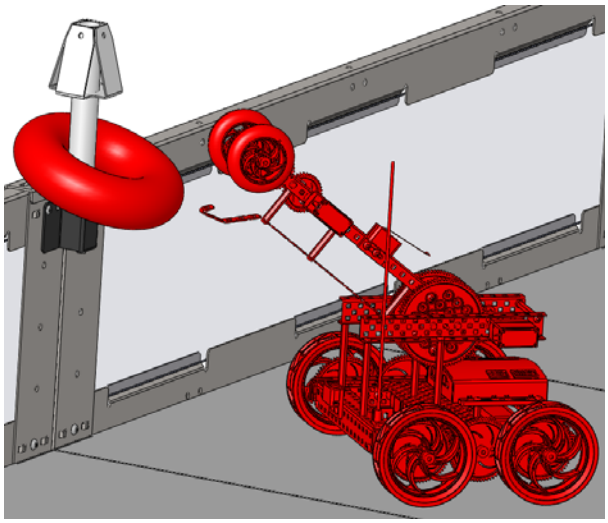
Pinning – A *robot* is considered to be *pinning* an opposing *robot* if it is inhibiting the movement of an opponent *robot* while the opposing robot is in contact with the foam playing surface and another *field element*.

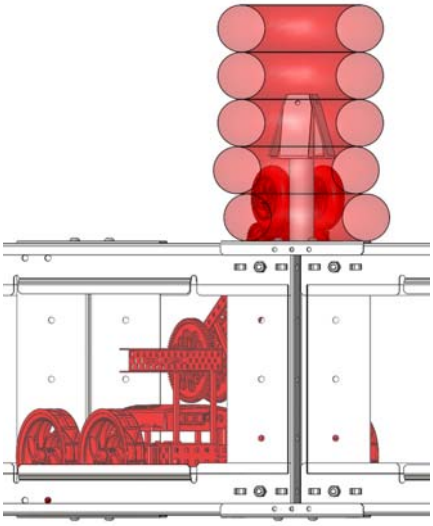
- A *robot* that blocks or inhibits the movement of an opposing robot while the opposing robot is not in contact with any field element other than the foam playing surface is not considered to be *pinning*

Robot – Anything (which has passed inspection) a team places on the field prior to the start of a *match*.

Scored – A *tube* is considered *scored* if it is NOT touching a *robot* of the same color and it meets ONE of the following two criteria:

- A *goalpost* passes through the hole in the center of the *tube* AND the *tube* is fully below the top of the *goalpost*. (In the diagram below and to the left, the *tube* is legally scored by this criteria)
- The *tube* is touching another *scored tube* and not touching any of the foam field tiles. (In the diagram below and to the right, all *tubes* are legally scored; the bottom three by the first criteria, the top two by the second criteria)





Student – Anyone enrolled in a pre-college school or home-schooled as part of a pre-college educational curriculum.

Tube – A red or blue torus shaped foam scoring object with an overall diameter of 7” and a “hole” diameter of 3” and a “tube” diameter of 2”.

Yellow Ladder Rung – A yellow PVC pipe that acts as a ladder rung. The *Yellow Ladder Rung* is 18” above the ground and signifies the height that needs to be surpassed by a robot for a robot to be considered *high hanging*.

Game Rules

Scoring

- A *tube* that is *scored* upon a *goalpost* is worth two (2) points for the *alliance* of the color of the *tube*.
- A *goalpost* that is *owned* is worth five (5) points for the *owning alliance.*
- A *robot* that is *low hanging* from the *ladder* is worth ten (10) points for the corresponding *alliance*.
- A *robot* that is *high hanging* from the *ladder* is worth twenty (20) points for the corresponding *alliance*.

Scoring in Autonomous Mode

- At the end of the *autonomous period,* the *alliance* that has most total points receives a ten (10) point bonus.

Safety Rules

<S1> If at any time the *robot* operation or team actions are deemed unsafe or have damaged the *field elements* or scoring objects, by the determination of the referees, the offending team may be disqualified. The *robot* will require re-inspection before it may again take the field.

<S2> If a *robot* goes completely out-of-bounds (outside the playing field), it will be disabled for the remainder of the match.

Note: The intent is NOT to penalize *robots* for having mechanisms that inadvertently cross the field border during normal game play.

General Game Rules

<G1> When reading and applying the various rules in this document, please remember that common sense always applies in the VEX Robotics Competition.

<G2> At the beginning of a *match*, each *robot* must be smaller than a volume of 18 inches wide by 18 inches long by 18 inches tall. An offending *robot* will be removed from the match at the Head Referee's discretion.

a. Alignment devices (templates, tape measures, lasers, etc.) that are not part of the *robot* may NOT be used to assist with the positioning of the *robot*.

<G3> Each team shall include up to two *drivers* and one *coach*.

<G4> During a *match*, the *drivers* and *coach* must remain in their *alliance station*.

<G5> During the qualification rounds, the red *alliance* has the right to place their *robots* on the field last. During the elimination rounds, the higher seeded alliance has the right to place their robots on the field last. Once a team has placed their *robot* on the field, its position cannot be readjusted.

<G6> *Drivers* and *coaches* are prohibited from making intentional contact with any scoring object, *field element* or robots during a *match.* Any intentional contact will result in a disqualification. Accidental contact will not be penalized, unless the contact directly impacts the final score of the match. This type of accidental contact will result in a disqualification

<G7> During a *match*, *robots* may be remotely operated only by the *drivers* and/or by software running in the on-board control system. If a *coach* touches his/her team's controls anytime during a *match*, the *robot* will be disabled and the team disqualified.

<G8> *Tubes* that leave the playing field will be returned to the playing field at the location nearest the point at which they exited. Referees and event volunteers will return the *tubes* as promptly as possible.

<G9> Scores will be calculated for all *matches* immediately after the *match* once all objects on the field come to rest.

<G10> *Robots* may not intentionally detach parts during any *match*, or leave mechanisms on the field. If a detached component or mechanism prevents scoring the team will be disqualified. Multiple intentional infractions may result in disqualification for the entire competition.

<G11> Strategies aimed solely at the destruction, damage, tipping over, or *entanglement* of *robots* are not in the spirit of the VEX Competition and are not allowed. However, *VEX Round Up* is an interactive game. Some incidental tipping, *entanglement*, and damage may occur as a part of normal game play. If the tipping, *entanglement*, or damage is ruled to be intentional, the offending team may be disqualified from that *match*. Repeated offenses could result in a team being disqualified from the remainder of the competition.

<G12> *Robots* must be designed to permit easy removal of *tubes* from any grasping mechanism without requiring that the *robot* have power after the *match*.

<G13> Field tolerances may vary by as much as +/-1", so teams must design their *robots* accordingly.

<G14> *Tube* tolerances may vary by as much as +/-1/8"

<G15> Replays are at the discretion of the event organizer and head referee. Possible reasons for a replay could be attributed to an error or failure of official field personnel, the scoring system, the field controls, or the field itself.

<G16> All teams must adhere to all VEX Robotics Competition Rules as they are written, and must abide by the listed intent of the rules. Every team has the opportunity to ask for official rules interpretations in the VEX Robotics Competition Question & Answer Forum. Any responses in this Q&A forum should be treated as official rulings from the VEX Robotics Competition Game Design Committee, and represent the correct and official interpretation of the VEX Robotics Competition Rules.

There may also be periodic "Team Updates" posted on the *VEX Round Up* webpage in the competition section of www.VEXrobotics.com. These updates are also "official" parts of the *VEX Round Up* rules.

The VEX Robotics Competition Question & Answer Forum can be found at www.RobotEvents.com and www.VEXforum.com, or directly at http://www.vexrobotics.com/round-up-qa.

<G17> All teams are expected to conduct themselves in a respectful and professional manner while competing in VEX Robotics Competition events. If team members are disrespectful or uncivil to event staff, volunteers or fellow competitors, they may be disqualified from their current or upcoming *match*.

VEX Round Up Specific Game Rules

<SG1> At the beginning of each *match*, each *alliance robot* must be placed such that they are touching one of their colored *alliance starting tiles* and not touching any *tube* other than those permitted by <SG2>. No more than one *robot* may start the match on any one *alliance starting tile*.

<SG2> Prior to the start of each *match*, each team will have one (1) *tube* available to preload into their robot. A *tube* is considered to be legally preloaded if it is touching the *robot* and not touching any *field element* or scoring object.

<SG3> A *tube* is not considered *scored* if it is being touched by a *robot* on an *alliance* of the same color at the conclusion of either period.

<SG4> A *robot* cannot *pin* an opposing *robot* for more than five seconds during the *driver controlled period* while on the foam playing surface. If a referee determines this rule to be violated, the offending *robot* will be disqualified for the match. There is no penalty for *pinning* during the *autonomous period*.

<SG5> *VEX Round Up* is a highly interactive game. Contact, ramming and tipping is especially likely to occur on the *ladder* as part of normal game play. Robots should be designed accordingly as these interactions on the *ladder* would not fall under <G11>. However, intentional *entanglement* is still not permitted on the *ladder*.

<SG6> Intentionally tipping the *ladder* is illegal and will result in the disqualification of the offending robot.

<SG7> Intentionally removing a *movable weighted base* from the playing field is illegal and will result in the disqualification of the offending robot.

SECTION 3

The Tournament

Overview

The main challenge of the VEX Robotics Competition will be played in a tournament format. Each tournament will include *practice*, *qualifying*, and *elimination matches*. After the *qualifying matches*, teams will be ranked based on their performance. The top teams will then participate in the *elimination matches* to determine the tournament champions.

Tournament Definitions

Alliance Captain – A student chosen to represent their team during *Alliance Selection* for the final *Elimination Matches*.

Alliance Selection – The process of choosing the permanent alliances for the *Elimination Matches.*

Elimination Match – A match used to determine the championship alliance. Alliances of three face off in a best two of three series, with two teams playing in each match. The first alliance to win two matches will proceed to the next round.

Practice Match – An un-scored match used to provide time for teams to get acquainted to the official playing field.

Qualifying Match – A match used to determine the rankings for the *Alliance Selection*. Alliances compete to earn *Win Points* and *Strength of Schedule Points*.

Strength of Schedule Points (SP) – The second basis of ranking teams. *Strength of Schedule points* are awarded in the amount of the score of the losing alliance in a *Qualifying Match.*

Win Points (WP) – The first basis of ranking teams. *Win Points* are awarded for winning (two points) and tying (one point) a *Qualifying Match*.

Practice Matches

At the event *practice matches* will be played in the morning during the team registration time until the Drivers Meeting begins. Every effort will be made to equalize practice time for all teams, but will be conducted on a first-come, first-served basis. These matches are not scored, and will not affect team ranking.

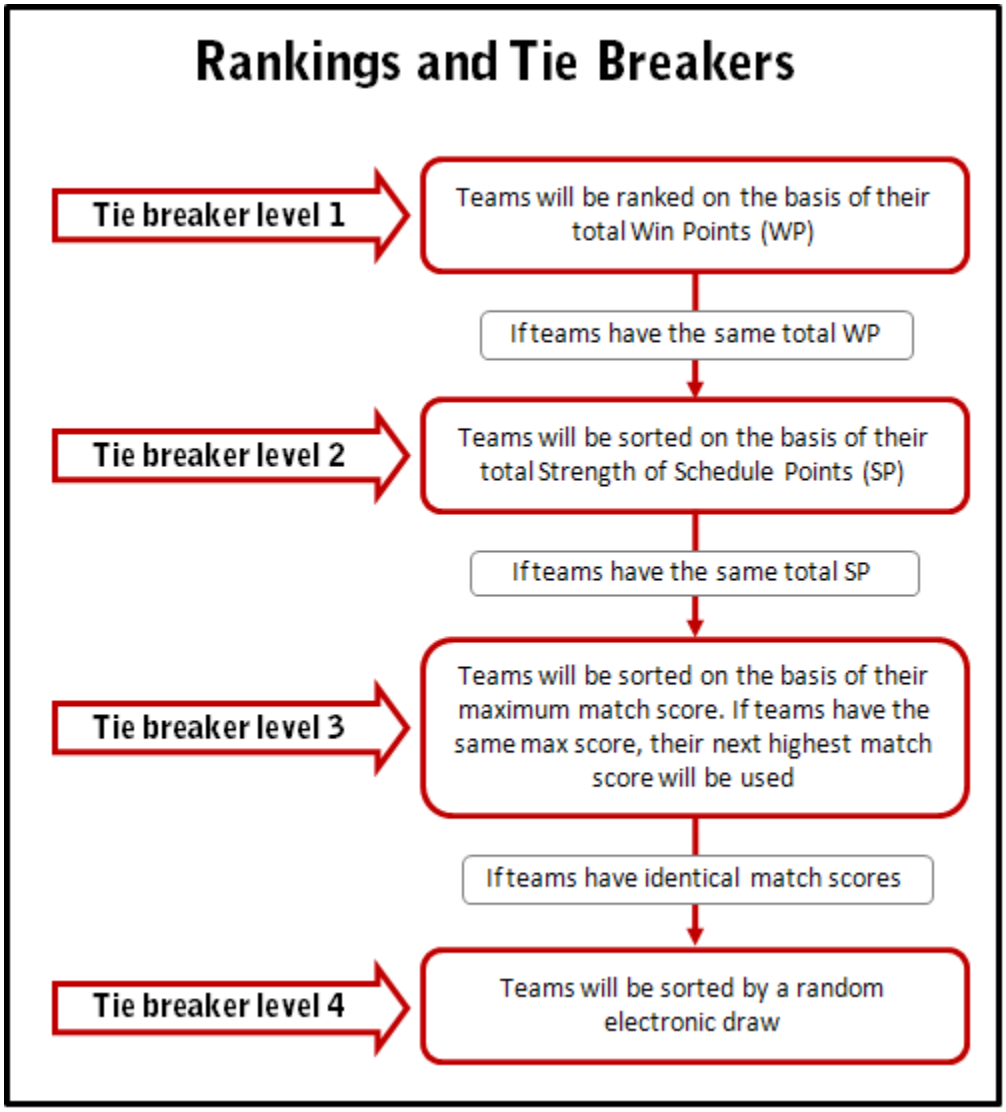
Qualifying Matches

Schedule

- The *qualifying match* schedule will be available prior to opening ceremonies on the day of competition. This schedule will indicate alliance partners and match pairings. It will also indicate the alliance's color – red or blue. For tournaments with multiple fields, the schedule will also indicate which field the match will take place on.
- The *qualifying matches* will start immediately after opening ceremonies in accordance with the qualifying match schedule.
- Teams will be randomly assigned an alliance partner to compete against two randomly assigned opponents in each *qualifying match*.
- All teams will be **scored** on the same number of *qualifying matches*.
- In some cases, a team will be asked to play in an additional *qualifying match*, but will not receive credit for playing this extra match.

Rankings

- At the conclusion of each match, *Win Points (WP)* will be issued:
  - Winning teams of a *qualifying match* receive two (2) *WP*
  - Losing teams of a *qualifying match* receive zero (0) *WP*
  - If a *qualifying match* ends in a tie, all four teams receive one (1) *WP*
  - If a team is disqualified they receive zero (0) *WP*
- All teams in each *Qualifying Match* will also receive *Strength of Schedule Points (SP)*.
  - The number of *SP* assigned for each match, is that of the losing alliance's score.
  - In the event of a tie, both alliances will receive the same *SP* (equal to the tie score).
  - If a team is disqualified they receive zero (0) *SP*
  - If both teams on an alliance are disqualified, the teams on the winning Alliance will be awarded their own score as their *SP* for that match.
- For a *qualifying match*, if **no** member of a team is present in the driver station at the start of a match, that team is declared a "no show" and will receive zero (0) *WP* and zero (0) *SP*. A "no show" is treated exactly the same as a disqualification.



Elimination Matches

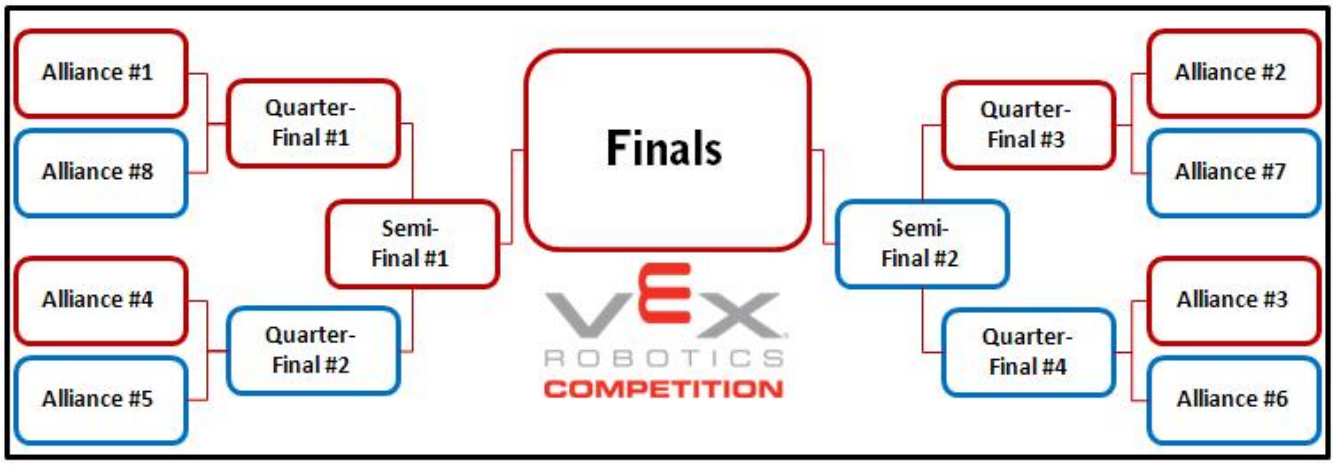
- The *alliance selection* process will consist of two rounds of selection, such that eight alliance captains will form elimination alliances consisting of three teams.
- These eight alliances will participate in a tournament to determine the event champions.
- If a team is disqualified during an *elimination match*, then their entire alliance is disqualified, and the match will be recorded as a loss.

Alliance Selection Process

- Every team will choose a student to act as a team representative.
  - These student representatives will proceed to the playing field at the designated time to represent their teams in the *alliance selection*.
- There will be eight alliances formed in the *alliance selection*.
- In order of tournament ranking, the student representative of the highest ranked team not already in an alliance will be asked to step forward as an *alliance captain* to invite another available team to join their alliance.
- A team is available if they are not already part of an alliance, or have not already declined an alliance invitation.
  - If the team accepts, it is moved into that alliance.
  - If a team declines an invitation, they CANNOT be invited into another alliance, but are still available to select their own alliance if the opportunity arises.
  - If a team declines, the *alliance captain* from the inviting team must then extend another invitation.
- This process will continue until all eight *alliance captains* have been designated and chosen one alliance partner.
- **The same method is used for each *alliance captain*'s second choice. Teams will select in the same order they did in the first round.** Any teams remaining after alliance eight makes their second choice will not compete in the *Elimination Matches*.
- Some smaller events may choose to use a different alliance format to better suit the number of teams, please see the event modification section of this document for more details.

Match Ladder

The *elimination matches* will play in a ladder format as shown below.



Elimination Scoring

In the elimination rounds, teams do not get *win points*; they get a win, loss or tie. Within each bracket of the Elimination Match Ladder, matches will be played to determine which alliance advances, as follows:

- The first alliance to win two matches advances.
- Any tied matches will be replayed until one alliance has two wins, and advances.

Tournament Rules

<T01> Referees have ultimate authority during the competition. **Their rulings are final.**

a. The referees will not review any recorded replays.
b. Any questions for the referees must be brought forward by a student drive team member within the time period of two (2) matches.

<T02> The only people from a team permitted by the playing field are the three drive team members who are identified by the drive team badges. These badges are interchangeable.

<T03> During matches, two teams from an alliance will play on the field. **Any team which sits out the first match in an elimination series, must play in the second match, with no exceptions.** In the third and any subsequent matches, any two of the three teams may play. Prior to each *elimination match*, the *alliance captain* must let the referee know which two teams will be playing in the upcoming match.

<T04> There are no time outs in the qualifying rounds; in the elimination rounds, each alliance will be allotted ONE time out of no more than three minutes, as permitted by the head referee. The matches must progress according to schedule.

a. If a robot cannot report for a match, at least one member of the team should report to the field for the match.

<T05> All team members, including coaches, **must** wear safety glasses or glasses with side shields while in the pit or alliance stations during matches. While in the pit area it is highly recommended that all team members wear safety glasses.

Event Modifications

Small Tournaments: In the case that an event has fewer than 24 teams (the requisite amount to have eight full alliances), tournaments may be played as follows:

- If there are between 18 and 23 teams at a tournament
  - Alliances will still consist of three teams
  - The number of alliances will be equal to the amount of teams divided by three, less any remainder. (e.g. If there are 19 teams, 19/3 = 6.33 → 6 picking teams)
- If there are 17 or fewer teams
  - Alliances will consist of two teams
  - The number of alliances will be equal to the amount of teams divided by two, less any remainder. (e.g. If there are 13 teams, 13/2 = 6.5 → 6 picking teams)
  - Some tournaments of this size may choose to have one alliance of 3 teams to allow all teams to participate in the elimination rounds. (e.g. If there are 17 teams, 7 alliances of 2 and 1 alliance of 3). Three team alliances must still adhere to <T03> despite competing against other 2 team alliances.
    - If a tournament is using this format, alliances should be selected as per usual until each alliance has two teams. The remaining team would then be added to the lowest ranked alliance. (e.g. 7th is lower ranked than 6th)
- The match ladder follows the same format as a full tournament, with byes being awarded when there is no applicable alliance. (e.g. If there are seven alliances, there would be no 8th alliance, thereby awarding a bye to the 1st alliance in the quarter-finals.)

Field Height: At many tournaments the playing field will be placed on the floor. Some tournament organizers may choose to elevate the playing fields by up to 36". For safety reasons, no drive team members will be allowed to stand on any sort of object during a match, despite the presence of raised fields.

SECTION 4

The Robot

Overview

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

Robot Rules

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

<R1> Only one (1) robot will be allowed to compete per team in the VEX Robotics Competition. Though it is expected that teams will make changes to their robot at the competition, a team is limited to only one (1) robot.

a. Teams may not compete with one robot, while a second is being modified or assembled.
b. Teams may not switch back and forth between multiple robots during a competition.

<R2> Every robot will be required to pass a full inspection before being cleared to compete. This inspection will ensure that all robot rules and regulations are met. Initial inspections will take place during team registration/practice time.

a. If significant changes are made to a robot, it must be re-inspected before it will be allowed to compete.
b. All robot configurations must be inspected before being used in competition.
c. Teams may be requested to submit to random spot-inspections by event personnel. Refusal to submit will result in disqualification.
d. Referees or inspectors may decide that a robot is in violation of the rules. In this event, the team in violation will be disqualified and the robot will be barred from the playing field until it passes re-inspection.

For further information on the inspection process please refer to Appendix D, Robot Inspection Guidelines

<R3> The following types of mechanisms and components are NOT allowed:

a. Those that could potentially damage playing field components.
b. Those that could potentially damage other competing robots.
c. Those that pose an unnecessary risk of entanglement.

<R4> At the beginning of any match, robots must be smaller than 18” x 18” x 18”.

a. During inspections, robots will be measured in one of two ways
    i. Robots will be placed into a “sizing box” which has interior dimensions matching the above size constraints. To pass inspection, a robot must fit within the box without touching the box walls or ceiling.
    ii. Robots will be sized using a VRC Robot Sizing Tool. Robots will be placed on the base plate and must not touch the measurement slide as it is passed over the base plate. Please see http://www.vexrobotics.com/275-1455.html for a visual reference
b. Robots may expand beyond their starting size constraints after the start of a match.
c. Any restraints used to maintain starting size (i.e. zip ties, rubber bands, etc) MUST remain attached to the robot for the duration of the match.

<R5> Robots may be built ONLY from Official **Robot** Components from the VEX Robotics Design System unless otherwise specifically noted within these rules.

a. During inspections if there is a question about whether something is an official VEX component, a team will be required to provide documentation to an inspector, which proves the component's source. Such types of documentation include receipts, part numbers, or other printed documentation.
b. Only the VEX Robotics Design System Components specifically designed to be used for Robot construction are allowed. Using additional components outside their typical purpose is against the intent of the rule (i.e. please don't try using VEX apparel, competition support, or other non-robot products on a VEX Robotics Competition Robot).
c. The packaging, manual binders, styrofoam, cardboard, plastic bags, software CD's etc. from the VEX kits are NOT included and CANNOT be used for robot construction. Only the VEX robot parts themselves are allowed.
d. Products from the VEXpro product line cannot be used for robot construction. Products from the VEXpro line which are also cross listed as part of the VEX EDR product are legal.

<R6> Official VEX products are ONLY available from VEX & Official VEX Resellers. To determine whether a product is "official" or not, consult www.VEXrobotics.com.

a. Products **identical** to those listed on this site are also considered "official VEX products". For the purposes of this rule, products which are identical in all ways except for color are permissible.
   Note: It is up to inspectors to determine whether a component is "identical" to an official VEX component.
b. VEX Robotics Competition teams from countries that primarily use the metric system may utilize metric fasteners comparable in size, length, and head type to VEX fasteners.

<R7> Robots are allowed the following additional "non-VEX" components:

a. Any material strictly used as a color filter for a VEX Light Sensor.
b. Any parts which are identical to legal VEX parts. For the purposes of this rule, products which are identical in all ways except for color are permissible.
c. Teams may add non-functional decorations provided that these do not affect the robot performance in any significant way or affect the outcome of the match. These decorations must be in the spirit of the competition. Inspectors will have final say in what is considered "non-functional".
   i. Any decoration which interacts with a game piece would be considered functional, hence illegal
d. Any non-aerosol based grease, when used in **extreme** moderation on surfaces and locations that do NOT come into contact with the playing field walls, foam field surface, game objects, or other robots.
e. Polycarbonate as cut from a single 12" x 24" sheet up to 0.0625" thick. (Please note that polycarbonate is different from acrylic sheet, which is not legal. Polycarbonate is sold under trade names such as Lexan® and Makrolon®.)

<R8> Additional VEX Robotics Design System Components that are released during the competition season are considered legal for use.

a. Some "new" components may have certain restrictions placed on them upon their release. These restrictions will be documented in a Team Update. Team Updates will be posted to the "VEX Round Up" home page in the Competition section of www.VEXrobotics.com

<R9> Robots must use ONLY one (1) VEX EDR Microcontroller.

a. Examples of VEX EDR Microcontrollers are the VEX v.5 PIC Microcontroller and the VEX Cortex Microcontroller.
b. Microcontrollers that are part of other VEX product lines such as VEXpro or VEX RCR are not allowed.

<R10> Robots must ONLY utilize the VEXnet system for all robot communication.

a. VEX 75Mhz Crystal Radios are prohibited. (Some events may allow the use of 75Mhz Crystal Radios, please see the Special Event Rule Modifications later in this section.)
b. Electronics from the VEX-RCR product line are prohibited including all VEXplorer electronics.

<R11> Robots may use up to ten (10) VEX EDR motors or VEX Servos (Any combination, up to ten)

a. Of these ten (10) allowed motors, teams may use a maximum of four (4) "2-Wire Motor 393" modules.
b. 2-Wire Motors must be controlled by a 2-Wire Motor Port, either directly on a VEX Microcontroller, or on a "VEX Motor Controller 29" module.
c. Teams may NOT use multiple 2-wire Motor Ports, 3-wire PWM Motor Ports, or Motor Controller 29 modules on a single motor.

<R12> A maximum of one (1) VEX Y-cable can be used per Motor Port of the Microcontroller or Power Expander. (You cannot "Y off a Y" to have more than two (2) motors controlled by the same Motor Port.)

a. Teams using the Cortex Microcontroller can only power one (1) 2-wire Motor per each of the two 2-wire motor ports on the Microcontroller. It is illegal to "Y" off a 2-wire Motor Port.

<R13> The only allowable sources of electrical power for a VEX Robotics Competition Robot is any single (1) VEX 7.2V Robot Battery Pack of any type, unless the robot is utilizing the VEX Power Expander, and a single (1) 9V backup battery. Robots utilizing the VEX Power Expander can use a second (2) VEX 7.2V Robot Battery of any type.

a. Additional batteries cannot be used on the robot (even ones that aren't connected).
b. Robots are permitted to use a maximum of one (1) VEX Power Expander
c. To ensure reliable wireless communication, it is required that all teams connect a charged 9V Backup battery to their VEXnet system using the VEXnet Backup Battery Holder (276-2243).
d. Any VEX 7.2V Battery Pack is legal, in the quantities described above.

<R14> No more than two VEX hand-held transmitters may control a single robot during the tournament. No modification of these transmitters is allowed of ANY kind.

a. No other methods of controlling the robot (light, sound, etc) are permissible.

<R15> Parts may NOT be modified as follows:

a. Motors, extension cords, sensors, controllers, battery packs, and any other electrical component of the VEX Robotics Design System may NOT be altered from their original state in ANY way.
b. Welding, soldering, brazing, gluing, or attaching in any way that is not provided within the VEX Robotics Design System will NOT be allowed.
    - Mechanical fasteners may be secured using Loctite or a similar thread-locking product.
        - This may be used for securing hardware ONLY.
c. External wires on VEX electrical components may become damaged during use. These wires may be repaired using soldering or twist/crimp connectors such that the original functionality / length is not modified or enhanced in any way. These repairs may be covered by up to 1" of insulating tape, or heat shrink tubing as long as this covering is not used for other functional gain. Wire used in repairs must be identical to VEX wire. **Teams may make these repairs at their own risk; incorrect wiring may have undesired results.**

<R16> The Robot on/off switch must be accessible without moving or lifting the robot. The Robot Microcontroller lights should also be visible by competition personnel to assist in diagnosing robot problems.

<R17> Teams must bring their robots to the field prepared to play. Teams who use VEX pneumatics must have their systems charged before they place the robot on the field.

<R18> To participate in an official VEX Robotics Competition Tournament a team must first register on www.RobotEvents.com. Upon registering they will receive their VEX Team Identification Number (VEX Team ID#) and a welcome kit containing VEX Team Identification Number Plates. Every robot should have their VEX Team ID# Plates displayed on a minimum of 2-opposing sides.

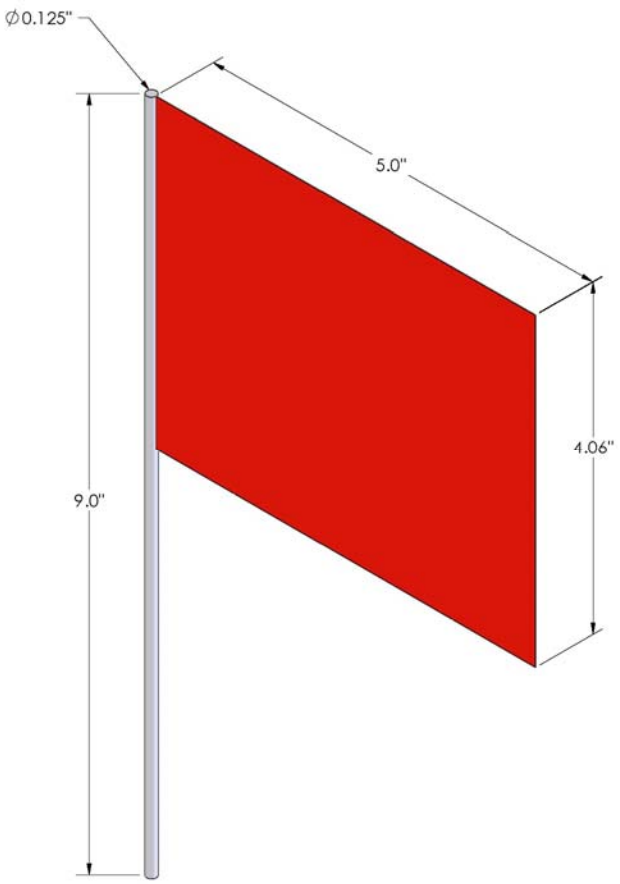
a. The VEX Team Identification Number Plates are considered a non-functional decoration, and cannot be used as a functional part of the robot.
b. These number plates must fulfill all robot rules (i.e. they must fit within the 18" cube per <R4>, they cannot cause entanglement, etc.)

<R19> Robots must include a mounting device to securely hold one VEX Robot Identification Flag throughout an entire match.

a. The VEX Robot Identification Flags are considered a non-functional decoration, and cannot be used as a functional part of the robot.
b. These flags must fulfill all robot rules (i.e. they must fit within the 18" cube per <R4>, they cannot cause entanglement, etc.)

Notes on VEX Robot Identification Flags:

- The flags will be issued to teams in their VEX Robotics Competition registration materials.
- These flags may also be available at some events
- Replacement and extra flags are available for purchase at www.VEXrobotics.com
- For flag details please refer to the following diagram.
- VEX Threaded Standoffs work as simple flag holders, as shown below.



<R20> During the Autonomous Period human operators are prohibited from providing ANY feedback to the robots. Robots must operate and react only to sensor inputs and to pre-programmed commands. Human operators will not be allowed to use their hand-held controllers. As such, teams are responsible for programming their robot with custom software if they want to perform in Autonomous mode.

For more information on this, teams should consult the help guides produced by the developers of their chosen programming software.

Special Event Rule Modifications

The rules listed in this section represent the way the game will be played at ALL VEX Robotics Competition "Championship" Events. We know that some events will choose to modify the rules slightly to suit unique circumstances. In particular, we expect some events will make the following rule exceptions:

a. Utilize the VEX 75 Mhz Crystal Radio Transmitter & Receiver instead of or in conjunction with the VEXnet 802.11g Wireless link.
b. Allow AA batteries to power the robot instead of a VEX 7.2V Battery Pack

If an event makes the changes they need to inform all attending teams. It is especially important that any 75 Mhz events make sure their teams are using the correct communication type.

For additional information on using the 75 Mhz Crystal Radio Transmitter & Receiver, refer to "Appendix G - 75 Mhz Crystal Radio Tournaments".