



2008 MVP ROBOTICS CHALLENGE



SPONSORED BY:

ROCKWELL AUTOMATION

AMERICAN ACRYLICS, LLC

WAUKESHA COUNTY TECHNICAL COLLEGE

FOUNDED BY:

THE ULTIMATE PROTECTION SQUAD 1675

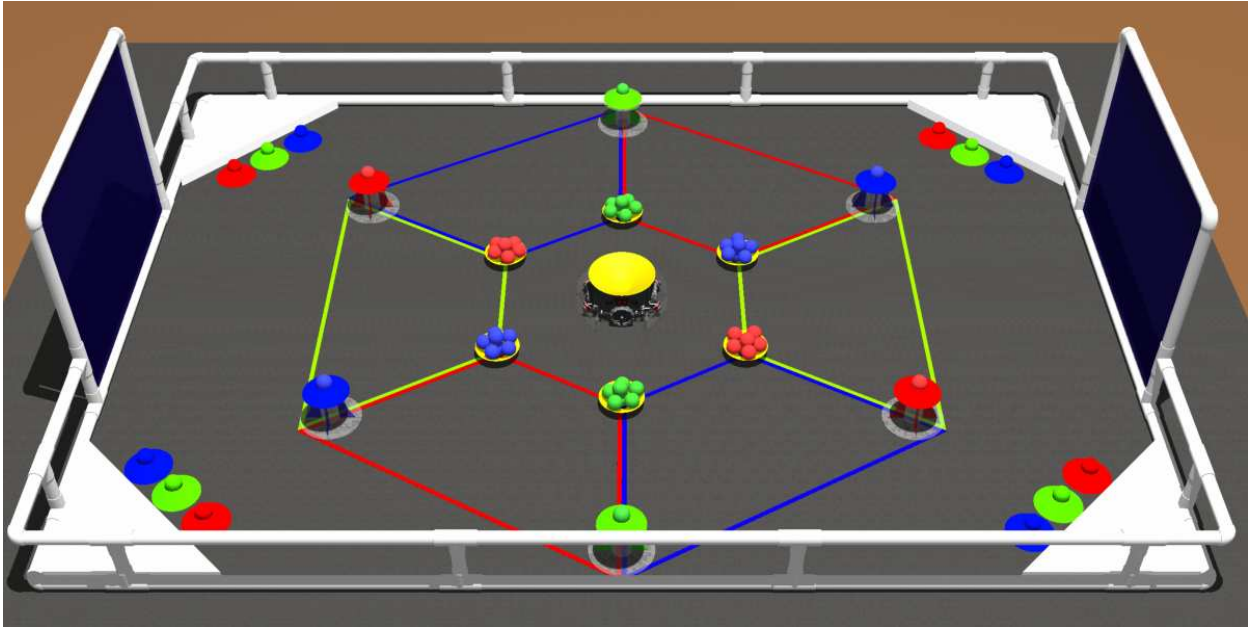
MORE ROBOTICS 1714

MILWAUKEE FIRST SUPPORT ORGANIZATION

1. Objective

The objective of “Conefusion” is to design and build a radio-controlled robot that will allow you and your partnered team to earn a higher Match Score than the two opposing alliances.

2. The Game



Visit www.midwestvex.org to download files containing larger, dimensioned field diagrams and descriptions of each of the elements on the field above.

2.1 Field Description:

2.1.1 The Official Midwest Vex Programs Field measures 10 feet by 14 feet and is viewable on www.midwestvex.org. The surface of the playing area consists of 2' x 2' interlocking foam floor tiles, rough side up, available from www.softtiles.com.

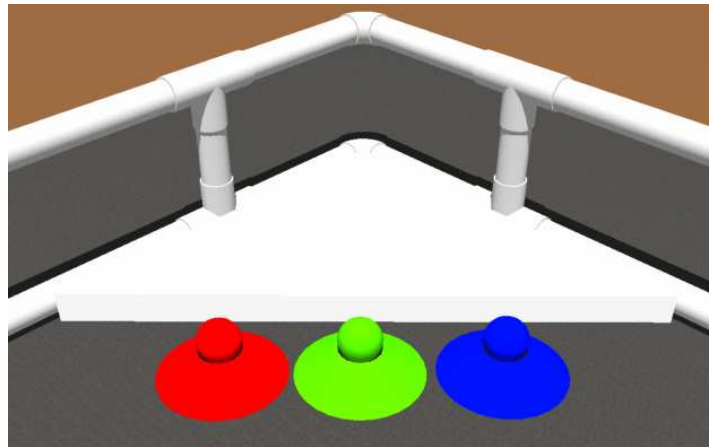
2.1.2 All official field dimensions will be within +/- 1/2" tolerance.

2.1.3 Alliance Zones: The center of the playing field features a hexagon composed of six trapezoidal Alliance Zones – two for each alliance located opposite one another. The center of the hexagon is open and does not belong to any alliance. The inside hexagon measures 24 inches point to point, while the outer hexagon measures 60 inches point to point. Each robot will begin the match in their own corresponding colored Alliance Zone, which is defined by colored tape. Alliances will be designated as either “Red”, “Blue”, or “Green” on a match-by-match basis as noted on the match schedule distributed and posted at the competition.

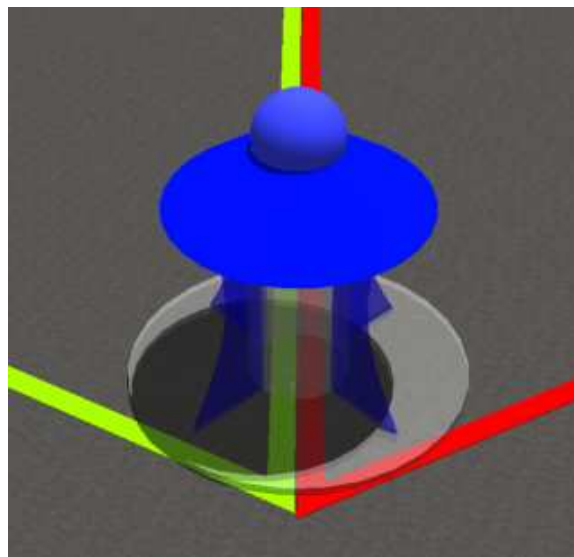
2.1.4 Platforms: In each corner of the field is a triangular acrylic platform. The top surface is raised 2.0 inches above the ground, and the two sides along the playing field perimeter measure 24 inches in length.

2.1.5 Balls and Cones: Located throughout the field are (60) 6.5mm ball pit balls (available from Toys R Us) and (24) disc Cones (commonly available at any sporting goods store in the soccer department) measuring 2.25" tall with a base diameter of 7.625".

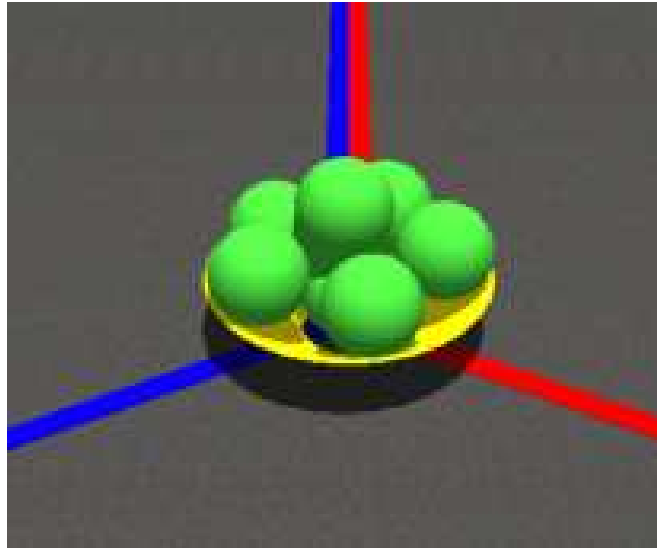
2.1.5.1 Corner Cones: On the ground in front of each Platform will be one Colored Cone of each alliance color. On top of each Cone will be a like colored Ball.



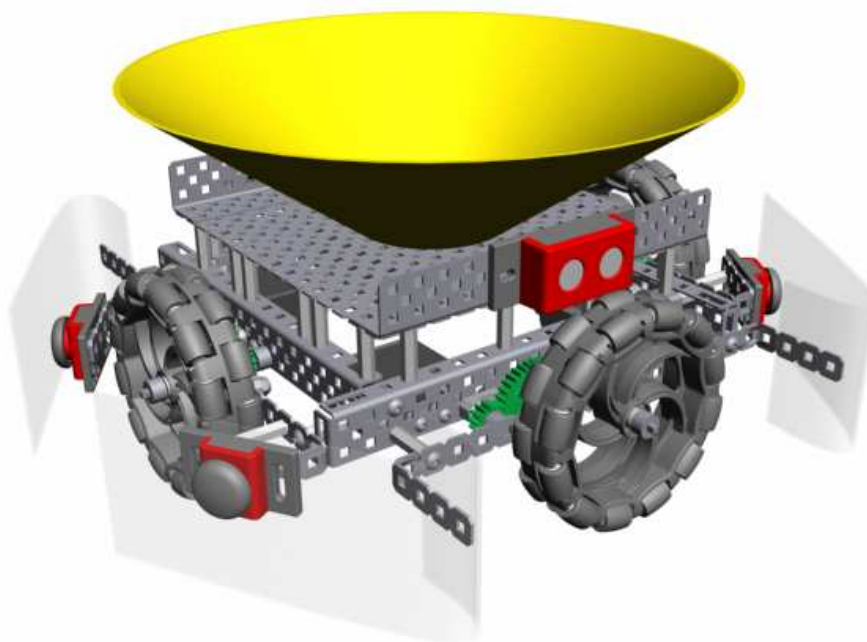
2.1.5.2 Pedestals: At each exterior point of the central hexagon will be an acrylic pedestal. On top of each Pedestal will be a Colored Cone of the alliance color that the Pedestal is not straddling (for example, a green Cone is located on top of the Pedestal that straddles a blue and red Alliance Zone). A like colored Ball is located on top of each Cone.



2.1.5.3 Neutral Cones: At each interior point of the central hexagon will be an inverted yellow Neutral Cone. On top of each Cone will be 7 Balls of the alliance color that the Neutral Cone is not straddling (for example, green Balls will be on top of the Neutral Cone that is straddling a blue and red Alliance Zone).



2.1.6 Shy-Goal 5000: This field element is highly interactive. Using a Vex Robotics platform, this goal darts away from objects detected by its two ultrasonic range sensors and four bumper switches. The top portion of Shy-Goal 5000 is an inverted, larger Cone of the same material as the Colored and Neutral Cones which measures 4" tall and has a base diameter of 11". A 3d model, or exact dimensions, will be available for download at www.midwestvex.org.



3. Scoring

3.1 All scoring will occur at the end of each two minute and thirty second match, after all robots and scoring objects have come to rest.

3.2 The primary scoring method will be to stack Cones atop each other and earn multipliers using Balls.

3.2.1 Each Cone in a stack is worth one (1) point, regardless of color. A Cone is stacked if it is wholly supported by:

- a.) another Cone in the stack.
- b.) a Ball considered part of the stack.

A stack consists of at least one Cone.

3.2.2 Points are awarded to the alliance corresponding to the color of the top Cone of the stack.

3.2.3 If the top Cone of the stack is a Neutral Cone, the stack is considered nullified and is not owned by any alliance.

3.2.4 Balls that are part of a stack act as multipliers. A Ball is considered part of a stack if it is wholly supported by Cones or other Balls within the stack. If more than half of a Ball's diameter is under the stack of Cones, but it is supported by the floor, the Ball is still considered part of the stack.

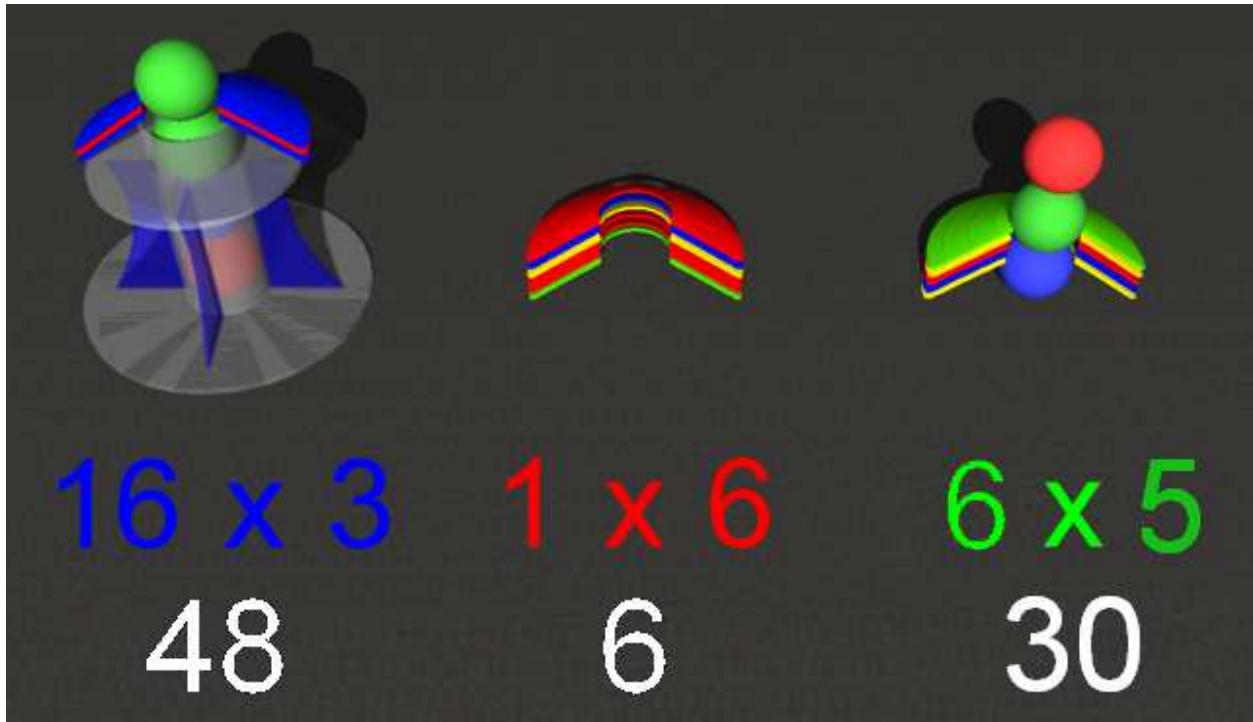
a.) Balls considered part of a stack of Cones positioned on the floor serve as 2x multipliers for points within the stack, regardless of Ball color.

- 1 Ball = 2x
- 2 Balls = 4x
- 3 Balls = 6x
- 4 Balls = 8x
- etc

b.) Balls considered part of a stack of Cones positioned on top of the Pedestal serve as exponential multipliers.

- 1 Ball = 2x
- 2 Balls = 4x
- 3 Balls = 8x
- 4 Balls = 16x
- Etc

Balls within the main support tube of the Pedestal are also considered part of the stack.



3.3 Shy-Goal 5000: All points associated with the Shy-Goal 5000 are considered bonuses and are counted separately from the points earned through stacks of Cones.

3.3.1 Each alliance earns four (4) points per Ball located within the large Cone regardless of Shy-Goal 5000 position.

3.3.2 If the Shy-Goal 5000 is positioned within an Alliance Zone after everything has come to rest at the end of the match, the corresponding colored alliance receives an additional four (4) points per Ball within the Shy-Goal 5000, regardless of color.

3.3 Corner Platforms: Each alliance will receive sixteen (16) points per robot properly supported by the platform. Refer to Section 5.9 for details on properly supported robots.

3.4 Match Scoring: Each alliance earns a Base Score and a Bonus Score based on their actions during the match. The Base Score is determined solely by the stacks of Cones. The Bonus Score is determined by robots on the Corner Platforms and points associated with the Shy-Goal 5000.

3.4.1 Match Score: An alliance's final Match Score is determined as follows:

$$\Sigma(\text{opposing alliances' Base Scores}) - \text{own Base Score} + \text{own Bonus Score}$$

For example, the Red Alliance's final Match Score is the Blue Base Score plus the Green Base Score minus the Red Base Score plus the Red Bonus Score.

3.5 Tie Breakers: In the event of a tie, the winner of the match will be determined by the following criteria, in this order:

- The alliance that owns the Goal-Bot 5000.
- The alliance with the most robots on the Platforms.
- The alliance with the most corresponding color Balls contained within the Shy-Goal 5000.
- The alliance with the most owned stacks of Cones. This does not relate to the number of Cones within the stacks.

4. Matches

4.1 The competition will consist of Qualifying Matches followed by Elimination Matches. Each match is two minutes and thirty seconds long. There is no autonomous period.

4.2 Field Crew: Each team is allowed to bring one driver and one coach to the field. The coach and driver may switch positions at any time during the match, provided that the coach is also a student. The driver must be pre-college age. Both members must remain in the Player Station for the entire duration of the two minute and thirty second match. Failure to do so will result in a 10 point penalty. Teams are expected to be present for each of their scheduled matches; however, if a robot is unable to compete for a scheduled match, the team is required to send one representative to stand in the driver's area for the duration of the match.

4.3 Match Safety: Safety glasses are required at all times in the pit area and on the competition field. Teams will not be permitted to compete unless all team members on the competition field are wearing safety glasses. Teams must provide their own safety glasses for the event; no safety glasses will be supplied by the event coordinators. It is recommended that teams bring extra safety glasses to events for any team visitors.

4.4 Qualifying Matches

4.4.1 All teams will play in approximately the same number of Qualifying Matches (the number of matches will differ by no more than one match). The number of qualifying matches at each event will be determined by the length of the event and the number of teams competing.

4.4.2 Teams will be given their schedule of qualification matches before the start of the first match. The qualification match schedule will show the match number, the alliances competing in each match, and the color that each team is assigned for that match.

4.4.3 At the end of each qualifying match, the Ranking Score for each alliance will be awarded based on the Match Score. The team with the highest Match Score (1st place position) receives three (3) points, the team with the second highest Match Score (2nd place position) receives two (2) points, and the last alliance receives one (1) point.

4.5 Ranking

At the end of the qualifying matches, teams will be ranked from 1 to N (N being the total number of teams present) based on the following:

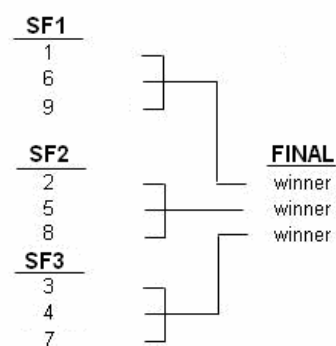
- Highest Ranking Score
- Highest Match Score
- Most times the Shy-Goal 5000 was in Alliance Zone at the end of the match.

4.6 Elimination Matches

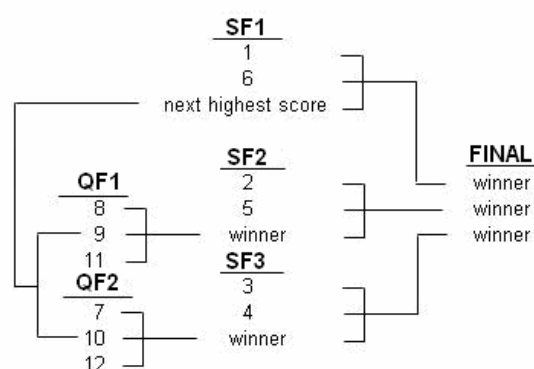
4.6.1 The number of teams participating in Elimination Matches will be no less than 18 but may be increased prior to the start of the event based on the number of teams participating.

4.6.2 Alliance selection procedure for the Elimination Matches will be run like the FRC elimination alliance selections. The top ranked teams become “Selecting Teams” and are able to select their own alliance partners. In the first round of selections, the highest seeded team will pick first and the lowest seeded team will pick last. If a team is picked that is ranked as a “Selecting Team”, then the next seeded team is bumped up to pick. A “Selecting Team” may refuse an invitation from a higher seeded team, but may not then accept an invitation from a different “Selecting Team”. A team outside of the top seeded teams may not accept an invitation from any team if a previous invitation is refused. To allow more teams to participate in the Elimination Matches, it may be determined prior to the start of the tournament to use three team alliances. In this case, the second round of selections will be conducted in reverse, with the lowest seeded team making the first selection and the highest seeded team making the last pick. If the competition allows for three team alliance selections, the third pick will go from highest seeded team to lowest. Each team of the three team alliance must play in at least one Elimination Match.

4.6.3 The number of top seeded teams that earn the right to select their alliances partners will be determined prior to the start of the tournament based on the number of attending teams. One of the two following variations of the tournament bracket will be used to determine an event champion:



18 / 27 TEAM BRACKET



24 / 36 TEAM BRACKET

4.6.4 If the 24 / 36 Team Bracket is used for the tournament, 12 alliances are created during the alliance selection process. The alliances ranked 7th, 10th, and 12th are matched in Quarter Final 1, and alliances ranked 8th, 9th, and 11th are matched in Quarter Final 2. The winner from Quarter Final 1 moves on to Semi Final 2 against the 2nd and 5th ranked alliances. The winner from Quarter Final 2 moves on to Semi Final 3 against the 3rd and 4th ranked alliances. Of the four remaining, the alliance with the highest average score (based solely on elimination matches) moves on to face the 1st and 6th ranked alliances in Semi Final 1. The winning alliances of each Semi Final move on to face each other in the Finals.

If the 18 / 27 Team Bracket is used for the tournament, 9 alliances are created during the alliance selection process. Semi Final 1 consists of the 1st, 6th, and 7th ranked alliances; Semi Final 2 consists of the 2nd, 5th, and 8th ranked alliances; and Semi Final 3 consists of the 3rd, 4th, and 9th ranked alliances. As with the 24 / 36 Team Bracket, the winning alliances of each Semi Final move on to face each other in the Finals.

4.6.5 The elimination tournament requires two victories in a round to advance to the next round. Therefore each round will consist of a minimum of two matches and may require up to four matches to determine a winner.

5. General Rules

5.1 Disqualification: Robots may be disqualified based on their actions which violate the rules of the game. If a referee calls for a disqualification during a match, the robot will be disabled and they will receive a score of zero for the match. If disqualification is not determined until the completion of the match, the offending robot will receive a score of zero for the match. The alliance partner of a disqualified robot will still receive the score earned by all robots during the match, provided that they are also not disqualified. In both situations, the opposing alliances will receive a score based on the points that they earned. The disqualification of one robot during the Elimination Matches will disqualify the entire alliance.

5.2 Safety Hazards:

5.2.1 Referees may request that teams alter any portion of their robot that is considered a safety hazard. It is the right of the referees to prevent teams from playing in matches until such changes are made to the robot.

5.2.2 Referees will disqualify any robot that they deem to be a repeat safety hazard. A safety hazard is any direct action of, or mechanical failure on said robot which may increase the possibility of immediate damage to other robots, field objects, or personnel.

5.3 Loss of Parts: All parts of the robot must remain attached to the robot for the duration of the match and must not cause any hazard of entanglement to any other robot, or else that robot's team may run the risk of disqualification. Minor pieces which become detached from the robot and do not affect the outcome of the match will not result in a disqualification.

5.4 Out of Bounds: If a robot leaves the playing field for any reason so that it must exert force on the ground outside of the field border, the robot will be immediately disabled. If a robot is forced out of bounds by an opposing robot, both robots will be disabled and the aggressor will be given a 10 point penalty.

5.5 Pinning: Pinning occurs when an opposing robot is held against an obstacle and cannot move, in any direction, because of your robot's presence. Pinning will be visibly counted out by the closest referee for a duration of 5 seconds. If a robot is being pinned for five seconds, the team doing the pinning must back off for at least five seconds before they can resume pinning. Failure to do so will result in a 10 point penalty of the aggressor. If a robot continues to engage in this behavior, they may be disqualified.

5.6 Flipping: Robots may not flip an opposing team's robot. The flipping robot will be disqualified from the match if in the referee's decision they initiated an action which results in flipping. In incidents where the flipped robot initiates action or both robots are in motion, disqualification may not occur and will be at the discretion of the referees.

5.7 Intent to Destroy: Strategies resulting in the destruction of or damage to an opponent's robot or the field and field element is not in the spirit of the competition and will not be allowed.

5.8 Alliance Zone: At the start of the match, teams may place their robot anywhere inside either of their Alliance Zones. Only one robot may start in each Alliance Zone. The tape which defines the Alliance Zone is considered part of the zone and robots may be in contact with it. The exterior edge of the tape forms an infinite vertical plane which robots must begin entirely within. Robots may not be touching or "hovering" over any Pedestals, Neutral Cones, Colored Cones, or Balls. Teams must make a joint decision as to which Alliance Zone their robots will be placed in before each match.

5.9 Robots on the Corner Platforms: A robot is considered on a Corner Platform as long as the robot is not supported by another field element. Therefore, a robot that it is resting on Cones, Balls, or any other field elements will not be considered to be on the Platform. However, if the robot is being partially supported by another robot which is not on the Platform, it will still be considered to be on the platform but the supporting robot will not be.

5.10 Scoring Objects: Any scoring object which leaves the playing area during a match will be returned to the field near the point at which it exited at the referee or volunteer's earliest convenience.

5.11 Shy-Goal 5000 Rules and Regulations: The Shy-Goal 5000 is a precision machine from the future and needs to be treated as such.

5.11.1 Robots may NOT lift or tip over the Shy-Goal 5000 such that one or more of its wheels are no longer in contact with the surface of the field. The flipping robot will be disqualified from the match if in the referee's decision they initiated an action which results in flipping. In incidents where both the robot and the Shy-Goal 5000 are in motion, disqualification may not occur and will be at the discretion of the referees.

5.11.2 A Robot may NOT grab or hold the Shy-Goal 5000. Robots must be designed such that their devices may not become attached to the Shy-Goal 5000. A 10 point penalty will be given for each occurrence and the offending robot may be disqualified for the remainder of the match.

5.11.3 Strategies aimed solely at the destruction or damage of the Shy-Goal 5000, or meant to interfere with the Shy-Goal 5000's natural operation is not in the spirit of the competition and will not be allowed.

5.12 Robot Control: Team members may interact with their robot during a match only through the normal operation of the VEX control system. Only designated drivers may be in contact with the controls during the match.

5.13 Robot Modification: Teams are allowed to modify their robots in between matches as long as the robot remains compliant with all specifications and rules after the modification. Any modification should be brought to the attention of the referees or head inspector prior to the start of the team's next match. Teams may be subject to re-inspection at the discretion of the referees/head inspector.

5.14 Robot Identification: Teams must have their team number clearly marked on four sides of their robot, such that it is visible from 15 ft. away. Teams must also have the ability to designate Red, Blue, or Green alliances with a color insert or flag. These inserts must be provided by the team and must not be a functional part of the robot.

5.15 Rule Clarification: All questions or requests for rule clarifications should be submitted to rules@midwestvex.org. Questions and answers will be publicly posted on the event website. Any questions or clarifications resulting from league nights will also be posted on the event website.

5.16 Referee Rulings: All referee decisions regarding rules of play and scoring are final. If there is a question regarding a referee decision the driver may approach the head referee for clarification immediately following that match.

6. The Robot

6.1 Size Restriction: At the start of each match, every part of the robot must fit, unconstrained, in a stable position, within a cube with 15 inch sides. The robot may only contact the surface of the field in starting position. Robots will be measured before the beginning of Qualification Matches.

6.2 Weight Restriction: There is no restriction on the robot's weight, and it will not be measured at the competition.

6.3 Controls: Teams will be required to use one (1) competition remote control. Frequency modules will be provided by the competition coordinators and are not allowed to be brought to the competition site. Each team's remote is required to be tethered to a field disable tether during matches.

6.4 Pit Operation: Teams must bring a tether for robot control in the pit area. Robots may not be operated outside of the competition field or pit area. Failure to follow this rule may result in forfeiture of the next round of competition.

6.5 Construction Restrictions:

6.5.1 A robot must be designed to operate by reacting only against features within the confines of the playing field boundaries and may not interact with anything outside the boundaries of the playing field.

6.5.2 Gaining traction by use of adhesives or by abrading or breaking the surface of the playing field is not allowed and will be considered to be damaging the playing field and is subject to disqualification.

6.5.3 A robot may not contaminate the playing field or an opponent's robot with lubricants or other debris.

6.5.4 Teams may use 7.2V NiCd batteries of any manufacture, but only one battery (six cells) may be used on the robot at a time. The battery cost does not count towards the cost limit listed below.

6.5.5 Only parts from the VEX Robotics Design System Starter Kit are permitted unless specified on the additional materials list below.

6.5.6 Modifications are permitted to the mechanical parts of the kit. Teams may opt to buy their own replacement or spare parts from www.vexrobotics.com but these may not be used as part of the robot until the part fails. Teams may NOT intentionally modify any of the kit electronics. Modification of items on the additional materials list is permitted.

6.5.7 A parts outline form the VEX Robotics Design System Starter Kit can be found at <http://www.vexrobotics.com/vex-robotics-design-system.shtml>.

6.6 Materials: Teams are restricted to the contents of 2 VEX Robotics Design System Starter Kits. Additional materials may be used as outlined below. Each team must submit a Bill of Materials outlining their parts and expenses before their first match. We ask that the Bill of Materials distinguish between starter kit materials and additional materials.

6.7 Additional Materials List:

- String of no more than ¼" in diameter.
- Rubber bands of no more than 1" in width.
- Non-functional decorations
- A maximum of \$200 in additional VEX accessories, VEX Expansion kits, or VEXplorer kits available from www.vexrobotics.com. Anything that comes with the kit, including the VEX packaging, may be used.
- This competition does not use autonomous mode. However, you may choose to program certain functions in your robot. The programming kit may be used to program custom functions to your robot but does not count against the \$200 maximum listed above.

6.8 Energy Sources: The energy used by the devices in the competition must come solely from:

- A change in altitude of the center of gravity of the device
- Electrical energy delivered by the battery to the electronics and motors provided with the kit.