



2020 **SOCCKER** **SHOOTOUT**

Presented By



DTE Energy®
Foundation



V1 - 09/21/20

2020
SOCCKER 
SHOOTOUT

Contents

1 Introduction

1.1	Overview	4
1.2	OCCRA Soccer Shootout: A Primer	5

2 The Game

2.1	Overview	6
2.2	Game Description	6
2.3	Game Definitions	9
2.4	Game Scoring	16
2.5	General Game Rules	18
2.6	Specific Game Rules	23

3 The Competition

3.1	Overview	30
3.2	Competition Description	30
3.3	Competition Definitions	31
3.4	Qualifying Matches	33
3.5	Rankings	34
3.6	Alliance Selection Process	35
3.7	Double Elimination Bracket	36

4 The Robot

4.1	Overview	37
4.2	Robot Rules	37

5 Conduct and Safety, Manual Updates, Q&A

5.1	Conduct and Safety	45
5.2	Manual Updates	46
5.3	Q&A System	47



Appendix A - Field Specifications and Drawings (PDF)

Appendix B - Field CAD Model _ (SolidWorks & STEP)

Appendix C - Kit of Parts (PDF)

Appendix D - Robot Pre-Inspection Worksheet (PDF)

Appendix E - OCCRA Awards (PDF)

Appendix F - OCCRA Soccer Shootout One Pager (PDF)

Appendix G - Rules Cheat Sheet (PDF)

Section 1 - Introduction

1.1 Overview

OCCRA (Oakland County Competitive Robotics Association) is a county-wide association of students, teachers and volunteers providing opportunities in science, technology, engineering, and mathematics (STEM) disciplines for students in grades 6-12. Each year, school-based teams of students and mentors participate in a competitive robotics tournament, challenged to display their technical and collaboration skills through intense and fast-paced gameplay.

OCCRA is supported by the Oakland Schools Education Foundation (OSEF), whose support is made possible through the generosity and support of area businesses and individuals.

OCCRA's Mission

The Oakland County Competitive Robotics Association (OCCRA) shall organize and administer a high school competitive robotics league in Oakland County for the purpose of:

1. Generating enthusiasm for technical and academic disciplines such as design, engineering, science, mathematics, and technology through student-designed and student-built robots.
2. Providing a format for integrating and applying diverse scientific, technical, and other areas of study within the high school curriculum.
3. Providing recognition and encouragement for students who devote their energies to these technical, scientific, and other areas of study.
4. Promoting team and workplace skills, and good sportsmanship.
5. Raising awareness within high schools of the diverse technical career options available in our county and state.
6. Creating partnerships with corporations and the educational community that will enrich the high school experience for our students by providing greater access to individuals in scientific and technical careers.



1.2 OCCRA Soccer Shootout: A Primer

OCCRA Soccer Shootout is played on a *Field* which is a twenty-four (24) foot x thirty (30) foot carpeted area, surrounded by a metal pipe *Field Perimeter*. Each *Match* consists of two (2) *Alliances* - one “red” and one “blue” - which are each composed of two (2) *Drive Teams* with one (1) *Robot* each. A *Match* lasts one-hundred and twenty (120) seconds, during which *Drivers* control the *Robots*. There is no autonomous period in OCCRA Soccer Shootout.

There is a *Goal Zone*, a *Low Goal*, and a *High Goal* on each end of the *Field*. There are also two (2) *Human Player Stations* and two (2) *Loading Zones* on each end of the *Field*. There are forty (40) *Balls* that can be Scored in different ways:

- *Low Goal Scored* when a *Ball* is scored in the *Alliance's Low Goal*; worth one (1) *Match Point* per *Ball*.
- *High Goal Scored* when a *Ball* is placed in the *Alliance's High Goal*; worth three (3) *Match Points* per *Ball*.

There is a *Ramp* in the middle of the *Field*. Each *Robot* that ends the *Match* completely within the *Ramp Zone* earns an additional three (3) *Match Points* towards its own *Alliance's* score.

The *Alliance* that has more *Match Points* at the end of the *Match* is declared the winner, and receives a *Win Bonus* of ten (10) *Match Points* added to their *Match* score, or if both *Alliances* have the same amount of *Match Points*, a *Tie Bonus* of five (5) *Match Points* is added to both *Alliances' scores*. All *Match Points* are scored once the *Match* ends and all objects have come to rest.

For more details and specific gameplay rules, please see Section 2 - The Game.

For more information about OCCRA, visit the [OCCRA Website](#), follow Oakland Schools on Twitter @[OaklandSchools](#), or visit Oakland Schools Facebook page at [Oakland Schools - Michigan](#).



Section 2 - The Game

2.1 Overview

This section describes the 2020 OCCRA game entitled *OCCRA Soccer Shootout*. It also lists the game definitions, scoring amounts, and game rules.

2.2 Game Description

Matches are played on a *Field* set up as illustrated in the figures and described throughout. Two *Alliances* - one “red” and one “blue” - composed of two (2) *Drive Teams* and *Robots* each, compete in each *Match*. The object of the game is to attain more *Match Points* than the opposing *Alliance* by scoring *Balls* in various ways, and by parking on the top of the *Ramp* at the end of the *Match*.

A *Win Bonus* is awarded to the *Alliance* that has the most *Match Points* at the end of the *Match*, or a *Tie Bonus* is awarded to both *Alliances* if the *Match Points* are tied.

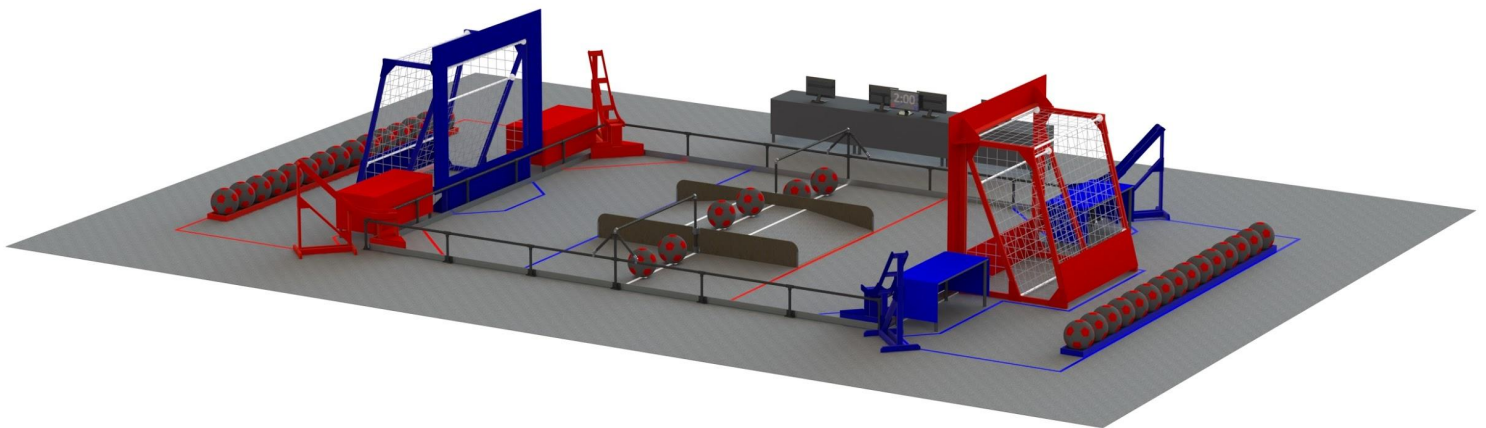


Figure 1: Iso view of the Field in its initial setup configuration.

Note: The illustrations in this section of the manual are intended to provide a general visual understanding of the game. Teams should refer to official field specifications, found in Appendix A, for exact field dimensions, and details of field construction.

Each OCCRA Soccer Shootout Match includes the following:

- Two (2) *Low Goals* and *High Goals*; Two (2) *Goal Zones* and *Offense Zones*
 - One (1) of each located at either end of the *Field* designated red or blue to correspond to the *Alliance Station Zone* on the opposite end of the *Field*.
- Two (2) *Crossbars*, one (1) *Ramp*, and one (1) *Ramp Zone*
 - One (1) *Crossbar* located above the *Center Line* on each side of the *Field*.
 - One (1) *Ramp* located in the center of the *Field*.
 - One (1) *Ramp Zone* located on the top and center of the *Ramp*.
- Two (2) *Alliance Station Zones* and four (4) *Driver Stations*
 - One (1) *Alliance Station Zone* located at either end of the *Field* designated red or blue.
 - Two (2) *Driver Stations* located at each end of the *Field* designated red or blue to correspond with the *Alliance Station Zone* it is within.
- Four (4) *Human Player Stations* and four (4) *Loading Zones*
 - One (1) *Human Player Station* located in each corner of the *Field* designated red or blue to correspond to the *Alliance Station Zone* on the same end of the *Field*.
 - One (1) *Loading Zone* located in each corner of the *Field* designated red or blue to correspond to the nearest *Human Player Station*.
- Forty (40) *Balls*
 - Six (6) *Balls* that start on the carpet along the *Center Line* on the *Field*.
 - Fifteen (15) *Balls* that start in each *Alliance Station Zone*.
 - One (1) *Ball* that is available for each *Robot* to have as a preload at the beginning of the *Match*. If not used as a preload, then the *Ball shall be placed on the field, touching the Robot*. If a *Robot* does not take the field, then the preload ball shall be removed from play.
- One (1) *Center Line*
 - Marked with white tape located along the center of the *Field* under both *Crossbars* and across the *Ramp*, with crosshair markings designating the starting location of *Ball* on the *Field*.

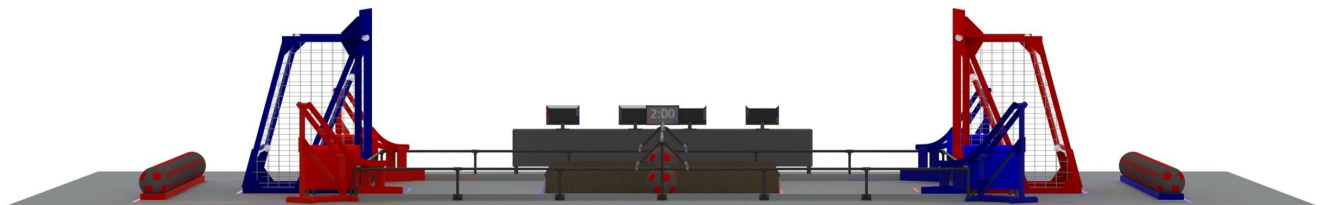


Figure 2: Front view of the *Field* in its initial setup configuration.

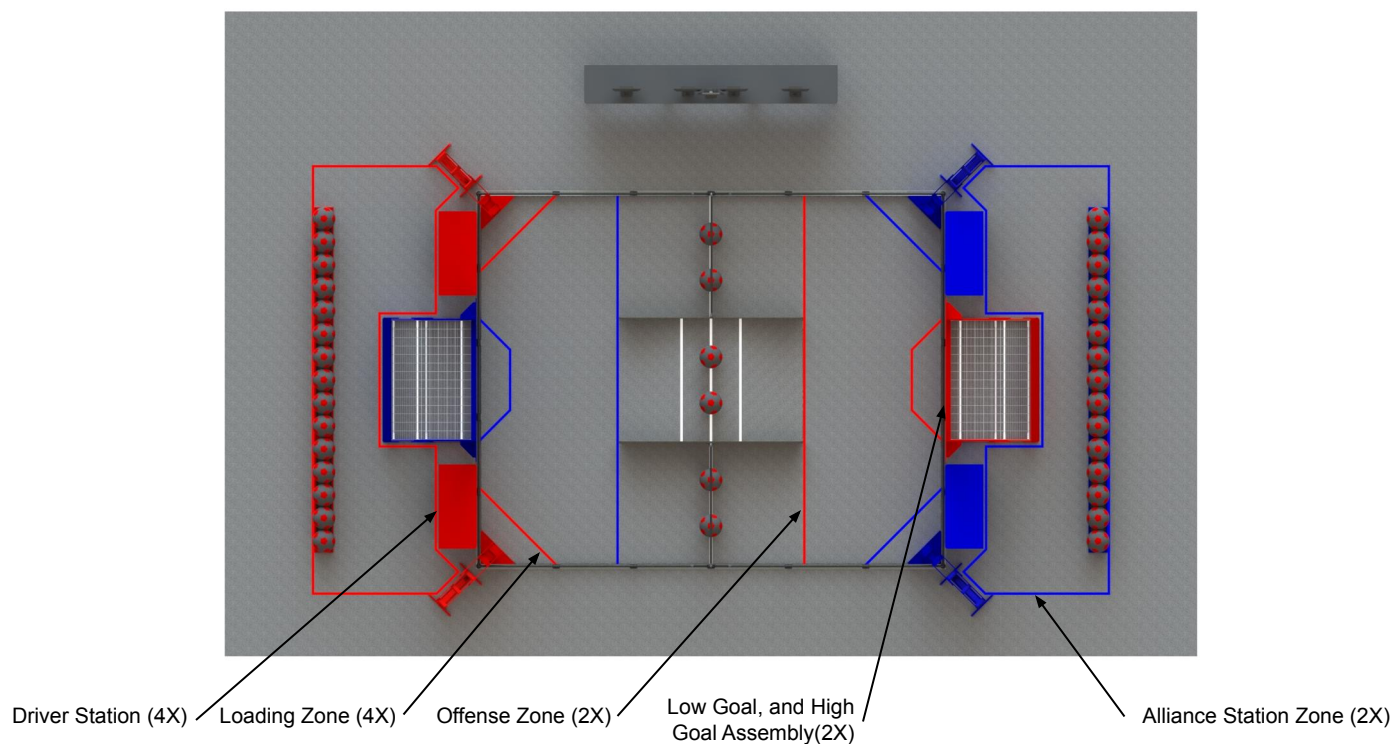


Figure 3: Top view of the Field in its initial setup configuration; annotated Balls, Goals, Human Player Stations, Driver Stations

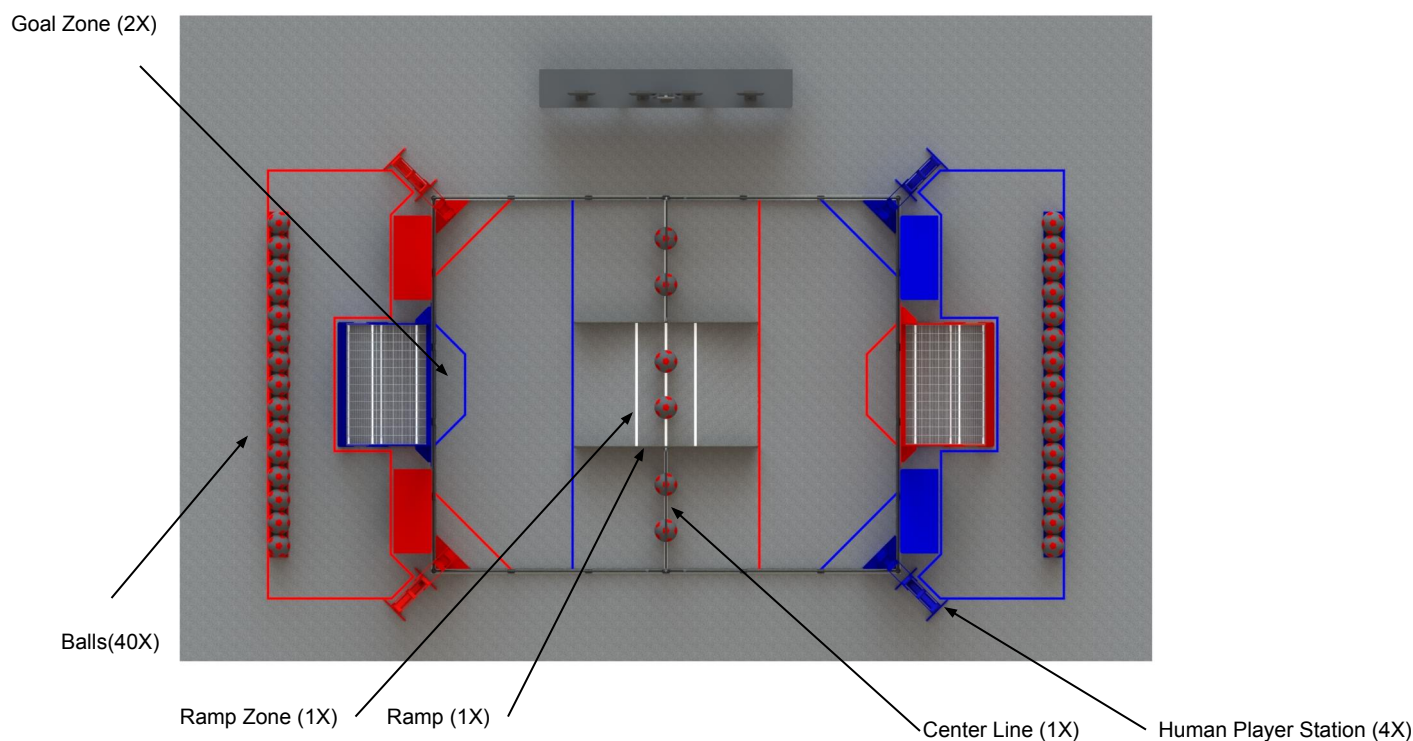


Figure 4: Top view of the Field in its initial setup configuration; annotated Zones and Lines

2.3 Game Definitions

Alliance - A pre-assigned grouping of two *Teams* that are paired together during a given *Match*.

Alliance Station Zone - A zone marked with red or blue tape. Each zone is located at either end of the *Field*, and all *Drive Team* members of the corresponding *Alliance* must remain in this zone during the *Match*.

Ball - An 17" inflated black and red ball resembling a soccer ball, weighing approximately twenty-four (24) ounces. Balls available at beachnecessities.com



Figure 5: Iso view of a Ball

Bypassed - A *Robot* that is unable or ineligible to compete in a *Match* as determined by the *Head Referee* and *Field Technical Advisor* resulting in a *Robot* being *Disabled*.

Center Line - A line marked with white tape. This line spans the width of the *Field* centered along the length of the *Field*. This line travels under both *Crosshairs*, as well as travelling across the center of the *Ramp*. There are crosshair marks along the *Center Line* to designate where *Balls* start on the *Field*.

Coach - A *Student* that is on the *Drive Team* and coaches the *Drivers* for their *Team*.

Crossbar - A bar made of metal pipe that spans a portion of the center of the *Field* above the *Center Line*, with a clearance under the bar to the carpet of thirty-six (36) inches. The bar spans from the side edge of the *Field* to the side wall of the *Ramp*.



Figure 6: Iso View of a Crossbar

Disablement - A penalty that may be applied to a *Team* if either the *Drive Team* or *Robot* associated with the *Drive Team* is acting in an unsafe or egregious manner. A *Referee* or *Field Technical Advisor* may ask a *Drive Team* to disable their *Robot* in certain cases.

Disqualification - A penalty applied to a *Team* after a *Match* for certain rule violations. A team that is *Disqualified* in a *Qualifying Match* receives zero (0) *Match Points*. When a *Team* is *Disqualified* in an *Elimination Match*, the entire *Alliance* is *Disqualified* and receives a loss for the *Match*. At the *Head Referee's* discretion, repeated violations and *Disqualifications* for a *Team* may lead to its *Disqualification* for the entire event.

Drive Team - A group of *Students* from a single *Team* that participate in a *Match*. A *Drive Team* consists of up to two (2) *Drivers*, a *Coach*, and a *Human Player*.

Driver - Up to two (2) *Students* that are part of the *Drive Team* and control the *Robot* for their *Team*. Only the *Drivers* may control their *Robot*.

Driver Station - A table for *Drivers* from a single *Team* to operate their *Robot* from.

Entanglement - A *Robot* status. A *Robot* is entangled if it has gripped, hooked, or attached to an opposing *Robot* or a *Field Element*, at the *Head Referee's* discretion.

Field - A twenty-four (24) foot wide x thirty (30) foot long carpeted area surrounded by a *Field Perimeter*.

Field Element - The carpet, *Field Perimeter*, *Zones*, *Goals*, *Human Player Station*, and all supporting structures.

Field Fault - An error in *Field* operation that causes a *Match* to be disrupted enough that the outcome of the *Match* is effected, as determined by the *Head Referee*.

Field Perimeter - A roughly twenty inch (~20") tall structure constructed of metal pipes that surround the *Field*.

Field Technical Advisors - Event staff that assist *Teams* in getting *Robots* ready to play a *Match* on the *Field*. They can, along with the *Head Referee*, decide to *Bypass* and *Disable Robots* in a *Match* depending on circumstances.

Foul - A penalty assessed by a *Referee* upon a rule violation that calls for it. Each *Foul* results in three (3) *Match Points* awarded to the opposing *Alliance*, and repeated *Fouls* could result in *Disablement* or *Disqualification* as decided by the *Head Referee*.



Goal - A Goal consists of one of each of the following:

High Goal - A structure that is constructed of wood, netting, and steel tubing, and has an opening approximately ninety-three (93) inches wide, and twenty-four (24) inches tall. The bottom edge of the opening of the *High Goal* is approximately seventy (70) inches off the ground. The bottom edge of the opening of the *High Goal* is set back from the front of the *Goal* approximately twelve (12) inches. *Balls* can be *Scored* into the *High Goal* by being thrown through the opening and into the space below. *Balls* can also potentially bounce off the *High Goal* bottom edge structure and into the *Low Goal*.

Low Goal - A structure that is constructed of wood, netting, and steel tubing, and has an opening approximately ninety-three (93) inches wide, and forty-six (46) inches tall. The bottom edge of the opening of the *Low Goal* is approximately twenty-four (24) inches off the ground. The top edge of the opening of the *Low Goal* is the same post as the bottom edge of the opening of the *High Goal*. *Balls* can be *Scored* into the *Low Goal* by being thrown or placed through the opening and into the space below.

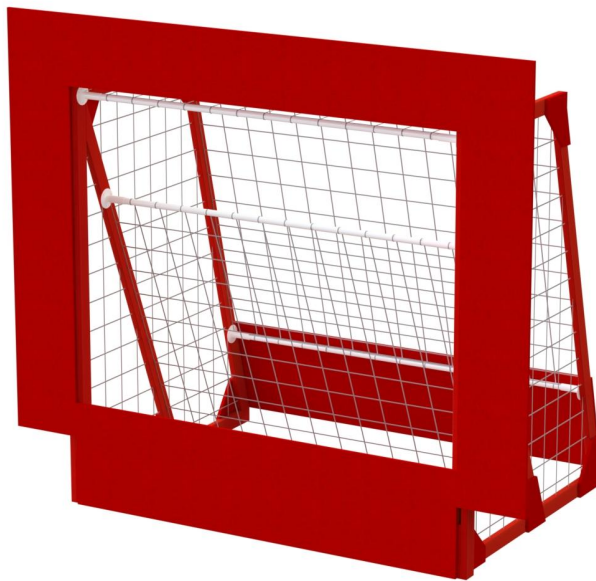


Figure 7: Iso view of the Red Alliance High Goal and Low Goal

Goal Zone - A zone marked with red or blue tape to correspond to the *Goal* at the same end of the *Field*. A trapezoidal shaped area measuring ninety-six (96) inches wide by twenty-four (24) inches deep located at each end of the *Field* and centered along the width of the *Field*.

Head Referee - The leader of the Referees who officiates each Match. The Head Referee makes any and all final decisions on Match play.

Hoarding - A Robot status. A Robot is Hoarding if it is actively blocking opposing Robot access to two (2) or more Balls.

Human Player - A Student that is part of the Drive Team and loads Balls into the Field from the Human Player Station. Human Players are the only ones on the Drive Team allowed to handle Balls.

Human Player Station - A structure designed to allow Human Players to either load a Ball into one of the Robots on their Alliance, or to roll a Ball into the Field. Only Human Players may operate a Human Player Station. The Human Player must release Balls at the top of the structure such that they gain speed as they roll off the Human Player Station. The height of the front of the Human Player Station is approximately twenty-three and a half (23.5) inches above the carpet.

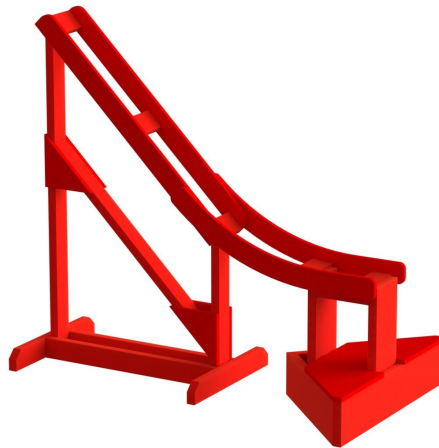


Figure 8: Iso view of a Red Alliance Human Player Station

Loading Zone - Any of the four (4) zones in the corners of the Field marked with either red or blue tape. These zones are 24 inches deep as measured from the front face of the Human Player Station, extending to the field perimeter and is a diagonal line across the corner.

Match - A Match consists of one hundred and twenty (120) seconds of driver-controlled time. There is no autonomous mode in OCCRA Soccer Shootout.

Match Points - Any points that an Alliance earns by Scoring and gaining a Win or Tie Bonus during a Match.

Match Point Total - The total amount of *Match Points* a *Team* has gained out of its twelve (12) highest scoring *Qualifying Matches*.

Offense Zone - A zone marked with red or blue tape to correspond with the *Goal* on the same end of the *Field*. This zone extends the full width of the *Field* and extends from the tape line to the end of the *Field* towards the corresponding *Goal*.

Placebo - A *Robot* supplied by the event courtesy of **The Robot Space** that a *Team* can elect to use and drive in place of their own *Robot* during a *Match*. If at least one *Team* from each *Alliance* in a *Match* requests to use the *Placebo*, then neither *Team* is allowed to use it.

Possession - A *Robot* has *Possession* of a *Ball* if it is carrying, holding, or surrounding it. A *Robot* must be surrounding the *Ball* on more than two (2) contact points to be considered as possession.

Ramp - A structure in the middle of the *Field* constructed out of wood and covered in carpet, measuring ninety-six (96) inches wide. The center plateau section is forty-eight (48) inches long, and eight (8) inches above the ground. Each ramp section is forty-eight (48) inches long and has an incline of approximately 8.7 degrees. There are walls on either side of the *Ramp* along its entire length which are sixteen (16) inches tall.

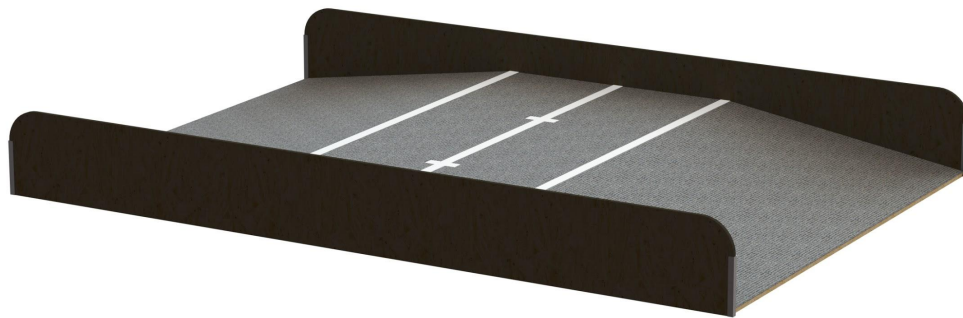


Figure 9: Iso view of the Ramp

Ramp Zone - The plateau area marked with white tape that is the width of the *Ramp*, and measures forty-eight (48) inches long centered on the top of the *Ramp*.

Referee - Event staff in charge of officiating *Match* play.

Referee Flag - A stick with a red flag on one end and a blue flag on the other. *Referees* will use this to announce *Fouls* being called during a *Match*, with the red side displayed to announce a *Foul* committed by the red *Alliance*, and the blue side for the blue *Alliance*.

Robot - Any machine which has passed inspection that a *Team* places on the *Field* prior to the start of a *Match*.

Scored - One of two *Ball* statuses, or a *Robot* status. Check section 2.4 for more details about when game objects are considered *Scored*.

High Goal Scored - a *Ball* status. A *Ball* is *High Goal Scored* when the *Ball* has passed through the *High Goal* opening, and remains within the *High Goal*. *Match Points* for a *High Goal Scored Ball* are awarded to the *Alliance* color that the *High Goal* corresponds with. If a *Ball* goes through the opening of the *High Goal*, but bounces back through the opening not remaining in the *High Goal*, then the *Ball* will not count as *High Goal Scored*. If the *Ball* bounces into the *Low Goal*, it does not count as *High Goal Scored* but will count as *Low Goal Scored* if it meets the definition below. *Balls* can only be *High Goal Scored* by the *Robot* in its *Alliance's Offense Zone*.

Low Goal Scored - a *Ball* status. A *Ball* is *Low Goal Scored* when the *Ball* has passed through the *Low Goal* opening, and remains within the *Low Goal*. *Match Points* for a *Low Goal Scored Ball* are awarded to the *Alliance* color that the *Low Goal* corresponds with. If a *Ball* goes through the opening of the *Low Goal*, but bounces back through the opening not remaining in the *Low Goal*, then the *Ball* will not count as *Low Goal Scored*. *Balls* can only be *Low Goal Scored* by a *Robot* in its *Alliance's Offense Zone*.

Ramp Scored - a *Robot* status. A *Robot* is *Ramp Scored* when the *Robot* is fully supported by surfaces within the *Ramp Zone* at the end of the *Match*. *Robots* may be touching the *Ramp Walls* and be considered *Ramp Scored*.

Starting Configuration - The twenty-eight inch (28") width by thirty-eight inch (38") length by forty-eight inch (48") height size limitation that a *Robot* must fit within at the beginning of a *Match* to be eligible to play.

Starting Position - Where *Robots* must be placed to start a *Match*. One *Robot* from an *Alliance* must start partially within their opponent's *Goal Zone* while touching the *Field Perimeter*, while the other *Robot* on the *Alliance* must start touching their own *Alliance's Offense Zone* line. (See fig. 12 Section 2.6)



Student - Anyone enrolled in a pre-college school or who is home-schooled as part of a pre-college educational curriculum located in Oakland County, Michigan. Eligibility may also be granted based on a disability, or other merits, and final decision of eligibility for all students will be decided by the OCCRA administrators.

Team - One or more *Students* make up a *Team*. *Teams* are associated with different high schools in Oakland County, Michigan.

Tie Bonus - The five (5) *Match Point* bonus added to the *Match* score of the *Alliances* in a *Match* that has ended with both *Alliances* having the same amount of *Match Points* when the *Match* ends. No Tie Bonus will be awarded in a match which ends in a 0-0 tie.

Trapping - A *Robot* status. A *Robot* is *Trapping* if it has restricted an opposing *Robot* into a small confined area of the *Field* (*limited mobility, limited access to Balls or Field Elements*), or up against a *Field Element*, and has not provided an avenue for escape. *Trapping* can be direct (e.g. pinning an opposing *Robot* to a *Field Perimeter* wall) or indirect (e.g. preventing a *Robot* from escaping a corner of the *Field*).

Win Bonus - The ten (10) *Match Point* bonus added to the *Match* score of the *Alliance* in a *Match* that has more *Match Points* than the opponent when the *Match* ends.



2.4 Game Scoring

Match Action	Match Point Value
Low Goal Scored	1
High Goal Scored	3
Ramp Scored	3
Foul	3 (Added to opponent's score)
Win Bonus	10
Tie Bonus	5

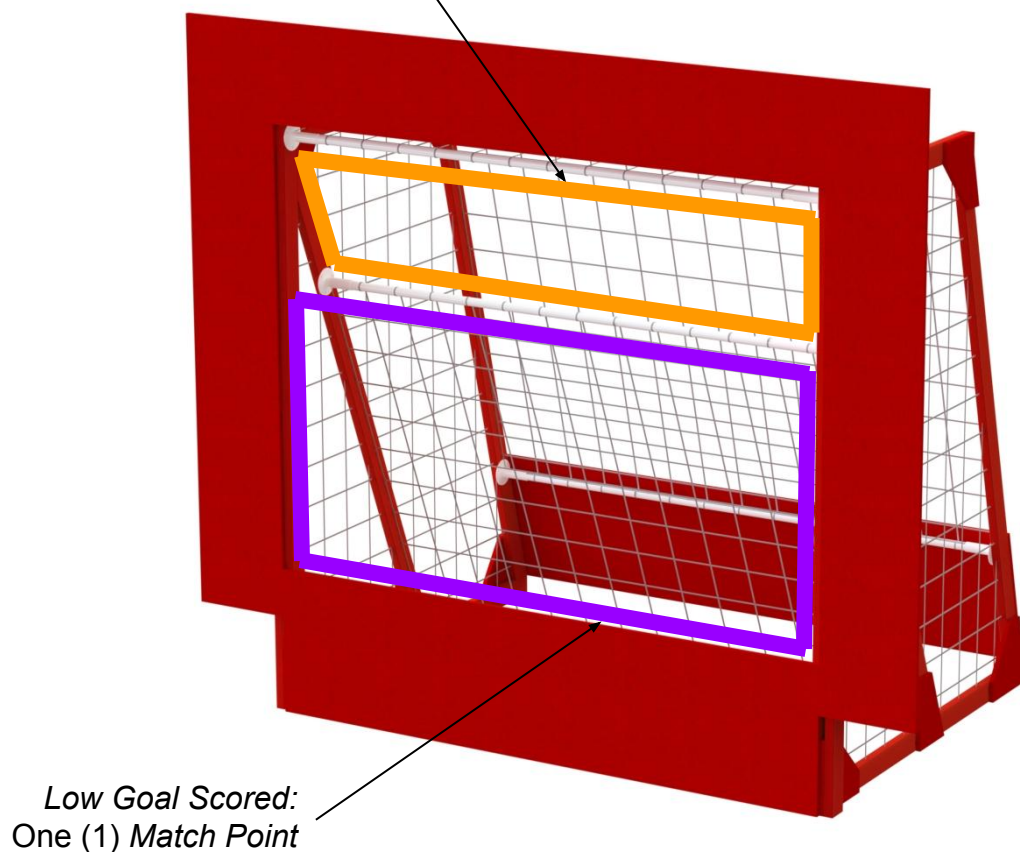
Figure 10: Scoring matrix

A *Ball* can only count as one (1) of two (2) *Scoring* statuses, either *Low Goal Scored* or *High Goal Scored*.

An *Alliance* can only earn either a *Win Bonus* or a *Tie Bonus* but not both in the same *Match*.

Balls and *Robots* are *Scored* once the *Match* is over and all objects have come to rest.

High Goal Scored:
Three (3) Match Points



Low Goal Scored:
One (1) Match Point

Figure 11: Iso view of Red Alliance Goal, annotated to show High Goal and Low Goal openings

2.5 General Game Rules

<G1> Treat everyone with respect. All *Teams* are expected to conduct themselves in a respectful manner while competing in OCCRA Competition events. If a *Team* or any of its members (*Students* or adults associated with the team) are disrespectful to event staff, volunteers, or fellow competitors, they may be *Disqualified* from a current or upcoming *Match*. *Team* conduct pertaining to <G1> may also impact a team's eligibility for judged awards. Repeated or extreme violations of <G1> may result in a *Team* being *Disqualified* from an entire event, depending on the severity of the situation, at the discretion of the *Head Referee* and other event staff.

Robotics competitions often induce intense, high stress situations. These are good opportunities to model and/or gain experience in handling these situations in a positive and productive manner. It is important that we all exhibit maturity and class when dealing with any difficult situations that may present themselves in both the OCCRA competition and our lives in general.

<G2> Use common sense. When reading and applying the various rules in this document during *Match* play and at events, please remember that common sense always applies in the OCCRA competition, and any and all rule decisions made by the *Head Referee* and the Game Design Committee are final.

<G3> Robots begin the Match in the Starting Configuration. At the beginning of a *Match*, each *Robot* must be smaller than a volume of twenty-eight inches (28") wide by thirty-eight inches (38") long by forty-eight inches (48") tall. Using *Field Elements*, such as the *Field Perimeter* wall, to maintain starting size is only acceptable if the *Robot* would still satisfy the constraints of <R4> and pass inspection without the *Field Element*. *Robots* in violation of this limit will be removed from the *Field* or *Disabled* prior to the start of the *Match*, at the *Head Referee* and *Field Technical Advisor's* discretion.

<G4> Keep your Robots together. *Robots* may not intentionally detach parts during the *Match* or leave mechanism(s) on the *Field*.

Minor violations of this rule that do not affect the *Match* will result in a warning. Violations that affect the outcome of the *Match* will result in a *Disqualification*. *Teams* that receive multiple warnings may also receive a *Disqualification* at the *Head Referee's* discretion. Multiple intentional infractions may result in *Disqualification* for the entire competition.



<G5> The offensive robots set last. In *Qualification Matches*, the robots starting in the Goal Zone must be placed on the field first, followed by the placement of the robots on the Offensive Lines. In *Elimination Matches*, the higher seeded *Alliance* has the right to place its *Robots* on the *Field* last. Robots shall be placed in the order Blue Defender, Red Defender, Blue Offender, Red Offender. Once a *Team* has placed its *Robot* on the *Field*, its position cannot be readjusted prior to the *Match*. If a *Team* violates this rule, the opposing *Alliance* will be given the opportunity to reposition their *Robots* promptly.

- A. *Robots* must be placed on the *Field* promptly. Repeated failure to do so could result in a violation of <G1>. The exact definition of the term “promptly” is at the discretion of the *Head Referee* and the event coordinator, who will consider event schedule, previous warnings or delays, etc.

<G6> Operate your own Robot. Each *Team* shall include up to four (4) *Drive Team* members. No *Drive Team* member may fulfill this role for more than one *Team*. Only the two (2) designated *Drivers* on a *Drive Team* may control the *Robot*; the *Coach* and *Human Player* may not operate the *Robot*.

- A. Exceptions may be made in situations where a *Team* does not have enough available *Students* to have a complete *Drive Team*; for example during the diversity *Qualification Matches* if a *Team* does not have enough female *Students*, they may have a female *Student* from a different *Team* fill in to complete their *Drive Team*. These exceptions will be allowed at the discretion of the *Head Referee*.

<G7> Only Drive Team members in and around the Field. During a *Match*, all *Drive Team* members other than the *Human Player* must remain in their *Alliance's Driver Station Zone*, and are the only members of a *Team* allowed in the *Field* area. *Drive Team* members are not allowed to use any sort of communication devices during their *Match*. Devices with communication features must not be visible, or have the features turned off (e.g. a phone in airplane mode). Violations of this rule could be considered a violation of <G1>.

<G8> Only Human Players interact with Balls and the Field. The only member of a *Drive Team* that can handle *Balls* or interact with the *Field* in any way other than operating a *Team's Robot* is the *Human Player*, and all *Human Players* must remain within their *Alliance Station Zone*.



<G8-1> No contact with Robots during the match. Team members may not touch any robots on the field once the match has begun. Minor violations of these rules that do not affect the *Match* will result in a warning. Violations that affect the outcome of the *Match* will result in a *Disqualification*. Teams that receive multiple warnings may also receive a *Disqualification* at the *Head Referee's* discretion.

Exception: A *Drive Team* member is allowed to ask a *Field Technical Advisor* to reach into the *Field* if the *Match* has started and their *Robot* has not moved at all. An FTA will assess the safety risk and may refuse the request. Touching the *Robot* in this case is permitted for only the following reasons:

- Turning the *Robot* power or Cortex on or off.
- Plugging in a battery and/or other power-related devices.
- Plugging in a VEXnet Key.

<G9> You can't force an opponent into a Foul. Intentional strategies that cause an opponent to violate a rule are not permitted, and will not result in an infraction on the opposing *Alliance*.

Minor violations of this rule that do not affect the *Match* will result in a warning. Violations that affect the outcome of a *Match* will result in a *Disqualification*. Teams that receive multiple warnings may also receive a *Disqualification* at the *Head Referee's* discretion.

<G10> Don't destroy other Robots; but be prepared for interaction. Strategies aimed solely at the destruction, damage, tipping over, or entanglement of opposing *Robots* are not part of the ethos of the OCCRA competition and are not allowed. If the tipping, entanglement, or damage is ruled to be intentional or egregious, the offending *Team* may be *Disqualified* from that *Match*. Repeated offenses could result in *Disqualification* from the entirety of the competition.

- A. OCCRA Soccer Shootout is intended to be an offensive game. Teams that partake in solely defensive or destructive strategies will not have the protections implied by <G10> (see <G11>). However, defensive play which does not involve destructive or illegal strategies is still within the spirit of this rule.
- B. OCCRA Soccer Shootout is an interactive game. Some incidental tipping, entanglement, and damage may occur as a part of normal gameplay without violation. It will be up to the *Head Referee's* discretion whether the interaction was incidental or intentional.



<G11> Offensive Robots get the benefit of the doubt. In the case where *Referees* are forced to make a judgement call regarding a destructive interaction between a defensive and offensive *Robot*, or an interaction which results in a questionable rules violation, the *Referees* will err on the side of the offensive *Robot*.

<G12> Let go of Balls after the Match. *Robots* must be designed to permit easy removal of *Balls* from any mechanism without requiring the *Robot* to have power after a *Match*.

<G13> "It ain't over 'till it's over." All *Matches* will be scored after the *Match* ends, and once all *Balls* and *Robots* have come to rest.

<G14> Be prepared for minor Field variance. *Field Element* tolerances may vary from nominal by $\pm 1.0"$. *Ball* tolerance and weights may vary from nominal by $\pm 0.5"$ and ± 0.25 lbs respectively. *Ball* placement at the beginning of the *Matches* may vary from nominal by $\pm 6.0"$. *Teams* are encouraged to design their *Robots* accordingly. A *Team* may point out any *Field Element* or *Ball* that seems too much out of tolerance of its designated starting orientation to *Field staff*, and an attempt will be made to correct it; however a *Match* may be started without the issue resolved at the discretion of the *Head Referee*. Please make sure to check Appendix A for more specific nominal dimensions and tolerances.

<G15> Replays are possible, but rare. Replays are at the discretion of the *Head Referee*, and will only be issued in the most extreme circumstances.

<G16> Using the Placebo. If a *Team* is unable to *Field* a *Robot* for a *Match*, then their *Alliance* may request to use the *Placebo*. This *Robot* may be controlled by either *Team* on the *Alliance* for that *Match*. It is the responsibility of the *Alliance* requesting to use the *Placebo* to supply the *Robot* battery to use for the *Match*.

If there is at least one (1) *Team* from both *Alliances* in a given *Match* requesting to use the *Placebo*, then neither *Team* will be allowed to use it, and both *Alliances* must play with only one *Robot*.

The *Placebo* will be donated by **The Robot Space**, and event staff and volunteers from *Teams* at the event will attempt to keep the *Placebo* in good working condition. While event staff will do their best to keep the *Placebo* operational, no guarantees can be made on the condition or functionality of the *Placebo*. It is not intended to be above average at playing the game, just to have enough functionality to benefit the *Alliance* over not having a functional *Robot* at all.



<G17> The Q&A system is an extension of the game manual. All *Teams* must adhere to all OCCRA competition rules as written in this game manual. *Teams* have the opportunity to ask for official rule interpretations in the OCCRA Competition Q&A System. All responses in this system should be treated as official rulings from the OCCRA Game Design Committee (GDC), and they represent the correct and official interpretation of the OCCRA competition rules. The Q&A is the **ONLY** official source for rulings besides the game manual, and live rulings at events by the *Head Referee*.

The OCCRA Q&A system can be found at [ChiefDelphi](#).

<G18> The GDC reserves the right to make changes to the rules. All rules in this manual are subject to change, as decided by the OCCRA Game Design Committee (GDC). We do not expect any major changes to take place, however if the GDC decides a change is needed, it will do so. Any strategies deemed not in the spirit of the game will be disallowed even if not expressly forbidden in the current rules, at the discretion of the *Head Referee*. Specific changes that could be considered would be the number of Balls that start either on the *Field* or in the *Human Player Zone*. Again, the GDC does not anticipate any changes will be needed.

Any changes made to the manual will be announced in Manual Updates emailed to *Teams* and posted on [ChiefDelphi](#), and the game manual will be updated to reflect the change made. Any rule changes made will also be announced during *Drive Team* meetings at the beginning of every event.



2.6 Specific Game Rules

<SG1> Starting a Match. Prior to the start of each *Match*, each *Robot* must be placed such that it satisfies the following conditions:

1. One (1) *Robot* per *Alliance* is placed such that it is partially within the opponent's *Goal Zone*, and contacting the *Field Perimeter*.
2. One (1) *Robot* per *Alliance* is placed such that it is touching the *Offense Zone* line corresponding with its own *Alliance*.

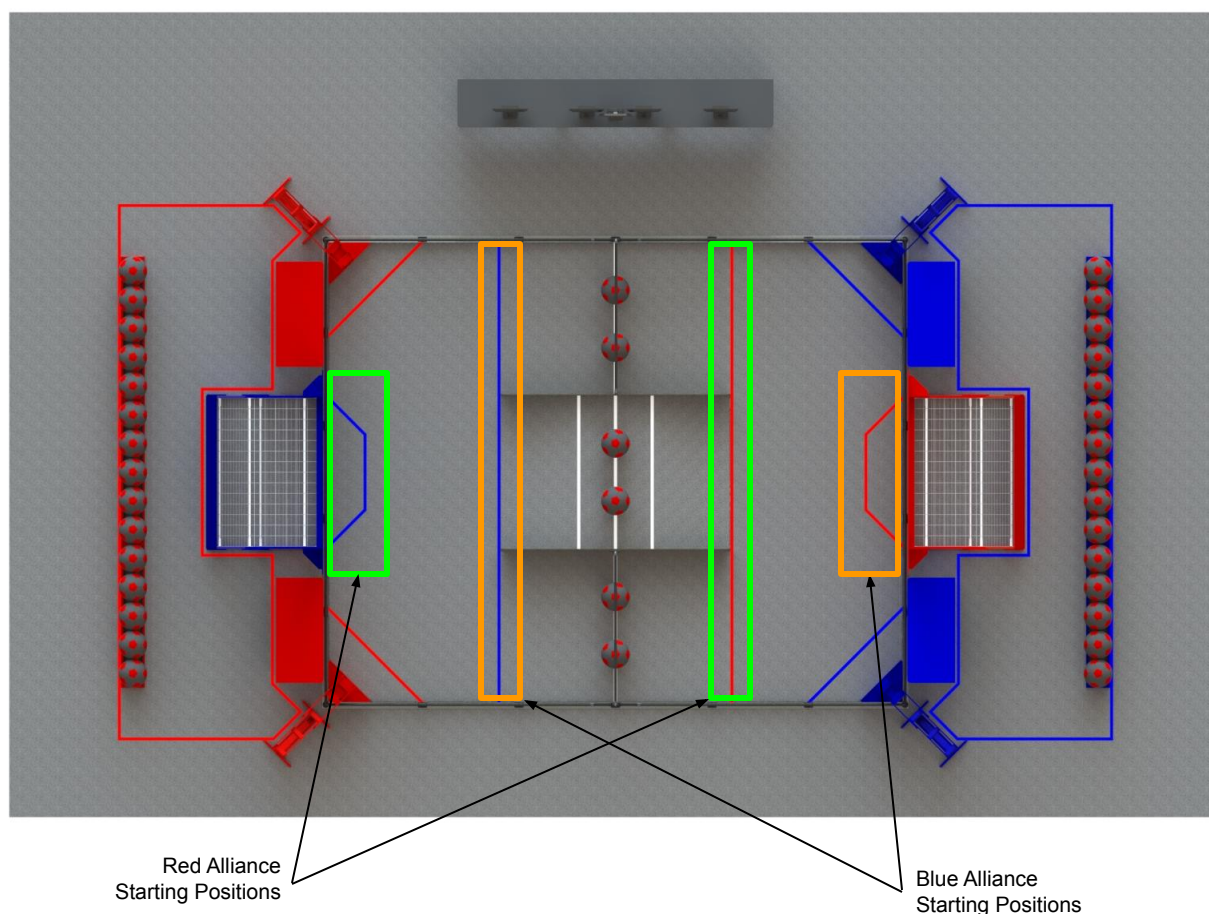


Figure 12: Top view of the Field; annotated starting positions

<SG2> Robot extension is limited once the Match begins. As per <G3>, at the beginning of a *Match*, *Robots* must be smaller than a volume of twenty-eight (28) inches wide by thirty-eight (38) inches tall by forty-eight (48) inches tall.

Once the *Match* begins, a *Robot* may extend horizontally up to twenty-two (22) inches past its initial *Starting Configuration* from any one side at time. *Robots* may not extend in multiple directions at once. Horizontal extensions beyond the *Starting Configuration* are limited to a height of 36 inches or lower. *Robots* may not extend vertically above 48 inches at any time.

Violation: FOUL per extension violation.

Minor accidental violations of this rule will only result in a verbal warning during a *Match*. Violations that affect the outcome of a *Match* of this rule will result in a *Disqualification*. Multiple violations of this rule could also result in a *Disqualification* from the *Match*.

Note: Due to these extension rules, *Robots* may be able to reach over or through the *Human Player Stations* or *Goals*, or outside the *Field Perimeter*. Any contact between *Robots* involving any extension per <SG2> will be scrutinized as detailed in <G10> and <G11>. *Robots* may not reach outside of the *Field Perimeter* in an egregious manner. Minor violations of this rule that do not affect or interfere with the *Match* will result in a warning. *Match* affecting offenses will result in a *Disqualification* at the *Head Referee's* discretion. *Teams* that receive multiple warnings may also receive a *Disqualification* at the *Head Referee's* discretion.

<SG3> Do not touch the opponent's Goal or Goal Scored Balls. *Robots* may not touch or interact with the opponent's *Goal* or any *Goal Scored Balls*.

Violation: FOUL per occurrence.

Minor accidental violations of this rule will only result in a verbal warning during a *Match*. Violations that affect the outcome of a *Match* will result in a *Disqualification*. Multiple violations of this rule could also result in a *Disqualification* from the *Match*.



<SG4> **Watch your Possession limit.** Robots may only possess one *Ball* at a time.

Violation: **FOUL** per every extra *Ball Possessed* beyond the *Possession* limit related to the *Robot* in question.

Note: If a *Robot* has an extra *Ball* past its *Possession* limit, and quickly makes an effort to remove the *Ball* from the *Robot*, the *Team* may not be penalized. This judgement will be at the discretion of the *Head Referee*. Repeated intentional violations of this rule could result in *Disqualification* from the *Match*.

<SG5> **Hoarding is prohibited.** Robots may not *Hoard* more than two (2) *Balls* at any given time during a *Match*. *Possessed Balls* do not count towards the *Hoarding* limit.

Violation: **FOUL** every five (5) seconds the *Hoarding* occurs.

Note: The key phrase in the definition of *Hoarding* is “actively blocking opposing *Robot* access”. This means strategically positioning a *Robot* such that it is “defending” *Balls*, and actively preventing an opponent from accessing them.

Hoarding is a very intentional and strategic maneuver. Most scenarios where a *Robot* interacts with multiple *Balls* in the corner of the *Field* would not be considered *Hoarding*. However, *Teams* should exercise caution in these situations, and *Referees* are encouraged to provide verbal warnings if a *Robot* is in danger of a violation before a *Foul* is called. Repeated violations of this rule could result in *Disqualification* from the *Match*.

<SG6> **Keep Balls to yourself and your Alliance partner.** Robots may not intentionally drop or place *Balls* on or in an opposing *Robot*.

Violation: **FOUL** per *Balls* dropped or placed on opposing *Robot*.

Violations that affect the outcome of a *Match* will result in a *Disqualification*.

Repeated violations of this rule could also result in *Disqualification* from the *Match*.

<SG7> No descoring Balls from the Field or Goals. Though it is expected that some *Balls* may unintentionally leave the *Field* during *Match* play, *Teams* may not intentionally or strategically remove *Balls* from the *Field*, or from any *Goal*.

Violation: **FOUL** per *Ball* descored intentionally

Note: *Balls* that leave the *Field* during *Match* play, accidentally or intentionally, will be returned onto the *Field* closest to where it exited.

Teams should keep <G11> and <SG3> in mind when considering this rule as well.

Minor accidental violations of this rule will only result in a verbal warning during a *Match*. Violations that affect the outcome of a *Match* will result in a *Disqualification*. Multiple violations of this rule could also result in a *Disqualification* from the *Match*.

<SG8> Don't "clamp" your Robot to the Field. Robots may not intentionally grasp, grapple, or attach to any *Field Elements*. Strategies with mechanisms that react against multiple sides of a *Field Element* in an effort to latch or clamp onto said *Field Element* are prohibited. The intent of this rule is to prevent *Teams* from both unintentionally damaging the *Field* and/or anchoring themselves to the *Field*.

Violation: **FOUL** every five (5) seconds the "clamping" occurs.

Minor accidental violations of this rule will only result in a verbal warning during a *Match*. Violations that affect the outcome of a *Match* of this rule will result in a *Disqualification*. Multiple violations of this rule could also result in a *Disqualification* from the *Match*.

<SG9> Only load Balls onto the Human Player Station. Human Players may only load *Balls* onto the Human Player Station. Human Players should not be breaking the vertical plane of the *Field Perimeter* when loading *Balls* onto the Human Player Station.

Violation: **FOUL** per *Ball* loaded.

Violations that affect the outcome of a *Match* will result in a *Disqualification*. Repeated violations of this rule could also result in *Disqualification* from the *Match*. Human Players will be given verbal warnings if they are being unsafe at all.



<SG10> Human Players can only carry one Ball at a time. Each *Human Player* may individually only carry one *Ball* at a time, and no other *Drive Team* members are permitted to touch any *Ball* at any time.

Violation: **FOUL** per extra *Ball* carried.

Minor accidental violations of this rule will only result in a verbal warning during a *Match*. Violations that affect the outcome of a *Match* will result in a *Disqualification*. Multiple violations of this rule could also result in a *Disqualification* from the *Match*.

Note: *Human Players* on the same *Alliance* are allowed to pass, hand-off, or toss *Balls* to one another in order to more quickly get a *Ball* to the *Human Player Station*, as long as it is done in a safe manner. There is no limitation on which *Human Player Station* either of the *Human Players* on an *Alliance* can go to introduce a *Ball* to the *Field*, as long as they stay in the *Alliance Station Zone*.

<SG11> Only one defender in the Goal Zone at a time. Only one (1) *Robot* on an *Alliance* can be partially within the opponent's *Goal Zone* at a time.

Violation: **FOUL** per occurrence.

Violations that affect the outcome of a *Match* will result in a *Disqualification*. Multiple violations of this rule could also result in a *Disqualification* from the *Match*.

<SG12> Score Balls into Goals only when in the Offense Zone. *Robots* must be at least partially within their *Offense Zone* to *High Goal Score* or *Low Goal Score* a *Ball*.

Violation: **FOUL** per *Ball* scored

Minor accidental violations of this rule will only result in a verbal warning during a *Match*. Violations that affect the outcome of a *Match* will result in a *Disqualification*. Repeated violations of this rule could also result in *Disqualification* from the *Match*.



<SG13> Don't touch your opponent in their Loading Zones. Robots may not contact opposing Robots while the opposing Robot is at least partially touching their *Loading Zones*.

Violation: **FOUL** per occurrence, and again every five (5) seconds the contact continues.

Minor accidental violations of this rule that occur when the opposing Robot is not attempting to load a *Ball* from either the *Human Player Station* or floor at least partially within the *Loading Zone* will only result in a verbal warning during a *Match*. Violations that affect the outcome of a *Match* will result in a *Disqualification*. Multiple violations of this rule could also result in a *Disqualification* from the *Match*.

<SG14> Don't linger in your opponent's Loading Zones. Robots may only be partially or fully within opposing Loading Zones for a maximum of five (5) seconds if they are being contacted by opposing Robots. If Robots are pushed into their opponent's zone by their opponent, they are still required to exit the zone within five (5) seconds, unless the opponent is *Trapping* the Robot, preventing them from exiting the zone.

Violation: **FOUL** after five (5) continuous seconds and additional **FOUL** every five (5) seconds thereafter.

A Robot that has shown to be non-functional will not be assessed **FOULS** under this rule unless it is directly preventing the opponent from gaining reasonable access to their *Human Player Station*. If they become functional later in the *Match*, **FOULS** could be assessed at the *Referee's* discretion. Violations that affect the outcome of a *Match* will result in a *Disqualification*. Repeated violations of this rule could also result in *Disqualification* from the *Match*.

<SG15> No Trapping for more than five (5) seconds. A Robot may not *Trap* an opposing Robot for more than five (5) seconds during a *Match*. A *Trap* is officially over once the *Trapping Robot* has moved away and the Robots are separated by at least six (6) feet. If a *Team* does *Trap* the same Robot again without backing up at least six (6) feet, the count will resume from where it left off when the *Trapping Robot* initially backed off.

Violation: **FOUL** per *Trap* count.

Violations that affect the outcome of a *Match* will result in a *Disqualification*. Repeated violations of this rule could also result in *Disqualification* from the *Match*.



<SG16> The Field should be laid out according to the manual. At the start of the Match, all *Balls* and *Field Elements* will be placed in their designated locations. See Appendix A for exact measurements and specifications. Any concerns regarding *Balls* or *Field Element* starting positions should be raised with the *Head Referee* prior to the Match; *Team* members should never adjust *Balls* or *Field Elements* themselves.

Section 4 - The Robot

4.1 Overview

This section describes the rules specific to *Robots* in *OCCRA Soccer Shootout*. Any rules that may apply to the *Robots* specifically listed in any of the other sections still apply, whether they are listed here again or not.

4.2 Robot Rules

<RI> What is a Robot? Only one (1) *Robot* will be allowed to compete per *Team* in *OCCRA Soccer Shootout*. Though it is expected that *Teams* will make changes to their *Robot* at the competition, a *Team* is limited to only one (1) *Robot* at the competition. As such, a *Robot*, for the purposes of the *OCCRA Soccer Shootout* competition, has the following subsystems:

Subsystem 1: Mobile *Robot* base including wheels, tracks, legs, or any other mechanism that allows the *Robot* to navigate the majority of the flat playing *Field* surface.

Subsystem 2: Power and control system that includes the hardware outlined as part of the OCCRA Control Box, and the associated motors and actuators for the mobile *Robot* base.

Subsystem 3: Additional mechanisms (and associated motors and actuators) that allow manipulation of *Balls* or navigation of *Field Elements*.

Given the above definitions, a minimum *Robot* for use in any *OCCRA Soccer Shootout* event must consist of Subsystems 1 and 2 above. Thus, if you are replacing an entire Subsystem of either Subsystem 1 or 2 from above, you have now created a second *Robot* and are no longer legal.

- *Teams* may not compete with one *Robot* while a second is being modified or assembled.
- *Teams* may not switch back and forth between multiple *Robots* during a competition. This includes using different *Robots* for *Qualification* and *Elimination Matches*.



- Multiple *Teams* may not use the same *Robot*. Once a *Robot* has competed under a given *Team* number at an event, it is “their” *Robot* - no other *Teams* may compete with it for the duration of the competition season.

Note: *Teams* using the *Placebo* for a *Match* are excused from this rule. The *Placebo* may be used by a *Team* that already has its own *Robot* in the case that their *Robot* is not able to play a *Match*. The *Placebo* may be used by any and all *Robots* at any event; with the exception of in *Elimination Matches* unless they are the lowest seeded *Alliance* and there were an odd number of teams at the county championship.

<R2> Robots must be pre-inspected. All *Robots* must be pre-inspected using the *Robot Pre-Inspection Worksheet* (Appendix D) before coming to the official inspection at the first event of the season. An adult mentor and at least one *Student* must carry out this pre-inspection. This form is required to be submitted at the official check-in station (registration) at the first event the *Team* attends.

<R3> Robots must be inspected. Every *Robot* will be required to pass a full inspection before it is cleared to compete. This inspection will ensure that all *Robot* rules are met. Inspection will take place at the beginning of every event a *Team* attends. Inspection will be performed by event staff and follow the same worksheet as the *Robot Pre-Inspection Worksheet*.

- If significant changes are made to a *Robot*, such as partial or full replacement of Subsystem 3, it must be re-inspected before it will be allowed to compete.
- If a *Robot* has multiple functional configurations, all possible configurations must be inspected before being used in competition.
- *Teams* may be requested to submit to random spot-inspections by event personnel. Refusal to submit will result in *Disqualification*.
- *Referees* or event staff may decide that a *Robot* is in violation of the rules. If this occurs, the *Team* in violation will be *Disqualified* and the *Robot* will be barred from the *Field* until it passes re-inspection. Minor infractions may only result in a warning, at the discretion of the *Head Referee*.

<R4> Certain mechanisms may not be allowed. The following types of mechanisms and components are NOT allowed:

- Those that could potentially damage *Field Elements*.



- Those that could potentially damage other competing *Robots*.
- Those that pose an unnecessary risk of entanglement.

<R5> Robots have starting and expansion size limits. At the beginning of any *Match*, *Robots* must be smaller than twenty-eight inches (28") wide by thirty-eight inches (38") long by forty-eight inches (48") tall.

- During inspections, *Robots* will be measured in one of two ways:
 1. *Robots* will be placed on top of a rectangle of tape, with the dimensions to the outer edges of the tape matching the length and width constraints.
 2. A tape measure or similar measuring device will be used to check the height, and possibly the length and width of the *Robot*.
- 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*.

Robots may expand beyond their starting size constraints after the start of a *Match*, in accordance with <SG2>; twenty-two inches (22") outside the *Starting Configuration*. *Robots* may not expand vertically past the forty-eight inch (48") tall starting limit.

<R6> Robot components can be made before kickoff. Components, whether it be parts or assemblies, can be used to compete with that were used in a previous OCCRA season, or from any offseason development or other robot competition, so long as the components used meet the requirements of all the other rules in this manual.

<R7> Robots should be completely developed by Students. *Robots* must be designed, built, and programmed by *Students*. Teachers, mentors, parents, etc. may answer questions, give instruction on practices, help build practice *Field Elements*, assist in tool and safety education, etc. but should not be involved in the design, build, programming, or development of the *Robots*.

Note: This rule is enforced via the "honor system", as there is no way for OCCRA to enforce this rule on *Teams* outside of events. We ask that all *Teams*, and specifically all teachers, mentors, parents, etc. use their best judgement as to whether they should do something or not. If there are any questions, the OCCRA Soccer Shootout Q&A can be utilized.



<R8> Robots have a weight limitation. Robots may not weigh more than one-hundred fifteen pounds (115lbs), including the battery and all decorations. Robots utilizing a pneumatic system with a compressor mounted on the Robot may weigh a maximum of one-hundred twenty pounds (120lbs). Robots that have a pneumatic system without a compressor mounted to the Robot are restricted to the 115 pound weight limit.

<R9> Robot frames should be off the ground and not easily stuck. Robots may not have any “wedge” shaped frame members on the edge of the Robot, and may not have any frame members that could snag the carpet of the Field. This is a subjective rule that will be inspected on a case-by-case basis, so Teams should use their best judgement to ensure their frame will not easily wedge under other Robots or Field Elements, or snag or catch on the carpet.

<R10> Robots have limitations on what parts can be used. All parts on the Robot must come from one of three sources:

1. Parts that come supplied in the Kit of Parts (KoP).
2. Parts that have been fabricated from simple material stock using allowed tools.
3. Parts that are COTS and cost less than or equal to \$100 as an individual part.
 - Any items that are ordered from a vendor as a “special-order” item, or in other terms is customizable to certain specifications is not allowed.
 - If a device or mechanism cannot be bought for less than \$100, but the individual components that make up the device or mechanism can be bought for a total cost of less than \$100 and then assembled by the Team, it is legal to use.
 - The AndyMark AM14U frame only kit is exempt from this rule and is legal to use as the robot drive chassis.
 - Any part that is not readily available to all Teams is not allowed.

<R11> Robots and parts may only be made using certain tools. Any custom fabricated parts by the *Team* must be made using approved tools and machinery. The list of approved tools and machinery is as follows:

- Any standard hand tools (screwdrivers, pliers, center punch, tape measure, hammer, wrench, file, knife, etc.)
- Chain breaker/chain puller
- Manual pry bar or press
- Any standard type of hand saw (hacksaw, coping saw, miter saw, etc.)
- Any standard type of electric saw (saber saw, jigsaw, bandsaw, circular saw, etc.)
- Any standard electric drill and bit set (drill bit, taps, dies), including a drill press
 - This does NOT include precision machines (mill, lathe, CNC, Router, etc.)
- Any standard rotary tool (Dremel-type) and the corresponding bits
- Any standard deburring tool
- Any standard vice or clamp
- Any standard type of sander, chisel, or grinder (includes electric belt sanders)
- Any standard soldering iron and solder
- Any standard pop-rivet tool, stapler, and staple gun - manual, electric, or pneumatic
- Any standard heat gun, hair dryer, etc.
- Any standard non-industrial sewing machine

All tools must be used in a safe manner, and within the specific shop safety rules each *Team* has in place. OCCRA suggests any cutting tools, manual or electric, be supervised by a qualified adult.

Note: There are no “precision machining tools” on this list; the use of industrial-level machines not typically found in high schools (such as 3D-printers, mills, lathes, routers, laser-cutters, CNC brakes, etc.) would create an unfair advantage to those *Teams* with accessibility to such machines and are prohibited.



<R12> Robots must have an Alliance flag holder, and visible team number. All Robots must have a flag holder to retain an *Alliance* flag supplied by OCCRA at the events. This flag holder must be a piece of half ($\frac{1}{2}$) inch PVC pipe that extends upward from the *Robot* and allows the *Alliance* flag to be visible from all sides. Robots must also have a *Team* number displayed that is written in digits at least four (4) inches high and visible from all sides.

<R13> Robots with pneumatics must follow strict guidelines. All pneumatics components used must be COTS items and unaltered in any way that might compromise the integrity of the component. Any COTS pneumatics parts are allowed as long as they meet the criteria of <R10>.

The only compressors allowed on a *Robot* are one of the following:

- The Thomas compressor
- The AndyMark 1.1 Pump
- VIAIR 00090 compressor (supplied in the KoP)

The only tubing sizes allowed is the eighth inch ($\frac{1}{8}$ "") supplied in the KoP or standard quarter inch ($\frac{1}{4}$ "").

The pneumatic circuit must be controlled with a pressure switch and relay, and protected with a relief valve at one-hundred twenty (120) psi or lower.

The pressure to all actuators must be controlled by regulators and may not exceed sixty (60) psi. The gauge on this regulator must be readily visible for ease of reading.

For safety reasons, a pressure relief valve must be connected to the accumulator tank(s) and easily accessible.

<R14> Robots may only use certain motors and servos. The only motors legal to use on the *Robot* are twelve (12) Volt DC brushed motors rated below three-hundred fifty (350) Watts, and must be from the KoP, or available for purchase from AndyMark, BaneBot, The Robot Space, or VEX. There is no limit as to how many motors a *Team* is allowed to use, however *Teams* should keep in mind that maximum total current on the *Robot* is limited to one-hundred twenty (120) Amps, and there are ten (10) motor control signal outputs on the Cortex. Brushless motors are not legal in OCCRA.

Standard electric servos including the VEX 393 may also be used, and there is no limit as to how many servos can be used. However, no servos are included in the KoP.



<R15> Robots must use certain power sources. There are two main power sources for an OCCRA Robot. The Cortex must be powered by the VEX 7.2V Battery, and *Teams* must either use the one provided in the KoP, or purchase one directly from VEX or The Robot Space. Any servos on the *Robot* should be powered through the Cortex.

In addition, it is strongly suggested that *Teams* use a standard nine (9) Volt battery connected to the backup battery port on their Cortex. This protects *Teams* from losing communications with their *Robot* during a *Match* if they temporarily or completely lose their main Cortex power. While *Teams* will be allowed to play without a backup battery, it is strongly suggested *Teams* take this extra precaution.

The rest of the *Robot* must be powered by an eighteen (18) Amp-hour twelve (12) volt battery, either supplied through the KoP, or a functionally equivalent model. Any battery that is legal for competition in the FIRST Robotics Competition will also be considered legal to use in OCCRA. No lithium-ion batteries are allowed.

<R16> Robots can only use certain control devices. There is no limit to how many relays and motor controllers a *Team* can use. The Spike relay or the Adafruit DRV8871 are legal relays to use. The Victor SP, Victor SPX, Talon SRX, SPARK, and SPARK Max are legal motor controllers that can be used. The compressor must be run by a single automotive relay that OCCRA will supply to all *Teams* in the KoP.

All wires routed from motors and actuators must be secured to the strain relief bolt on the side of the control box before entering the box and attaching to the various relays and motor controllers.

<R17> Robots can only use certain gauge size wire and breakers. Only the following specified wire gauge sizes may be used:

- #6 gauge or larger wire must be used between the twelve (12) volt *Robot* battery and the positive and negative distribution strips.
- #16 gauge or larger wire must be used to carry current from the relay controllers to the pneumatic solenoids.
- #14 gauge or larger should be used for all other wiring on the *Robot*.

Main circuit-breakers may be either eighty (80) amp or one-hundred twenty (120) amp (OCCRA will continue phasing out the eighty (80) amp breakers). Branch circuits must be protected by breakers rated at thirty (30) amp or lower.



<R18> Robots must have a control box. All of the electrical control systems used on the *Robot* should be housed within the control box, a single clear plastic case. The controls case has been pre-wired for *Teams* convenience. Components should be neatly laid out and arrange key components so that their indicator lights are clearly visible to event staff, *Referees*, and *Field Technical Advisors*.

Robots must use the VEX Cortex controller as the *Robots* main CPU on board. All the other main electrical control system components (fuse block, relays, motor controllers, and fuses/circuit breakers) should be housed within the control box.

The control box should be securely mounted to the *Robot*, such that it will not move or fall off when the *Robot* runs into *Field Elements* or other *Robots*. The lid of the control box should be secured to the box using the clasps, but *Teams* are encouraged to add something to help keep the lid secure on the box. The lid must be easily removed and the inside of the control box easily accessed.

Teams may use a PWM splitter cable if they wish to have a single control signal run multiple relays or motor controllers.

<R19> Robots must be controlled using VEX joysticks. The *Robot* must be controlled using the VEX joysticks. *Teams* may tether a second joystick to the first if they wish to control the *Robot* using multiple joysticks. The Cortex and primary joystick must both use the VEXnet 2.0 keys for communication between the *Robot* and joysticks. VEXnet 1.0 keys may not be used.

<R20> No modifications to pneumatic or electrical components. *Teams* may not modify any pneumatic or electrical components in any way, unless otherwise stated in official OCCRA documentation.

Section 5 - Conduct and Safety, Team Updates, Q&A

Section 5.1 - Conduct and Safety Rules

<CS1> Keep the Robot and Drive Team members safe. Teams should ensure that all actions the Robot makes on the Field and in general are safe. If the Robot becomes out of control or is putting anyone in danger, the joysticks should be turned off and every effort made possible to stop the Robot from operating.

All Students on the Drive Team are required to wear safety glasses and closed toed shoes while at the Field. Students should make sure they are never reaching inside the Field during a Match.

An adult is allowed to help transport the Robot on and off the Field if desired to ensure student safety. This adult is not allowed in the Driver Station during the Match.

<CS2> Keep the pit area safe, clean, and respectful. Teams should ensure that they do everything they can to be respectful to the venue hosting the event and the other Teams around their pit area.

All Students in the pit are required to wear safety glasses and closed toed shoes. Students must also make sure that they are using safe practices when operating any tools in the pit, and should get adult supervision for anything that requires it.

Students should keep their pit clean, with no loose parts on the floor as a tripping hazard, all trash thrown away or recycled, and no horseplay anywhere in the pit area. Food and drink is not allowed in the pits, with the exception of bottled drinks.

<CS3> Use any available electricity in the pit safely. There may or may not be available electricity in each Team pit at an event.

If Teams do not have electrical power available in their pit, they may set up equipment (such as battery chargers, power tools, etc.) on the side of the overall pit area such that it is out of the way and set up safely. Due to the possibility of not having electrical power access in the Team's pit, it is suggested that Teams bring cordless equipment to use in their pits.



If *Teams* do have electrical power in their pit, it is expected that they keep power lines organized and not in the way so as to cause tripping hazards. *Teams* should use OCCRA supplied cables and power strips to set up the electrical power, as this helps keep the event more organized and easier to clean up at the end of the event.

No electrical tools that cause any sparks or excessive noise are to be used in the pit areas at events.

<CS4> Be on your best behavior when attending events. OCCRA highly values teaching and promoting professional attitudes and manners, and expects all *Students* to conduct themselves in such a manner. Anyone who is found to be excessively disrespectful or unprofessional by event staff may be asked to leave.

Team spirit is highly encouraged at events, and OCCRA wants all *Students* to cheer for their *Team* and other *Teams* as much as possible. Signs, spirit materials, etc. are all encouraged as long as they do not negatively affect other spectators experience. Excessively loud noise makers that are distracting to field staff and *Drive Teams* may be removed. Laser pointers are strictly forbidden.

<CS5> No sponsors on Robots, apparel, or at events. OCCRA is very appreciative of any and all corporate sponsors that help support the organization. Any corporation that contributes personnel resources or financial resources in excess of \$200 to OCCRA will be recognized by the organization with a large banner at each event, public address announcements at each event, with acknowledgement in brochures and in printed programs.

Individual *Teams* shall not display corporate names or logos on their *Robots*, *Team* apparel, or anywhere at the events where an association with an individual school is apparent.

Section 5.2 - Manual Updates

Throughout the season, there may be updates that need to be made to the game manual, as well as other information *Teams* need to know. OCCRA will email a Manual Update to *Teams* any time the manual or other updates occur, with any important information either the Game Design Committee or OCCRA steering committee feels needs to be shared. These Manual Updates will also be posted on the OCCRA Forum on [ChiefDelphi](#).



Section 5.3 - Q&A System

The Q&A system is an opportunity for *Students* and/or their teachers, mentors, parents, etc. to ask specific questions about the *OCCRA Soccer Shootout* rules and interpretations that they do not think are completely clear or about something they do not think is addressed in the rules. The Q&A System will be managed by the Game Design Committee, and any answers given are official rulings by the GDC and are an extension of this game manual. Only answers given in writing in the Q&A System are official rulings outside of the game manual, other than live rulings by the *Head Referee* at events.

Questions asked in the Q&A system should be specifically about *Match* play, the competition structure, or specific technical questions related to the *Robot* rules. The GDC will not answer questions that use examples of mechanisms or anecdotal descriptions. If the answer to a question is already in the game manual, the GDC will direct you to read the game manual, and quote the specific rule pertaining to your question.

Any answers that are critical enough to the rules will cause an update to the game manual to better clarify in the manual the issue that the answer covered. These will be published in the game manual and notified to teams in Manual Updates.

The OCCRA Q&A system can be found at [ChiefDelphi](#).

