VEX IQ CHALLENGE
PITCHING IN

**2021 - 2022
Game Manual
Version 2.2**

Table of Contents

Changelog

Version 2.2 - December 7, 2021
- Updated <R9> to include 2nd Generation VEX IQ Electronics
- Added a note to <LRT5>, clarifying that there is only one Starting Corral in a Live Remote Match
- Various minor typo corrections

Version 2.1 - October 6, 2021
- Updated Live Remote Tournament section with Global Rankings

Version 2.0 - August 31, 2021
- Added a new rule, now <G19>, stating that *Robots* which are not contacting the *Floor* may control a maximum of two (2) *Balls*
- Updated the definition of *Team*, and <G8> to permit single *Drivers*
- Various minor typo corrections

Version 1.1 - July 27, 2021
- Updated <LRT4> to change *Starting Positions* in *Live Remote Matches*
- Various minor typo corrections

Version 1.0 - June 29, 2021
- Added a Blue Box to rule <R8> reminding *Teams* to be mindful of non functional decorations that could potentially distract *Alliance* partner *Robots*
- Updated Figure 11 to show the full, correct boundaries of the *Low Goal*
- Updated Figure 19 to show the *Robot* more clearly within the height restriction

Version 0.2 - June 15, 2021
- Updated <R8> to include rubber bands
- Updated Figure 2 to show the full, correct *Starting Positions*
- Various minor typo corrections

Version 0.1 - May 22, 2021
- Initial Release

Section 1
The Game

Game Description

Matches are played on a *Field* set up as illustrated in the figures throughout. The *Robot Skills Challenge* and the *Teamwork Challenge* use the exact same setup for the *Field Elements*.

In the *Teamwork Challenge*, an *Alliance* of two (2) *Robots*, operating under *Driver Control*, work together in each *Match*.

In the *Robot Skills Challenge*, one (1) *Robot* attempts to score as many points as possible. These matches consist of *Driving Skills Matches*, which will be entirely *Driver Controlled*, and *Programming Skills Matches*, which will be *Autonomous* with limited human interaction.

In the *Live Remote Challenge*, an *Alliance* of two (2) *Robots*, each operating on their own field under driver control, work together over a live video connection.

The object of the game is to attain the highest score by Scoring *Balls* in Goals, Clearing *Starting Corrals* and by *Hanging* at the end of the *Match*.

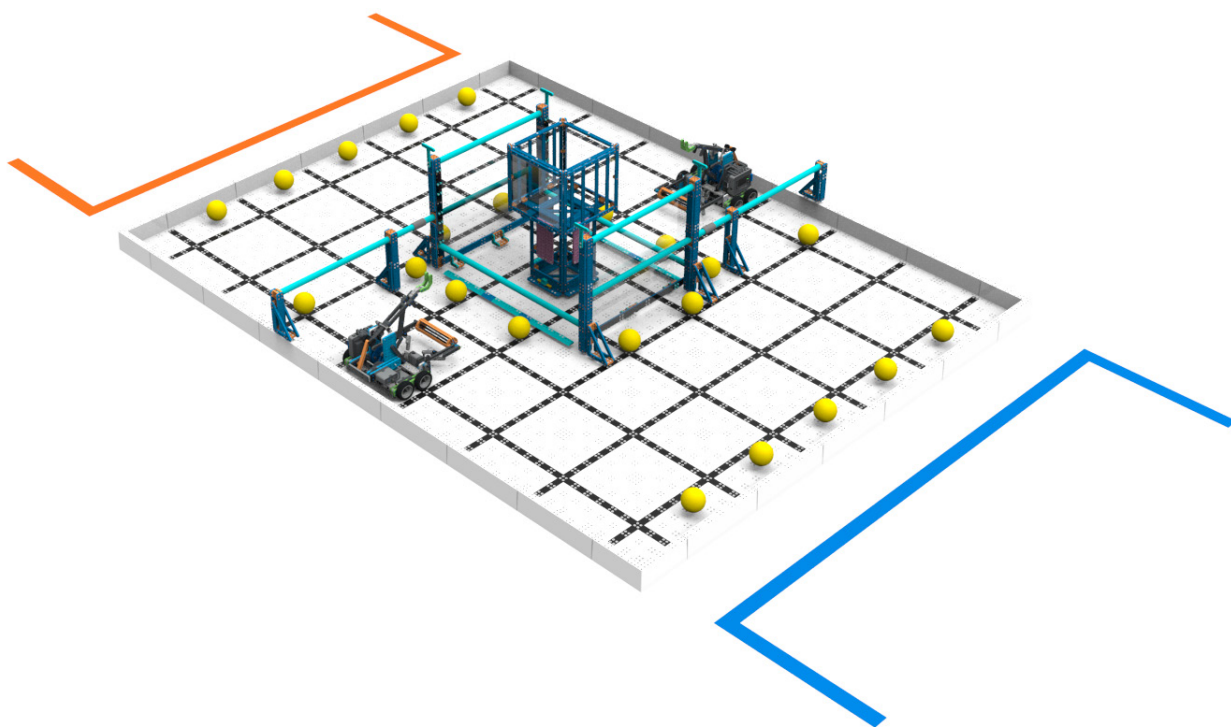
*Figure 1: Starting configuration of the **Field** for a VEX IQ Challenge Pitching In **Match**.*

Each VEX IQ Challenge Pitching In *Match* includes twenty-two (22) *Balls*.
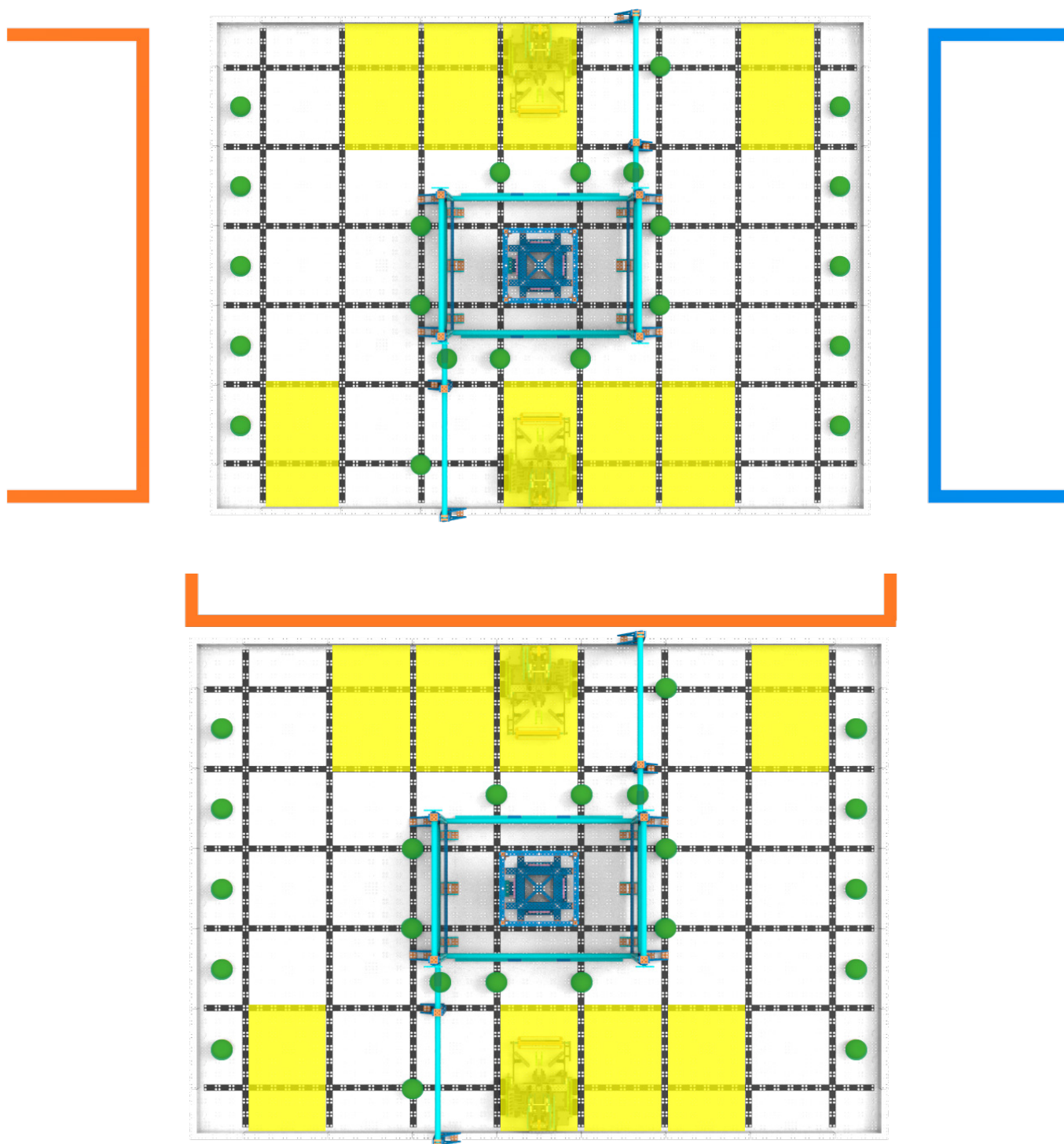

*Figure 2: Overhead view of the **Field** for a **Teamwork Match**. The **Starting Positions** and **Balls** are highlighted. Either **Driver Station** configuration seen above may be used. See <G9> for more details.*

Game Definitions

Adult – Anyone who is not a *Student*.

Alliance – A pre-assigned grouping of two (2) *Teams* that are paired together during a given *Teamwork Match*.

Alliance Score – Points scored in a *Teamwork Match* awarded to both *Teams*.

Autonomous – A *Robot* that is operating and reacting only to sensor inputs and to commands pre-programmed by the *Students* into the *Robot* control system. The *Robot* is operating without input from a VEX IQ Controller.

Builder – The *Student*(s) on the *Team* who assemble(s) the *Robot*. An *Adult* cannot be the *Builder* on a *Team*. *Adults* are permitted to teach the *Builder*(s) associated concepts, but may never work on the *Robot* without the *Builder*(s) present and actively participating.

Designer – The *Student*(s) on the *Team* who design(s) the *Robot* to be built for competition. An *Adult* cannot be the *Designer* on a *Team*. *Adults* are permitted to teach the *Designer*(s) associated concepts, but may never work on the design of the *Robot* without the *Designer*(s) present and actively participating.

Disablement – A penalty applied to a *Team* for a rule violation. During *Disablement*, a *Team* is no longer allowed to operate their *Robot*, and the *Drivers* will be asked to place their controller on the ground. A *Disablement* is not the same as a *Disqualification*.

Disqualification – A penalty applied to a *Team* for a rule violation (see <T11> for more details). If a *Team* is Disqualified in a *Match*, the *Head Referee* will notify the *Team* of their violation at the end of the *Match* At the *Head Referee's* discretion, repeated violations or *Disqualifications* for a single *Team* may lead to its *Disqualification* for the entire event.

Driver – The *Student Team* member who stands in the *Driver Station* and is responsible for operating and controlling that *Team's Robot*. Up to two *Team* members may fulfill this role in a given *Match* (see <G8>).

Driver Controlled – A *Robot* operating under the control of a *Driver*.

Driver Station – The designated areas around the *Field*, where the *Drivers* must remain during their *Match* unless legally interacting with their *Robot*. See Figure 2.

Field – The entire playing *Field*, being six (6) field tiles wide by eight (8) field tiles long, totaling forty-eight (48) field tiles. The *Field* is surrounded by the field perimeter consisting of four (4) outside corners and twenty-four (24) straight sections.

Field Element – The field perimeter, *Floor*, PVC pipes, plastic sheets, and VEX IQ elements which are attached to the *Field*.

Floor – The interior part of the *Field* made up of the field tiles that are within the field perimeter.

License Plate – A physical component on the *Robot* that has the *Team's* VEX IQ Challenge number displayed. The *License Plate* must have a length and height of 3.5″ x 1.5″ (88.9mm x 38.1mm) and must not exceed a width of 0.25″ (6.35mm) per <R4>.

Match – A *Driving Skills Match*, *Programming Skills Match*, or *Teamwork Match*.

- **Driving Skills Match** – A *Driver Controlled* period that is sixty seconds (1:00) long with only one (1) *Robot* on the Field.
- **Programming Skills Match** – An *Autonomous* period that is sixty seconds (1:00) long with only one (1) *Robot* on the Field.
- **Skills Match** – A *Driving Skills Match* or *Programming Skills Match*.
- **Teamwork Match** – A *Driver Controlled* period that is sixty seconds (1:00) long with one (1) *Alliance* on the *Field*.
- **Live Remote Match** A *Teamwork Match* that is played via the Live Remote Tournament system. The *Alliance* is made up of two (2) *Teams*, each playing on their own fields. See the Tournament section for more details.

Programmer – The *Student*(s) on the *Team* who write(s) the computer code that is downloaded onto the *Robot*. An *Adult* cannot be the *Programmer* on a *Team*. *Adults* are permitted to teach the *Programmer*(s) associated concepts, but may never work on the code that goes on the *Robot* without the *Programmer*(s) present and actively participating.

Robot – A machine that has passed inspection (i.e. satisfies all *Robot* Rules), designed to execute one or more tasks autonomously and / or by remote control from a human operator.

Student – Anyone born after May 1, 2006 (i.e. who will be 15 or younger at VEX Worlds 2022). Eligibility may also be granted based on a disability that has delayed education by at least one year. *Students* are the individuals who design, build, repair, and program the *Robot* with minimal *Adult* assistance.

- **Elementary School Student** - Any *Student* born after May 1, 2009 (i.e. who will be 12 or younger at VEX Worlds 2022). Elementary School *Teams* may "play up" and compete as a Middle School *Team*.
- **Middle School Student** – Any eligible *Student* that is not an *Elementary School Student*.

Team – Two or more *Students* make up a *Team*. A *Team* is classified as an *Elementary School Team* if all members are *Elementary School Students*. A *Team* is classified as a *Middle School Team* if any members are *Middle School Students*, or made up of *Elementary School Students* who declare themselves as "Playing Up" as *Middle School Students* by registering their team as a *Middle School Team*.

Once declared and playing as a *Middle School Team*, that *Team* may not change back to a *Elementary School Team* for the remainder of the season. *Teams* may be associated with schools, community / youth organizations, or a group of neighborhood *Students*.

> Teamwork is a core tenet of the VEX IQ Challenge, and the recommended *Team* size is 2-3 *Students*. However, in the 2021-2022 season, there may be local health guidelines outside of *Team* control that make it difficult for multiple *Students* to meet together on a regular basis. In these circumstances, one-*Student Teams* are a permissible exception to the recommended *Team* size, although these exceptions are expected to be rare.

Specific Game Definitions

Ball - A yellow, padded, roughly spherical object, with an overall diameter of approximately 3" (76.2mm) and a weight of approximately 25g.
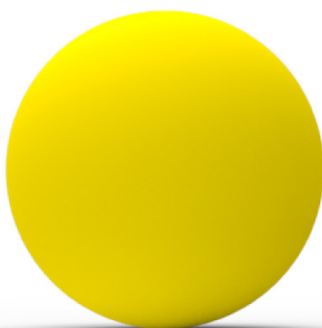

Figure 3: A Ball

Cleared - A *Starting Corral* status. A *Starting Corral* is considered *Cleared* at the end of a *Match* if no *Balls* are contacting the *Floor* inside of the *Starting Corral*. Referees can check any *Balls* in question by sliding a piece of paper between the *Ball* and the *Floor*.
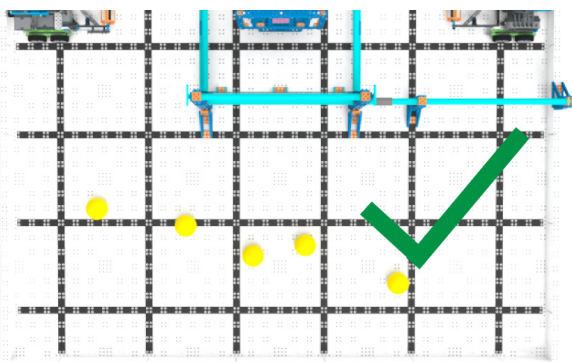

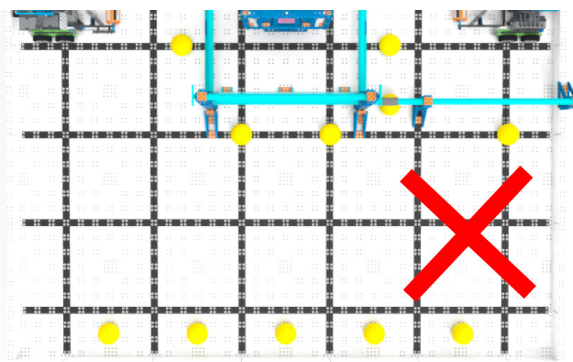*Figure 4: An example of a Cleared Starting Corral.*

Figure 5: An example of a Starting Corral that would not be considered Cleared, because there are Balls still in contact with the Floor inside the Corral.

Hanging - A *Robot* status at the end of a *Match*.

- **Low Hanging** – A *Robot* is *Low Hanging* if it is contacting one of the *Hanging Bars*, is not contacting the *Floor*, and is not supported by any *Balls*. Referees can check to see if a *Robot* is *Low Hanging* by sliding a piece of paper between the *Robot* and the *Floor*.
- **High Hanging** – A *Robot* is *High Hanging* if it is contacting one of the *Hanging Bars*, is not supported by any *Balls*, and is completely above a horizontal plane that is in line with the bottom edge of the lower *Hanging Bar*. Referees can check to see if a *Robot* is *High Hanging* by sliding a VEX IQ part which is 15 holes long (e.g. a 1x15 beam) underneath it.

Note 1: A *High Hanging Robot* does not also count as a *Low Hanging Robot*.

Note 2: Referees can check to see if a *Robot* is supported by any *Balls* by gently removing the *Ball* in question.
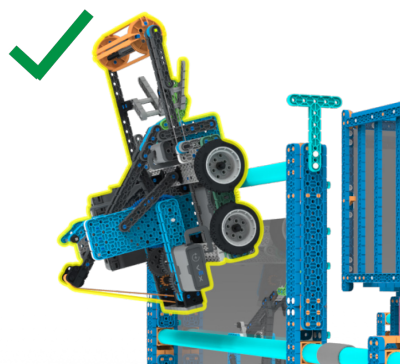
*Figure 6: This **Robot** would be considered **High Hanging**, because it is completely above the bottom edge of the lower **Hanging Bar**.*
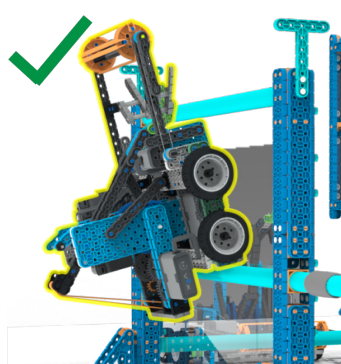
*Figure 7: This **Robot** would be considered **Low Hanging**, because it is not completely above the bottom edge of the lower **Hanging Bar**.*
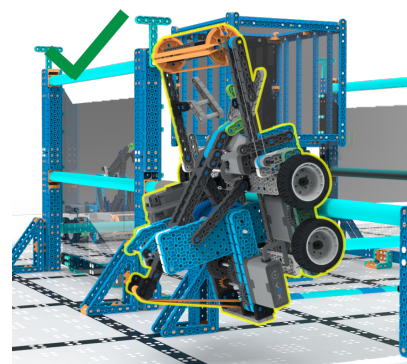
*Figure 8: This **Robot** would be considered **Low Hanging**, because it is contacting a **Hanging Bar**, is not contacting the **Floor**, and is not supported by any **Balls**.*

Hanging Bar - One of the teal PVC pipes, 0.84" (21.3mm) in diameter, that run parallel to the *Starting Corrals*. The bottom edge of the highest set of *Hanging Bars* is 15.5" (393.7mm) from the *Floor*; the bottom edge of the lower set of *Hanging Bars* is 7.5" (190.5mm) from the *Floor*.

Note: The lowest set of teal PVC pipes, which define the *Low Goal*, are not considered *Hanging Bars*.
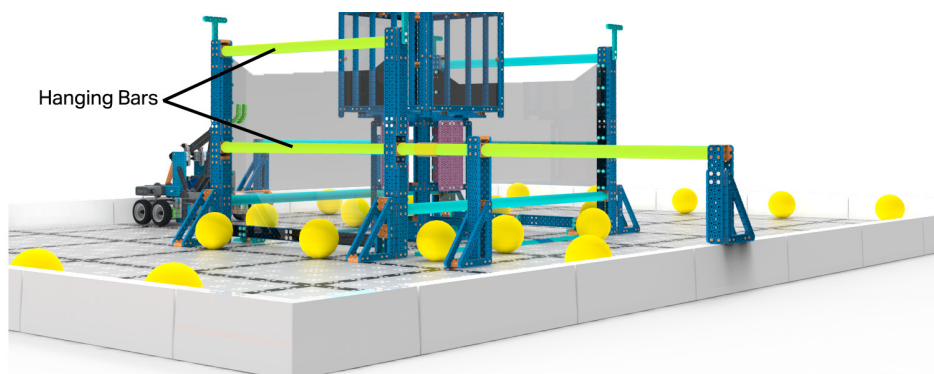

*Figure 9: An overview of the **Field**. The **Hanging Bars** are highlighted.*

High Goal - The cube-shaped structure built out of VEX IQ parts and clear plastic sheets that is elevated in the center of the *Field*. The support structure underneath the clear cube, with green and pink VEX IQ parts on each side, is not considered part of the *High Goal*.
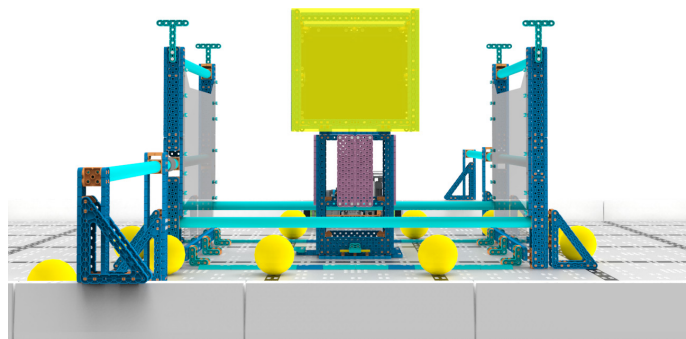

*Figure 10: The **High Goal**.*

Low Goal - The area in the center of the *Field* surrounding the *High Goal* structure. On two sides, the *Low Goal* is bound by clear plastic sheets. On the other two sides, the *Low Goal* is bounded by the outer edge of the teal PVC pipes, and the VEX IQ parts attached to the *Floor*. The plastic sheets, PVC pipes, and VEX IQ parts are considered part of the *Low Goal*.
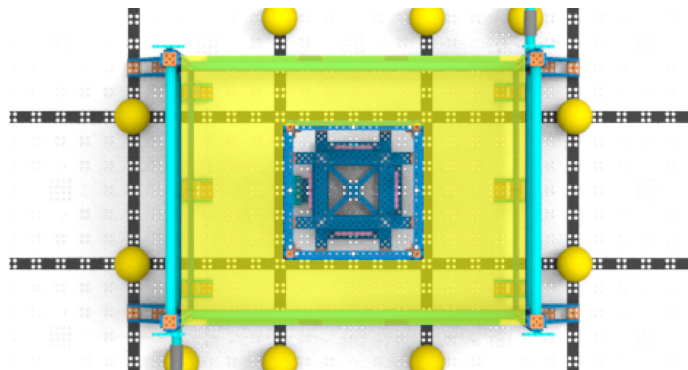
Figure 11: The Low Goal.

Scored - A *Ball* status. A *Ball* is considered *Scored* at the end of a *Match* if it is not touching a *Robot*, and if it is "in" one of the Goals:

1. The *Ball* is partially or fully within the three-dimensional area defined by the infinite vertical projection of the *Low Goal*, or
2. The *Ball* is above the bottom surface of the *High Goal*, and partially or fully within the three-dimensional area defined by the infinite vertical projection of the *High Goal*.

Note: Once a *Ball* is considered *Scored* in the *High Goal*, it is no longer considered *Scored* in the *Low Goal*.
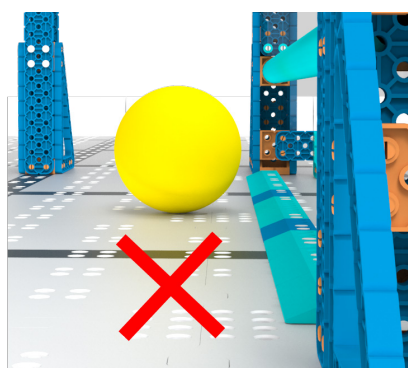
*Figure 12: This **Ball** would not be considered **Scored**, because it is not fully or partially within the vertical projection of the **Low Goal**.*

*Figure 13: This **Ball** would be considered **Scored** in the **Low Goal**, because it is partially within the vertical projection of the **Low Goal**.*
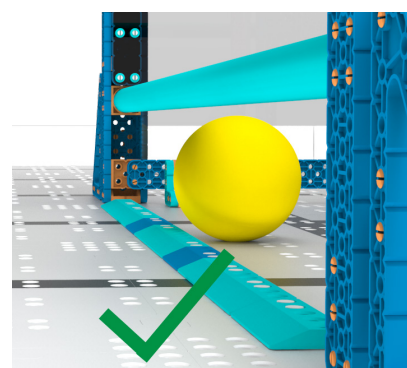
*Figure 14: This **Ball** would be considered **Scored** in the **Low Goal**, because it is fully within the vertical projection of the **Low Goal**.*
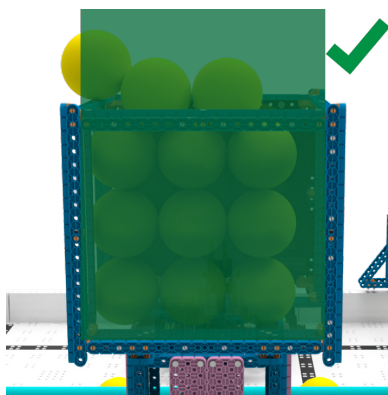
*Figure 15: All **Balls** would be considered **Scored** in the **High Goal**, because they are full or partially within the vertical projection of the **High Goal**.*

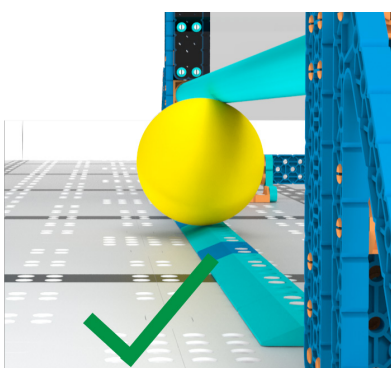*Teams* may encounter other *Ball* / Goal states than the examples depicted in the figures above. In these edge cases, *Teams* will be given the "benefit of the doubt", and the *Ball* should generally be considered *Scored. Head Referees* will not be expected or required to define a perfectly rigid imaginary vertical projection or check imperceptibly small measurements.

Starting Corral - One of two areas of the *Floor* on either end of the *Field*, each of which are bound by the *Field* perimeter and the outside of the solid black line closest to the 6' edge of the *Field*. The *Starting Corral* is defined as this portion of the *Floor*, not the three-dimensional volume above it.
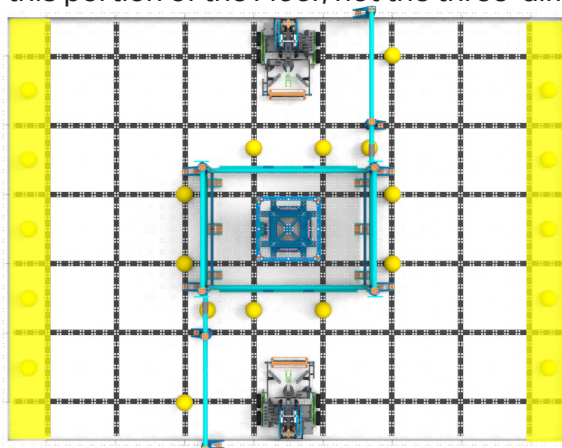
*Figure 16: An overview of the Field. The **Starting Corrals** are highlighted.*

Starting Position – Any one of the designated 11" x 19" (279.4mm x 482.6mm) volumes of the *Field* where *Robots* must start the *Match*. *Starting Positions* are bound by the inner edges of the long black lines, outer edge of the short black line, and the inner edge of the field perimeter. See Figure 17 for more details.
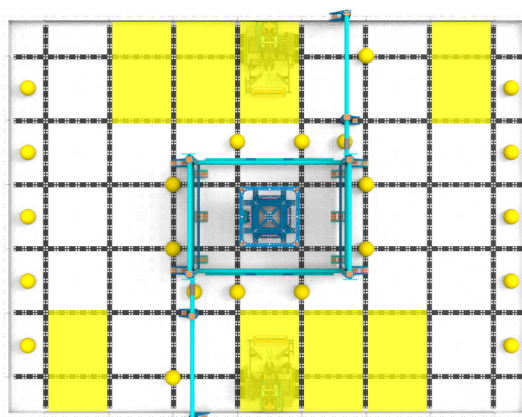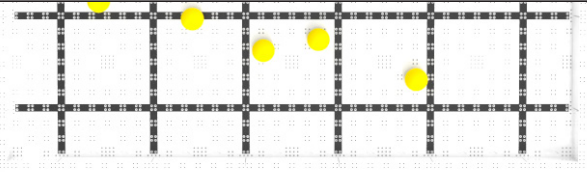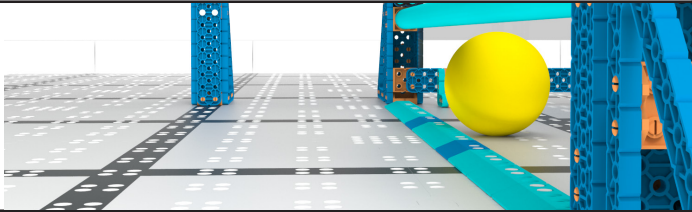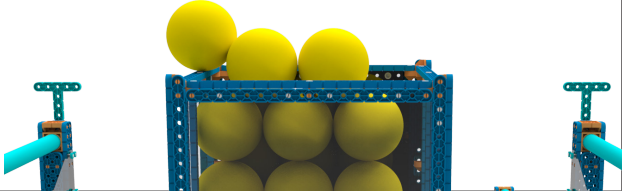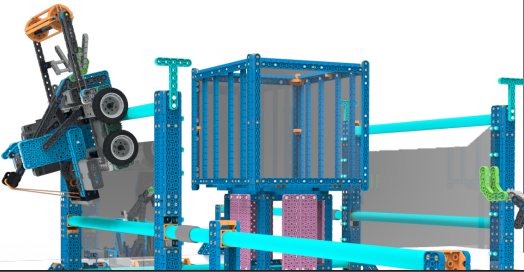
*Figure 17: An overview of the **Field**. The **Starting Positions** are highlighted.*

Scoring

Each Cleared Starting Corral	5 Points
Each Ball in the Low Goal	2 Points
Each Ball in the High Goal	6 Points
Each Robot Low Hanging	6 Points
Each Robot High Hanging	10 Points

	Each *Starting Corral* that is *Cleared* is worth five (5) points.
	Each *Ball* that is *Scored* in the *Low Goal* is worth two (2) points.
	Each *Ball* that is *Scored* in the *High Goal* is worth six (6) points.
	Each *Robot* that is *Low Hanging* is worth six (6) points.
	Each *Robot* that is *High Hanging* is worth ten (10) points.

Safety Rules

\<S1\> Stay safe, don't damage the Field. If, at any time, the *Robot* operation or *Team* actions are deemed unsafe or have damaged any *Field Elements* or *Balls*, the offending *Team* may be *Disabled* and/or *Disqualified* at the referees' discretion. The *Robot* will require re-inspection before it may again take the *Field*.

General Game Rules

\<G1\>Treat everyone with respect. All *Students* and *Adults* associated with a *Team* are expected to conduct themselves in a respectful and positive manner while participating in the VEX IQ Challenge. If *Team* members are disrespectful or uncivil to staff, volunteers, or fellow *Teams* at an event, the *Team* may be *Disqualified* from their current or upcoming *Match*. Judges may also consider *Team* conduct and ethics when determining awards.

In all aspects of the VEX IQ Challenge, the *Students* make the decisions and "do the work" with *Adult* mentorship. The VEX community prides itself on being a positive learning environment where no one is bullied, harassed, or berated. *Teams* avoid placing unnecessary stress upon *Students* and event volunteers; instead, challenging situations are viewed as teachable moments to model positive behaviors and good sportsmanship.

This rule exists alongside the **REC Foundation Code of Conduct**. Violation of the Code of Conduct can be considered a violation of \<G1\> and can result in *Disqualification* from a current *Match*, an upcoming *Match*, an entire event, or (in extreme cases) an entire competition season. The Code of Conduct can be found at https://www.roboticseducation.org/codeofconduct

For the 2021-2022 season, some events may establish additional Health & Safety guidelines beyond the scope of this Game Manual. These guidelines will be communicated to all *Teams* in advance via Health & Safety notes associated with the event registration on robotevents.com. All *Teams* (including *Students* and *Adults* associated with the *Team*) must abide by these guidelines as written. Violation of an event-specific Health & Safety rule may be considered a violation of \<G1\> and / or the REC Foundation Code of Conduct.

\<G2\> VEX IQ is a student-centered program. *Adults* may assist *Students* in urgent situations, but *Adults* may never work on or program a *Robot* without *Students* on that *Team* being present and actively participating. *Students* must be prepared to demonstrate an active understanding of their *Robot's* construction and programming to judges or event staff.

Some amount of *Adult* mentorship, teaching, and / or guidance is an expected and encouraged part of the VEX IQ Challenge. No one is born an expert in robotics! However, obstacles should always be viewed as teaching opportunities. Obstacles are not tasks for an *Adult* to solve without *Students* present and actively participating.

When a mechanism falls off, it is…
…Okay for an *Adult* to help a *Student* investigate why it failed, so that it can be improved.
…Not okay for an *Adult* to put the *Robot* back together.

When a *Team* encounters a complex programming concept, it is…
…Okay for an *Adult* to guide a *Student* through a flowchart to understand its logic.
…Not okay for an *Adult* to write a pre-made command for that *Student* to copy / paste.

During *Match* play, it is…
…Okay for an *Adult* to provide cheerful, positive encouragement as a spectator.
…Not okay for an *Adult* to explicitly shout step-by-step commands from the audience.

This rule operates in tandem with the REC Foundation Student Centered Policy, which is available on the REC Foundation website for *Teams* to reference throughout the season: https://www.roboticseducation.org/studentcenteredpolicy

Violation of this rule could be considered a violation of <G1> and / or the REC Foundation Code of Conduct.

<G3> Use common sense. When reading and applying the various rules in this document, please remember that common sense always applies in the VEX IQ Challenge.

<G4> Pre-Match setup. At the beginning of a *Match*, each *Robot* must meet the following criteria:

1. Only be contacting the *Floor* and / or the *Field* perimeter (i.e. not contacting any *Balls*, other *Field Elements*, or other *Robots*).
2. Fit within an 11" x 19" (279.4mm x 482.6mm) area, bounded by one of the *Starting Positions*.
3. Be no taller than 15" from the *Floor*.
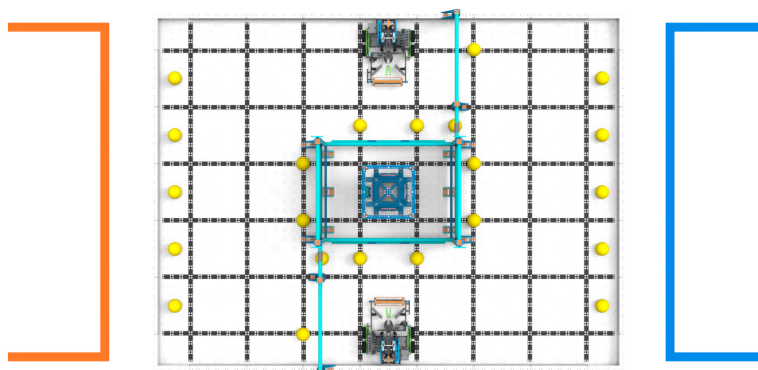
Figure 18: Two Robots in a legal Match starting configuration.

<G5> Expansion is limited during a Match. During the *Match*, *Robots* may not expand beyond the following restrictions:

a. Horizontally, beyond an 11" x 19" (279.4mm x 482.6mm) area.
b. Vertically, beyond 19" (482.6mm) high. This is the same height as the top of the teal T-shaped VEX IQ parts in the center of the *Field*. See Figure 19.

This expansion limit does not require that the *Robot* stay in the same configuration as it was when it began the *Match*. It simply means that, at any given moment during the *Match*, it should be able to fit within an 11" x 19" x 19" (279.4mm x 482.6mm x 482.6mm) rectangular prism. *Robots* will be tested for compliance with this rule, alongside rule <R6>, during inspection.

*Figure 19: **Robots** may not vertically expand beyond 19".*

The intent of testing compliance with this rule during inspection is to reduce the need for judgment calls during a *Match*. The 19" height restriction is not a "virtual ceiling"; for example, it is legal for a portion of the *Robot* to extend beyond the T-shaped VEX IQ markers while *Hanging*, so long as it never momentarily extends beyond 19" along the way. If a *Head Referee* is unsure of a *Robot's* compliance with this rule, they may request a field-side height check for the configuration that was seen momentarily during the *Match*.
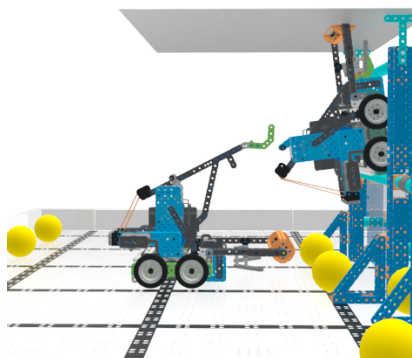
*Figure 20: The same **Robot** from Figure 19 in a **Hanging** position.*

Violations of this rule will result in a warning for minor offenses that do not affect the *Match*. Major offenses and / or offenses which improve the score will result in a *Disqualification*. *Teams* who receive multiple warnings, or who are unable to easily remedy the violation, may also receive a *Disqualification* at the *Head Referee's* discretion. In this case, <R2> would apply, and *Robots* may need to be re-inspected for compliance with <R5>.

<G6> The Robot must represent the skill level of the Team. Each *Team* must include *Drivers*, *Programmer*(s), *Designer*(s), and *Builder*(s). No *Student* may fulfill any of these roles for more than one VEX IQ Challenge *Team* in a given competition season. *Students* may have more than one role on the team, e.g. the *Designer* can also be the *Builder*, the *Programmer* and a *Driver*.

a. *Team* members may move from one *Team* to another for non-strategic reasons outside of the *Team's* control.
    i. Examples of permissible moves may include, but are not limited to, illness, changing schools, conflicts within a *Team*, or combining / splitting *Teams*.

ii. Examples of strategic moves in violation of this rule may include, but are not limited to, one *Programmer* "switching" *Teams* in order to write the same program for multiple *Robots*, or one *Student* writing the Engineering Notebook for multiple *Teams*.

iii. If a *Student* leaves a *Team* to join another *Team*, <G6> still applies to the *Students* remaining on the previous *Team*. For example, if a *Programmer* leaves a *Team*, then that *Team's Robot* must still represent the skill level of the *Team* without that *Programmer*. One way to accomplish this would be to ensure that the *Programmer* teaches or trains a "replacement" *Programmer* in their absence.

> Points ii and iii are intended to represent real-world constraints that are found in industry engineering. If a vital member of a real-world engineering team were to suddenly leave, the remaining members of the team should still be capable of working on / maintaining their project.

b. Within a single event, a *Driver* may only drive for one (1) *Team*. If a *Team* attends an event with only one (1) *Driver* in attendance, then that *Team* is granted an allowance to use another qualified *Driver* from the Event. This substitute *Driver* is given an exemption for this event and may only *Drive* for this one *Team* at that event. Once the event is over, the substitute *Driver* will go back to his or her original *Team*. This exception is only granted if a *Team* has one (1) *Driver* in attendance due to reasons outside of the *Team's* control, such as illness.

c. When a *Team* qualifies for a Championship event (e.g., States, Nationals, Worlds, etc) the *Students* on the *Team* attending the Championship event are expected to be the same *Students* on the *Team* that was awarded the spot. *Students* can be added as support to the *Team*, but may not be added as *Drivers* or *Programmers* for the *Team*.

i. An exception is allowed if one (1) *Driver* and / or one (1) *Programmer* on the *Team* cannot attend the event. The *Team* can make a single substitution of a *Driver* or *Programmer* for the Championship event with another *Student*, even if that *Student* has competed on a different *Team*. This *Student* will now be on this new *Team*, and may not substitute back to the original *Team*.

Violations of this rule will be evaluated on a case-by-case basis, in tandem with the **REC Foundation Student Centered Policy** as noted in <G2>, and the **REC Foundation Code of Conduct** as noted in <G1>.

<G7> Be prepared to play. *Teams* must be prepared to play when they bring their *Robots* to the *Field*. For example, *Teams* must ensure that their batteries are charged and their VEX IQ Controller is paired with their *Robot* before placing the *Robot* on the *Field*.

<G8> Drivers switch Controllers midway through the Match.

a. In a given *Match*, only two (2) *Drivers* may be in the *Driver Station* per *Team*. No *Driver* shall operate a *Robot* for more than thirty-five seconds (0:35). The two *Drivers* must switch their controller between twenty-five seconds (0:25) and thirty-five seconds (0:35) remaining in the *Match*. The second *Driver* may not touch their *Team's* controls until the controller is passed to them. Once the controller is passed, the first *Driver* may no longer touch their *Team's* controls.

b. For the 2021-2022 season, *Teams* may elect to have one *Driver* in the *Driver Station*, instead of two. If only one *Driver* is present in the *Driver Station*, they may drive for the full *Match*, and a controller switch is not required. It is at the *Team's* discretion whether they wish to have one *Driver* or two. If two *Drivers* are present in the *Driver Station*, the controller switch rules in <G8a> would then apply.

c. *Drivers* are the only *Team* members that are allowed to be in the *Driver Station*. No *Adults* are permitted in the *Driver Station*.

The intent of point "b" in this rule is to provide flexibility for *Teams* who are unable to meet in a traditional capacity due to local health guidelines. As noted in the definition of "*Team*", teamwork is a core tenet of the VEX IQ Challenge, and the two-*Student* drive team is intended to be a fundamental application of this skill. If a *Team* has the capacity to include multiple *Students*, it should also be expected that they will not take advantage of this single-*Driver* exception for strategic gain.

<G9> Drivers drive your Robot, and stay in the Driver Station. During a *Match*, *Robots* may only be operated by that *Team's Drivers*. *Drivers* must remain in their *Driver Station*, except when legally interacting with their *Robot* as per <G18>. *Drivers* are not allowed to use any communication devices while in the *Driver Station*. Devices with communication features turned off (e.g. a phone in airplane mode) are allowed.

Note: Either *Driver Station* option, as shown in Figure 2, may be used.

<G10> Hands out of the Field. *Drivers* are prohibited from making intentional contact with any *Field Element*, *Ball*, or *Robot* during a *Match*, except for the allowances in <G18> and / or <RSC7>.

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

Accidental contact may result in a warning, *Disqualification*, or *Disablement* at the *Head Referee's* discretion.

<G11> Keep Balls in the Field. *Balls* that leave the *Field* during a *Match* will not be returned. The phrase "Leaving the *Field*" means that a *Ball* is outside of the Field Perimeter and no longer in contact with the *Field*, *Field Elements*, other *Balls*, or *Robots*.

If a *Ball* is on its way out of the *Field* (as determined by the *Head Referee*), but is deflected back into the field by a *Driver*, field monitor, ceiling / wall, or other external factor, <G10> would still apply. This *Ball* should be considered "out of the field" and removed by the *Head Referee*. If the redirection occurred due to contact with a *Driver*, it will be at the *Head Referee's* discretion whether <G9> or <G10> should apply.

<G12> When it's over, it's over. Scores will be calculated for all *Matches* immediately after the *Match* is complete, and once all *Robots* and *Balls* on the *Field* come to rest.

a. Referees or other event staff are not allowed to review any videos or pictures from the *Match*, per <T1b>.
b. If there is a concern regarding the score of a *Match*, a *Driver* from that *Match* (not an *Adult*), may discuss the score with the *Head Referee*. See <T2> for more details.
c. This rule's intent is for *Driver* inputs and *Robot* motion to cease at the end of the *Match*. A pre-programmed routine which causes the *Robot* to continue moving after the end of the *Match* would violate the spirit of this rule. Any Scoring which takes place after the *Match* due to *Robots* continuing to move will not count.

Note: Using a motor's built-in "Hold" function, such as to remain *Hanging*, is permissible.

<G13> Keep your Robot together. *Robots* may not intentionally detach parts or leave mechanisms on the *Field* during any *Match*. If an intentionally detached component or mechanism affects game play, the *Team* may be Disqualified at the *Head Referee's* discretion. Parts that become unintentionally detached from the *Robot* are no longer considered to be part of the *Robot* and can be either left on the *Field*, or collected by a *Driver* (utilizing <G18>).

<G14> Don't damage the Field. *Robots* may not grasp, grapple, or attach to any *Field Elements* other than the *Hanging Bar*. 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.

a. *Robots* may grasp, grapple, or attach to *Balls*. However, *Robots* which cause damage to *Balls* could be considered in violation of this rule and / or <S1>.
b. While the *Hanging Bars* are excluded from this rule, their supporting structures are not. Incidental contact with other *Field Elements* while *Hanging* will not be penalized, but *Teams* are not permitted to grapple, clamp, or attach to any *Field Elements* other than the *Hanging Bars* while *Hanging*.
c. If the *High Goal* becomes detached or otherwise unseated at any point during the *Match* due to accidental contact with a *Robot*, all *Balls* which would otherwise be considered *Scored* in the *High Goal* will instead be considered *Scored* in the *Low Goal* at the end of the *Match*.
    i. Any intentional, strategic, repeated, or otherwise egregious damage to the *High Goal* structure would be considered a severe violation of this rule and will result in a *Disqualification* at the *Head Referee's* discretion.

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

The key words in this rule are "clamping" or "anchoring". The intent of this rule is to prevent *Robots* from actions which could unintentionally damage the *Field* during standard gameplay. Passive contact that does not cause damage, such as bumping into the clear plastic sheet or using *Field Elements* for alignment, are fine.

<G15> Let it go after the Match is over. *Robots* must be designed to permit easy removal of *Balls* from their *Robot* without requiring that the *Robot* have power or remote control after the *Match* is over.

<G16> Be prepared for minor field variance. *Field* tolerances may vary by as much as ±1" unless otherwise specified. *Teams* must design *Robots* accordingly.

<G17> Match Replays are allowed, but rare. Requests to re-play a *Match* over again from its start are at the sole discretion of the *Event Partner* and *Head Referee*. Replays will only be issued in the most extreme circumstances. Some example situations that may warrant a *Match* replay are as follows:

a. Score Affecting "Field fault" issues.
    i. *Balls* not starting in the correct positions
    ii. *Field Elements* detaching or moving beyond normal tolerances, that is not a result of *Robot* interactions.

b. Score Affecting game rule issues.
   i. The *Field* is reset before a score is determined.

<G18> Handling the Robot mid-match is only allowed under certain circumstances. If a *Robot* goes completely outside the playing *Field*, gets stuck, tips over, or otherwise requires assistance, the *Team's Drivers* may retrieve & reset the *Robot*. To do so, they must:

1. Signal the Referee by placing their VEX IQ Controller on the ground. (Or table, if the field is elevated.
2. Remove any *Balls* being controlled by the *Robot* from the *Field*.
   i. In the context of this rule, "controlled" implies that the *Robot* was manipulating the *Ball*, and not simply touching it. For example, if the *Ball* moves with the *Robot* either vertically or while turning, then the *Robot* is "controlling" the *Ball*.
3. Place the *Robot* back into a *Starting Position* which does not have any *Balls* in it. If no "empty" *Starting Positions* are available, then any *Balls* in the *Starting Position* where the *Robot* is being placed must be removed from the *Field*.

Note: If the *Drivers* cannot reach the *Robot* due to the *Robot* being in the center of the *Field*, the *Drivers* may ask the *Head Referee* to pick up the *Robot* and hand it to the *Drivers* for placement. according to the conditions above.

This rule is intended so *Teams* can fix damaged *Robots* or help get their *Robots* "out of trouble." It is not intended for *Teams* to use as part of a strategy to gain an advantage during a *Match*. If a *Head Referee* determines that a *Team* is strategically exploiting this rule, they may be Disqualified from said *Match*.

<G19> Ball control is limited while Hanging. *Robots* which are not contacting the *Floor* may control a maximum of two (2) *Balls*.

In the context of this rule, "control" implies that the *Robot* is manipulating the *Balls*, not simply touching them. For example, if a *Ball* moves with the *Robot* either vertically or while turning, then the *Robot* is "controlling" the *Ball*. Other synonyms for "control" could be "hold", "possess", "support", "lift", or "carry".

There is no restriction on the number of *Balls* a *Robot* may control at any other point during the *Match*. However, a *Robot* which is controlling more than two (2) *Balls* must remove any excess *Balls* from their *Robot* before leaving contact with the *Floor*.

Minor, momentary, or incidental violations of this rule that do not affect the Match will result in a warning. Score affecting offenses will result in a *Disqualification*. *Teams* that receive multiple warnings may also receive a *Disqualification* at the *Head Referee's* discretion.

<G20> This manual will have four scheduled updates. This manual will have a series of "major" and "minor" updates. Each version is official and must be used in official VIQC events until the release of the next version, when the previous version becomes void.

All updates may include clarifications that have been made in response to questions posted in the official Q&A system. Additionally, the three "major" updates, released in June, August, and April, may include gameplay or rule changes to resolve critical issues, if needed. *Teams* must be familiar with the information included in each major update, as there will be no "grace period" if a rule is changed that prohibits a previously-legal part, mechanism, or strategy.

Note: Multi-week league events that "cross over" a major update, and encounter a rule change that impacts their event, should contact their REC Foundation Representative. Cases will be reviewed individually depending on the context of the event and the rule that has changed. This is the only possible "grace period" exception.

May 29, 2021	Version 0.1	Initial game release
June 7, 2021	(N/A)	Official Q&A system opens
June 15, 2021	Version 0.2	Minor typographical errors or formatting issues found in the initial release. There will be very few rule changes, if any.
June 29, 2021	**Version 1.0**	May include critical gameplay or rule changes inspired by input from the official Q&A system and the VEX community.
July 27, 2021	Version 1.1	"Q&A clarification update" only
August 31, 2021	**Version 2.0**	May include gameplay or rule changes inspired by early-season events.
October 6, 2021	Version 2.1	"Q&A clarification update" only
December 7, 2021	Version 2.2	"Q&A clarification update" only
February 1, 2022	Version 2.3	"Q&A clarification update" only
April 5, 2022	**Version 3.0**	May include gameplay or rule changes pertaining specifically to the VEX Robotics World championship

<G21> The Q&A system is an extension of this Game Manual. All *Teams* must adhere to all VEX IQ Challenge Rules as they are written and must abide by the stated intent of the rules. Every *Team* has the opportunity to ask for official rules interpretations in the VEX IQ Challenge Question & Answer System.

All responses in this Q&A system should be treated as official rulings from the VEX IQ Challenge Game Design Committee, and they represent the correct and official interpretation of the VEX IQ Challenge Rules. The Q&A system is the only source for official rulings and clarifications.

The VEX IQ Challenge Question & Answer System can be found at https://www.robotevents.com/VIQC/2021-2022/QA

Section 2
The Robot

Description

Every *Robot* must pass a full inspection before being cleared to participate in the VEX IQ Challenge. This inspection will ensure that all *Robot* rules and regulations are met. Initial inspections will typically take place during team registration / practice time. Every *Team* should use the rules below as a guide to pre-inspect their *Robot* and ensure that it meets all requirements.

Inspection Rules

<R1> One Robot per Team. Only one (1) *Robot* will be allowed to participate per *Team* at a given event. Though it is expected that *Teams* will make changes to their *Robots* at the event, a *Team* is limited to only one (1) *Robot*, and a given *Robot* may only be used by (1) *Team*. The VEX IQ system is intended to be a mobile robotics design platform. As such, a VEX IQ Challenge Robot, for the purposes of the VEX IQ Challenge, has the following subsystems:

- **Subsystem 1**: Mobile robotic base including wheels, tracks, or any other mechanism that allows the *Robot* to navigate the majority of the flat playing *Field* surface. For a stationary *Robot*, the robotic base without wheels would be considered Subsystem 1.
- **Subsystem 2**: Power and control system that includes a VEX IQ legal battery, a VEX IQ control system, and associated Smart Motors for the mobile robotic base.
- **Subsystem 3**: Additional mechanisms (and associated Smart Motors) that allow manipulation of *Balls* or navigation of *Field* obstacles.

Given the above definitions, a minimum *Robot* for use in any VEX IQ Challenge event (including Skills Challenges) must consist of subsystem 1 and 2 above. Thus, if you are swapping out an entire sub-system of either item 1 or 2, you have now created a second *Robot* and are no longer legal.

a. *Teams* may not participate with one *Robot* while a second is being modified or assembled.
b. *Teams* may not switch between multiple *Robots*. This includes using different robots for Skills Challenge and Qualification / Elimination Matches.
c. Multiple *Teams* may not use the same *Robot* during a competition or season. Once a *Robot* has competed under a given *Team* number at an event, it is "their" *Robot* - no other *Team* may compete with it for the duration of the competition season.
d. *Robots* which have not passed inspection (i.e. who are in violation of one or more *Robot* rules) will not be permitted to play in any *Matches* until they have done so. <T10> will apply to any *Matches* that occur until the *Robot* has passed inspection.
e. If a *Robot* has passed inspection, but is later found to be in violation of a *Robot* rule during a *Match*, then they will receive a *Disqualification* for that *Match* and <R1d> will apply until the violation is remedied and the *Team* is re-inspected.

The intent of <R1a>, <R1b>, and <R1c> are to ensure an unambiguous level playing field for all *Teams*. *Teams* are welcome (and encouraged) to improve or modify their *Robots* between events, or to collaborate with other *Teams* to develop the best possible game solution.

However, a *Team* who brings and / or competes with two separate *Robots* at the same tournament has diminished the efforts of a *Team* who spent extra design time making sure that their one *Robot* can accomplish all of the game's tasks. Similarly, a multi-team organization that shares a single *Robot* has diminished the efforts of a multi-team organization who puts in the time, effort, and resources to undergo separate individual design processes and develop their own *Robots*.

To help determine if a robot is a "separate *Robot*" or not, use the Subsystem definitions found in <R1>. Above that, use common sense as referenced in <G3>. If you can place two complete and legal *Robots* on a table next to each other, then they are two separate *Robots*. Trying to decide if changing a pin, a wheel, or a motor constitutes a separate *Robot* is missing the intent and spirit of this rule.

<R2> Robots must be a representation of the skill level of the team. The *Robot* must be designed, built and programmed by members of the *Team*. *Adults* are permitted to mentor and teach design, building and programming skills to the *Students* on the *Team*, but may not design, build or program that *Team's Robot*.

In VIQC, we expect *Adults* to teach different linkages, drive-trains, and manipulator applications to the *Students*. Then, they should allow the *Students* to determine which designs to implement and build on their *Robot*. Similarly, *Adults* are encouraged to teach the *Students* how to code various functions involving applicable sensors, then have the *Students* program the *Robot* from what they have learned.

<R3> Robots must pass inspection. The *Team's Robot* must pass inspection before being allowed to participate in any *Matches*. Noncompliance with any *Robot* rule will result in *Disqualification* of the *Robot* at an event until the *Robot* is brought back into compliance.

a. If significant changes are made to a *Robot*, it must be re-inspected before it will be allowed to participate in a *Match*. This can be done by the *Head Referee* before the start of the *Match*.
b. If a *Robot* has multiple functional configurations, all possible configurations must be inspected before being used in competition.
c. *Teams* may be requested to submit to random inspections by event personnel during the event. Refusal to submit will result in *Disqualification*.

<R4> Only registered Teams may compete in the VEX IQ Challenge. To participate in an official VEX IQ Challenge Event, a *Team* must first register on robotevents.com. Upon registering they will receive their VEX IQ Challenge Team Number and two (2) VEX IQ Challenge *License Plates*. Every *Robot* must have at least one (1) VEX IQ Challenge *License Plate* displayed with their VEX IQ Challenge Team Number clearly written or printed upon it.

a. *License Plates* must fulfill all *Robot* rules.
b. *License Plates* must be clearly visible at all times. For example, *License Plates* must not be in a position that would be easily obstructed by a *Robot* mechanism during standard *Match* play

c. *License Plates* other than the official VEX IQ Challenge *License Plate* (VEX Part Number 228-7401) may be used.
    i. Any unofficial *License Plates* used must be the same length and height as the official *License Plate* (3.5" x 1.5" [88.9mm x 38.1mm]) . They must not exceed the width of the official *License Plate* (0.25" [6.35mm]).
    ii. Unofficial *License Plates* are considered non-functional decorations, and must therefore meet all of the criteria listed in <R8>. Therefore, 3D printed *License Plates* are permitted within these rules.

*Figure 21: A VEX IQ Challenge **License Plate***

<R5> Starting configuration. At the start of each *Match*, the *Robot* must be able to satisfy the following constraints:

a. Only be contacting the *Floor* and **/** or the Field Perimeter.
b. Fit within an 11" x 19" (279.4mm x 482.6mm) area, bounded by the *Starting Positions*.
c. Be no taller than 15" from the *Floor*.

<R6> The Match configuration will be inspected. The starting configuration of the *Robot* at the beginning of a *Match* must be the same as a *Robot* configuration inspected for compliance.

a. *Teams* using more than one *Robot* configuration at the beginning of *Matches* must tell the inspector(s), and have the *Robot* inspected in its largest configuration(s).
b. A *Team* may NOT have its *Robot* inspected in one configuration, and then place it in an uninspected configuration at the start of a *Match*.
c. Once the *Match* begins, *Robots* must not be capable of violating the 19" height limit set forth by <G5>. *Teams* may be requested to demonstrate any extendable *Robot* mechanisms during inspection, to ensure compliance with this limit. Software limitations are acceptable, for the purposes of this rule.

<R7> VEX IQ product line. *Robots* may be built ONLY from Official Robot Components from the VEX IQ product line, unless otherwise specifically noted within these rules.

a. Official VEX IQ products are ONLY available from VEX Robotics & official VEX Resellers. To determine whether a product is "official" or not, consult www.vexiq.com.
b. If an Inspector or event official questions whether something is an official VEX IQ component, the *Team* will be required to provide documentation to an Inspector that proves the component's source. Such types of documentation include receipts, part numbers, or other printed documentation.

c. Only the VEX IQ components specifically designed for use in *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 IQ apparel, team or event support materials, packaging, *Field Elements*, or other non-robot products on a VEX IQ Challenge Robot).

d. Products from the VEX V5, VEX EXP. Cortex, or VEXpro product line cannot be used for *Robot* construction. Products from the VEX product line that are also cross-listed as part of the VEX IQ product line are legal. A "cross-listed" product is one which can be found in both the VEX IQ and VEX V5 sections of the VEX Robotics website.

e. Mechanical / structural components from the VEX Robotics by HEXBUG product line are legal for *Robot* construction. However, electrical components from the VEX Robotics by HEXBUG product line are illegal for *Robot* construction.

f. Mechanical / structural components from the VEX GO product line are legal for *Robot* construction. However, electrical components from the VEX GO product line are illegal for *Robot* construction.

g. Official Robotics Components from the VEX IQ product line that have been discontinued are still legal for Robot use. However, *Teams* must be aware of <R7b>.

h. 3D printed components, such as replicas of legal VEX IQ parts or custom designs, are not legal for Robot use.

i. Additional VEX IQ products that are released during the season are legal for use.

j. A comprehensive list of legal parts can be found in the VEX IQ Challenge Legal Parts Appendix, at https://www.vexrobotics.com/iq/competition/viqc-current-game . This Appendix is updated as needed if / when new VEX IQ parts are released, and may not coincide with the scheduled Game Manual updates in <G20>.

<R8> Non-VEX IQ components. *Robots* are allowed to use the following additional "non-VEX IQ" components:

a. Appropriate 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 event. Inspectors will have the final say in what is considered "nonfunctional" and "appropriate".
   i. Any decorations must be backed by legal materials that provide the same functionality, (For example, if your *Robot* has a giant decal that prevents *Balls* from falling out of the *Robot*, the decal must be backed by VEX IQ material that also prevents the *Balls* from falling out).
   ii. The use of non-toxic paint is considered a legal non-functional decoration. However, any paint being used as an adhesive or to impact how tightly parts fit together would be classified as functional.

b. Rubber bands that are identical in length and thickness to those included in the VEX IQ product line (#32 & #64).

c. ⅛" metal shafts from the VEX V5 product line.

> *Teams* should be mindful of any non-functional decorations which could risk "distracting" *Alliance* partner *Robots*, such as the Vision Sensor or other sensors.

<R9> Microcontroller. *Robots* are limited to ONE (1) VEX IQ Robot Brain (1st or 2nd generation).

a. Robot Brains, microcontrollers, or other electronic components that are part of the VEX GO, VEX EXP, VEX V5, VEX Cortex, VEX 123, VEXpro, or VEX Robotics by HEXBUG product lines are not allowed.

> i. The Robot AA Battery Holder (228-3493) is the only exception to this rule, per <R11>
b. *Robots* must use one (1) VEX IQ 900 MHz radio, VEX IQ 2.4 GHz radio, or VEX IQ Smart Radio in conjunction with their VEX IQ Robot Brain.
c. The only legal method of driving the *Robot* during *Teamwork Matches* and *Driving Skills Matches* is the VEX IQ Controller.

<R10> Motors. *Robots* may use up to six (6) VEX IQ Smart Motors.

a. Additional motors cannot be used on the *Robot* (even ones that aren't connected).

<R11> Batteries. The only allowable sources of electrical power for a VEX IQ Challenge *Robot* is one (1) VEX IQ Robot Battery or six (6) AA batteries via the Robot AA Battery Holder (228-3493).

a. Additional batteries cannot be used on the *Robot* (even ones that aren't connected).
b. *Teams* are permitted to have an external power source (such as a rechargeable battery pack) plugged into their VEX IQ Controller during a *Match*, provided that this power source is connected safely and does not violate any other rules (such as <G7>).

Note: Although it is legal, the Robot AA Battery Holder (228-3493) is not recommended for use in the VEX IQ Challenge.

<R12> Firmware. *Teams* must have their VEX IQ firmware (VEXos) up to date. *Teams* can download the latest version of VEXos at www.vexiq.com/vexos.

<R13> Modifications of parts. Parts may NOT be modified. Examples of modifications include, but are not limited to, bending, cutting, sanding, gluing, or melting.

a. Cutting metal VEX IQ or VEX V5 shafts to custom lengths is permitted. This is the only legal exception to this rule.

<R14> Prohibited items. The following types of mechanisms and components are NOT allowed:

a. Those that could potentially damage *Field Elements* or *Balls*.
b. Those that could potentially damage other *Robots*.
c. Those that pose an unnecessary risk of entanglement.

<R15> Passing Inspection. A *Robot* is deemed successfully inspected when it has been recorded as "passed" by an Inspector.

Section 3
The Tournament

Description

The VEX IQ Challenge encompasses both the *Teamwork Challenge*, the *Robot Skills Challenge,* and the *Live Remote Challenge*. This section determines how the *Teamwork Challenge* and *Robot Skills Challenge* are to be played at a given event.

Awards may be given to top *Teams* in each format, as applicable. Awards may also be given for overall performance in the judged criteria. Please review the Awards Appendix for more details, available in the VEX IQ Challenge (2021-22 Pitching In) section of www.vexrobotics.com or www.roboticseducation.org.

The Tournament

Event Partner - The VEX IQ Challenge tournament coordinator who serves as an overall manager for the volunteers, venue, event materials, and all other event considerations. *Event Partners* serve as the official liaison between the REC Foundation, the event volunteers, and event attendees.

Finals Match – A *Teamwork Match* used to determine the *Teamwork Challenge* champions.

Head Referee - An impartial volunteer responsible for enforcing the rules in this manual as written. *Head Referees* are the only individuals who may discuss ruling interpretations or scoring questions with *Teams* at an event.

Match Stop Time – The time remaining (i.e. displayed on the timer or audience display) in a tiebreaker *Finals Match* when an *Alliance* ends the *Match* early by placing their controllers on the ground. The *Match Stop Time* is rounded down to the nearest even number. For example, if controllers are set down when the displayed time is 13 seconds, the *Match Stop Time* is recorded as 12 seconds. If an *Alliance* does not finish the *Match* early, they receive a default *Match Stop Time* of 0 seconds.

Live Remote Challenge - A modified version of the *Teamwork Challenge* that is played at a Live Remote Tournament. Live Remote Tournaments include *Qualification Matches* and *Finals Matches*, and may include *Practice Matches*.

Practice Match – A non-scored *Match*.

Qualification Match – A *Teamwork Match* used to determine the event rankings.

Robot Skills Challenge – A portion of the VEX IQ Challenge. The *Robot Skills Challenge* consists of *Driving Skills Matches* and *Programming Skills Matches*.

Teamwork Challenge – A portion of the VEX IQ Challenge. The *Teamwork Challenge* consists of *Teamwork Matches*. The *Teamwork Challenge* includes *Qualification Matches* and *Finals Matches*, and may include *Practice Matches*.

Tournament Rules

<T1> The Head Referee has ultimate authority on ruling decisions during the competition.

a. *Head Referees* must have the following qualifications.
    i. Be at least 16 years of age
    ii. Be approved by the *Event Partner*
    iii. Contain the following attributes:
        1. Thorough knowledge of the current game and rules of play.
        2. Effective decision making.
        3. Attention to detail.
        4. Ability to work effectively as a member of a team.
        5. Ability to be confident and assertive when necessary.
        6. Strong communication and diplomacy skills.
    iv. The *Head Referee* must be an REC Foundation Certified VIQC *Head Referee* for the current season.
b. *Head Referees* may not review any photo or video *Match* recordings to determine a score or ruling.
c. *Head Referees* are the only individuals permitted to explain a rule, *Disqualification* or warning to the *Teams*.
d. The *Head Referee* must give the rule number of the rule violated when issuing a *Disqualification* or warning to a *Team*.
e. Per <T2>, an *Event Partner* may not overrule a *Head Referee's* decision.

Violations of the REC Foundation Code of Conduct may involve additional escalation beyond the *Head Referee's* initial ruling, including (but not limited to) investigation by an REC Foundation representative. Rules <S1>, <G1>, and <G2> are the only rules for which this escalation may be required.

Note: Scorekeeper Referees score the *Match*, serve as observers for the *Head Referees* and advise the *Head Referee*, but should not communicate any rules or infractions directly to the *Teams*. Scorekeeper Referees must be at least 15 years of age.

<T2> The Drivers are permitted to immediately appeal the Head Referee's ruling. If the *Drivers* wish to dispute a score or ruling, those *Drivers* must stay in the *Driver Station* until the *Head Referee* talks with them. The *Head Referee* may choose to meet with the *Drivers* at another location and / or at a later time so that the *Head Referee* has time to reference materials or resources to help with the decision.

Once the *Head Referee* announces that his or her decision has been made final, the issue is over and no more appeals may be made. The *Event Partner* may not overrule the *Head Referee's* decision. Violations of this rule may result in the team being Disqualified from the *Match* in question and / or the event and is up to the discretion of the *Head Referee*.

<T3> Teamwork Matches. During *Teamwork Matches*, two (2) *Teams* form an *Alliance* that will play on the *Field*.

a. *Qualification Match Alliances* are randomly selected.

b. *Finals Match Alliances* are assigned as follows:
    i. The first and second ranked *Teams* form an *Alliance*
    ii. The third and fourth ranked *Teams* form an *Alliance*
    iii. And so on, until all *Teams* participating in *Finals Matches* have formed an *Alliance*.

<T4> Time Outs. There are no time outs in *Qualification Matches* or *Finals Matches*.

<T5> Ending a Match early. If an *Alliance* wants to end a *Qualification Match* or a *Finals Match* early, both *Teams* must signal the referee by ceasing all *Robot* motion and placing their controllers on the ground. The referee will then signal to the *Teams* that the *Match* is over and will begin to tally the score. If the *Match* is a tiebreaker *Finals Match*, then the *Match Stop Time* will also be recorded.

<T6> Practice Matches may be played at some events, but are not required. If *Practice Matches* are run, every effort will be made to equalize practice time for all *Teams*.

<T7> Qualification Matches will occur according to the official match schedule. This schedule will indicate *Alliance* partners, *Qualification Match* time, and, if the event has multiple *Fields*, which *Field* the *Qualification Match* will be played on.

Note: The official *Match* schedule is subject to changes at the *Event Partner's* discretion.

<T8> Each Team will be scheduled Qualification Matches as follows.

a. When in a tournament, the tournament must have a minimum of four (4) *Qualification Matches* per *Team*. The suggested amount of *Qualification Matches* per *Team* for a standard tournament is six (6) and up to ten (10) for a championship event.
b. When in a league, there must be at least three (3) league ranking sessions and each session must have a minimum of two (2) *Qualification Matches* per *Team*. The suggested amount of *Qualification Matches* per *Team* for a standard league ranking session is four (4). *Event Partners* may choose to have *Qualification Matches* as part of their league finals session.

<T9> Teams are ranked by their average Qualification Match scores.

a. When in a tournament, every *Team* will be ranked based on the same number of *Qualification Matches*.
    i. For tournaments that have more than 1 division, *Teams* will be ranked among all *Teams* in the event, i.e. there is no divisional ranking. The top *Teams*, regardless of division, will advance to the *Finals Matches*.
b. When in a league, every *Team* will be ranked based on the number of *Matches* played. *Teams* that participate in less than 60% of the total *Matches* available will be ranked below *Teams* that partici-pate in at least 60% of the total *Matches* available, e.g. if the league offers 3 ranking sessions with 4 *Qualification Matches* per *Team*, *Teams* that participate in 8 or more *Matches* will be ranked higher than *Teams* who participate in 7 or fewer *Matches*. Being a no-show to a *Match* that a *Team* is sched-uled in still constitutes participation for these calculations.
c. A certain number of a *Team's* lowest *Qualification Match* scores will be excluded from the rankings based on the quantity of *Qualification Matches* each *Team* plays. Excluded scores do not affect participation for leagues.

Number of Qualifying Matches per Team	Number of excluded Match scores
Between four (4) and seven (7)	1
Between eight (8) and eleven (11)	2
Between twelve (12) and fifteen (15)	3
Sixteen (16) or more	4

*Table 1: **Matches** that will be "dropped" from a Team's final average **Qualification Match** scores.*

d. In some cases, a *Team* will be asked to play an additional *Qualification Match*. The extra *Match* will be identified on the Match Schedule with an asterisk and will not impact the *Team's* ranking (or participation for leagues). *Teams* are reminded that <G1> is always in effect and *Teams* are expected to behave as if the additional *Qualification Match* counted.

e. Ties in *Team* ranking are broken by:
    i.   Removing the *Team's* lowest score and comparing the new average score.
    ii. Removing the *Team's* next lowest score and comparing the new average score (on through all scores)
    iii. If the *Teams* are still tied, the *Teams* will be sorted by random electronic draw.

<T10> Be at your match on time. If no member of a *Team* is present in the *Driver Station* at the start of a *Match*, that *Team* is considered a "no show" and will receive zero (0) points. The other *Team* in the *Alliance* will still play and receive points for the *Match*.

<T11> Disqualifications. A *Team* that is Disqualified in a *Qualification Match* receives zero (0) points for the *Match*. The other *Team* on their *Alliance* will still receive points for the *Match*.

a. In *Finals Matches*, *Disqualifications* apply to the whole *Alliance*, not just one *Team*. An *Alliance* that is Disqualified in a *Finals Match* will receive zero (0) points.

<T12> Teams playing in Finals Matches. The number of *Finals Matches*, and therefore the number of *Teams* who will participate in *Finals Matches*, is determined by the *Event Partner*. Events that qualify teams directly to VEX Worlds must have a minimum of five (5) *Finals Matches* if there are ten (10) or more *Teams* in attendance.

<T13> Finals Match Schedule. *Finals Matches* are played sequentially, starting with the lowest ranked *Alliance*. Each *Alliance* will participate in one (1) *Finals Match*. The *Alliance* with the highest *Finals Match* score is the *Teamwork Challenge* champion.

a. *Alliances* are ranked by their *Finals Match* score. The highest scoring *Alliance* is in first place, the second highest scoring *Alliance* is in second place, etc.

b. Ties for first place will result in a series of tiebreaker *Finals Matches*, starting with the lower seeded *Alliance*. The *Alliance* with the highest tiebreaker *Finals Match* score will be declared the *Teamwork Challenge* champion.
    i.   If the tiebreaker *Finals Match* scores are tied, the *Alliance* with the higher *Match Stop Time* will be declared the winner.
    ii. If the *Match Stop Time* is also tied, a second series of tiebreaker *Finals Matches* will be played. If this second series of tiebreaker *Finals Match* is also tied, then the higher seeded *Alliance* will be declared the winner.

c. If there is a tie for a place other than first, the higher seeded *Alliance* will receive the higher rank.

Example 1: Alliance 6 and Alliance 3 are tied for first place. During the tiebreaker *Finals Match*, Alliance 6 scores 13 points and has a *Match Stop Time* of 12 seconds. Alliance 3 scores 13 points and has a *Match Stop Time* of 10 seconds. Alliance 6 is the *Teamwork Challenge* winner.

Example 2: Alliance 4 and Alliance 5 are tied for third place. Alliance 4 is the third place winner and Alliance 5 is the fourth place winner. In this way, the lower ranked *Alliance* must "overcome" the higher ranked *Alliance* in order to become the Teamwork Challenge champion.

<T14> Elevated Fields. At many events, the playing *Field* will be placed on the ground. Some events may choose to elevate their *Fields*. At the 2022 VEX Robotics World Championship, the *Fields* will be 18" high.

<T15> Students must be accompanied by an Adult. No *Student* may attend a VIQC event without a responsible *Adult* supervising them. The *Adult* must obey all rules and be careful to not violate student-centered policies, but must be present at the event in the case of an emergency.

Robot Skills Challenge Rules

<RSC1> Standard rules apply in most cases. All rules and scoring from previous sections apply to *Skills Matches*, unless otherwise specified.

<RSC2> Skills Field Layout. For each *Skills Match*, the *Field* will be set up exactly the same as a standard VIQC Pitching In *Match*.

<RSC3> Skills Scoring and Ranking at events. For each *Skills Match*, *Teams* are awarded a score based on the standard rules and scoring rules. *Teams* will be ranked based on the sum of their highest *Programming Skills Match* score and highest *Driving Skills Match* score.

a. If two *Teams* are tied for the highest score, the tie will be broken by looking at both *Team's*' next highest *Programming Skills Match* score. If the *Teams* remain tied, the tie will be broken by looking at both *Team's*' next highest *Driving Skills Match* score. This process will repeat until the tie is broken. If a *Team* only plays one or two (1 or 2) of their available *Programming* or *Driving Skills Matches*, their score for the unattempted *Match(es)* will be considered a score of zero (0) when determining the winner of ties.
b. If the tie cannot be broken (i.e. both *Teams* have the exact same scores for each *Programming Skills Match* and *Driving Skills Match*), then the following ordered criteria will be used to determine which team had the "best" *Programming Skills Match*:
   i. Points for *Balls Scored* in the *High Goal*
   ii. Points for *High Hanging*
   iii. Points for *Low Hanging*
   iv. Points for *Balls Scored* in the *Low Goal*
c. If the tie still cannot be broken, the same process in the step above will be applied to the *Team's* highest *Driving Skills Match*.
d. If the tie still isn't broken, the *Event Partner* may choose to allow *Teams* to have one more deciding *Match*, or both *Teams* may be declared the winner.

<RSC4> Skills Rankings Globally. *Teams* are ranked based on their Robot Skills scores globally based on the following tiebreakers.

a.   Highest Robot Skills score (combined Programming and Driving Skills Score from a single event)
b.   Highest *Programming Skills Match* score
c.   Highest *Driving Skills Match* score
d.   Earliest posting of the Highest Programming Skills score, i.e. the first *Team* to post a score ranks ahead of other *Teams* that post the same score at a later time.
e.   Earliest posting of the Highest Driving Skills score, i.e. the first *Team* to post a score ranks ahead of other *Teams* that post the same score at a later time.

<RSC5> Skills Starting Positions. During *Skills Matches*, *Robots* may be placed in any of the eight (8) available *Starting Positions* on the *Field*.

<RSC6> Skills Match Schedule. *Teams* play *Skills Matches* on a first-come, first-served basis. Each *Team* will get the opportunity to play exactly three (3) *Driving Skills Matches* and three (3) *Programming Skills Matches*.

Teams should review the event agenda and their *Match* schedule to determine when the best possible time is to complete their Robot Skills Matches. If the Robot Skills area closes before a *Team* has completed all six (6) Robot Skills Matches, but it is determined that there was adequate time given, then the *Team* will automatically forfeit those unused *Matches*.

<RSC7> Handling Robots during a Programming Skills Match. A *Team* may handle their *Robot* as many times as desired during a *Programming Skills Match*.

a.   Upon handling the *Robot*, it must be immediately brought back to any legal *Starting Position*.
  i.   *Drivers* may reset or adjust the *Robot* as desired from this position, including pressing buttons on the Robot Brain or activating sensors.
b.   Any *Ball* being controlled by the *Robot* while being handled must be removed from the *Field*. Controlled requires that the *Robot* was manipulating the *Ball* and not simply touching it, e.g. if the *Ball* moves with the *Robot* either vertically or while turning, the *Robot* is controlling the *Ball*.
c.   Any *Ball* contacting the chosen *Starting Position* (as to where the *Robot* is placed) must be removed from the *Field* for the remainder of the *Match*.
d.   During a *Programming Skills Match*, *Drivers* may move freely around the *Field*, and are not restricted to the *Driver Station* when not handling their Robot.
  i.   The rest of <G8>, which states that *Drivers* are not allowed to use any communication devices during their Match, still applies.
  ii.   An intent of this exception is to permit *Drivers* who wish to "stage" *Robot* handling during a *Programming Skills Match* to do so without excessive running back and forth to the *Driver Station*.

Note: This rule only applies to *Programming Skills Matches*. *Driving Skills Matches* are still governed by <G18>, especially for strategic violations.

<RSC8> Starting a Programming Skills Match. *Drivers* must start a *Robot's Programming Skills Match* routine by pressing a button on the Robot Brain or manually activating a sensor. Because there is no VEX IQ Controller hand-off, only one (1) *Driver* is required for *Programming Skills Match* (though *Teams* may still have two (2) if desired). <G7> still applies to any *Driver* participating in the *Match*.

a. Pre-match sensor calibration is considered part of the standard pre-match setup time, i.e. the time when *Team* would typically be turning on the *Robot*, moving any mechanisms to their desired legal start position, etc.
b. Pressing a button on the VEX IQ Controller to begin the routine is not permitted. To avoid any confusion, *Teams* are advised not to bring controllers to *Programming Skills Matches*.

> In accordance with <G6>, *Teams* should be mindful of event schedules and set their *Robot* up as promptly as possible. The definition of "prompt" is at the discretion of the *Event Partner* and *Head Referee*, and could depend on things like how much time is left for the Skills Challenge field(s) to be open, how many *Teams* are waiting in line, etc. As a general guideline, three seconds to calibrate a Gyro Sensor would be acceptable, but three minutes to debug a program would not.

Robot Skills Challenge Format Options

To better accommodate varying health & safety circumstances in different regions, the 2020-2021 season will feature different avenues for *Event Partners* to host Robot Skills Challenge competitions. Regardless of the format chosen for a given event, all rules, scoring, and rankings listed in this Appendix apply. However, some formats will have additional rules in place to ensure fair and consistent gameplay.

Robot Skills Challenge at a Standard Qualifying Tournament

• The Robot Skills Challenge is an optional event. *Teams* who do not compete will not be penalized in the main tournament.

• *Teams* may play Robot Skills Matches on a "first come, first serve" basis, or by a pre-scheduled method determined by the *Event Partner*.

• *Teams* will be given the opportunity to play exactly three (3) *Programming Skills Matches* and three (3) *Driving Skills Matches*. *Teams* should be aware of when the Robot Skills fields are open so that they do not miss their opportunity, e.g. if a *Team* waits until five minutes before the Robot Skills fields close, then they have not used the opportunity given to them and will not be able to compete in all six matches.

Skills-Only Event: In-Person, Live

• *Teams* may play Robot Skills Matches on a "first come, first serve" basis, or by a pre-scheduled method determined by the *Event Partner*.

• Further details regarding Skills-Only Event logistics can be found in the REC Foundation Qualification Criteria document.

Live Remote Tournament Overview

Traditional VEX IQ Challenge events are held "in-person" in a classroom, school gymnasium, or community center. In the 2021-2022 season, *Event Partners* can also choose to hold an event entirely remotely, utilizing the RobotEvents.com Live Remote Tournament interface. More information about this interface can be found here: https://www.roboticseducation.org/about-live-remote-tournaments/

In a Live Remote tournament, the VIQC Pitching In Teamwork Challenge is played by an *Alliance* composed of two *Teams* operating under driver control. Each *Team* competes on a separate field (i.e. there are two *Robots*, two *Teams*, and two fields in each *Match*).

An *Alliance's* score at the end of a *Match* is calculated by combining the fields of each *Team*. The object of the game is to attain the highest score by Scoring *Balls* in Goals, Clearing *Starting Corrals* and by *Hanging* at the end of the *Match*.

Unless otherwise noted below, all rules and scoring found in the standard Game Manual apply to Live Remote Matches.

Live Remote Tournament Rules

<LRT1> The following rules from the Game Manual also apply to Live Remote Tournament events:

- <G17> - *Match* replays are at the discretion of the *Head Referee*.
- <R3> - *Teams* will complete a full *Robot* inspection in accordance with <R3>.
- <T15> - An *Adult Team* contact must be present in all *Matches*.

<LRT2> All *Team* camera footage must be streamed live, from one camera feed, with no "cuts". A *Team's* camera must be placed on the "audience side" of the field, i.e. with the *Drivers* facing the camera.

<LRT3> *Matches* must include some live interaction between the *Team* and the *Head Referee*.

<LRT4> This rule is an extension of rule <G9>. During a *Live Remote Match*, *Drivers* must stand in the *Driver Station*.

a. During a *Match*, the *Drivers* in the *Driver Station* are the only *Team* members permitted to influence the operation of their *Robot*, either directly or indirectly. The intent of this rule is to prohibit "sideline coaching" from other *Team* Members who are in close proximity to the *Drivers*.
   i. Although an *Adult Team* contact is required to be present, <G2> still applies during the *Match*. *Adult Team* Members are explicitly prohibited from providing "sideline coaching" once the *Match* begins.
b. *Drivers* are permitted to utilize devices with communication features enabled while in the *Driver Station*. The intent of this rule is to allow *Drivers* to monitor the Live Remote video feeds of their *Alliance* partners. Using a device with communication features enabled to receive "sideline coaching" from another *Team* Member would still be a violation of this rule.
c. Communication with an *Alliance* partner's *Drivers* is not considered a violation of this rule.

Note: If *Drivers* are unable to stand in the *Driver Station* due to external circumstances in their remote environment, such as a wall, then they should inform the *Head Referee* of this constraint prior to the *Match* and / or during the field inspection. Exceptions to that portion of this rule may be granted at the *Head Referee's* discretion. *Head Referee* are advised to give *Teams* the "benefit of the doubt" in this situation.

<LRT5> In a *Live Remote Match*, each field is set up with twenty-two (22) *Balls*, as shown below in figure 22.

Note: The *Balls* on the "right" side of the *Field*, as depicted in Figure 22 or when viewed from the "audience side", are considered in their *Starting Corral*. There is only one *Starting Corral* in a *Live Remote Match*.
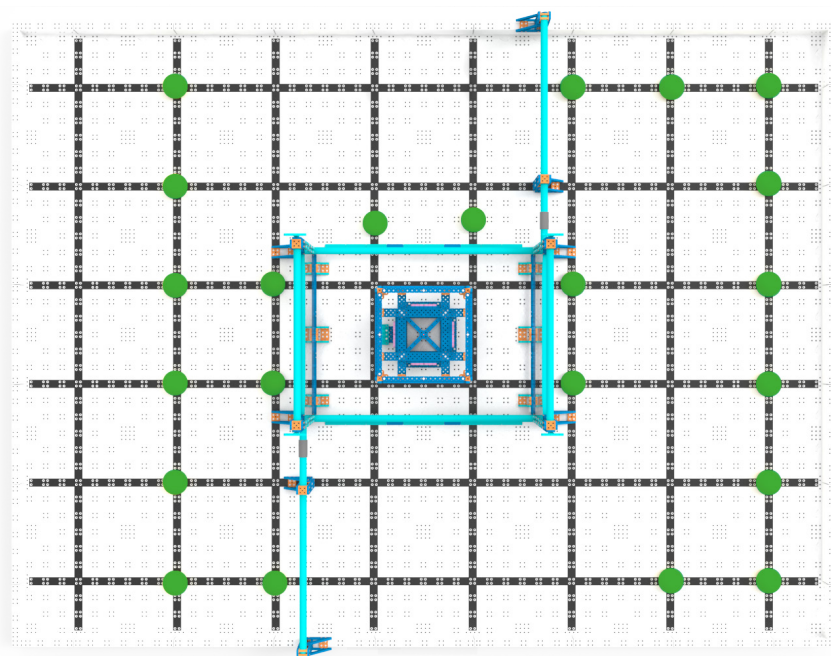

*Figure 22: A Field in its starting configuration for a **Live Remote Match.Ball** positions have been highlighted.*

<LRT6> Robots must begin *Live Remote Matches*, in one of the highlighted *Starting Positions* depicted below. In addition, only one *Robot* from the *Alliance* may start on a given side of the field, as shown in Figure 23; i.e. one *Robot* must start on the "audience side", and one *Robot* must start on the "*Driver Station* side".
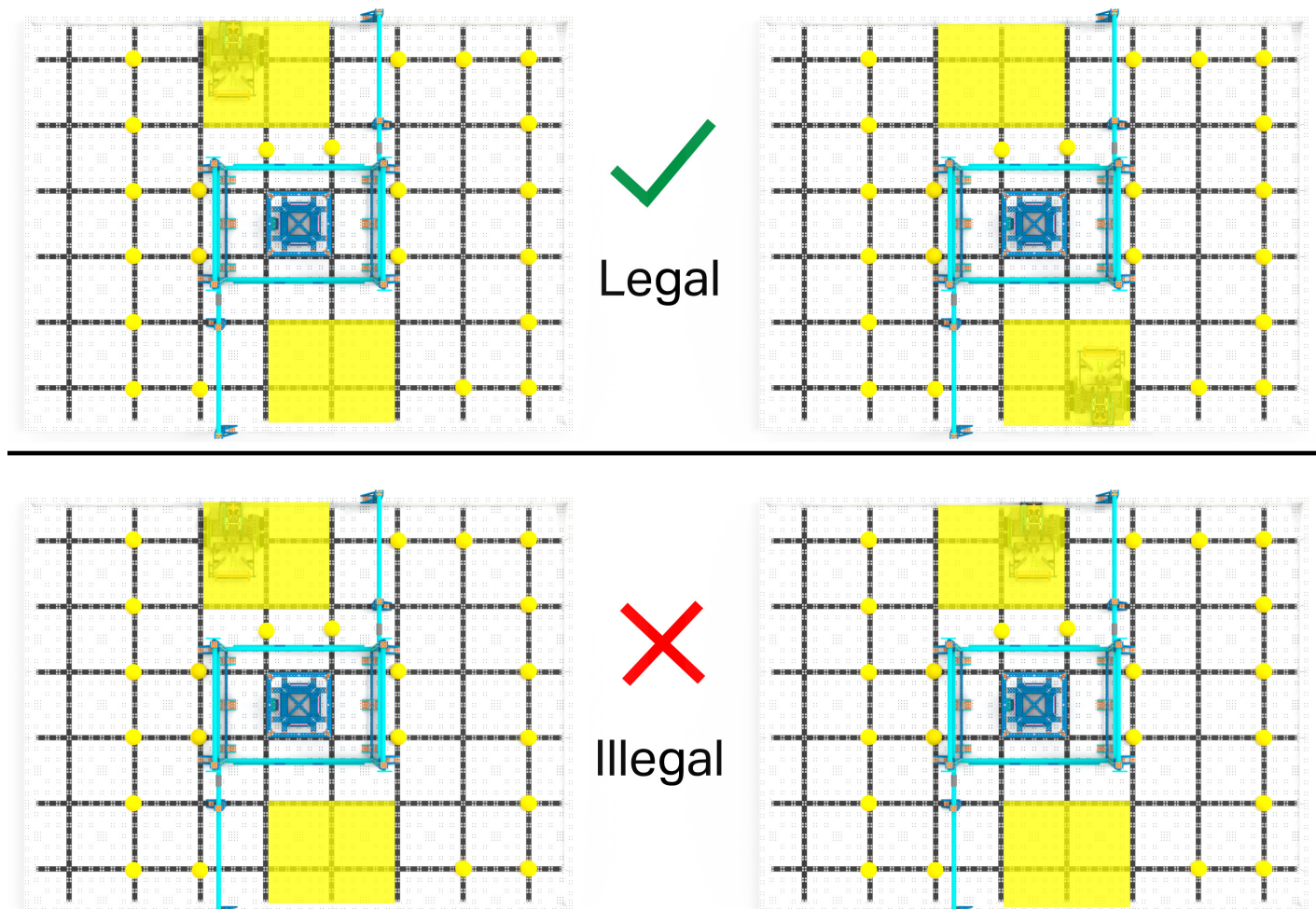
Figure 23: Examples of legal and illegal Robot Starting Positions in a Live Remote Match.

VIQC World Live Remote Tournament Ranking

Teams will be ranked globally from qualifying Live Remote Tournament results at <u>robotevents.com</u> according to the following process:

- A *Team's* ranking at an individual LRT event would be the sum of:
  - ○ Average score of their *Qualification Matches*.
    - The average would not include matches dropped per <T9>.
  - ○ Points based on the *Team's* rank after the completion of all *Finals Matches*, including tiebreakers per <T13>:
    - 1st Place - 20 points
    - 2nd Place - 10 points
    - 3rd Place - 5 points

- A *Team's* World LRT Ranking would be an average of their (2) top highest LRT event rankings. If a *Team* has only participated in (1) LRT event, their LRT Ranking will still be averaged over (2) events.

- If *Teams* are tied in the World LRT Rankings, then the *Team* that posted their highest LRT event score first would be ranked higher. If there is still a tie, the ranking will be randomly assigned.