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VEX V5 ROBOTICS COMPETITION

PUSH BACK

2025 - 2026
Game Manual
Version 2.2

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Changelog

Version 2.2 - December 4, 2025

- Added *Offensive*, *Defensive* and *Goalkeeping* as new defined terms
- Updated Figures V-1 and V-3 to clarify intent
- Updated the red box of <SC3> for clarity
- Expanded the red box of <G4> to clarify rule enforcement
- Added a new bullet to <GG1> to clarify that anyone who is not a *Drive Team Member* cannot coach or affect the *Match,* and to specify that Drivers can only operate their own *Team's Robot*
- Updated <GG9> to clarify intent
- Added a red box to <GG15> to address judgement calls to decide who is "more" *Defensive*
- Revised <SG7> for clarity and intent
- Revised <SG9> to provide clarity regarding Loading multiple *Blocks* at one time
- Added a new figure to <SG10> to show "inside the *Goal*"
- Updated <SG10> and added a new *Violation* note to use the new "*Goalkeeping*" term
- Updated <R3> and added a bullet point for clarity and intent
- Added a new bullet to <R8> to limit the use of V5 Robot Brain accessories
- Updated <R19> to prohibit speakers and other devices that create sound
- Expanded <R20i> to reflect that zip tie measurements are nominal
- Revised <R25d> to include all legal plastics
- Added a new bullet to <R28> to prohibit modification of V5 Robot Brain accessories
- Revised <RSC2bii> to include edge cases
- Updated <VUR2> and added a red box to address the end of the VEXpro product line
- Added significant Q&A boxes throughout the manual
- Minor typo / formatting fixes

Version 2.1 - October 9, 2025

- Updated the definition of *Team* to provide clarity
- Updated the definition of *Major Violation* to clarify that *Minor Violations* carry over into *Elimination Matches*, unless otherwise specified
- Added *CoC-related Violation* as a defined term
- Added additional flowcharts under the definition of *Violation* to provide guidance
- Added a new bullet to <SC1> to reflect that the *Match* score should not be changed based on *Violations* during the *Match*
- Revised <SC5d> for clarity
- Added a bullet to <G1>, stating that event attendees are not allowed to record audio or video of *Teams'* discussions with *Head Referees* or other event staff/volunteers
- Split <G4> into two rules and rewrote it, to clarify intent
- Added rule <G5>
- Updated <GG2a> to clarify that *Teams* that participate in zero *Qualification Matches* cannot be considered for judged awards
- Added two bullets to <GG7> to clarify intent
- Added a new paragraph and *Violation* notes to <GG9> to address reaching inside a *Goal*, and anchoring
- Updated the *Violation* note in <GG16> to clarify intent
- Revised <GG17> to clarify that a *Holding* count should begin immediately once the *Head Referee* observes a suspected *Holding* interaction
- Added <SG4a> to provide guidance on handling *Blocks* that should have left the *Field*, but were deflected back into it

- Revised <SG9> and added a *Violation* note to specify that *Match Loads* must be introduced one at a time
- Added a new paragraph to <SG10> to clarify when "reaching inside a *Goal*" becomes anchoring.
- Updated <SG11> to include *Match Affecting Violations*
- Updated <RSC2b> to specify the number of *Blocks* for a filled *Control Zone*
- Clarified that that standard gameplay *Violations* that occur in *Practice Matches* should not be tracked
- Updated <T5> to clarify intent and add a tolerance for the *Control Zone* tape lines
- Added "anchoring the metal plates to the underlying surface with tape or hardware" as a permissible field modification in <T6>
- Updated <T7> to clarify that all Robot Skills Challenge *Fields* must be consistent with each other
- Revised <T20a> for clarity
- Added significant Q&A boxes throughout the manual
- Minor typo / formatting fixes

Version 2.0 - September 4, 2025

- Updated the definition of *Loader* to provide clarity
- Updated the definition of *Park Zone* to include the portion of the *Floor* Tiles bordered by the *Field Perimeter* and the plastic extrusions
- Revised <SC2a> to clarify inside surfaces, and updated Figure SC2-2 to show an applicable example
- Updated the *Autonomous Win Point* criteria for Worlds-qualifying events and revised the red box in <SC6>
- Revised <GG1> to clarify that only three *Drive Team Members* can attend a *Match*
- Revised <GG2> to clarify that the *Robot* must remain at the *Field* for the entire duration of the *Match*
- Revised <GG3> to address Smart Field Control connections and errors
- Revised <GG4> and added a red box to remove penalties for reaching over the *Field* in ways that are safe and don't impact the *Match*
- Updated <GG17> to reduce *Holding* to a 3-Count, and standardize when *Head Referees* should begin and end *Holding* counts
- Updated <SG4> to remove "intentionally or strategically", to remove the need for referee judgement calls
- Revised <SG9>, and added *Violation* notes and a new figure to clarify when a *Block* can be added to a *Loader* during a *Match*
- Updated <SG11> to protect any *Robot* that is at least partially within the vertical projection of its *Alliance*-colored *Park Zone*
- Revised <R3> to add a red box that addresses inspection markers
- Updated <R9> to clarify intent
- Added a bullet to <RSC1> to clarify that removing *Blocks* from the *Field* in *Robot Skills Matches* is not a violation
- Updated <RSC2> to require *Robots* to move to receive points for a *Parked Robot* in *Robot Skills Matches*
- Updated <RSC3> to clarify intent
- Updated <VUG2> to clarify intent
- Updated <VUR1> to allow unmodified legal *Raw Stock*
- Added "Sphere" as a legal form of *Raw Stock* in <VUR4>
- Updated <VAIT2b> to clarify intent
- Added significant Q&A boxes throughout the manual
- Minor typo / formatting fixes

Version 1.1 - August 7, 2025

- Revised the *Violation* note in <SG4> to include strategic and intentional removal of *Blocks* from the Field
- Updated <SG7e> to clarify intent
- Updated <SG8b> to clarify that incidental *Violations* of <SG7> will not be penalized
- Revised <*SG9*> to clarify that *Drive Team Members* are allowed to use both hands when introducing *Blocks* into a *Loader*
- Updated <SG9d> to note that *Blocks* bouncing out through the bottom opening of a *Loader* after being properly introduced should not be considered a *Violation*
- Added a new bullet to <SG9> to state that *Blocks* can only be added to a *Loader* containing 5 or fewer *Blocks*
- Updated <VUR4> to include tapped/threaded-hexagonal stock
- Added Section 7, VEX AI Robotics Competition
- Added a new drawing for *Control Zone* tape specifications to Appendix A
- Added significant Q&A boxes throughout the manual
- Minor typo / formatting fixes

Version 1.0 - June 26, 2025

- Revised the definition of *Major Violation* to differentiate between intentional actions and intentional *Violations*
- Updated <SG7eii> to include all *Blocks* on the other side of the *Autonomous Line*
- Revised <R5> to give *Event Partners* more freedom in measuring *Robot* starting sizes
- Added a new subclause to <RSC2a> to clarify that *Blocks* contacting a *Robot* at the end of a *Robot Skills Match* should not be considered as *Scored*
- Added a bullet to <RSC3> to clarify that *Robot Skills Matches* do not include *Match Load Blocks*
- Updated <T1e> to clarify that *Head Referees* must follow the rules in the game manual
- Updated <VUR4> to include hexagonal and rounded stock
- Updated <VUR12d> to allow *Sensors* to be powered by *External Processors*
- Removed through-bore encoder housings from <VUR13b>
- Added significant Q&A boxes throughout the manual
- Minor typo / formatting fixes

Version 0.2 - June 5, 2025

- Added a link to the obsoleted game manual version in the “Updates” section, to use as a reference during update grace periods
- Clarified that the most current version of the English language PDF of the manual (this document) takes precedence over any other supplemental or translated material
- Updated the definition of *Lifting* to clarify intent
- Updated the definition of *Control Zone* to clarify boundaries
- Revised <SC2> to clarify that *Blocks* must be in contact with the inside surface(s) of the plastic trough to be considered as *Scored*
- Updated <GG1a> to clarify that devices are allowed in the *Alliance Station*, but communication features may not be used for any reason during a *Match*. Using devices for translation purposes post-*Match* is allowed
- Updated <GG13> to clarify that an *Alliance* will be ineligible to receive an *Autonomous Win Point* if they commit a *Violation* during the *Autonomous Period*
- Updated <SG2> and <SG3> to clarify vertical and horizontal expansion limits

- Revised <SG7> and added a new figure to clarify intent regarding *Blocks* starting on the *Autonomous Line*
- Added a bullet to <SG9> to clarify that *Blocks* that bounce out of a *Loader* while being Loaded into the *Field* should not be considered a *Violation*
- Updated <SG10> to clarify intent
- Revised wording of <R6ai> and <R6b> to clarify intent
- Added VEX Smart Field Controller Brains to the list of prohibited items in <R19>
- Updated <R20i> to include metric equivalents
- Added a bullet to <RSC2b> to clarify intent
- Updated the list of acceptable *Field* modifications to <T6>, and added them to the end of Appendix A
- Revised <VUG3> to clarify that Match Load *Blocks* may be entered into the *Field* during the *Driver Controlled Period*
- Minor typo / formatting fixes

Version 0.1 - May 11, 2025

- Initial Release

Quick Reference Guide

Scoring Rules	
<SC1>	All Scoring statuses are evaluated after the *Match* ends
<SC2>	*Scored Block* criteria
<SC3>	*Controlled* criteria
<SC4>	*Parked Robot* criteria
<SC5>	Scoring of the *Autonomous Bonus* is immediately after the *Autonomous Period* ends
<SC6>	*Autonomous Win Point*

Safety Rules	
<S1>	Be safe out there
<S2>	*Students* must be accompanied by an *Adult*
<S3>	Stay inside the *Field*
<S4>	Wear safety glasses
<S5>	Each *Student Team* member must have a completed participant release form on file

General Rules	
<G1>	Treat everyone with respect
<G2>	V5RC is a *Student*-centered program
<G3>	Use common sense
<G4>	All work must represent the skill level of the *Students* on the *Team*.
<G5>	Each *Student* can only belong to one *Team*.

General Game Rules	
<GG1>	Only *Drive Team Members*, and only in the *Alliance Station*
<GG2>	A *Team's Robot* should attend every *Match*
<GG3>	*Robots* on the *Field* must be ready to play
<GG4>	Hands out of the *Field*
<GG5>	*Match* replays are allowed, but rare
<GG6>	*Disqualifications*
<GG7>	*Time Outs*
<GG8>	Keep your *Robot* together
<GG9>	Don't hook your *Robot* to the *Field*, and don't get *Entangled*
<GG10>	The red *Alliance* places last
<GG11>	Controllers must stay connected to the *Field*
<GG12>	Autonomous means "no humans"
<GG13>	All rules still apply in the *Autonomous Period*
<GG14>	Don't destroy other *Robots*
<GG15>	*Offensive Robots* get the "benefit of the doubt" when judgment calls are required
<GG16>	You can't force an opponent into a penalty
<GG17>	No *Holding* for more than a 3-count
<GG18>	Use *Blocks* to play the game

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Specific Game Rules	
<SG1>	Starting a *Match*
<SG2>	Horizontal expansion is limited
<SG3>	Vertical expansion is limited
<SG4>	Keep *Blocks* in the *Field*
<SG5>	Each *Robot* gets one *Block* as a Preload
<SG6>	A *Robot* may carry, push, or plow an unlimited number of *Blocks*
<SG7>	Don't cross the *Autonomous Line*, and don't interfere with your opponents' actions
<SG8>	Engage with the *Autonomous Line* at your own risk
<SG9>	*Match Loads* may be introduced during the *Match* under certain conditions
<SG10>	Don't reach inside enclosed sections of *Goals*, and no *Goalkeeping*
<SG11>	*Park Zones* are protected during the endgame

Robot Rules	
<R1>	One *Robot* per *Team*
<R2>	*Robots* must represent the *Team's* skill level
<R3>	*Robots* must pass inspection
<R4>	There is a difference between accidentally and willfully violating a *Robot* rule
<R5>	*Robots* must fit within an 18" x 18" x 18" volume
<R6>	Officially registered *Team* numbers must be displayed on *Robot* license plates
<R7>	Let go of *Blocks* after the *Match*
<R8>	*Robots* have one Brain
<R9>	Keep the power button accessible
<R10>	Firmware
<R11>	Use a "Competition Template" for programming
<R12>	Motors are limited
<R13>	Electrical power comes from VEX batteries only
<R14>	*Robots* use VEXnet
<R15>	Give the radio some space
<R16>	One or two Controllers per *Robot*
<R17>	*Robots* are built from the VEX V5 system
<R18>	New VEX parts are legal
<R19>	Prohibited Items
<R20>	Certain non-VEX components are allowed
<R21>	Custom V5 Smart Cables are allowed
<R22>	A limited amount of tape is allowed
<R23>	Certain non-VEX fasteners are allowed
<R24>	Visual decorations are allowed
<R25>	A limited amount of custom plastic is allowed
<R26>	Pneumatics are limited
<R27>	Most modifications to non-electrical components are allowed
<R28>	No modifications to electronic or pneumatic components are allowed

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Robot Skills Challenge Rules	
<RSC1>	Standard rules apply in most cases
<RSC2>	Scoring *Robot Skills Matches*
<RSC3>	*Robot* and *Field* setup for *Robot Skills Matches*
<RSC4>	*Skills Stop Time*

Tournament Rules	
<T1>	*Head Referees* have final authority on all gameplay and *Robot* ruling decisions
<T2>	*Head Referees* must be qualified
<T3>	*Drive Team Members* are permitted to immediately appeal a *Head Referee's* ruling
<T4>	The *Event Partner* has ultimate authority regarding all non-gameplay decisions
<T5>	Be prepared for minor *Field* variance
<T6>	*Fields* may be repaired at the *Event Partner's* discretion
<T7>	*Fields* at an event must be consistent with each other
<T8>	There are three types of field control that may be used
<T9>	There are two types of *Field Perimeter* that may be used
<T10>	*Qualification Matches* follow the *Match Schedule*
<T11>	Each *Team* will have at least six *Qualification Matches*
<T12>	*Qualification Matches* contribute to a *Team's* ranking for *Alliance Selection*
<T13>	*Qualification Match* tiebreakers
<T14>	Small tournaments have fewer *Alliances*
<T15>	Send a *Student* representative to *Alliance Selection*
<T16>	Each *Team* may only be invited once to join one *Alliance*
<T17>	*Elimination Matches* follow the *Elimination Bracket*
<T18>	*Elimination Matches* are a blend of "Best of 1" and "Best of 3"
<T19>	Ties in *Elimination Matches* lead to limited rematches
<T20>	Skills *Match Schedule*
<T21>	Skills Challenge *Fields* do not require the same modifications as the Head-to-Head *Fields*
<T22>	Skills rankings at events
<T23>	Skills rankings globally
<T24>	Robot Skills at league events

VEX U Robotics Competition Game Rules	
<VUG1>	Different *Robot* placement than rule <GG10>
<VUG2>	Different expansion
<VUG3>	Different availability of *Loaders*
<VUG4>	Different *Autonomous Win Point* criteria
<VUG5>	Don't cross the *Autonomous Line*, and don't interfere with your opponents' actions
<VUG6>	Engage with the *Autonomous Line* and *Neutral Zone* at your own risk
<VUG7>	Some electronic devices may be in motion or moving at the beginning of the *Match*.

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VEX U Robotics Competition Robot Rules	
<VUR1>	*Teams* may use two (2) *Robots*
<VUR2>	*Teams* may use any official VEX Robotics products, other than the listed exceptions
<VUR3>	*Fabricated Parts*
<VUR4>	*Raw Stock*
<VUR5>	The following material types are not considered *Raw Stock*
<VUR6>	*Fabricated Parts* may not be made from *Raw Stock* which poses a safety or damage risk
<VUR7>	*Fabricated Parts* must be made by *Team* members
<VUR8>	Springs
<VUR9>	Fasteners
<VUR10>	One (1) V5 Robot Brain and up to two (2) V5 Robot Radios
<VUR11>	No motor restrictions
<VUR12>	No *Sensor* and other *Additional Electronics* restrictions
<VUR13>	Commercially available *Electromechanical Assemblies* are not legal
<VUR14>	Unlimited amount of the following commercially available pneumatic components
<VUR15>	*Teams* may use commercially available bearings on their *Robot*

VEX U Robotics Competition Tournament Rules	
<VUT1>	VURC *Matches* are played 1-*Team* vs. 1-*Team*
<VUT2>	*Qualification Matches* are conducted in a revised 1v1 format
<VUT3>	*Elimination Matches* will be conducted without an *Alliance Selection*
<VUT4>	The *Autonomous Period* at the beginning of each Head-to-Head *Match* will be 30 seconds
<VUT5>	The *Driver Controlled Period* is shortened to 90 seconds
<VUT6>	*VEX U Student* eligibility
<VUT7>	VURC tournaments have fewer *Teams* in Eliminations

VEX U Robotics Competition Robot Skills Rules	
<VURS1>	VURC *Robot Skills Matches* use the same *Field* layout as VURC Head-to-Head *Matches*
<VURS2>	Both *Robots* must start the *Robot Skills Match* in starting positions for the red *Alliance*
<VURS3>	*Teams* are permitted to use both *Robots* in VEX U *Robot Skills Matches*

VEX AI Rule Modifications: Scoring	
<VAISC1>	*Control Bonus* criteria
<VAISC2>	*Parked Robot* criteria
<VAISC3>	*Isolation Bonus* scoring
<VAISC4>	*Isolation Win Point* criteria

VEX AI Rule Modifications: Game	
<VAIG1>	Standard game rules apply
<VAIG2>	Autonomous means “no humans.”
<VAIG3>	*Teams* are responsible for the actions of their *Robots*
<VAIG4>	Different expansion
<VAIG5>	Different availability of *Loaders*

VEX AI Rule Modifications: Robot Skills Challenge	
<VAIRS1>	Standard rules from V5RC and VURC apply
<VAIRS2>	Rule <VURS3> applies as written
<VAIRS3>	VAIRC *Robot Skills Matches* use the same tape lines as V5RC, with a different *Field* layout
<VAIRS4>	VAIRC *Robot Skills Match* starting positions
<VAIRS5>	*Blocks* can be added to *Loaders* by *Robots*, not by *Drive Team Members*
<VAIRS6>	*Blocks* that leave the *Field* cannot be reintroduced
<VAIRS7>	VAIRC *Robot Skills Match* scoring

VEX AI Rule Modifications: Tournament	
<VAIT1>	The following VURC rules apply as written
<VAIT2>	VEX AI Robotics Competition *Team* makeup
<VAIT3>	*Students* may only participate on one VAIRC *Team*

VEX AI Rule Modifications: Robot	
<VAIRM1>	Most VEX U *Robot* rules apply as written
<VAIRM2>	Any components used for AI vision processing are considered *Additional Electronics*
<VAIRM3>	VAIRC *Teams* may also participate in V5RC or VURC

VEX V5 ROBOTICS COMPETITION

PUSH BACK

Section 1
Introduction

Section 1 - Introduction

Overview

This section provides an introduction to the VEX V5 Robotics Competition (V5RC) and V5RC Push Back.

The VEX V5 Robotics Competition

The world around us is constantly changing, and so are the ways we learn. Traditional classroom methods don't always capture the hands-on problem solving and collaboration that are essential in STEM fields. Competitive robotics provides an alternative approach—one that engages students in real-world applications of engineering, coding, and design. Instead of just reading about these concepts, you get to experience them firsthand as you test ideas, refine solutions, and work as part of a team to overcome challenges. By combining creativity with technical skills, the VEX V5 Robotics Competition helps make STEM learning more dynamic, practical, and inspiring.

Competitive robotics isn't just about building a robot—it's about learning to approach challenges with confidence, resilience, and teamwork. The same problem-solving mindset that helps you design and refine a VEX robot is the foundation for tackling real-world engineering problems, scientific breakthroughs, and technological innovations. Push Back is more than just a game—it's an opportunity to develop skills that will shape the problem solvers and innovators of tomorrow.

Working together with other people—whether it be your own teammates or someone from another organization—can be challenging, but it's just as much a part of the VEX V5 Robotics Competition as building a robot.

Within this manual, you'll find the rules that define Push Back. These rules are designed to create a competitive yet fair environment that rewards creativity, strategy, and collaboration. Just like in the real world, constraints exist to challenge you—not to limit your potential, but to inspire innovative solutions.

As you embark on this season, remember that every challenge is an opportunity to grow. Whether you're fine-tuning your design, refining your strategy, or working through unexpected setbacks, the lessons you learn here will stay with you far beyond the competition field.

Good luck, and we look forward to seeing your creativity and innovation in action!

Sincerely,

The VEX Robotics Game Design Committee, composed of members from VEX Robotics, the Robotics Education & Competition Foundation, and DWAB Technology

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V5RC Push Back: A Primer

VEX V5 Robotics Competition Push Back is played on a 12'x12' square *Field*, set up as illustrated in the figures throughout.

In Head-to-Head *Matches*, two (2) *Alliances*—one (1) "red" and one (1) "blue"—composed of two (2) *Teams* each, compete in *Matches* consisting of a fifteen (15) second *Autonomous Period* followed by a one minute and forty-five second (1:45) *Driver Controlled Period*.

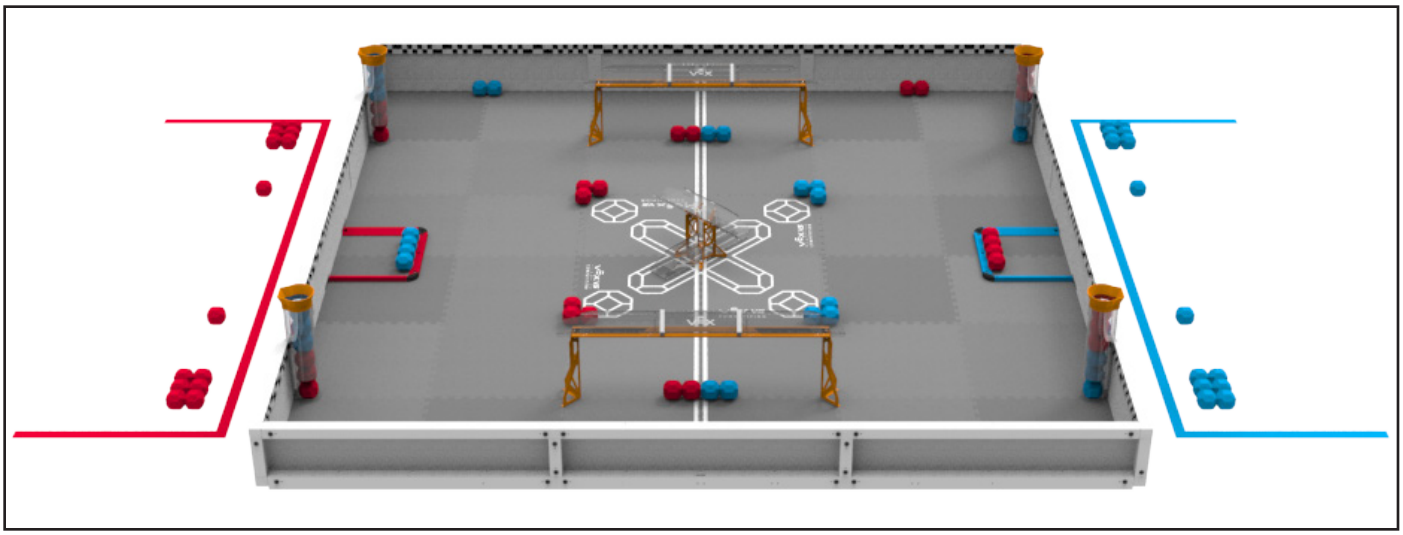
The object of the game is to attain a higher score than the opposing *Alliance* by Scoring *Blocks* in *Goals*, *Controlling* zones within *Goals*, clearing *Loaders*, and *Parking* in defined zones at the end of the *Match*.

An *Autonomous Win Point* is awarded to any *Alliance* that completes a set of assigned tasks by the end of the *Autonomous Period*.

An *Autonomous Bonus* is awarded to the *Alliance* that has the most points at the end of the *Autonomous Period*.

Teams may also compete in *Robot Skills Matches*, where one (1) *Robot* tries to score as many points as possible. See Section 4 for more information.

At the VEX U collegiate level, *Teams* play in a modified tournament with a 30-second *Autonomous Period* and additional *Robot* build challenges. See Section 6.



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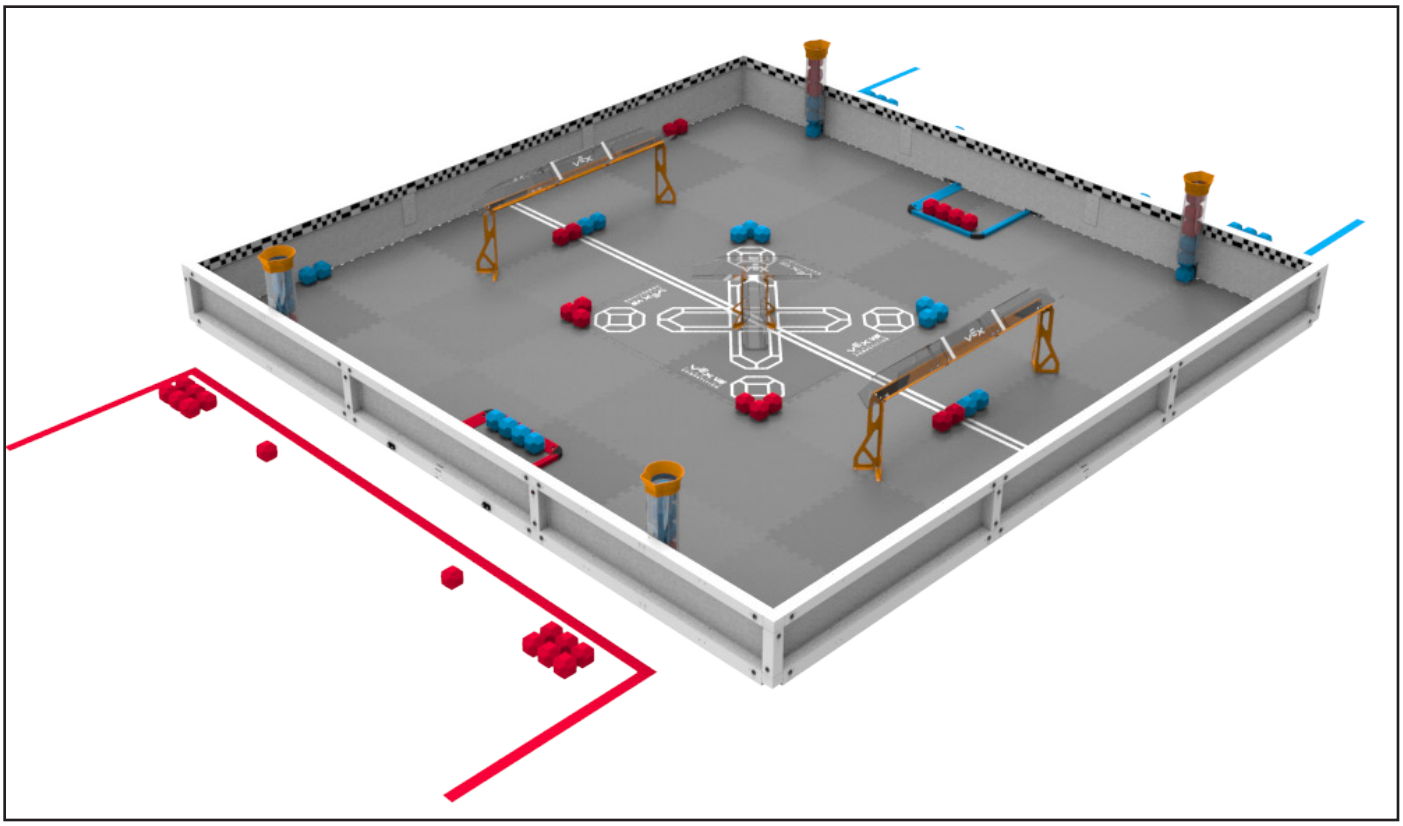
About the Game Manual - A Note from the GDC

This Game Manual contains everything there is to know about this season's game, V5RC Push Back. It is intended to be a resource for all *Teams*, *Head Referees*, *Event Partners*, and other members of the V5RC community.

The rules contained in the following pages can be thought of as "constraints" that define this game, just as engineers begin any design project by defining their constraints. At the beginning of a season, "constraints" are all we have. We don't know what the winning *Robot*, best strategy, or most-frequently violated rule will be any more than you do. Isn't that exciting?

When exploring a new game, please approach this Game Manual with that mentality of looking at rules as constraints. The Game Manual and its appendices—and the official Q&A on RobotEvents.com—contain the full and complete list of constraints that are available for competitors to strategize, design, and build their *Robots*.

Obviously, all *Teams* must adhere to these rules, and any stated intents of these rules. However, beyond that, there is no "right" way to play. There are no hidden restrictions, assumptions, or intended interpretations beyond what is written here. So, it is up to you, the competitor, to find the path through these constraints that best suits your *Team's* goals and ambitions.



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Our Intent - How We Want the Game Played

The *Game Design Committee* (GDC) carefully designs each VEX Robotics Competition game with a clear vision of how we believe it should be played. The GDC envisions Push Back as a fast-paced game driven by constant back-and-forth action, where *Teams* must balance strategies to maintain control of *Goals* around the *Field*. *Teams* are encouraged to actively manipulate both their own and their opponents' game pieces, creating dynamic shifts in scoring opportunities throughout the *Match*. Due to this continuous interaction, *Offensive* strategies should naturally be more effective than purely *Defensive* ones. At all times, there should be an open lane for a *Robot* to score into a *Goal*, ensuring that gameplay remains fluid and engaging. With a large quantity of *Blocks* available in both colors, no *Team* should ever be without access to their own game pieces. This design ensures that *Teams* remain focused on strategic decision-making, adaptability, and active gameplay rather than passive blocking or hoarding.

As the season progresses and *Teams* develop new strategies, certain aspects of gameplay may evolve in ways that were not initially anticipated. To ensure that the game remains fair, competitive, and aligned with its original intent, the GDC has identified key areas that may be subject to clarification or adjustment throughout the season. While updates are not limited to these areas, the GDC believes these are some of the most critical for maintaining the integrity of gameplay:

- **No Possession Limit:** The GDC has intentionally designed this game without a possession limit, as we believe such a restriction would hinder strategic play. However, we are mindful of potential exploitation, such as excessive hoarding of game objects. If it becomes clear that this is negatively impacting gameplay, we will consider implementing a possession limit. If a possession limit is implemented, the limited quantity could also be subject to future updates. Any updates to this quantity should not be more than 3-5 *Blocks* per update.
- **Size of the Control Zone for Long Goals:** The GDC may adjust the size of this zone if it is determined to be disproportionate to the flow of gameplay. Any change to this zone should be limited to no more than one *Block* size per update to ensure gradual, controlled adjustments.
- **Goal Defense:** The GDC intends for *Matches* to remain dynamic and offense-driven. While *Defensive* strategies are a natural part of gameplay, excessive *Goal*-tending or prolonged stalemates are not in the spirit of the game. If *Defensive* play becomes too dominant, the GDC will consider rule adjustments to incentivize more *Offensive* engagement.

Any potential adjustments would be made with the goal of ensuring that the game plays as intended for the duration of the season. While we will try our best to adhere to the self-imposed limits on change per update, we may make larger/broader changes if it is deemed absolutely necessary. Any updates will be communicated through official rule updates.

Updates

This manual will have a series of "major" and "minor" updates over the course of the season. Each version is official and must be used in official V5RC events until the release of the next version, upon which the previous version becomes void.

The latest version of the Game Manual can always be found at https://link.vex.com/docs/25-26/v5rc-pushback-manual.

Known major release dates are as follows:

Release Date	Effective Date	Version #	Details
May 11, 2025	**May 11, 2025**	**Version 0.1**	Initial game release
May 27, 2025	May 27, 2025	N/A	Official Q&A system opens
June 5, 2025	June 12, 2025	Version 0.2	Minor typographical errors or formatting issues found in the initial release. Very few rule changes are expected.
June 26, 2025	**July 3, 2025**	**Version 1.0**	May include gameplay or rule changes inspired by input from the official Q&A system and the VEX community.
August 7, 2025	August 14, 2025	Version 1.1	Clarification / minor update
September 4, 2025	**September 11, 2025**	**Version 2.0**	May include gameplay or rule changes inspired by early-season events.
October 9, 2025	October 16, 2025	Version 2.1	Clarification / minor update
December 4, 2025	December 11, 2025	Version 2.2	Clarification / minor update
January 29, 2026	**February 5, 2026**	**Version 3.0**	May include gameplay or rule changes inspired by mid-season events.
April 2, 2026	**April 9, 2026**	**Version 4.0**	May include gameplay or rule changes pertaining specifically to the VEX Robotics World Championship.

In addition to these known major updates, there may also be unscheduled updates released throughout the season if deemed critical by the GDC.

Any scheduled or unscheduled updates will always be released on a Thursday, no later than 5:00 PM CST (11:00 PM GMT). These updates will be announced via the VEX Forum, automatically pushed to the V5RC Hub app, and shared via VEX Robotics / REC Foundation social media & email marketing channels. Once announced, the new version of the Game Manual will be immediately available at the link above.

Generally, Push Back Game Manual updates, scheduled or unscheduled, will include a **grace period** before the updated rules go into effect for competitions. See the Release Table above for specific dates. This grace period does not apply to the **Version 0.1 Release**, which serves as the initial rule set for the season. Any events that begin **before** the 7-day grace period has ended should **continue using the rules from the previous Game Manual Release**. This policy ensures fairness and consistency, allowing *Teams* to adapt their strategies and gameplay accordingly before the changes are enforced in official competitions.

During the 7-day grace period, the previous manual version will be available at https://link.vex.com/docs/25-26/v5rc-pushback-manual-obsolete. This link will be only be active during the grace period following each manual update, and will be disabled once it ends.

The GDC reserves the right to enforce critical updates to the Game Manual as effective immediately upon release, if we feel that the changes are critical for competitive integrity, safety, and/or other extenuating circumstances.

Multi-week league events (or similar) that cross over a grace period should use the version of the Game Manual that is in effect at the beginning of each league session. Leagues should update to new versions of the Game Manual between sessions as appropriate.

The Q&A System

When first reviewing a new robotics game, it is natural to have questions about situations which may not be immediately clear. Navigating the Game Manual and seeking out answers to these questions is an important part of learning a new game. In many cases, the answer may just be in a different place than you first thought—or, if there is no rule explicitly prohibiting a gameplay strategy, then that usually means it is legal!

However, if a *Team* is still unable to find an answer to their question after closely reviewing the relevant rules, then every *Team* has the opportunity to ask for official rules interpretations and clarifications in the VEX Robotics Question & Answer System. These questions may be posted by a *Team's Adult* representative via the RobotEvents account that is associated with that *Team*.

All responses in this Q&A system should be treated as official rulings from the VEX Robotics *Game Design Committee*, and they represent the correct and official interpretation of the VEX V5 Robotics Competition rules. The Q&A system is the only source besides the Game Manual for official rulings and clarifications, and is functionally an extension of the Game Manual. Unlike Game Manual updates, Q&A rulings are effective immediately upon release.

The VEX V5 Robotics Competition Question & Answer System will open May 27th.

Before posting on the Q&A system, be sure to review the Q&A Usage Guidelines.

1. Read and search the manual before posting.
2. Read and search existing Q&As before posting.
3. Quote the applicable rule from the latest version of the manual in your question.
4. Make a separate post for each question.
5. Use specific and appropriate question titles.
6. Questions will (mostly) be answered in the order they were received.
7. This system is the only source for official rules clarifications.

If there are any conflicts between the English-language PDF of the Game Manual and other supplemental or translated materials (e.g., referee training materials, the V5RC Hub app, the game reveal video, a translated game manual, etc.), the most current version of the English-language PDF of the Game Manual takes precedence.

Similarly, it can never be assumed that definitions, rules, or other materials from previous seasons apply to the current game. Q&A responses from previous seasons are not considered official rulings for the current game. Any relevant clarifications that are needed should always be re-asked in the current season's Q&A.

Additional Policies

The rules and guidelines in these official documents and policies apply to *Teams* and events in the VEX Robotics Competitions alongside the rules in this Game Manual.

- **Code of Conduct** - Outlines the expectations of behavior and ethical standards for all attendees at REC Foundation-sanctioned events.
- **Student-Centered Policy** - Communicates the REC Foundation's goal of maximizing learning opportunities for *Students*, and the mandate that *Students* use designs, code, and game strategies that are consistent with their abilities and knowledge. The related Important Behavior Guidelines for *Team Adults* provides guidelines for *Adults* to promote *Student*-centeredness when interacting with *Teams*.
- **Commitment to Coach Excellence** - Communicates the partnership and expectations between the REC Foundation and Coaches. Must be agreed to during *Team* registration.
- **Commitment to Event Excellence** - Communicates the partnership and expectations between the REC Foundation and *Event Partners*, with the goal of providing *Teams* with quality and uniform competition experiences throughout our programs.
- **Guide to Judging** - Provides policies and procedures for the judging process, and guidelines for *Teams'* engineering notebooks.
- **Organizational Policy** - Provides guidelines for organization and *Team* numbers that are assigned during *Team* registration.
- **Qualifying Criteria** - Provides the criteria that *Teams* and events must meet to qualify for Event Region Championships and the VEX Robotics World Championship.
- **Youth Protection Policy** - Provides information, guidelines, and procedures to create safe environments for participants in our range of programs.

VEX V5 ROBOTICS COMPETITION

PUSH BACK

Section 2
The Game

Section 2 - The Game

Field Overview

The V5RC Push Back *Field* consists of the following:

- 88 *Blocks*
  - 44 blue *Blocks*
    - 2 Preloads
    - 12 *Match Loads*
    - 18 that start the *Match* in predetermined locations on the *Field*
    - 12 that start the *Match* in *Loaders*
  - 44 red *Blocks*
    - 2 Preloads
    - 12 *Match Loads*
    - 18 that start the *Match* in predetermined locations on the *Field*
    - 12 that start the *Match* in *Loaders*
- Four *Loaders*, two adjacent to each *Alliance Station*
- Four *Goals*
  - 2 *Long Goals*
  - 2 *Center Goals*, one Upper and one Lower
- 2 *Park Zones*, one blue and one red

Note: The illustrations in this section of the Game Manual are intended to provide a general visual understanding of the game. ***Some figures may highlight or change the appearance of certain Field and Scoring Elements to emphasize or clarify intent.***

Teams should refer to official Field specifications, found in Appendix A, for exact Field dimensions, a full Field bill of materials, and exact details of Field construction.

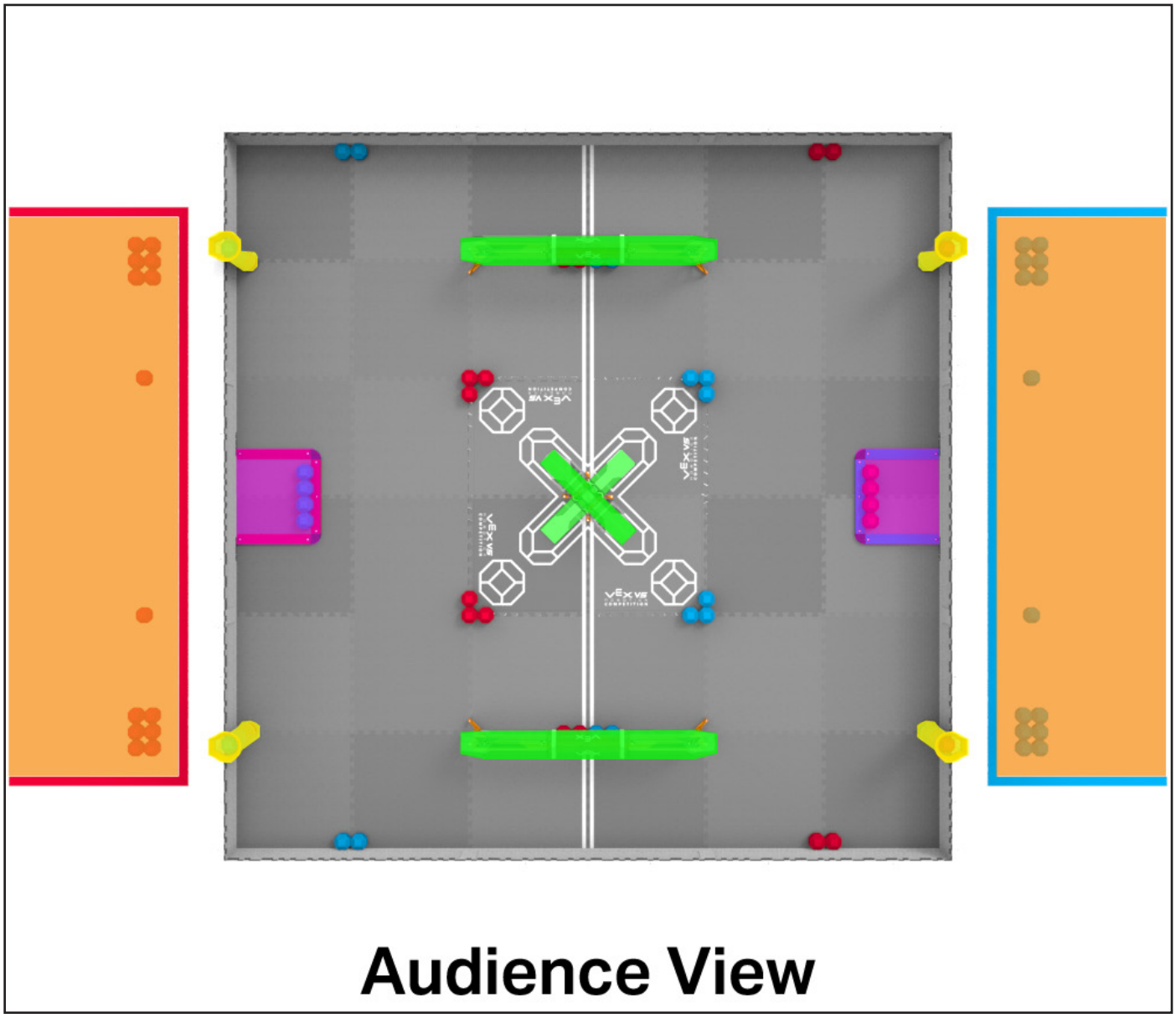


Figure FO-1: *An overhead view of the V5RC Push Back Field, with Alliance Stations (orange), Loaders (yellow), Park Zones (pink), and Goals (green) highlighted.*

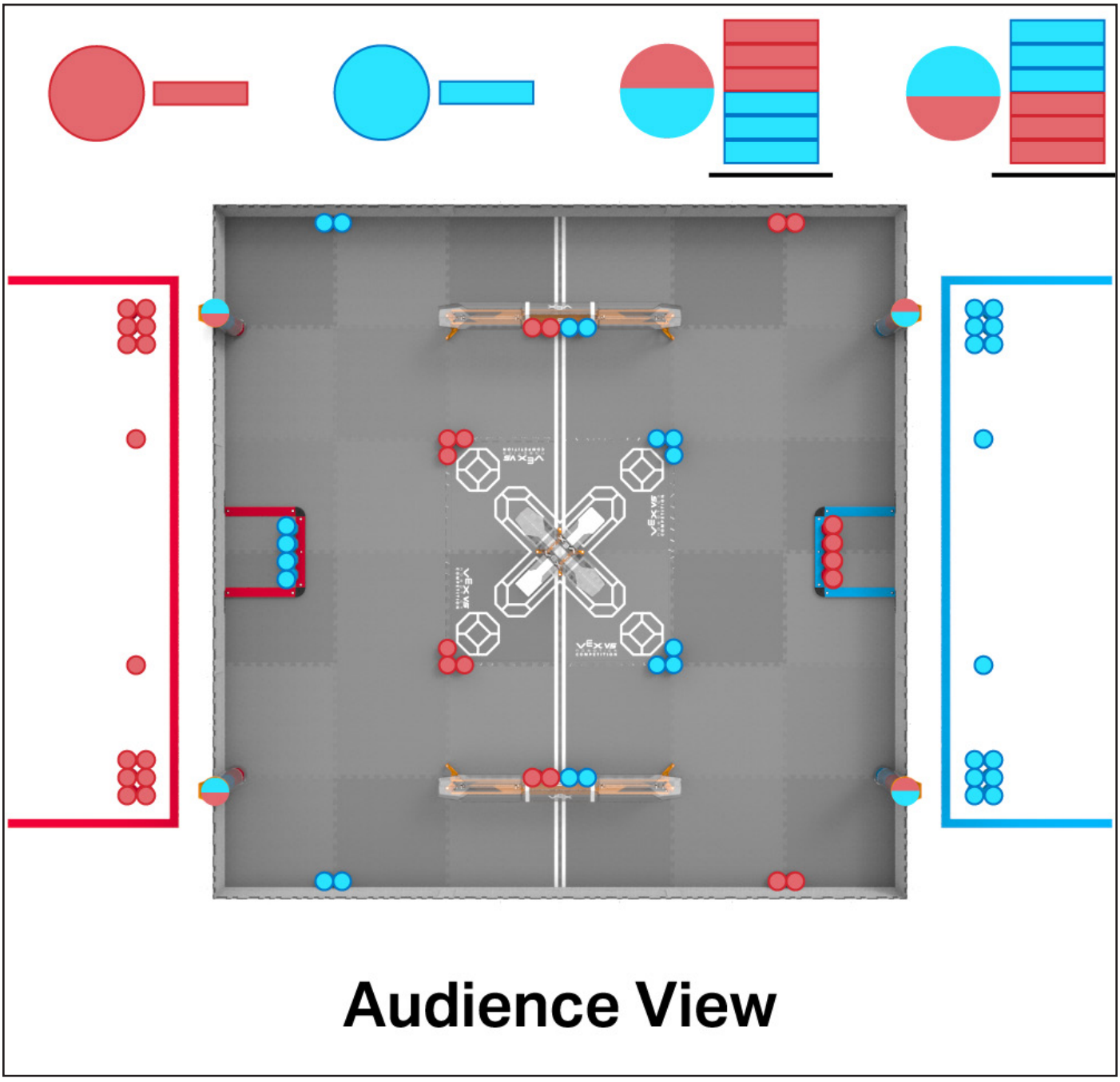


Figure FO-2: *An overhead view of the V5RC Push Back Field in its starting configuration, with highlighted Blocks (Red / Blue).*

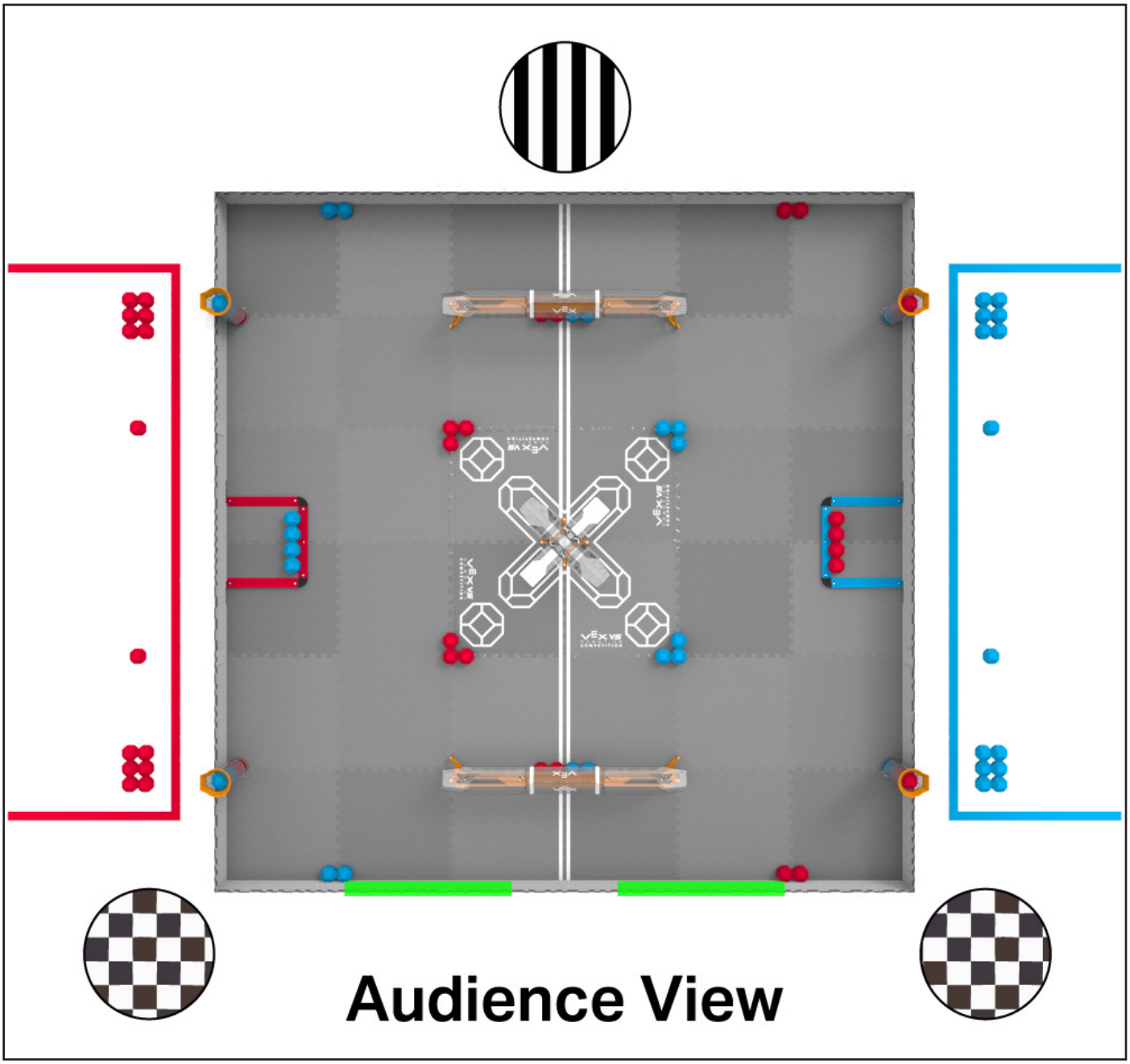


Figure FO-3: *The recommended locations of the Field Monitor (green), Head Referee (black & white stripes), and Scorekeeper Referees (black & white checkerboard).*

General Definitions

Adult - Anyone who is not a *Student* or another defined term (e.g., *Head Referee*).

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

Alliance Station - The designated regions where the *Drive Team Members* must remain for the duration of the *Match*.

Autonomous Bonus - A point bonus awarded to the *Alliance* that has earned the most points at the end of the *Autonomous Period*. See <SC5> for more information.

Autonomous Win Point (AWP) - An additional *Win Point* awarded to any *Alliance* that has completed a defined set of tasks at the end of the *Autonomous Period* of a *Qualification Match*. Both *Alliances* can earn an *Autonomous Win Point* if both *Alliances* accomplish these tasks. See <SC6> for more information.

Defensive - A category of strategies, *Robot* actions, and/or *Robot* statuses that can be employed by a Team during a *Match*; see rules <GG14> and <GG15> for more information. A *Robot* is *Defensive* while it is engaged in actions that cannot increase its *Alliance's* score for the current *Match*, and instead limits an opponent's ability to score or play the game. A *Robot* can be in possession of a scoring object and capable of scoring, but still be *Defensive* based on its actions. Examples include, but are not limited to:

- De-scoring in a way that doesn't increase points for the *Robot's* own *Alliance*
- Limiting access to a portion of the *Field* while not attempting to score
- *Holding*, blocking, impeding, or otherwise restricting or controlling an opponent's movements
- *Goalkeeping*

> Remember, *Defensive Robot* actions or *Robot* statuses are not automatically *Violations*. However, *Robot* actions or statuses that are performed or achieved in a *Defensive* manner are more likely to be *Violations*, and *Teams* should be more careful when employing *Defensive* strategies.

Disablement - A penalty applied to a *Team* for a safety *Violation*. A *Team* that receives a *Disablement* is not allowed to operate their *Robot* for the remainder of the *Match*, and the *Drive Team Member*(s) will be asked to place their controller(s) on the ground or another safe location outside of the *Field*, as directed by the *Head Referee*.

Version 2.2 - Released December 4, 2025

Disqualification - A penalty applied to a *Team* for a *Major Violation*. A *Team* that receives a *Disqualification* in a *Qualification Match* receives zero (0) *Win Points*, (0) *Autonomous Win Points*, (0) *Autonomous Points*, and (0) *Strength of Schedule Points*. When a *Team* receives a *Disqualification* in an *Elimination Match*, the entire *Alliance* is *Disqualified* and they receive a loss for the *Match*. At the *Head Referee's* discretion, repeated *Violations* and/or *Disqualifications* for a single *Team* may lead to its *Disqualification* for the entire tournament (see <GG6>). A *Team* that receives a *Disqualification* in a *Driving Skills Match* or *Autonomous Coding Skills Match* receives a score of zero (0) for that *Robot Skills Match*.

Drive Team Member - A *Student* who stands in the *Alliance Station* during a *Match*. *Adults* are not allowed to be *Drive Team Members*. See rule <GG1>.

Entanglement - A *Robot* status. A *Robot* is *Entangled* if it has grabbed, hooked, or attached to an opposing *Robot* or a *Field Element*. See rule <GG14>.

Field - The entire playing *Field*, comprising of the *Floor* and the *Field Perimeter*.

Field Element - The *Field*, white tape, *Loaders*, *Goals*, *Park Zones*, and all supporting structures and accessories (such as field monitors, etc.).

Field Perimeter - The outer part of the *Field*, made up of 12 straight sections.

Floor - The interior flat part of the playing *Field*, made up of an array of six (6) gray foam field tiles wide by six (6) gray foam field tiles long (totaling 36 field tiles) that are within the *Field Perimeter*.

Game Design Committee (GDC) - The creators of Push Back, and authors of this Game Manual. The GDC is the only official source for rules clarifications and Q&A responses; see Section 1.

Holding - A *Robot* status; see rule <GG17> for more information. *Holding* is legal until it exceeds the limits in <GG17>. A *Robot* is considered to be *Holding* if it meets any of the following criteria during a *Match*:

- **Trapping** - Limiting the movement of an opponent *Robot* to a small or confined area of the *Field*, approximately the size of one foam field tile or less, without an avenue for escape. Note that if a *Robot* is not attempting to escape, it is not considered *Trapped*.
- **Pinning** - Preventing the movement of an opponent *Robot* through contact with the *Field Perimeter*, a *Field Element*, or another *Robot*.
- **Lifting** - Controlling an opponent's movements by raising or tilting the opponent's *Robot* off of the foam tiles. Preventing a *Robot* that is already off of the *Floor* from returning to the *Floor* may also be considered *Lifting* or *Trapping*.

Match - A set time period, consisting of a *Autonomous Period* and/or *Driver Controlled Periods*, during which *Teams* play a defined version of Push Back to earn points.

- **Autonomous Period** - A time period during which *Robots* operate and react only to sensor inputs and pre-programmed commands.
- **Driver Controlled Period** - A time period during which *Drive Team Members* operate their *Robot* via remote control.

Match Type	Participants	Specific Rules	Autonomous Period (m:ss)	Driver Controlled Period (m:ss)
Head-to-Head	Two *Alliances* (red/blue), each composed of two *Teams*, with one *Robot* each	Scoring ("SC"), General Game ("GG") and Specific Game ("SG") sections	0:15	1:45
Driving Skills Match	One *Team*, with one *Robot*	Section 4	None	1:00
Autonomous Coding Skills Match	One *Team*, with one *Robot*	Section 4	1:00	None
VEX U Robotics Competition Head-to-Head	Two *Teams* (red/blue), with two *Robots* each	Section 6	0:30	1:30
VEX U Robotics Competition *Driving Skills Match*	One *Team*, with two *Robots*	Section 6	None	1:00
VEX U Robotics Competition *Autonomous Coding Skills Match*	One *Team*, with two Robots	Section 6	1:00	None
VEX AI Robotics Competition Head-to-Head	Two *Teams*, (red/blue), with two *Robots* each	Section 7*	0:15	1:45
VEX AI Robotics Competition Autonomous Coding Skills Match	One Team, with two Robots	Section 7*	1:00	None

**Note: The time periods in VAIRC are referred to as the Isolation Period and the Interaction Period.*

Offensive - A category of strategies, *Robot* actions, and/or *Robot* statuses that can be employed by a *Team* during a *Match*; see rules <GG14> and <GG15> for more information. A *Robot* is *Offensive* while it is engaged in actions that could directly increase its *Alliance's* score for the current *Match*. Examples include, but are not limited to:

- Adding an object to a *Goal* to score points
- Moving toward a *Goal* with an object that could earn points for their *Alliance*
- Changing the status of a *Field Element* or scoring object that acts as a multiplier or scoring bonus for their *Alliance*
- Achieving (or attempting to achieve) any *Robot* status that adds points to their *Alliance's* score
- Obtaining (or attempting to obtain) scoring objects

Robot - A machine that has passed inspection, designed by *Student Team* members to execute one or more tasks autonomously and/or by remote control from a *Drive Team Member*.

Student - A person is considered a *Student* if they meet both of the following criteria:

1. Anyone who is earning or has earned credit toward a secondary school (i.e., high school) diploma, certificate, or other equivalent during the six (6) months preceding the VEX Robotics World Championship. Courses earning credits leading up to high school would satisfy this requirement.
2. Anyone born after May 1, 2006 (i.e., who will be 19 or younger at VEX Worlds 2026). Eligibility may also be granted based on a disability that has delayed education by at least one year.
    - **Middle School Student** - A *Student* born after May 1, 2010 (i.e., who will be 15 or younger at VEX Worlds 2026). Any *Students* who meet this criteria may also compete as *High School Students*.
    - **High School Student** - Any eligible *Student* that is not a *Middle School Student*.

Team - One or more *Students* make up a *Team*. To participate in an official VEX V5 Robotics Competition event, a *Team* must first register on RobotEvents.com and receive a VEX V5 Robotics Competition *Team* number. A *Team's* unique number identifies their organization and their *Team* within that organization. Each *Team* must build their own *Robot*, create their own code, and maintain their own Engineering Notebook if they choose to use one.

- A *Team* is classified as a Middle School *Team* if all members are *Middle School Students*.
- A *Team* is classified as a High School *Team* if any of its members are *High School Students*, or if the *Team* is made up of *Middle School Students* who declare themselves "playing up" as *High School Students* by registering their *Team* as a High School *Team*.
- Once a *Team* has competed in an event as a High School *Team*, that *Team* may not change back to a Middle School *Team* for the remainder of the season. If a *Team* mistakenly registers as a Middle School *Team* but is ineligible for that age group, their registration may be revised mid-season with RSM assistance; all prior qualifications for the season will be lost.
- *Teams* may be associated with schools, community/youth organizations, or groups of neighborhood *Students*.

In the context of this Game Manual, *Teams* include three types of *Student* roles related to *Robot* build, design, and coding. See <G2> and <G5> for more information. *Adults* may not fulfill any of these roles.

- **Builder** - The *Student*(s) on the *Team* who assemble(s) and repair(s) the *Robot*. *Adults* are permitted to teach the *Builder*(s) how to use concepts or tools associated with *Robot* construction, but should never work on the *Robot*.
- **Coder** - The *Student*(s) on the *Team* who write(s) the computer code that is downloaded onto the *Robot*. *Adults* are permitted to teach the *Coder*(s) how to use concepts or tools associated with programming, but should never work on the code that goes on the *Robot*.
- **Designer** - The *Student*(s) on the *Team* who design(s) the *Robot*. *Adults* are permitted to teach the *Designer*(s) how to use concepts or tools associated with design, but should never work on the design of the *Robot*.

Time Out - A single break period no greater than three minutes (3:00) allotted for each *Alliance* during the *Elimination Bracket*. See <GG7>.

Violation - The act of breaking a rule in the Game Manual.

- **Minor Violation** - A *Violation* which does not result in a *Disqualification*.
  - Accidental, momentary, or otherwise non *Match Affecting Violations* are usually *Minor Violations*.
  - *Minor Violations* usually result in a verbal notification from the *Head Referee* during the *Match*, which should serve to inform the *Team* that a rule is being Violated before it escalates to a *Major Violation*.
- **Major Violation** - A *Violation* which results in a *Disqualification*.
  - Unless otherwise noted in a rule, all *Match Affecting Violations* are *Major Violations*.
  - If noted in the rule, egregious or strategic *Violations* or intentional actions that result in *Violations* may also be *Major Violations*.
  - Multiple *Minor Violations* within a *Match* or tournament may escalate to a *Major Violation* at the *Head Referee's* discretion or as specified in a rule. *Minor Violations* carry over into Eliminations unless otherwise specified within a rule.
- **Match Affecting** - A *Violation* which changes the winning and losing *Alliance* in the *Match*.
  - Multiple *Violations* within a *Match* can cumulatively become *Match Affecting*.
  - When evaluating if a *Violation* was *Match Affecting*, *Head Referees* will focus primarily on any *Robot* actions that were directly related to the *Violation*.
  - Determining whether a *Violation* was *Match Affecting* can only be done once the *Match* is complete and the scores have been calculated.

- **CoC-related Violation** - A *Violation* of a rule that relates to the RECF Code of Conduct and related processes. For V5RC, VURC, and VAIRC, the included rules are: <S2>, <G1>, <G2>, <G4>, <G5>, <R1> through <R4>, and *Major Violations* of <S1>.
    - Potential *CoC-related Violations* should be brought to the attention of the *Event Partner*, and resolved through the Code of Conduct Reporting Process in coordination with the *Head Referee*, Judge Advisor, and RECF Regional Support Manager. Follow-up investigations are conducted by the RECF Rules & Conduct Committee (RCC). Penalties for confirmed *CoC-related Violations* can range from single-Match *Disqualifications* to removal from the program.

Some rules include *Violation* Notes in *red italicized text* to denote special circumstances or provide additional clarifications. If no *Violation* Notes are found in a given rule, then it should be assumed that the above "default" definitions apply.

To determine whether a *Violation* may have been *Match Affecting*, check whether the *Team* who committed the *Violation* won or lost the *Match*. If they did not win the *Match*, then the *Violation* could not have been *Match Affecting*, and it was very likely a *Minor Violation*.

See the flowcharts in figures V-1, V-2, and V-3 for more information, and this article for full details of the event CoC process.

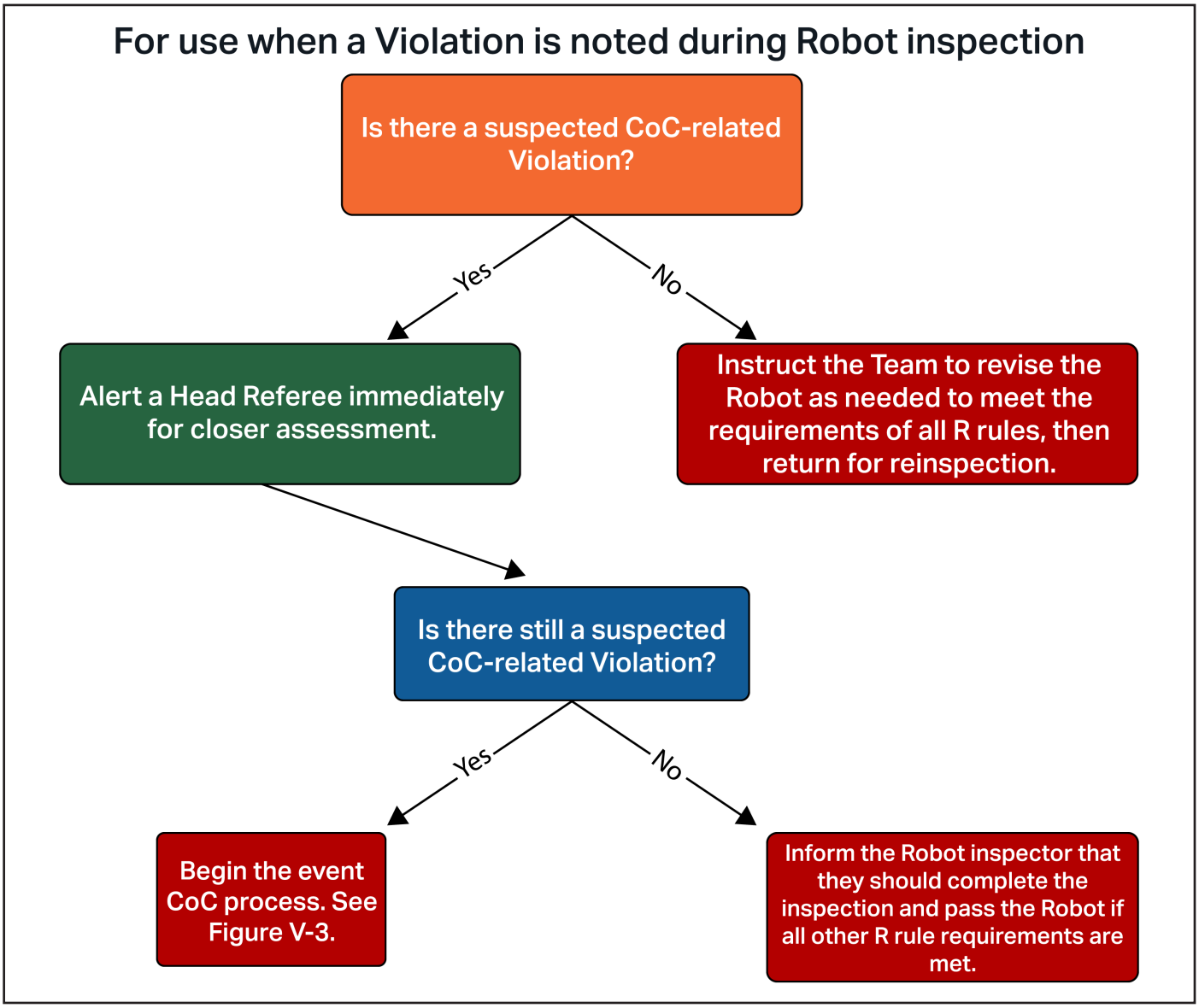


Figure V-1: *The process for determining Violations during Robot inspection.*

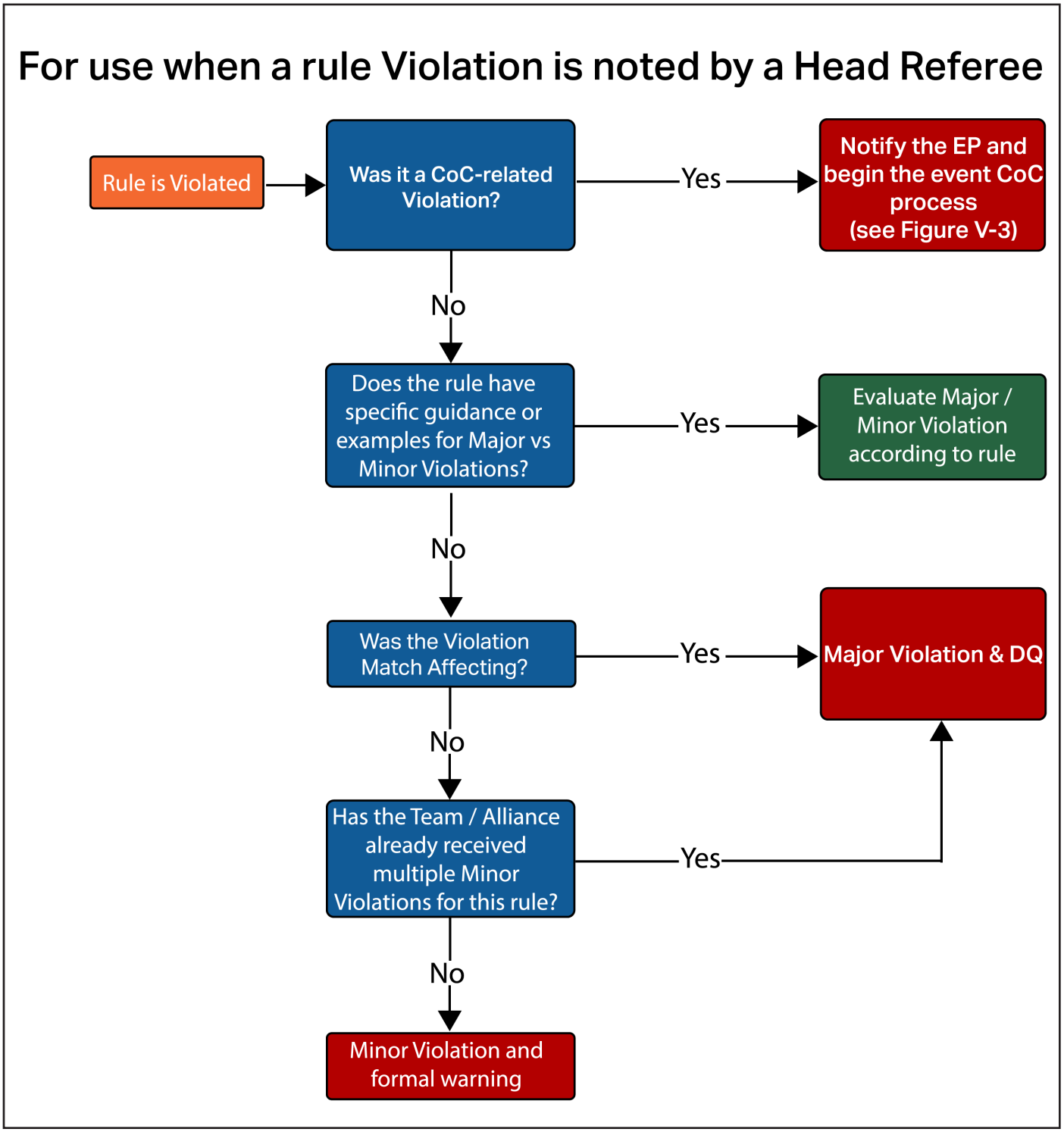


Figure V-2: *The process for determining whether or not an infraction should result in a Major Violation or Minor Violation*

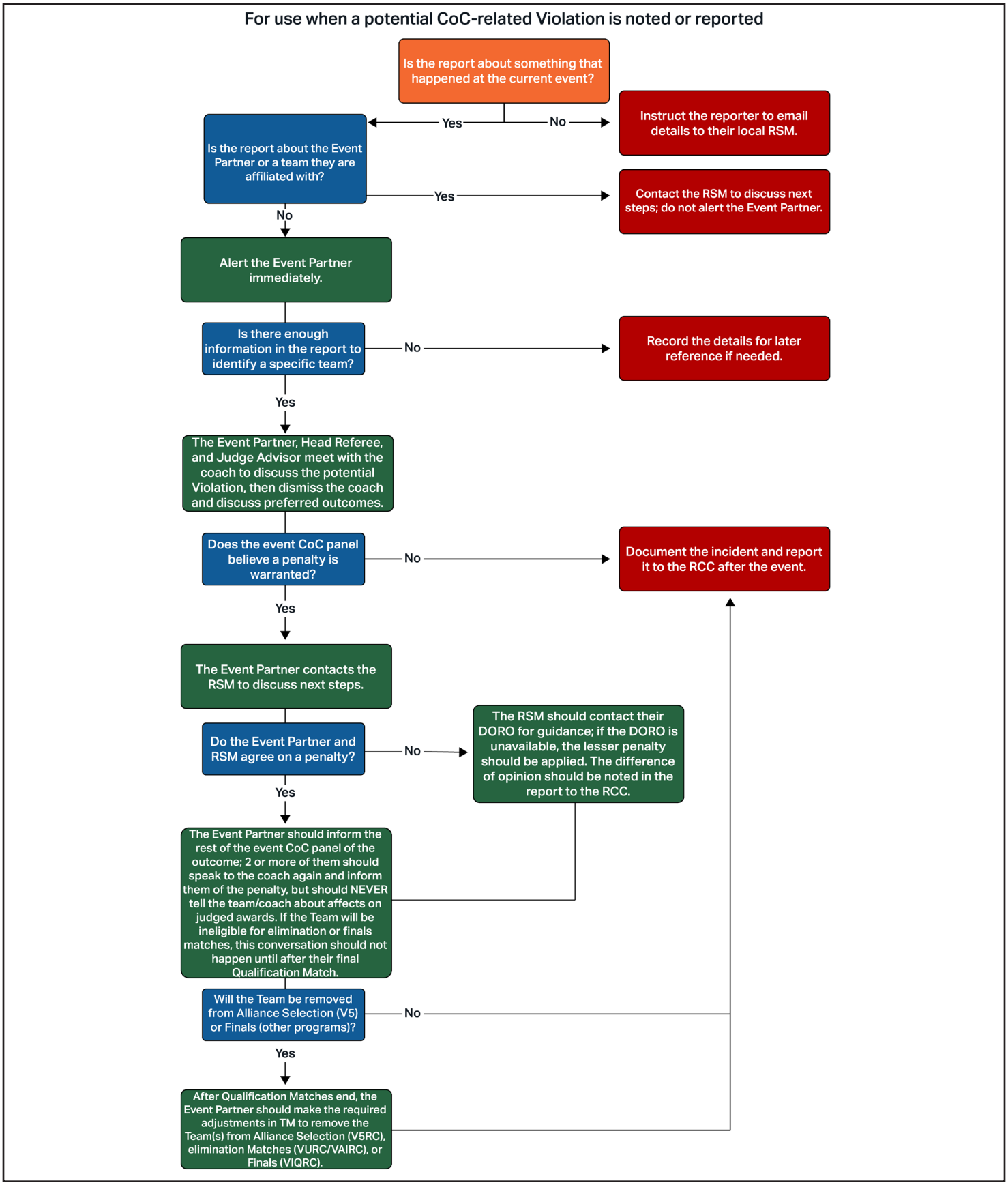


Figure V-3: *The process for determining CoC-related Violations*

Game-Specific Definitions

Autonomous Line - The pair of white tape lines that run across the *Field*, and the space between those lines. See <SG7> for more information.

Block - A blue or red 18-sided hollow plastic polygonal object with flat faces and a weight of approximately 40 grams. Each cross-section measures approximately 3.25" (82mm) between pairs of opposing flat faces, and 3.85" (98mm) between pairs of opposing corners.

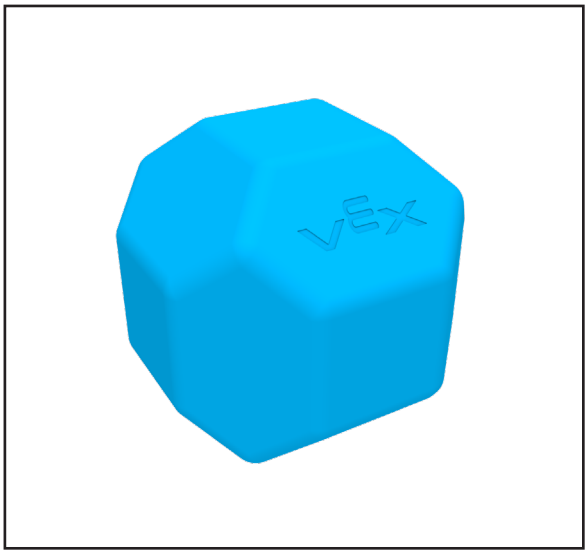


Figure B-1: *A Block*

Control Zone - A defined section of a *Goal* that can be *Controlled* by an *Alliance* at the end of a *Match*.

- **Long Goal** - The *Control Zone* for a *Long Goal* consists of the space between (but not including) the white tape lines (highlighted in green in Figure CZ-1), and holds up to three (3) *Blocks*.
- **Center Goal, Upper and Lower** - The *Control Zone* for a *Center Goal* includes the entire *Goal*.

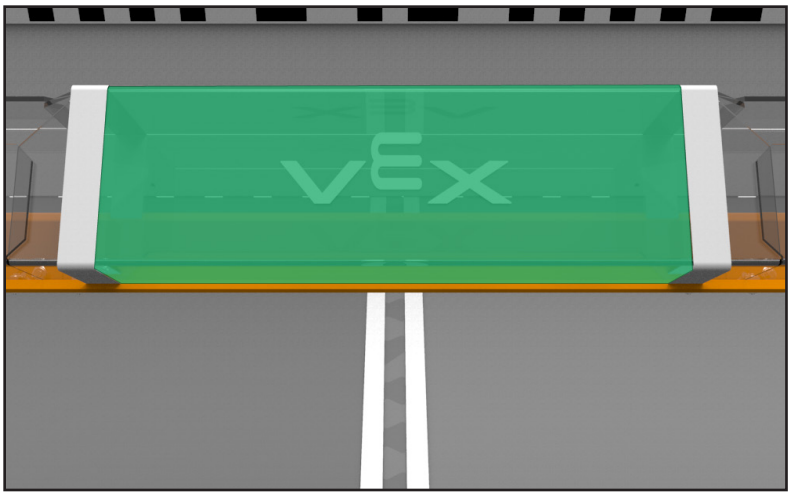


Figure CZ-1: *The Control Zone (highlighted green) of a Long Goal consists of the volume between the white tape lines, as shown.*

Controlled - A *Control Zone* status that is assessed at the end of the *Autonomous Period* and the end of the *Match*. A *Control Zone* is *Controlled* by an *Alliance* if a majority of the *Blocks* in that *Control Zone* are that *Alliance's* color. See rule <SC3> for details.

Goal - A *Field Element* that is constructed out of plastic and metal components into which *Blocks* can be *Scored*. Each *Long Goal* has a completely enclosed center section between two open sections. Each *Goal* includes a defined *Control Zone*.

- **Long Goal** - Each *Long Goal* is 48.8" (1239mm) in length, with a 13.33" (339mm) enclosed center section.
- **Center Goal, Upper and Lower** – Each *Center Goal* is 22.6" (574mm) in length.

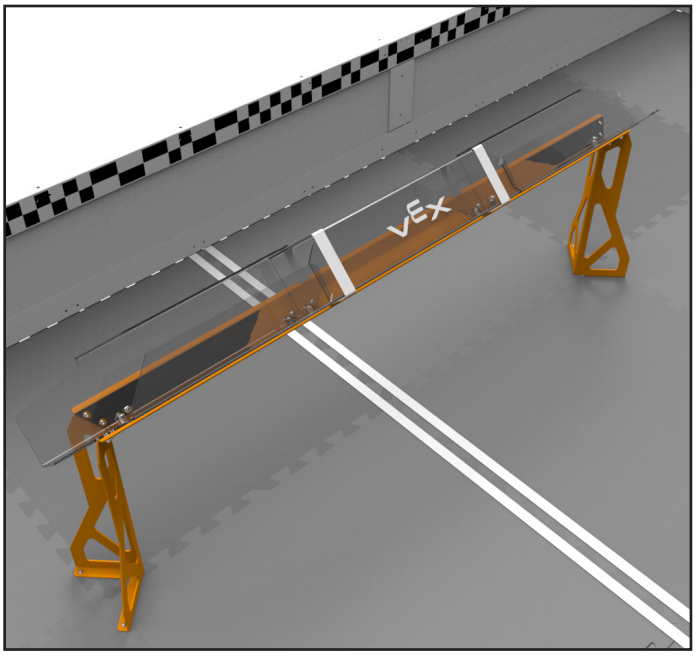


Figure G-1: *A Long Goal*

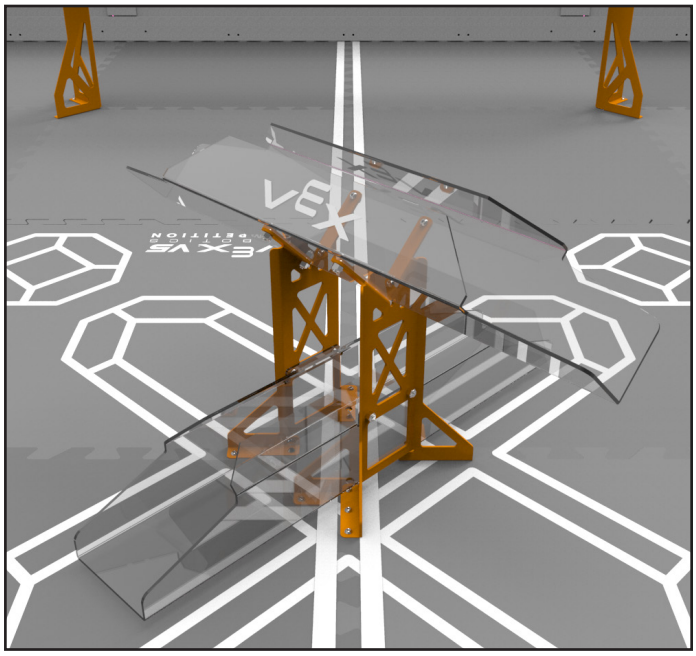


Figure G-2*: A Center Goal*

Goalkeeping - A *Robot* status and/or *Robot* action. In Push Back, a *Robot* is *Goalkeeping* while it is reaching into any open portion of a *Goal* while not attempting to change the score of the *Match* through legal means. A *Robot* can be in possession of a *Block* and capable of scoring, but still be *Goalkeeping* based on its actions. See <SG10> for more information.

Loader - One of four 21.34" (542mm) tall plastic and rubber structures that are attached to the *Field Perimeter*. *Robots* may remove *Blocks* from *Loaders* during a *Match*, and *Drive Team Members* may add *Match Load Blocks* to *Loaders* during the *Match* (see <SG9> for details). Each *Loader* begins the *Match* containing (6) *Blocks*.

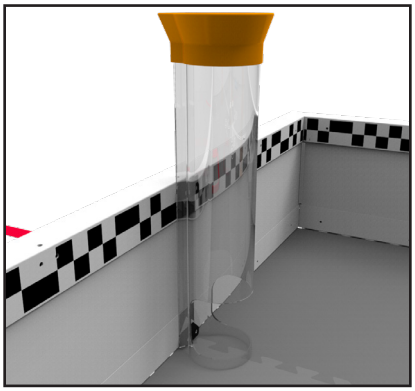


Figure L-1: *A Loader*

Match Load - One of the 24 Blocks, 12 per Alliance, that begin the Match in an Alliance Station and which may be introduced during the Match. See <SG9> for more information.

Parked - A *Robot* status at the end of the *Match*. See <SC4>.

Park Zone - A *Field Element* and enclosed section of the *Floor* that mark a location where *Blocks* begin a *Match* and *Robots* can be *Parked* at the end of the *Match*. *Park Zones* are made of red or blue plastic extrusions and black plastic connectors, and include the enclosed portions of the Field Tiles. Each *Park Zone* is 18.87" (479mm) wide x 16.86" (428mm) deep.

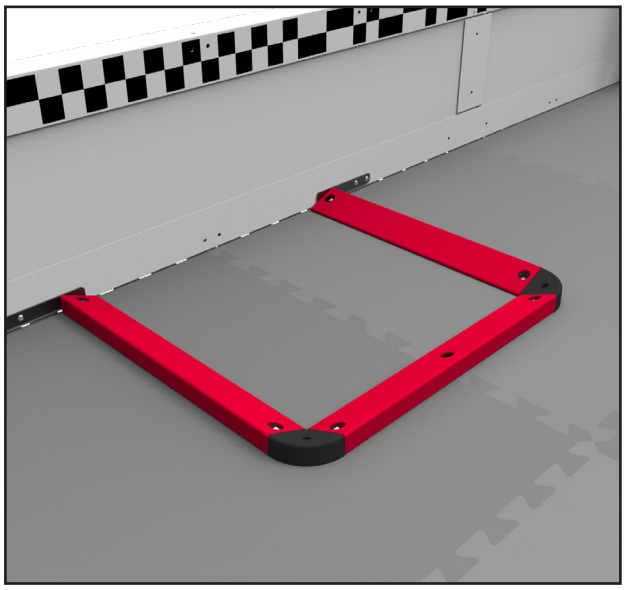


Figure PZ-1: *A Park Zone*

Scored - A *Block* status. See <SC2>.

Scoring

Autonomous Bonus	10 Points
Each *Block Scored*	3 Points
Each *Controlled* Zone in a *Long Goal*	10 Points
Controlled Center Goal - Upper	8 Points
Controlled Center Goal - Lower	6 Points
1 *Parked Alliance Robot*	8 Points
2 *Parked Alliance Robots*	30 Points

<SC1> All Scoring statuses are evaluated **after the Match ends**. Scores are calculated five (5) seconds after the *Match* ends, or once all *Blocks*, *Field Elements*, and *Robots* on the *Field* come to rest, whichever comes first.

a. This 5-second delay is intended to be the only permitted "benefit of the doubt" for last-second scoring actions. If an object or *Robot* is still in motion and "too close to call" between two states at the 5-second mark, then the less advantageous of the two states should be awarded to the *Robot*(s) in question. For example:

   i. A *Robot* which has *Parked* in a *Park Zone* but slowly droops down and is in contact with the top of the *Field Perimeter* at five (5) seconds would not be considered *Parked*.

   ii. A *Block* which slowly falls out of a *Goal* at five (5) seconds would not be considered *Scored*.

b. At the end of the *Match*, the on-screen timer displayed by Tournament Manager will hold the current *Match* information and "0:00" for five (5) seconds before moving to queue the next *Match*. This should be the primary 5-second visual cue used by *Teams* and *Head Referees*.

c. This 5-second delay is only intended to be a "benefit of the doubt" grace period, not an extra five (5) seconds of *Match* time. *Robots* which are designed to strategically exploit this grace period will receive a *Minor Violation*, and any post-*Match* movement will not be included in score calculation (i.e., the *Match* will be scored as it was at 0:00).

d. Referees should avoid contacting or moving *Robots* and/or *Blocks* as much as possible while evaluating Scoring statuses. If an object must be moved to evaluate the status of another object, its status must be agreed upon by all *Teams* and the *Head Referee*, and noted or recorded, before it is moved.

e. Referees must record counts based on verified scoring statuses evaluated after the *Match*, using final positions of *Blocks*, *Field Elements*, and *Robots*. Point considerations used to determine whether a *Violation* is *Match Affecting* (e.g., specified in *Violation* Notes) should NOT be added to or deducted from the actual score, and points scored during a *Violation* should not be deducted from a score.

<SC2> A *Block* is considered **Scored** if it meets all of the following criteria:

a. The *Block* is in contact with the inside surface(s) of the clear plastic part of a *Goal*.

   i. The edge faces of the clear plastic parts are not considered inside surfaces.

b. The *Block* is not in contact with a *Robot* of the same color as that *Block*.

c. The *Block* is not in contact with the *Floor*.

Significant Q&As:

- Q&A 2737 - Edge-case examples of scored and not scored Blocks

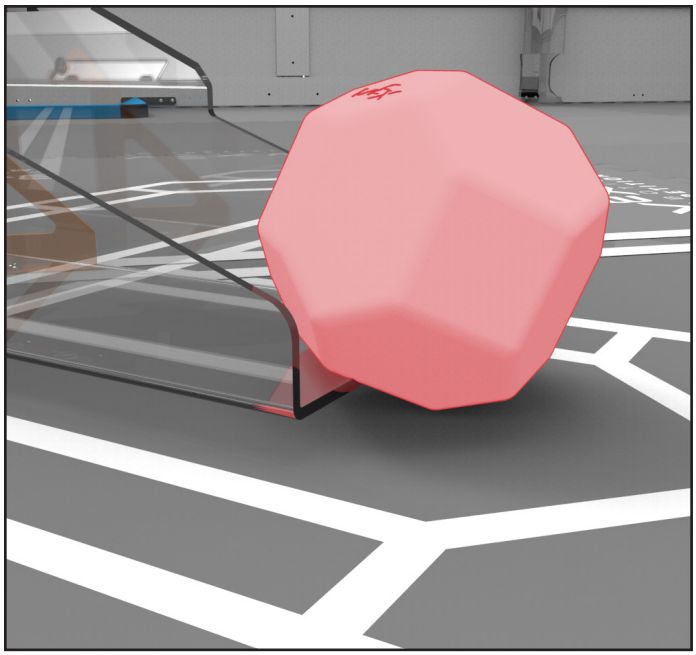


Figure SC2-1: *This Block is touching the Floor, and would not be considered Scored.*

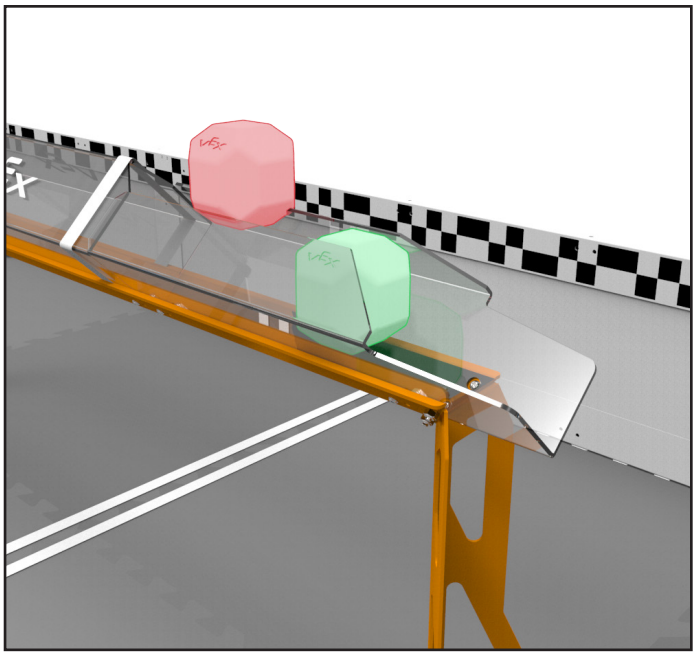


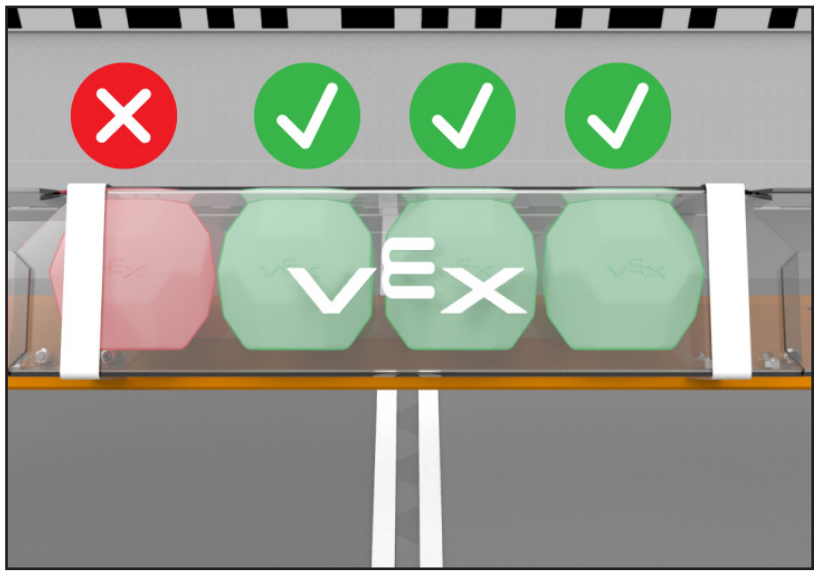
Figure SC2-2: *The left (red) Block is not contacting the inside surface of the Goal, so it would not be considered Scored. The right (green) Block is contacting the inside surface of the Goal and is not touching a Robot of the same color, so it is considered Scored.*

<SC3> A *Control Zone* is considered **Controlled** by an *Alliance* if a majority of the *Blocks Scored* in that *Control Zone* are the same color as the *Alliance*.

a. For Long Goals, a *Scored Block* is considered **Scored in the Control Zone** if it is entirely contained within that *Control Zone*.

b. A *Block* must be considered *Scored* in a *Goal* (see <SC2>) to also be considered *Scored* in a *Control Zone*.

Figure SC3-1: *The left-most (red) Block is not fully within the tape lines marking the boundaries of the Control Zone, and therefore would not be considered in determining which Alliance is in control of the Goal. The three other (green) Blocks are fully within the tape lines, and would be considered.*



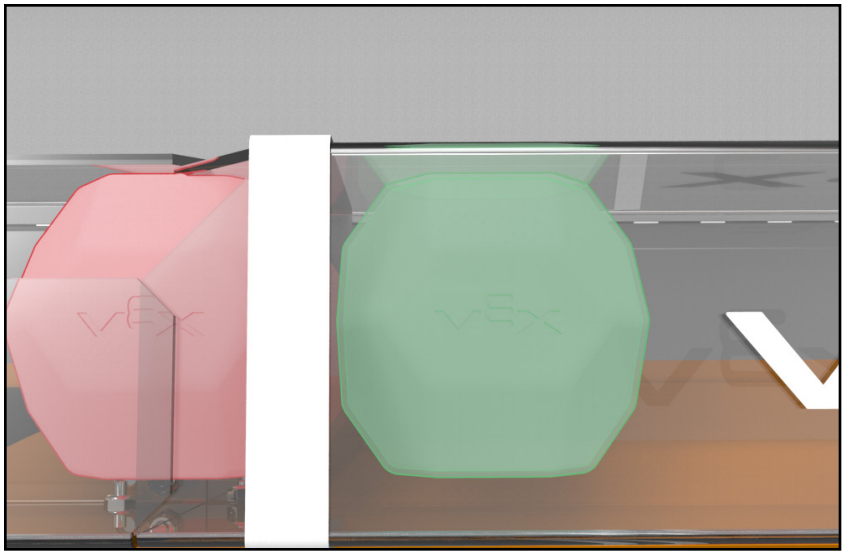


Figure SC3-2: *The (green) Block on the right is fully within the tape boundaries, and would be considered as scored.*

In most cases, if you can't see a little bit of the next *Block* on the "inside" of the tape line (see figure SC3-2), the *Block* on that side of the *Control Zone* probably isn't entirely contained within the *Control Zone*.

It's not practical to examine every *Block* at a detailed level to decide whether it's "entirely within" or not. If a *Head Referee* can't definitively tell whether a *Block* is entirely contained within a *Control Zone* or not, that *Block* should be considered *Scored* in the *Control Zone*. *Teams* should not be invited into the *Field* to contribute opinions; this decision is up to the *Head Referee*.

Significant Q&As:

- Q&A 2789 - The top surface of the Goal is the "tiebreaker" if there's slight variance in the tape lines

<SC4> A *Robot* is considered **Parked** if it meets all of the following criteria:

a. The *Robot* is not contacting the *Floor* outside of its *Alliance*-colored *Park Zone*.

b. The *Robot* is not contacting any *Field Elements* other than the inside face of the *Field Perimeter*, the *Floor* inside of its *Alliance*-colored *Park Zone*, and/or the plastic extrusions and connectors that are part of the *Park Zone*. Contact with these allowed elements is not required.

c. The *Robot* is at least partially within the vertical projection of its *Alliance*-colored *Park Zone*.

Significant Q&As:

- Q&A 2672 - Contact with Blocks doesn't affect a Parked status

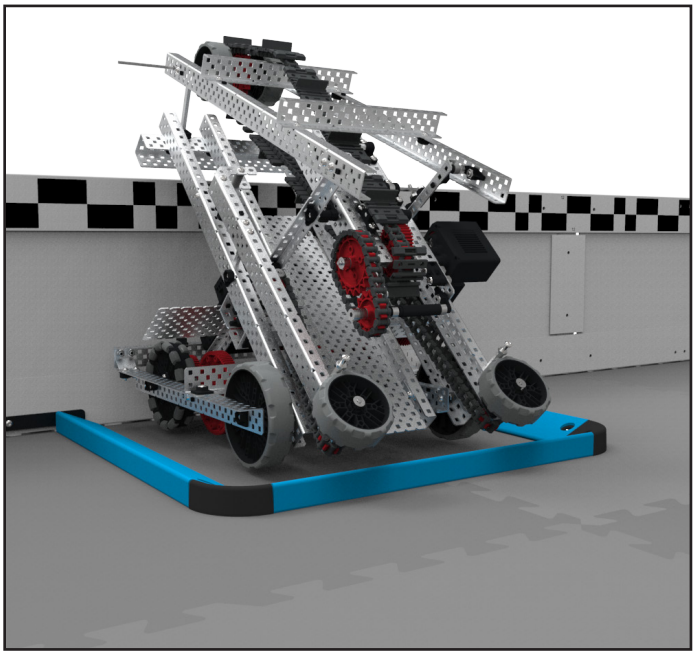


Figure SC4-1: *This Robot is at least partially within the vertical projection of their Alliance-colored Park Zone, and would be considered as Parked.*

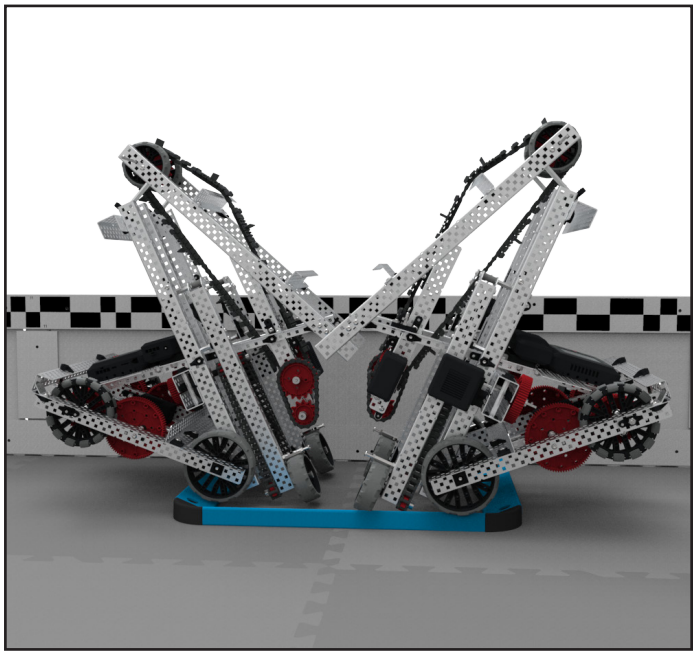


Figure SC4-2: *Both of these Robots would be considered as Parked, as they satisfy all the criteria listed above.*

<SC5> Scoring of the **Autonomous Bonus** is evaluated immediately after the *Autonomous Period* ends (i.e., once all *Blocks*, *Field Elements*, and *Robots* on the *Field* come to rest).

a. Points for *Parked Robots* are not included in the calculation of an *Alliance's* score for the purposes of determining the *Autonomous Bonus*.

b. If the *Autonomous Period* ends in a tie, including a zero-to-zero tie, each *Alliance* will receive an *Autonomous Bonus* of five (5) points.

c. Any *Violations*, Major or Minor, committed during the *Autonomous Period* will result in the *Autonomous Bonus* being automatically awarded to the opposing *Alliance*. See <GG13>.

d. Per rule <GG13>, if both *Alliances* commit *Violations* during the *Autonomous Period*, then no *Autonomous Bonus* will be awarded.

<SC6> An **Autonomous Win Point** is awarded to any *Alliance* that ends the *Autonomous Period* with all of the following tasks completed, and that has committed no *Violations* during the *Autonomous Period*:

1. At least seven (7) *Blocks* of the *Alliance's* color are *Scored*.
2. At least three (3) different *Goals* include at least one (1) *Scored Block* of the *Alliance's* color.
3. At least three (3) *Blocks* of the *Alliance's* color have been removed from *Loaders* adjacent to the *Alliance's Alliance Station*.
4. Neither *Robot* is contacting the *Park Zone* barrier.

For events which qualify directly to the World Championship (e.g., Event Region Championships and Signature Events), the following tasks must be completed for an *Alliance* to receive an *Autonomous Win Point*. The standard criteria above still apply to all other events.

1. At least ten (10) *Blocks* of the *Alliance's* color are *Scored*.
2. At least three (3) different *Goals* include at least two (2) *Scored Blocks* of the *Alliance's* color.
3. At least three (3) *Blocks* of the *Alliance's* color have been removed from *Loaders* adjacent to the *Alliance's Alliance Station*.
4. Neither *Robot* is contacting the *Park Zone* barrier.

Autonomous Win Point criteria may be further modified for the World Championship if needed, with details to be released in a future Game Manual update.

Autonomous Win Point criteria for World Championship-qualifying events will be used as a baseline to determine criteria for the World Championship. Any potential modifications will be minor, and will provide an increased challenge over the criteria listed above. For example, one possibility could be "At least twelve (12) *Blocks* Scored," instead of ten (10).

This rule is applied differently for VEX U. See Rule <VUG4>.

Safety Rules

<S1> Be safe out there. If at any time the *Robot* operation or *Team* actions are deemed unsafe or have damaged a *Field Element*, *Block*, or the *Field*, the offending *Team* may receive a *Disablement* and/or *Disqualification* at the discretion of the *Head Referee*. The *Robot* will require re-inspection as described in rule <R3> before it may take the *Field* again.

Violation Notes: Major Violations should be reported to and/or discussed with the Event Partner during the event, and should be reported to the REC Foundation Rules and Conduct Committee following the event.

<S2> Students must be accompanied by an Adult. No *Student* may attend a V5RC 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 for the full duration of the event in the case of an emergency. *Violations* of this rule may result in removal from the event.

Violation Notes: Violations should be reported to the Event Partner during the event, and should be reported to the REC Foundation Rules and Conduct Committee following the event.

<S3> Stay inside the Field. If a *Robot* is completely outside of the *Field* during a match, it will receive a *Disablement* for the remainder of the *Match*.

Note: The intent of this rule is not to penalize Robots for having mechanisms that inadvertently cross the Field Perimeter during normal game play.

<S4> Wear safety glasses. All *Drive Team Members* must wear safety glasses or glasses with side shields while at the *Field* for *Matches*. While in the pit and queuing areas, it is highly recommended that all *Team* members wear safety glasses.

<S5> Each Student Team member must have a completed participant release form on file for the event and season. A *Student Team* member cannot participate in an event without a completed release form on file.

General Rules

<G1> Treat everyone with respect. All *Teams* are expected to conduct themselves in a respectful and professional manner while competing in VEX V5 Robotics Competition events. If a *Team* or any of its members (*Students* or any *Adults* associated with the *Team*) are disrespectful or uncivil to event staff, volunteers, or fellow competitors, they may receive a *Disqualification* 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> could result in a *Team* being *Disqualified* from an entire event, depending on the severity of the situation.

We all can contribute to creating a fun and inclusive event experience for all event attendees. Some examples include:

When dealing with difficult and stressful situations, it is…

- Okay for *Teams* to be gracious and supportive when your *Alliance* partner makes a mistake.
- Not okay for *Teams* to harass, tease, or be disrespectful to your *Alliance* partner when a *Match* does not go your way.

When a *Team* does not understand a *Match* ruling or score, it is…

- Okay for *Drive Team Members* to consult with a *Head Referee* to discuss a ruling per the process outlined in <T3> in a calm and respectful manner.
- Not okay for *Drive Team Members* to continue arguing with the *Head Referees* after a decision has been finalized, or for *Adults* to approach a *Head Referee* with ruling/scoring concerns.

When *Teams* are getting ready for an upcoming *Match*, it is…

- Okay for *Teams* in an *Alliance* to develop a game strategy that utilizes the strengths of both *Robots* to cooperatively play the game.
- Not okay for *Teams* in an *Alliance* to intentionally play beneath their abilities to manipulate the *Match* results.

This rule exists alongside the REC Foundation Code of Conduct. Violation of the Code of Conduct can be considered a *Major 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 here.

More information regarding the event Code of Conduct process can be found here.

a. Event attendees are not allowed to record audio or video of *Teams'* discussions with *Head Referees* or other event staff/volunteers.

Violation Notes: Any Violations of <G1> may be considered Major Violations and should be addressed on a case-by-case basis. Teams at risk of a Major Violation of <G1> due to multiple disrespectful or uncivil behaviors will usually receive a "final warning," although the Head Referee is not required to provide one. All Major <G1> Violations/Disqualifications should be reported to and/or discussed with the Event Partner during the event, and should be reported to the REC Foundation Rules and Conduct Committee following the event.

Significant Q&As:

- Q&A 2871 - Manipulating Match results by playing beneath your abilities can be a G1 Violation, but isn't in all cases

<G2> V5RC is a student-centered program. *Adults* should not make decisions about the *Robot's* build, design, or gameplay, and should not provide an unfair advantage by providing 'help' that is beyond the *Student's* independent abilities. *Students* must be prepared to demonstrate an active understanding of their *Robot's* design, construction, and programming to judges or event staff. *Students* should build, design, and code the *Robot* with minimal *Adult* involvement.

Some amount of *Adult* mentorship, teaching, and/or guidance is an expected and encouraged facet of VEX competitions. No one is born an expert in robotics! However, obstacles should always be viewed as teaching opportunities, not problems for an *Adult* to solve for the *Team*.

When building or designing the *Robot*, it is…

- Okay for an *Adult* to help a *Student* consider why something failed, so it can be improved.
- Not okay for an *Adult* to provide step-by-step instructions or photos for the *Student* to copy.

When a mechanism falls off, it is…

- Okay for an *Adult* to help a *Student* consider why it failed, so it can be improved.
- Not okay for an *Adult* to investigate or 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 premade 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 in the REC Library for *Teams* to reference throughout the season.

Violation Notes: Potential Violations of this rule will be reviewed on a case-by-case basis. By definition, all Violations of this rule become Match Affecting as soon as a Robot which was built or coded by an Adult wins a Match. All reported and/or suspected <G2> Violations should be reported to the Event Partner during the event, and should be reported to the REC Foundation Rules and Conduct Committee following the event.

Significant Q&As:

- Q&A 2676 - Adults should not provide an unfair advantage by helping Students create custom plastic parts

<G3> Use common sense. When reading and applying the various rules in this document, please remember that common sense always applies in the VEX V5 Robotics Competition.

For example…

- If there is an obvious typographical error (such as "per <T5>" instead of "per <GG5>"), this does not mean that the error should be taken literally until corrected in a future update.
- Understand the realities of the VEX V5 Robot construction system. For example, if a *Robot* could hover above the *Field* for a whole *Match*, that would create loopholes in many of the rules. But… they can't. So don't worry about it.
- When in doubt, if there is no rule prohibiting an action, it is generally legal. However, if you have to ask whether a given action would violate <S1>, <G1>, or <T1>, then that's probably a good indication that it is outside the spirit of the competition.
- In general, *Teams* will be given the "benefit of the doubt" in the case of accidental or edge-case rules infractions. However, there is a limit to this allowance, and repeated or strategic infractions will still be penalized.
- This rule also applies to *Robot* rules. If a component's legality cannot be easily/intuitively discerned by the *Robot* rules as written, then *Teams* should expect additional scrutiny during inspection. This especially applies to those rules which govern non-VEX components (e.g. <R19>, <R20>, <R23>, etc). There is a difference between "creativity" and "lawyering." Basically, if there's not a rule that makes a *Robot* part legal, it's not allowed.

<G4> All work must represent the skill level of the Students on the Team. The *Team's* design, *Robot*, coding, strategy, and ongoing work must represent the skill level of the *Students* currently on the *Team*.

a. *Teams* must avoid academic dishonesty and should not copy a *Robot* or mechanism that has been provided for them. This includes, but is not limited to, the use of instructions, pictures & videos, notebooks, CAD designs, and/or any other documentation useful to the design process provided by anyone that is not a *Student* on the *Team* (including *Students* on another *Team*).

b. *Teams* may be inspired by designs by other *Teams*, and use an idea from someone else to spark innovation, but are expected to document and demonstrate this in their engineering notebook alongside evidence of iteration. *Teams* are required to present this evidence if asked to do so by a *Robot* inspector, *Head Referee*, *Event Partner*, or Judge.

   i. Using elements of another design as a starting point is acceptable if the *Team* is capable of demonstrating evidence of iteration, innovation, and/or modification that makes the design uniquely their own. Documentation should clearly demonstrate the idea that was used for inspiration, and how it was changed for the final implementation on the *Team's Robot*. It should be clear that this final implementation is not an exact copy of ANY other original design.

   ii. Failure to demonstrate evidence of iteration, innovation, and/or modification will result in a *Violation*.

c. *Teams* may use *Robot* plans and code (e.g., the annual Hero Bot, VEXcode configurations, etc.) provided by VEX Robotics or the RECF, but are encouraged to use these *Robots*, mechanisms, and code only as a starting point that *Students* modify, improve, or replace as their skills increase. Plans provided by VEX Robotics or the RECF are the only legal plans available for use in competition.

d. This rule still applies to *Teams* within the same school, organization, or club. *Robots* and/or code sets that are identical or substantially similar to one another across *Teams* within the same school/organization/club will be considered in *Violation* of this rule, regardless of whether they compete in the same or different events.

For more information, including acceptable and unacceptable examples of mechanical design, construction, coding, and strategy solutions, please refer to the Student Centered Policy in the RECF Library.

The VEX Robotics Competition and the Robotics Education & Competition Foundation (RECF) recognize that many third-party individuals and organizations produce and distribute robot designs, instructions, and/or other materials that are not under our direct control. We cannot legally regulate or restrict the activities of these external entities. However, when *Teams* use these resources in ways that violate the spirit and letter of the VEX Robotics Game Manual—particularly Rules<G2> and <G4>—they undermine the core mission of the program: to provide *Students* with hands-on opportunities to learn, design, and innovate.

While it is never our intent to punish *Students*, we can legally regulate and restrict the activities of the *Teams* in our competitions, and we must preserve the fairness, educational value, and integrity of the competition. Therefore, *Teams* found to be in *Violation* of these rules will be held accountable to the strictest interpretations of *<G2>* and <G4>.

It is the responsibility of each *Team* to be able to explain and defend the design, construction, and programming of their *Robot* if questioned by referees, inspectors, *Event Partners*, or judges. *Teams* should be prepared to describe their design process, justify design decisions, and demonstrate a full understanding of how their *Robot* and code function.

If a *Team* is unable, for any reason, to provide reasonable evidence (when requested by event staff) that their *Robot* and code are the result of their own work, it is appropriate to assume that the *Team* is in violation of <G2> and/or <G4>.

Event organizers cannot reasonably know the origins of every design or independently verify whether a *Robot* was created from scratch, purchased online, or copied from pictures of another *Team's* design. When questions of authenticity arise, the only direct and fair approach is to require *Students* to explain and defend their work. This is not unlike academic honesty concerns in schools, and intellectual property concerns in business. By requiring *Students* to defend their designs, we ensure that they are developing not only technical skills, but effective communication skills and accountability, as well.

Consequences may include disqualification from *Matches*, removal from events, and/or escalation of the investigation to VEX Robotics and the RECF for further disciplinary action, which may include sanctions up to and including removal from the program.

Event staff should bear in mind <G3>, and use common sense when enforcing this rule. It is not the intent to actively hunt for *Violations* of this rule, compare every *Robot* at an event to all other known *Robot* designs, or closely question every team at an event about their *Robot's* code. This rule is a set of tools for use if potential *Violations* are noted by or reported to event staff, and it is expected that most *Teams* will never be required to defend their *Robot* design or code.

Teams or individuals who deliberately weaponize, manipulate, or falsely report <G4> *Violations* for competitive gain or to harass another *Team* may be subject to a separate RECF Code of Conduct investigation. Misuse of this rule is considered a serious *Violation*.

Violation Notes:

- *Teams believed to be in Violation of this rule should be reported to the Judge Advisor, Head Referee, or Event Partner for further investigation in coordination with the RSM. Based on the investigation the Team may be removed from further Matches, have their Robot Skills Challenge scores removed, and/or be removed from consideration from judged awards.*
- *Violations of this rule will be evaluated on a case-by-case basis, in tandem with the RECF Student Centered Policy as noted in <G2>, and the REC Foundation Code of Conduct as noted in <G1>. All reported and/or suspected <G4> Violations should be reported to the Event Partners during the event, and should be reported to the RECF Rules and Conduct Committee following the event.*

Significant Q&As:

- Q&A 2677 - Teams may only use custom parts that were designed and created by the Students on that Team
- Q&A 2823 - Excerpts from the Student-Centered Policy about code, templates, and libraries
- Q&A 2834 - Specific G4 scenarios and clarifications
- Q&A 2843 - Ownership of ideas when students legally change teams
- Q&A 2850 - Holecounting a design is not the same as being inspired by it

<G5> Each Student can only belong to one Team. Each *Team* must include *Drive Team Members*, *Coder*(s), *Designer*(s), and *Builder*(s). Many also include notebooker(s). No *Student* may fulfill any of these roles for more than one VEX V5 Robotics Competition *Team* in a given competition season. *Students* may have more than one role on the *Team*, e.g., the *Designer* may also be the *Builder*, the *Coder*, and a *Drive Team Member*.

a. *Team* members may only 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, 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 *Coder* "switching" *Teams* in order to program multiple *Robots*, one student designing multiple *Teams'* *Robots*, or one *Student* writing the Engineering Notebook for multiple *Teams*.

iii. If a *Student* leaves a *Team* to join another *Team*, <G4> still applies to the *Students* remaining on the previous *Team*. For example, if a *Coder* leaves a *Team*, then that *Team's Robot* must still represent the skill level of the *Team* without that *Coder*. One way to accomplish this would be to ensure that the *Coder* teaches or trains a "replacement" *Coder* in their absence.

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

b. 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 *Drive Team Members* or *Coders* for the *Team*.

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

Note: Teams cannot "borrow" Students from other Teams to serve as Drive Team Members, Coders, Designers, Builders, or notebookers. However, Teams can add permanent members throughout the season under the guidelines of this rule.

Violation Note: Teams believed to be in Violation of this rule should be reported to the Judge Advisor, Head Referee, or Event Partner for further investigation in coordination with the RSM.

Event Partners should bear in mind <G3>, and use common sense when enforcing this rule. It is not the intent to punish a *Team* who may change *Team* members over the course of a season due to illness, changing schools, conflicts within a *Team*, etc.

Event Partners and referees are not expected to keep a roster of any *Student* who has ever been a *Drive Team Member* for one day. This rule is intended to block any instance of loaning or sharing *Team* members for the sole purpose of gaining a competitive advantage.

General Game Rules

<GG1> Only Drive Team Members, and only in the Alliance Station. During a *Match*, *Robots* may be only be operated by that *Team's Drive Team Members* and/or by software running on the *Robot's* control system in accordance with <R11> and <GG11>. A Team may send up to (3) *Drive Team Members* to their *Alliance Station* for each *Robot*, and those *Drive Team Members* must remain in their *Alliance Station* for the duration of the *Match*.

Drive Team Members are the only *Team* members that are allowed to be in the *Alliance Station* during a *Match*. *Adults* (other than event staff) are not permitted to be in the *Alliance Station* during a *Match*.

a. *Drive Team Members* are prohibited from any of the following actions during a *Match*:
   i. Using any sort of communication device in the *Alliance Station*. Non-headphone devices with communication features turned off (e.g. a phone in airplane mode or a walkie talkie turned off) are allowed. If communication features are needed for translation apps during post-*Match* discussions, it should not be considered a *Violation*.
   ii. Standing or sitting on any sort of object during a *Match*, regardless of whether the *Field* is on the floor or elevated, except as required by an official accommodation request that has been approved by the REC Foundation.
   iii. Bringing/using additional materials to simplify the game challenge during a *Match*.
   iv. To ensure that *Drive Team Members* are aware of verbal calls during a *Match* (as an application of rules <T1>, <G1>, <S1>, and <G3>), powered headphones, earbuds, and/or passive earpieces connected to electronic devices cannot be worn/used in the *Alliance Station* except as required by an official accommodation request that has been approved by the REC Foundation.

b. Individuals who are not *Drive Team Members* for a *Match* cannot provide directions, commands, or advice to the *Drive Team Members* during that *Match*. They're welcome to provide cheerful, positive encouragement, but should not affect *Match* play or strategy.

Point iii is intended to refer to non-*Robot*-related items that directly influence gameplay, such as a speaker that plays a buzzer sound to distract your opponent. Provided no other rules are violated, and the items do not pose any safety or *Field* damage risks, the following examples are not considered *Violations* of <GG1>:

- Materials used before or after a *Match*, such as a pre-*Match* alignment aid
- Strategic aids, such as a whiteboard or clipboard
- Earplugs, gloves, or other personal accessories

Violation Notes: Major Violations of this rule are not required to be Match Affecting, and could invoke Violations of other rules, such as <G1>, <G2>, or <G4>.

<GG2> A Team's Robot should attend every Match. The *Team's Robot* must report to the *Field* for the *Team's* assigned *Match*, even if the *Robot* is not functional. If the *Robot* is not at the *Field* for the entire duration of the *Match*, the *Team* will be considered a "no-show" and receive zero (0) *Win Points*, *Autonomous Win Points*, *Autonomous Points*, and *Strength of Schedule Points*.

a. *Teams* are expected to participate in all scheduled *Qualification Matches*, *Alliance Selection*, and *Elimination Matches*(if they're an *Alliance Captain* or were selected to join an *Alliance* for *Elimination Matches*). Failure to attend scheduled *Matches* or *Alliance Selection* may be considered a *Violation* of <G1> and the Code of Conduct. *Teams* that participate in zero *Qualification Matches* cannot be considered for judged awards.

Significant Q&As:

- Q&A 2733 - A Robot has to be at least in the Alliance Station to avoid a no-show

<GG3> Robots on the Field must be ready to play. When a *Team* puts their *Robot* on the *Field*, it must be prepared to play (e.g., batteries charged, sized within the starting size constraint, includes only the correct *Alliance*-color license plates, etc.).

a. *Teams* who use VEX pneumatics must have their systems charged before they place the *Robot* on the *Field*.

b. *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 *Event Partner*, who will consider event schedule, previous *Violations* or delays, etc.

c. If a *Robot* is delaying the scheduled start of a *Match*, it may be removed from the *Field* at the discretion of the *Head Referee* and *Event Partner*. The *Robot* may remain at the *Field* so that the *Team* does not get assessed a "no-show" (per <GG2>).

d. If a *Robot* is not placed on the *Field* prior to the start of a *Match*, it cannot be placed on the *Field* during that *Match*.

e. If an event is using Smart Field Control and a *Robot* is unable to successfully connect to Smart Field Control prior to the scheduled start of a *Match*, the *Head Referee* may ask the *Team* to remove their *Robot* from the *Field* in accordance with clause C.

   i. A *Robot* that connects to Smart Field Control but displays a 'Legacy Field Control' error on the field monitor is NOT considered successfully connected to Smart Field Control, and may be removed from the *Field* if it is delaying the scheduled start of a *Match*.

<GG4> Hands out of the Field. *Drive Team Members* are prohibited from making intentional contact with any *Blocks*, *Field Elements*, or *Robots* during a *Match*, apart from the contact specified in <GG4a> or while introducing *Match Loads* as described in rule <SG9>.

a. During the *Driver Controlled Period*, *Drive Team Members* may only touch their own *Robot* if the *Robot* has not moved at all during the *Match*. Touching the *Robot* in this case is permitted only for the following reasons:

i. Turning the *Robot* on or off.

ii. Plugging in a battery.

iii. Plugging in a V5 Robot Radio.

iv. Touching the V5 Robot Brain screen, such as to start a program.

Note: Movement caused by an external force, such as another Robot, should not prevent a Drive Team Member from interacting with their Robot under this rule.

b. *Drive Team Members* are not permitted to reach into the 3-dimensional volume of the *Field Perimeter* at any time during the *Match*, apart from the actions described above. Rule <S1> applies.

c. Transitive contact, such as contact with the *Field Perimeter* that causes the *Field Perimeter* to contact *Field Elements* or *Blocks* inside of the *Field*, could be considered a *Violation* of this rule.

d. Any concerns regarding *Field Element* or *Block* starting positions should be raised with the *Head Referee* prior to the *Match*. *Team* members may never adjust *Blocks* or *Field Elements* themselves.

> If a *Drive Team Member's* hands extend over the *Field* and/or *Field Perimeter* in a way that is safe and doesn't contact anything in the *Field*, it's unlikely to be a *Violation*. However, *Head Referees* may still ask *Drive Team Members* to step back and remain completely outside the *Field* when necessary (e.g., for safety reasons or to reduce the chances of gameplay interference).

<GG5> **Match replays are allowed, but rare.** *Match* replays (i.e., playing a *Match* over again from its start) must be agreed upon by both the *Event Partner* and *Head Referee*, and will only be issued in the most extreme circumstances. Some example situations that may warrant a *Match* replay are as follows (note that this is not an exhaustive list):

a. *Match Affecting* "Field fault" issues.

i. *Field Elements* starting in incorrect positions, and out of the allowed tolerances (see <T5>).

ii. Tape lines lifting.

iii. *Field Elements* detaching or moving beyond normal tolerances (not as a result of *Robot* interactions).

iv. The *Autonomous Period* or *Driver Controlled Period* ending early.

v. Field control disconnecting or *Disabling Robots*. Note, this is sometimes confused with a *Robot* whose motors have overheated, or bent pins on a controller's competition port causing intermittent drop-outs. In general, any true *Field* fault will impact both *Alliances* simultaneously, not one *Robot* at a time.

b. *Match Affecting* game rule issues.

i. *Head Referee Disables* a *Robot* for a misinterpretation of a rule *Violation*.

ii. *Head Referee* starts the *Driver Controlled Period* of the *Match* without determining the outcome of the *Autonomous Period* winner.

iii. The *Field* is reset before a score is determined.

iv. A *Match* is run before its scheduled time without a *Team*.

Note: As of the 2024-2025 season, the V5 white screen error is no longer a permitted cause for a guaranteed replay. More information about this error can be found here.

<GG6> Disqualifications. When a *Team* receives a *Disqualification* in a *Qualification Match*, they receive a score of zero (0) for the *Match*, as well as zero (0) *Win Points*, *Autonomous Win Points*, *Autonomous Points*, and *Strength of Schedule Points*.

a. If the *Team* receiving the *Disqualification* is on the winning *Alliance*, then *Teams* on the opposing *Alliance* who are not also *Disqualified* will receive the win for the *Match* and two (2) *Win Points*.
   i. The *Team's* non-*Disqualified Alliance* Partner is unaffected, i.e., they will also receive the win for the *Match* and two (2) *Win Points*.
b. If the *Match* was a tie, then each *Team* on the opposing *Alliance* (the *Alliance* that did not receive the *Disqualification*) will receive the win for the *Match* and two (2*) Win Points*. If both *Alliances* have a *Team* receiving a *Disqualification*, then all non-*Disqualified Teams* will receive a tie for the *Match* and one (1) *Win Point*.
c. *Autonomous Win Points* are not given to *Teams* that receive a *Disqualification*, and are not automatically awarded to the opposing *Alliance*.

When a *Team* is *Disqualified* in an *Elimination Match*, the entire *Alliance* is *Disqualified*; they receive a loss for the *Match*, and the opposing *Alliance* is awarded the win. If both *Alliances* receive a *Disqualification* in an *Elimination Match*, both *Alliances* receive a loss and will play another *Match* to determine a winner.

Note: If a Team is Disqualified in a Robot Skills Match, a score of zero (0) will be recorded for that Match.

<GG7> Time Outs. Each Elimination *Alliance* gets one three-minute *Time Out*, which they may request during the *Elimination Bracket*. The *Time Out* will be served at the time of the *Alliance's* next upcoming *Match*. *Alliances* must request their *Time Out* between *Elimination Matches*; they may not use their *Time Out* during a *Match*, for another *Alliance's Match*, or after they have been eliminated. There are no *Time Outs* during the *Qualification Match* schedule.

a. A *Time Out* can be ended early, but only if agreed to by both *Alliances* and the *Head Referee*.
b. An *Alliance's Time Out* request should never be denied if the *Alliance* legitimately needs extra time.

<GG8> Keep your Robots together. *Robots* may not intentionally detach parts during the *Match* or leave mechanisms on the *Field*.

Note: Parts which become detached unintentionally are a Minor Violation, are no longer considered "part of a Robot," and should be ignored for the purpose of any rules which involve Robot contact or location (e.g., Scoring) or Robot size.

Violation Notes: Major Violations of this rule should be rare, as Robots should never be designed to intentionally violate it. Minor Violations are usually due to Robots being damaged during gameplay, such as a wheel falling off.

<GG9> Don't hook your Robot to the Field, and don't get Entangled. *Robots* may not intentionally grasp, grapple, hook, attach to or otherwise *Entangle* with any *Field Elements*. Strategies with mechanisms that react against multiple sides of a *Field Element* in an effort to latch or hook onto said *Field Element* are prohibited. The intent of this rule is to prevent *Teams* from unintentionally damaging the *Field* and/or from anchoring to or otherwise *Entangling* themselves with the *Field*.

Whenever possible, *Head Referees* should alert *Teams* to potential *Violations* before they happen to prevent actual *Violations*. If a *Robot* takes immediate action to avoid or resolve the issue, and if the *Head Referee* determines that the issue had no effect on the *Match*, no *Violation* should be recorded.

Violation Notes:

- *If a Robot is reaching inside the open top portion of a Goal, it is that Team's responsibility to ensure that the Robot doesn't become entangled with the Goal when approached by other Robots. <GG16> will not apply during related interactions, and a Robot that becomes entangled while reaching into the open top of a Goal will receive a <GG9> Violation no matter how they became entangled.*

<GG10> The red Alliance places last. The red *Alliance* has the right to place its *Robots* on the *Field* last in *Qualification Matches* and *Elimination Matches*. Once a *Team* has placed its *Robot* on the *Field*, in order to avoid schedule delays its position should not be adjusted prior to the *Match*. <GG3> applies. If a *Team* chooses to reposition their *Robot* after it has already been placed, the opposing *Alliance* will also be given the opportunity to reposition their *Robots* promptly.

This rule is applied differently for VEX U. See Rule <VUG1>

<GG11> Controllers must stay connected to the Field. Prior to the beginning of each *Match*, *Drive Team Members* must plug their V5 Controller into the *Field's* control system. This cable must remain plugged in for the duration of the *Match*, and may not be removed until the "all-clear" has been given for *Drive Team Members* to retrieve their *Robots*. See <T8> for more information regarding *Field* control system options.

Violation Notes: The intent of this rule is to ensure that Robots abide by commands sent by the tournament software. Temporarily removing the cable to assist with mid-Match troubleshooting, with an Event Partner or other event technical staff present and assisting, would not be considered a Violation.

<GG12> Autonomous means "no humans." During the *Autonomous Period*, *Drive Team Members* are not permitted to interact with the *Robots* in any way, directly or indirectly. This could include, but is not limited to:

- Activating any controls on their V5 Controllers
- Unplugging or otherwise manually interfering with the *Field* connection in any way
- Manually triggering sensors (including the Vision Sensor) in any way, even without touching them
  Note: In extreme cases, with permission from the Head Referee, Teams may Disable their Robot during the Autonomous Period by holding the power button on their V5 Controller. This exception is only intended for egregious safety- or damage-related circumstances; Disabling an autonomous routine for strategic purposes would still be considered a Violation of <GG12>.

  Violation Notes: See <GG13>.

<GG13> **All rules still apply in the Autonomous Period.** *Teams* are responsible for the actions of their *Robots* at all times, including during the *Autonomous Period*. Any *Violations*, Major or Minor, committed during the *Autonomous Period* will result in the *Autonomous Bonus* being automatically awarded to the opposing *Alliance* and make the violating *Team's Alliance* ineligible for the *Autonomous Win Point*.

If both *Alliances* commit *Violations* during the *Autonomous Period*, then no *Autonomous Bonus* will be awarded.

Violation Note: In general, Minor Violations of SG rules that occur during the Autonomous Period should only affect the outcome of the Autonomous Period (i.e., the Alliance can't win the Autonomous Bonus or earn an Autonomous Win Point) and should not be considered when determining whether a Violation has been repeated during the event.

If a Head Referee determines that a Violation of an SG or GG rule during the Autonomous Period was intentional/strategic rather than accidental/situational, it should be recorded as a Minor or Major Violation and considered when determining whether a Violation has been repeated during the event.

Significant Q&As:

- Q&A 2694 - Any major or minor violation during the Autonomous Period makes you ineligible for the AWP or Autonomous Bonus (no exceptions)

<GG14> **Don't destroy other Robots.** But, be prepared to encounter defense. Strategies aimed solely at the destruction, damage, tipping over, or *Entanglement* of opposing *Robots* are not part of the ethos of the VEX V5 Robotics Competition and are not allowed.

a. V5RC Push Back is intended to be an *Offensive* game. *Teams* that partake in solely *Defensive* or destructive strategies will not have the protections implied by this rule (see <GG15>). However, *Defensive* play which does not involve destructive or illegal strategies is still within the spirit of this rule.

b. V5RC Push Back is also intended to be 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.

c. A *Team* is responsible for the actions of its *Robot* at all times, including the *Autonomous Period*. This applies both to *Teams* that are driving recklessly or potentially causing damage, and to *Teams* that drive around with a small wheel base. A *Team* should design its *Robot* such that it is not easily tipped over or damaged by minor contact.

Violation Notes:

- *Major Violations of this rule are not required to be Match Affecting. Intentional and/or egregious tipping, Entanglement, or damage may be considered a Major Violation at the Head Referee's discretion.*
- *Repeated Violations within a Match or tournament could be considered a Violation of <G1> and/or <S1> at the Head Referee's discretion.*

Significant Q&As:

- Q&A 2640 - Tipping caused by Blocks leaving Goals is not a Violation
- Q&A 2908 - Things to consider when deciding whether an interaction was intetional/egregious

<GG15> Offensive Robots get the "benefit of the doubt" when judgment calls are required. In a case where a *Head Referee* is forced to make a judgment call regarding a destructive interaction between a *Defensive* and *Offensive Robot*, or an interaction which results in a questionable *Violation*, referees will decide in favor of the *Offensive Robot*. This also applies during the *Autonomous Period* (see SG7a).

Head Referees must apply judgment when determining whether each *Robot* in a <GG15> interaction was *Defensive* or *Offensive*, and in some cases may need to consider which *Robot* was more *Defensive* or *Offensive* than another within the larger context of the *Match*. In these cases, the *Head Referee* should decide in favor of the less *Defensive* and/or more *Offensive Robot* based on the definitions and guidance in this game manual.

<GG16> You can't force an opponent into a penalty. Intentional strategies that cause an opponent to break a rule are not permitted, and will not result in a *Violation* for the opposing *Alliance*.

Violation Notes: In most cases, if a Team causes their opponent to break a rule, the Head Referee will simply not enforce the penalty on that opponent, and it will be considered a Minor Violation for the Team that forced a Violation. However, if the forced situation becomes Match Affecting in favor of the Team that forced the Violation, it will be considered a Major Violation for the Team that forced the Violation.

Significant Q&As:

- Q&A 2776 - Example GG16 scenarios and suggested rulings

<GG17> No Holding for more than a 3-count. A *Robot* may not *Hold* an opposing *Robot* for more than a 3-count during the *Driver Controlled Period*.

For the purposes of this rule, a "count" is defined as an interval of time that is approximately one second in duration, and "counted out" by *Head Referees* verbally. A *Holding* count should begin immediately once the *Head Referee* observes a suspected *Holding* interaction.

The *Holding* count should pause when at least one of the following conditions is met:

a. The two *Robots* are separated by at least two (2) feet (approximately one foam tile).

b. Either *Robot* has moved at least two (2) feet away (approximately one tile) from the location where the *Trapping* or *Pinning* count began.

   i. In the case of *Lifting*, this location is measured from where the *Lifted Robot* is released, not from where the *Lifting* began.

c. The *Holding Robot* becomes *Trapped* or *Pinned* by a different *Robot*.

   i. In this case, the original count would end, and a new count would begin for the newly *Trapped* or *Pinned Robot*.

d. In the case of *Trapping*, if an avenue of escape becomes available due to changing circumstances in the *Match*.

After a *Holding* count ends, a *Robot* may not resume *Holding* the same *Robot* again for a 5-count. If a *Team* resumes *Holding* the same *Robot* within that 5-count, the original *Holding* count will resume from where it ended. A *Head Referee* should use fingers to display the 5-count that occurs after the end of a *Holding* count, and "wave it off" after the *Holding* interaction has been cleared.

If the *Head Referee* determines that a *Robot* is not attempting to escape, then it is not considered *Pinned* or *Trapped*. This commonly occurs when the *Robot* has malfunctioned and lost the ability to move, or when the *Robot* is defending a *Field Element*.

This criteria is not required for *Lifting*; the *Holding* status begins as soon as the opponent becomes *Lifted*.

Holding is a standard and legal part of Head-to-Head game play, and only becomes a *Violation* if it exceeds the guidelines in this rule. By beginning a *Holding* count immediately after noticing a *Holding* interaction, and providing a visual signal when a *Holding* interaction has been cleared, *Head Referees* can help *Teams* avoid penalties.

Significant Q&As:

- Q&A 2743 - The Park Zone is not an avenue of escape from Pinning, but generally is an avenue of escape from Trapping
- Q&A 2744 - "Under the Long Goal" is not an avenue of escape from Pinning, but generally is an avenue of escape from Trapping

- Q&A 2744 - If two Robots are working together to Trap an opponent simultaneously, the Holding count can be applied to both Robots; it's possible for them to legally take turns trapping, but it's risky
- Q&A 2775 - More guidance on when and how to count Holding
- Q&A 2827 - Things to consider when deciding whether a Violation is Minor or Major

<GG18> Use Blocks to play the game. *Blocks* may not be used to accomplish actions that would be otherwise illegal if they were attempted by *Robot* mechanisms. If a rule is *Violated* through the use of a *Block* instead of a *Robot* mechanism, it should be evaluated as though the rule in question had been *Violated* by a *Robot* mechanism. Examples include, but are not limited to:

- Interfering with an opponent's Autonomous routine per <SG7>
- Using a *Block* to intentionally tip or *Entangle* an opponent *Robot*

The intent of this rule is to prohibit *Teams* from using *Blocks* as "gloves" to loophole any rule that states "a *Robot* may not [do some action]." This rule is not intended to be taken in its most extreme literal interpretation, where any interaction between an *Block* and a *Robot* needs to be scrutinized with the same intensity as if it were a *Robot*.

Specific Game Rules

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

a. No larger than 18" (457.2 mm) long by 18" (457.2 mm) wide by 18" (457.2 mm) tall.

b. Not contacting any *Blocks* other than a maximum of one (1) Preload. See rule <SG5>.

c. Not contacting any *Goals* or *Loaders*.

d. Not contacting any other *Robots*.

e. Completely stationary (i.e., no motors or other mechanisms in motion).

f. Contacting the barrier that defines their *Alliance's Park Zone*.

Note: Using external influences, such as Preloads or the Field Perimeter, to maintain a Robot's starting size is only acceptable if the Robot would still satisfy the constraints of <R5> and pass inspection without these influences.

Violation Notes: The Match will not begin with any conditions in this rule unmet. If a Robot cannot meet these conditions in a timely manner, the Robot will be removed from the Field and rules <R3d> and <GG2> will apply until the situation is corrected. They will not receive a Disqualification, but they will not be permitted to play in the Match.

This rule is applied differently for VEX U. See Rule <VUG7>

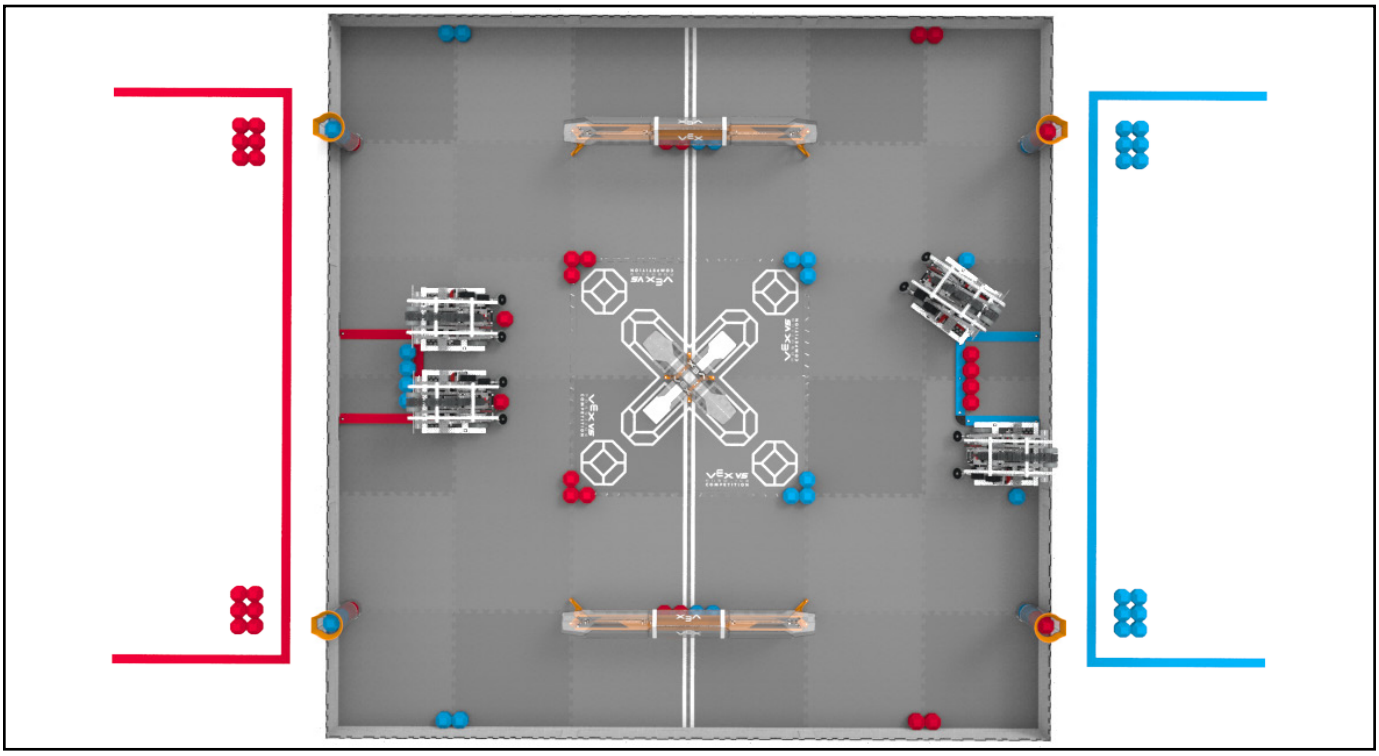


Figure SG-1: *An overhead view of the Field, with four Robots in legal starting positions.*

<SG2> Horizontal expansion is limited. Once the *Match* begins, *Robots* may expand horizontally beyond the 18" x 18" starting size limit within the following criteria:

a. The *Robot* can never be larger than 22" wide or 22" long (must always be able to fit within a 22"x22" square horizontal footprint).

Violation Notes:

- *The primary intent of this rule is to limit Defensive horizontal expansion. As such, Robots that expand horizontally in the vicinity of multiple Goals may be subject to rule <GG15>, and will not receive the "benefit of the doubt" in the case of any Head Referee judgment calls.*
- *Incidental/insignificant infractions that occur during a Match are only considered Minor Violations. Repeated Minor Violations should only escalate to a Major Violation in extreme circumstances. Examples of Minor Violations include, but are not limited to:*
  - *Loose wires*
  - *Broken zip ties / rubber bands*
  - *Bent or broken mechanical components that are not used for strategic gain*

This rule is applied differently for VEX U. See Rule <VUG2>

<SG3> Vertical expansion is limited. Once the *Match* begins, *Robots* may expand vertically beyond the 18" starting size limit within the following criteria:

a. No part of the *Robot* may exceed an overall height of 22" at any point during the *Match* (must always be able to fit within a hypothetical 22"x22"x22" cubic sizing box).

This rule is applied differently for VEX U. See Rule <VUG2>

<SG4> Keep Blocks in the Field. *Teams* may not remove *Blocks* from the *Field*. A *Block* that leaves the *Field* during *Match* play, intentionally or unintentionally, will be given to a *Drive Team Member* from the same color *Alliance* as the *Block* and may be used as a *Match Load* in accordance with <SG9>.

a. If a *Block* is leaving the *Field* (as determined by the *Head Referee*), but is deflected back into the field by a *Drive Team Member*, field monitor, ceiling/wall, or other external factor, it should still be considered "out of the *Field*" and removed by a scorekeeper or *Head Referee*. If the redirection occurred due to contact with a *Drive Team Member*, it will be at the *Head Referee's* discretion whether or not <GG4> (hands out of the *Field*) should apply.

Violation Notes:

- *After a Team's third Match with any Violation of this rule (either Major or Minor), all subsequent Violations of this rule will immediately escalate to a Major Violation.*
- *Any Team that removes three (3) or more Blocks from the Field in a single Match will receive a Major Violation.*
- *If it is not clear which Robot was the last to contact the Block, all involved Teams with a color that is opposite to the Block will receive a Violation.*

- *Due to the difficulty of determining Match Affecting implications of this rule, most Violations should be considered Minor. However, blatantly intentional and/or Match Affecting Violations (especially during Elimination Matches) may still immediately escalate to a Major Violation at the Head Referee's discretion.*

Significant Q&As:

- Q&A 2788 - Clarifications on how & when to return Blocks that have left the Field
- Q&A 2798 - Violation Note clarifications for the Autonomous Period
- Q&A 2809 - A Block on the Field Perimeter is still in the Field, unless it contacts something outside of the Field

<SG5> Each Robot gets one Block as a Preload. Prior to the start of each *Match*, each Preload must be placed such that it meets all of the following criteria:

a. Contacting one *Robot* of the same *Alliance* color as the Preload.

b. Not contacting the same *Robot* as another Preload.

c. Not contacting or within the volume of a *Goal* or *Loader*.

Note: If a Robot is not present for their Match, then that Robot's Preload may be used as a Match Load in accordance with <SG9>.

Violation Notes: See <SG1>.

<SG6> A Robot may carry, push, or plow an unlimited number of Blocks. However, horizontal and vertical expansion limits apply to all parts of the *Robot* for the entire duration of the *Match*. See rules <SG2> and <SG3>.

<SG7> Don't cross the Autonomous Line, and don't interfere with your opponents' actions. During the *Autonomous Period*, *Robots* may not contact foam tiles, *Blocks*, or *Field Elements* which are on the opposing *Alliance's* side of the *Autonomous Line*.

a. The *Autonomous Period* should be primarily **Offensive**, with *Teams* focusing on scoring and executing strategic maneuvers rather than *Defensive* disruption. *Teams* should avoid actions that are primarily *Defensive* in nature, including but not limited to:

   i. Intentionally disrupting *Blocks* or *Field Elements* on the opponent's side of the *Autonomous Line*.

   ii. Deliberately contacting an opponent's *Robot* to interfere with their autonomous path.

b. While some incidental contact or unintentional interactions may occur with *Robots* and/or *Blocks* on the other side of the *Autonomous Line*, *Teams* that employ deliberate *Defensive* autonomous strategies that impact their opponents' autonomous routines may be subject to Minor or *Major Violations* at the discretion of the *Head Referee*.

c. *Teams* may interact with the portions of each *Goal* that are on their *Alliance's* side of the *Autonomous Line*, but may not reach across to interact with the "open" portion of a *Goal* on their opponents' side of the *Field*.

d. *Blocks* that begin the *Match* in contact with the *Autonomous Line* are not considered to be on either side, and may be utilized by either *Alliance* during the *Autonomous Period*. For the purpose of this rule, all eight *Blocks* that begin the *Match* in groups that cross the *Autonomous Line* are considered to be in contact with the *Autonomous Line*. See Figure SG-7.

e. Direct contact with either of the following during the *Autonomous Period* will result in the *Autonomous Bonus* and an *Autonomous Win Point* being awarded to the opposing *Alliance*, unless the opposing *Alliance* also breaks rules in the *Autonomous Period*:

   i. An opponent *Robot* that isn't interacting with either the *Autonomous Line* or objects that begin the *Match* positioned above or in contact with the *Autonomous Line*.

   ii. *Blocks* on the other side of the *Autonomous Line*.

f. Causing a *Block* to contact an opponent *Robot* that is driving at the moment of contact is a *Violation*; intentional *Violations* may be subject to *Major Violations* and *Disqualifications* at the discretion of the *Head Referee*.

   i. Causing a *Block* to contact a stationary *Robot* is not considered a *Violation* unless the *Head Referee* determines it was a deliberate *Defensive* action.

   ii. *Blocks* that move across the *Autonomous Line* through *Goals* are not subject to <SG7>.

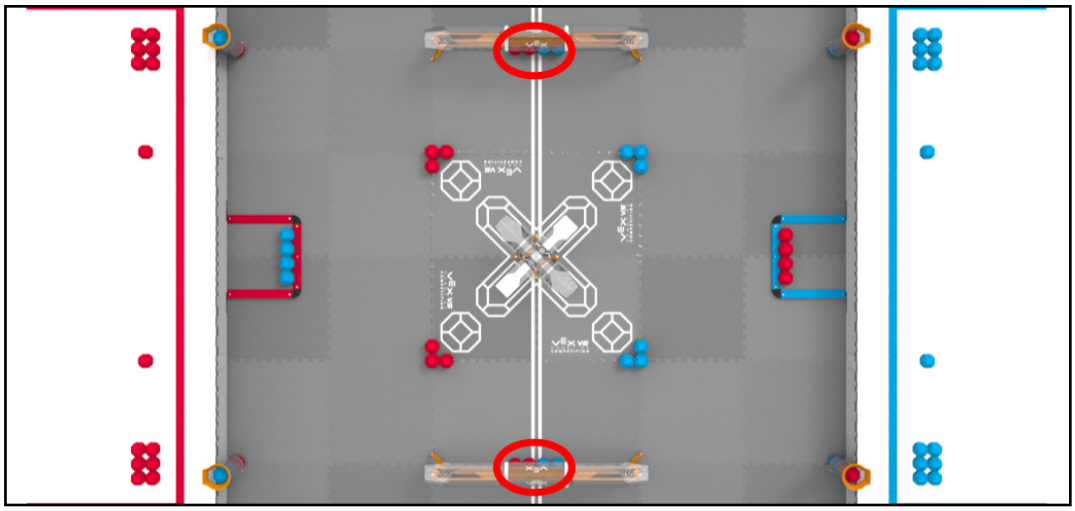


Figure SG-7: *These Blocks (circled in red) would be considered to be in contact with the Autonomous Line.*

Violation Notes:

- *All Violations of this rule (Major or Minor) will result in the Autonomous Bonus being awarded to the opposing Alliance. See <SG8b> for a potential exception caused by Autonomous Line interactions and <SG7e> for specific examples that also award an automatic Autonomous Win Point.*
- *Intentional, strategic, or egregious Violations, such as intentional contact with an opposing Robot while contacting the foam tiles on the opposing side of the Autonomous Line, will be considered Major Violations and should result in a Disqualification for the Match.*
- *Deliberate Defensive Autonomous strategies, as described in <SG8a>, may also be recorded as <G1> Violations at the Head Referee's discretion.*

This rule is applied differently for VEX U. See Rule <VUG5>.

Significant Q&As:

- Q&A 2645 - Descoring Blocks from Goals during the Autonomous Period is not a Violation, regardless of what happens to those Blocks afterward
- Q&A 2647 - Intentionally placing Blocks on the opponent's side of the Autonomous Line is a Violation
- Q&A 2924 - Scenarios and penalties for Robots and/or Blocks that cross the Autonomous Line

<SG8> **Engage with the Autonomous Line at your own risk.** Any *Robot* who engages with *Blocks* that begin the *Match* on the *Autonomous Line* should be aware that opponent *Robots* may also choose to do the same. Per <GG12> and <GG13>, *Teams* are responsible for the actions of their *Robots* at all times.

During the *Autonomous Period*, when *Robots* from opposing *Alliances* are both engaged with the same *Block*:

a. If a possible <GG14> *Violation* occurs (e.g., damage, *Entanglement*, or tipping over), a judgment call will be made by the *Head Referee* within the context of <GG14> and <GG15> (just as it would if the interaction had occurred during the *Driver Controlled Period*).

b. Incidental *Violations* of <SG7> will not be penalized and will not automatically award the *Autonomous Bonus* to the opponent as described in <GG13>. However, this allowance only applies when opposing *Robots* are interacting with the same element.

c. Intentional, strategic, repeated, or egregious offenses, such as negatively impacting *Robots* that are not engaging with the *Autonomous Line*, may still be deemed a *Violation* of <GG13>, <GG14>, <GG15>, <SG7>, <G1>, and / or <S1> at the *Head Referee's* discretion.

These gameplay elements are intended to be utilized by either *Alliance* during the *Autonomous Period*. This will inevitably result in *Robot*-on-*Robot* interactions, both incidental and intentional. The overarching intent of <SG8> is for the vast majority of these interactions to result in no rule *Violations* and/or penalties for either *Alliance*, just as no rules *Violations* occur in 99% of Driver-controlled interactions.

This rule is applied differently for VEX U. See Rule <VUG6>.

<SG9> **Match Loads may be introduced during the Match under certain conditions.** For the purpose of this rule, "introduce" refers to the moment when a *Drive Team Member* has released a *Block* into a *Loader*.

During this action, *Drive Team Members'* hands may temporarily break the plane of the *Field Perimeter*. This momentary interaction is an exception to rule <GG4>. Excessive, unnecessary, or unsafe actions while introducing a *Match Load* may be considered a *Violation* of <S1> and/or <G1> at the *Head Referee's* discretion.

Drive Team Members may introduce *Match Load Blocks* by placing them into either of the *Loaders* adjacent to their *Alliance Station*.

a. *Blocks* may only be added to *Loaders* during the *Driver Controlled Period* of a *Match*.

b. A *Match Load Block* may not be contacted by a *Robot* prior to being placed into a *Loader*.

c. *Match Load Blocks* may only be removed from a *Loader* by a *Robot*, and only through the bottom opening of the *Loader*.

d. *Blocks* that incidentally bounce out through the bottom opening of a *Loader* while being introduced should not be considered *Violations*.

e. A *Block* can only be added to a *Loader* if there are no *Blocks* partially or entirely within the orange portion of that *Loader*.

Violation Notes:

a. For the purposes of Match Affecting calculations, each illegal Match Load should be considered worth a value of 3 points. These values are not added to the actual score. If subtracting 3 points per illegal Match Load from the the offending Alliance's final score would change the outcome of the Match, then the <SG9> Violation should be considered Match Affecting.

b. For the purposes of this rule, the following guidelines should be used for escalating repeated Minor Violations to a Major Violation during Qualification Matches:

1. Six or more illegal Match Loads in a single Qualification Match.

2. Three or more Qualification Matches with at least one illegal Match Load (i.e., the third Match and all subsequent Matches with a Violation).

c. For the purposes of this rule, only Match Affecting Violations should be considered during Elimination Matches (i.e., repeated Minor Violations in Elimination Matches do not compound to Major Violations).

1. Point B-1 does not explicitly apply during Elimination Matches, although the risk of illegal Match Load becoming Match Affecting still inherently increases as the quantity of Match Loads increases.

2. Point B-2 does not apply during Elimination Matches.

The primary intent of clauses A & E are to prevent *Match Load Blocks* from being introduced in a way that overfills the *Loaders* (e.g., *Blocks* extending well above the top of the *Loader*), thereby reducing potential <SG4> and <SG9> *Violations* resulting from *Blocks* being removed/ejected from the top of the *Loader*. If a *Head Referee* is not certain whether or not a *Violation* of clause E occurred, they should give the *Team* the benefit of the doubt and not record it as a *Violation*. This benefit of the doubt must be applied equally to all *Teams* and *Matches* at that event. We don't intend this to be a rule that requires referees to closely watch every *Loader*. If there's brief overlap in the orange portion of a *Goal* as *Blocks* are rapidly added to a *Loader*, it probably shouldn't be considered a *Violation*.

This rule is applied differently for VEX U. See Rule <VUG3>.

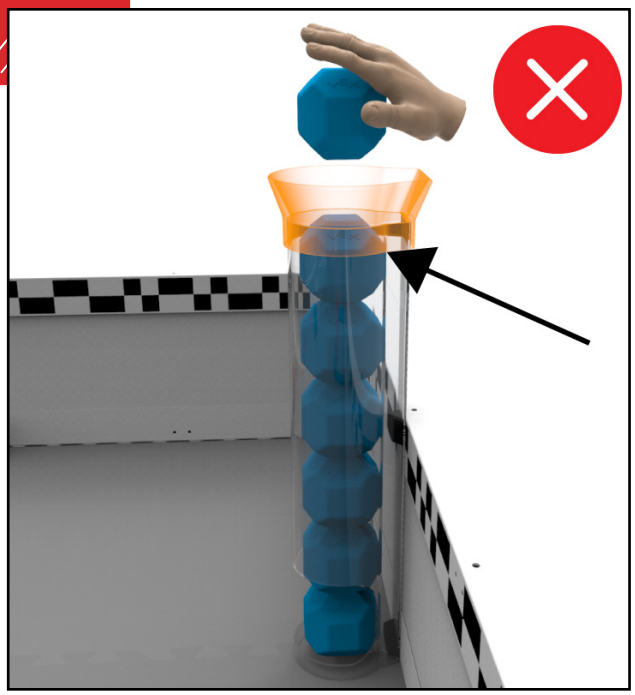


Figure SG9-1: *A Block is partially within the orange portion of the Loader, so it would not be legal to add a Block to this Loader.*

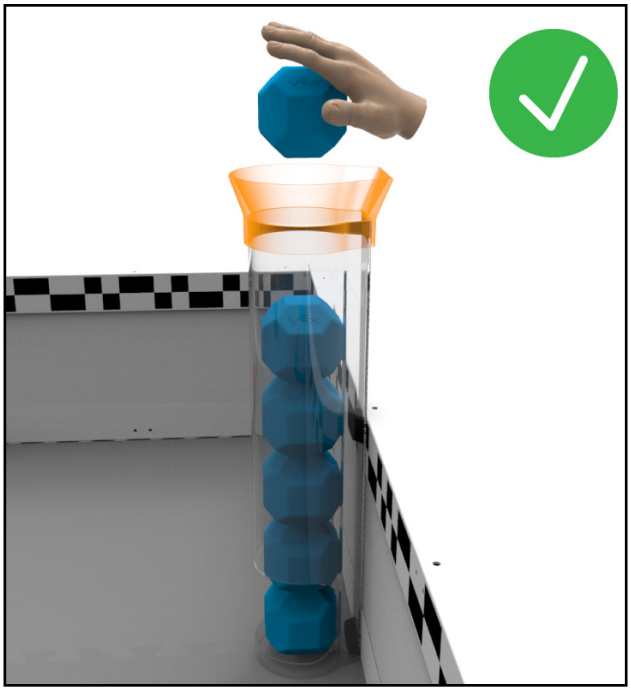


Figure SG9-2: *There are no Blocks within the orange portion of the Loader, so it is legal to add a Block to this Loader.*

<SG10> Don't reach inside enclosed sections of Goals, and no Goalkeeping. *Robots* are not permitted to directly contact *Blocks* that are fully within enclosed sections of *Long Goals*, but may add or remove *Blocks* from open sections of *Goals* at any time during a *Match*.

A *Robot* can only reach into any open portion of a *Goal* to legally move *Blocks* (e.g., into or out of the *Control Zone* or the entire *Goal*). If a *Head Referee* sees a *Robot* that is *Goalkeeping* in the *Driver Controlled Period* of a Head-to-Head *Match*, that *Robot* should be verbally warned away and should receive an <SG10> *Violation* if it remains.

a. Reaching inside the open top portion of a *Goal* to affect *Blocks* within that *Goal* is an inherently *Defensive* position, and will not get the benefit of the doubt (<GG15>) if judgment calls are required.

b. If a *Robot* is reaching inside the open top portion of a *Goal*, it is that *Team's* responsibility to ensure that the *Robot* doesn't become *Entangled* with the *Goal* when approached by other *Robots*. <GG16> will not apply during related interactions, and a *Robot* that becomes *Entangled* while reaching into the open top of a *Goal* will receive a <GG9> *Violation* no matter how they became *Entangled*.

Violation Note: An <SG10> Violation should be considered Match Affecting if the Team responsible ties or wins the Match by 10 points or less.

Significant Q&As:

- Q&A 2826 - Goalkeeping scenarios, including what should happen if two Goalkeeping Robots are pushing against each other
- Q&A 2837 - Clarifications on "inside a goal"

- Q&A 2845 - More clarification on “inside a goal”
- Q&A 2859 - One a Robot is outside of the Goal, they’re no longer Goalkeeping
- Q&A 2864 - Defensive actions around a Goal might be misinterpreted as Goalkeeping
- Q&A 2923 - If a Head Ref isn’t confident about a possible Violation for reaching into the closed part of a Goal, and it didn’t affect Blocks, they can probably ignore it

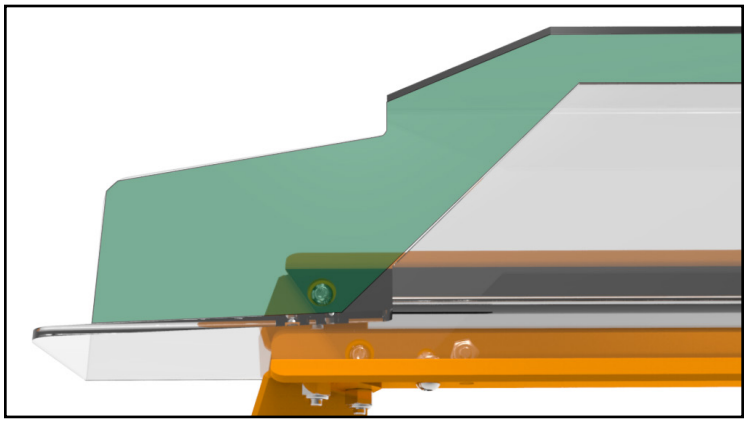


Figure SG10-1: *A diagram showing the portion at the end of the Goal (highlighted in green) that may pertain to Goalkeeping.*

<SG11> **Park Zones are protected during the endgame.** During the last 20 seconds of a *Match*, *Robots* may not directly or indirectly contact the other *Alliance’s Park Zone* or opponent *Robots* that are partially or entirely within the vertical projection of that *Park Zone*.

Violation Notes: Intentional, strategic, egregious, or Match Affecting Violations will be considered Major Violations.

Significant Q&As:

- Q&A 2751 - Examples of Violations through indirect contact
- Q&A 2786 - Guidelines for calculating whether a Violation is Match Affecting
- Q&A 2811 - Example scenarios with suggested rulings
- Q&A 2882 - Clarifications on intentional and Match Affecting Violations

VEX V5 ROBOTICS COMPETITION

PUSH BACK

Section 3
The Robot

Section 3 - The Robot

Overview

This section provides rules and requirements for the design and construction of your *Robot*. A VEX V5 Robotics Competition *Robot* is a remotely operated and/or autonomous vehicle designed and built by a registered VEX V5 Robotics Competition *Team* to perform specific tasks.

There are specific rules and limitations that apply to the design and construction of your *Robot*. Please ensure that you are familiar with these *Robot* rules before beginning your *Robot* design. These "inspection rules" are verified prior to the beginning of each event, in a formal *Robot* Inspection.

See Figure V-1 for more information on how to handle *Violations* of inspection rules and CoC-related rules during *Robot* inspection.

Most of these rules are "hard limits," such as the maximum number of motors permitted. However, some are "at inspector discretion," such as determining a mechanism's potential safety risk. At many events, the lead inspector and the *Head Referee* are the same person; if they are not, then the volunteer inspector should confirm any questionable judgment calls with the *Head Referee*. The *Head Referee* has final authority regarding all *Robot* rules, since it is ultimately their decision whether a *Robot* takes the *Field* for a *Match* after inspection has concluded (per <R3d> and <R3e>). See this REC Library article for more information and details on *Robot* inspection and legal parts.

Inspection Rules

<R1> One Robot per Team. Each *Team* can only bring one (1) *Robot* to a given event in the VEX V5 Robotics Competition. Though it is expected that *Teams* will make changes to their *Robot* at the competition, a *Team* is limited to only one (1) *Robot* at a given event, and a given *Robot* may only be used by one (1) *Team*. A VEX *Robot*, for the purposes of the VEX V5 Robotics Competition, has the following subsystems:

- Subsystem 1: Mobile robotic base including wheels, tracks, legs, 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 legal VEX battery, a legal VEX control system, and associated motors for the mobile robotic base.
- Subsystem 3: Subsystem 3: Additional mechanisms (and associated motors) that allow manipulation of *Blocks* and interactions with *Field Elements* and other *Robots*.

Given the above definitions, a minimum *Robot* for use in any VEX V5 Robotics Competition event (including Skills Challenges) must consist of subsystems 1 and 2 above. Thus, if you are swapping out an entire subsystem 1 or 2, you have now created a second *Robot* and have Violated this rule.

a. *Teams* may not compete with one *Robot* while a second is being modified or assembled at a competition.

b. *Teams* may not have an assembled second *Robot* on hand at a competition that is used to repair or swap parts with the first *Robot*.

c. *Teams* may not switch back and forth between multiple *Robots* during a competition. This includes using different *Robots* for *Robot Skills Matches*, *Qualification Matches*, and/or *Elimination Matches*.

d. 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 *Team* may EVER compete with it.

The intent of <R1a>, <R1b>, and <R1c> is 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. 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 *Robots* on a table next to each other, and they look like two separate legal/complete *Robots* (i.e., each has the 3 subsystems defined by <R1>), then they are two *Robots*. Trying to decide if changing a screw, a wheel, or a microcontroller constitutes a separate *Robot* is missing the intent and spirit of this rule.

This rule is applied differently for VEX U. See Rule <VUR1>.

<R2> Robots must represent the Team's skill level. The *Robot* must be designed, built, and programmed by members of the *Team*. *Adults* are expected to mentor and teach design, building, and programming skills to the *Students* on the *Team*, but *Adults* may not design, build, or program that *Team's Robot*. See rules <G2>, <G4> and <G5>.

In V5RC, we expect *Adults* to teach fundamental *Robot* principles like linkages, drive-trains, and manipulators, then 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 and mechanisms, then have the *Students* program the *Robot* from what they have learned.

<R3> Robots must pass inspection. Every *Robot* will be required to pass a full inspection before being cleared to compete. This inspection will ensure that all *Robot* rules and regulations are met. Initial inspections will take place during *Team* registration/practice time. Noncompliance with any *Robot* design or construction rule will result in removal from *Matches* or *Disqualification* of the *Robot* at an event until the *Robot* is brought back into compliance, as described in the following subclauses.

a. Significant changes to a *Robot*, such as a partial or full swap of Subsystem 3, must be re-inspected before the *Robot* may compete again.

b. All possible functional *Robot* configurations must be inspected before being used in competition. This especially pertains to modular or swappable mechanisms (per <R1>) and *Match* starting configurations/sizes (per <R5>).

c. *Teams* may be requested to submit to spot inspections by *Head Referees*. Refusal to submit will result in *Disqualification*.

   i. If a *Robot* is determined to be in *Violation* of a *Robot* rule before a *Match* begins, the *Robot* will be removed from the *Field*. The *Robot* may remain at the *Field* so that the *Team* does not get assessed a "no-show" (per <GG2>).

d. *Robots* which have not passed inspection (i.e., that may be in *Violation* of one or more *Robot* rules) will not be permitted to play in any *Matches* until they have done so. <GG2> will apply to any *Matches* that occur until the *Robot* has passed inspection.

e. If a *Robot* has passed inspection, but is later confirmed to be in *Violation* of a *Robot* rule during or immediately following a *Match* by a *Head Referee*, they will be *Disqualified* from that *Match*. This is the only *Match* that will be affected; any prior *Matches* that have already been completed will not be revisited. <R3d> will apply until the *Violation* is remedied and the *Team* is re-inspected.

f. All inspection rules are to be enforced within the discretion of the *Head Referee* within a given event. *Robot* legality at one event does not automatically imply legality at future events. *Robots* which rely on "edge-case" interpretations of subjective rules, such as whether a decoration is "non-functional" or not, should expect additional scrutiny during inspection.

g. Events may wish to use "inspection markers" (e.g., zip tie or sticker) to identify *Robots* that have passed inspection at that event. Inspection markers are functional components and are subject to all *Robot* rules, including legal materials and robot size/expansion limits.

h. Event staff and volunteers are allowed to photograph *Robots* during inspection and/or at other times as needed.

<R4> There is a difference between accidentally and willfully violating a Robot rule. Any *Violation* of *Robot* rules, accidental or intentional, will result in a *Team* being unable to play until they pass inspection (per <R3d>).

However, *Teams* who intentionally and/or knowingly circumvent or violate rules to gain an advantage over their fellow competitors are in *Violation* of the spirit and ethos of the competition. Any *Violation* of this sort should be considered a *Violation* of <G1> and/or the REC Foundation Code of Conduct. A *Team* that circumvents a *Robot* rule for a competitive advantage should receive an immediate *Disqualification* for the current *Match* and be reported to the *Event Partner* for discussion with the REC Foundation Regional Support Manager. As a result of that discussion, the *Team* may be *Disqualified* from the event.

The *Violation* should also be reported to the REC Foundation Rules and Conduct Committee following the event.

<R5> Robots must fit within an 18" x 18" x 18" volume.

a. Compliance with this rule may be checked using the official VEX Robotics On-Field Robot Expansion Sizing Tool.

b. *Event Partners* may construct and/or provide any sizing tool that measures the correct dimensions.

c. Any restraints used to maintain starting size (i.e., zip ties, rubber bands, etc.) must remain attached to the *Robot* for the duration of the *Match*, per <GG8>.

d. For the purposes of this rule, it can be assumed that *Robots* will be inspected and begin each *Match* on a flat standard foam field tile.

The official sizing tool is intentionally manufactured with a slightly oversized tolerance. Therefore, any contact with the sizing tool (i.e., a "paper test") while being measured should be considered a clear indication that a *Robot* is outside of the permitted size. This tolerance also provides a slight "leeway" for minor protrusions, such as screw heads or zip ties.

Other tools, such as custom sizing boxes or the legacy non-expanding VEX Sizing Tool (276-2086), may be used for informal checks. However, in the event of a conflict or "close call," a check with the official On-Field *Robot* Expansion Sizing Tool takes precedence.

This rule is applied differently for VEX U. See Rule <VUR1>.

<R6> Officially registered Team numbers must be displayed on Robot license plates. To participate in an official VEX V5 Robotics Competition event, a *Team* must first register on RobotEvents.com and receive a V5RC *Team* number. This *Team* number must be displayed on the *Robot* using license plates. *Teams* may choose to use the official V5RC License Plate Kit, or may create their own using only legal materials.

a. License plates must be placed in fixed locations on exactly two (2) horizontally opposing sides of the *Robot* and must remain visible, legible, and attached for the entirety of the *Match*. The top of a *Robot* is not considered a "side" for these two license plates

   i. License plates should be mounted in locations that remain stationary on the *Robot* during a *Match* (e.g, not on a rotating intake or flipping manipulator). The function of license plates is to identify *Robots* for referees, spectators, and other *Teams*. Identification is harder when a license plate on a *Robot* moves during a *Match*.

b. License plates must be attached to the *Robot* using materials that are legal for *Robot* construction. VEX IQ pins are no longer legal for mounting license plates on *Robots*.

c. *Robots* may only include license plates that match their *Alliance* color for the current *Match* (i.e., red *Alliance Robots* must have only red plates installed for the *Match*).

d. License plates are considered functional components, and must meet the requirements of all *Robot* rules.

e. Additional license plates cannot be used on the *Robot* for any purpose.

f. Team numbers must be in white font, and clearly legible.

g. Custom license plates used to meet the requirements of <R6a> and <R6f> must be within the following size limits:

   i. Height: between 2.0 (50.8mm) and 2.5 inches (63.5mm)

   ii. Width: between 4.0 (101.6mm) and 4.5 inches (114.3mm)

   iii. Thickness: up to 0.25" (6.35mm)

Imagine the *Robot* as a cube that's sitting flat on a flat surface. License plates should be placed onto two (2) opposing faces of that cube (excluding the top and bottom).

The intent of this rule is to make it immediately apparent to *Head Referees* and other event personnel which *Alliance* and which *Team* each *Robot* belongs to, at all times. It will be at the full discretion of the *Head Referee* and inspector at a given event to determine whether a given custom license plate satisfies the criteria listed in <R6>.

Teams wishing to utilize custom plates should be prepared for the possibility of this judgment, and ensure that they are prepared to replace any custom parts with official VEX license plates if requested. Not bringing official replacement plates to an event will not be an acceptable reason for overlooking a *Violation* of one or more points in <R6>. *Teams* are encouraged to use an easily-read, sans-serif font (e.g., Arial).

If a *Robot* must be removed from the *Field* based on this rule, <R3ci> applies and the *Team* should not be issued a "no-show."

Figure R6-1: *An example of a license plate made from the V5RC License Plate Kit.*

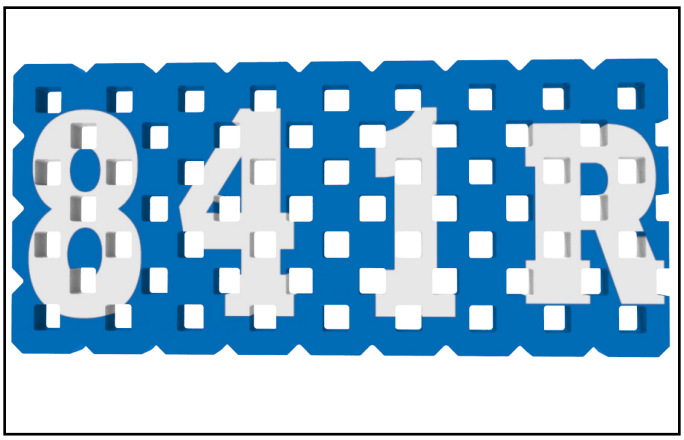


Figure R6-2: *An example of a legal custom license plate*

<R7> Let go of Blocks after the Match. *Robots* must be designed to permit easy removal of *Blocks* from any mechanism without requiring the *Robot* to have power after a *Match*.

<R8> Robots have one Brain. *Robots* must ONLY use one (1) VEX V5 Robot Brain (276-4810). Any other microcontrollers or processing devices are not allowed, even as non-functional decorations.

This includes microcontrollers that are part of other VEX product lines, such as VEX Cortex, VEX EXP, VEXpro, VEX CTE, VEX RCR, VEX IQ, VEX GO, or VEX Robotics by HEXBUG. This also includes devices that are unrelated to VEX, such as Raspberry Pi or Arduino devices.

a. V5 Robot Brain accessories (short flanges, long flanges, and the magnetic screen protector) are part of the V5 Robot Brain and are only legal for use on *Robots* as part of the V5 Robot Brain.

This rule is applied differently for VEX U. See Rule <VUR10> and <VUR12>.

<R9> Keep the power button accessible. The on/off button on the V5 Robot Brain and/or the Battery Cable connection on either the V5 Robot Brain or V5 Robot Battery must be accessible without moving or lifting the *Robot*. The V5 Brain screen must be easily visible during *Robot* inspection. Keeping the V5 Brain screen visible throughout a *Match* is recommended but not required.

This rule is in place to ensure the **safety of both competitors and field staff**. In the event that a *Robot* needs to be quickly powered off—whether due to a malfunction, *Entanglement*, or other safety concern—it is crucial that the power button and/or *Robot* Battery remains easily accessible. This allows competitors and/or field personnel to safely *Disable* the *Robot* without putting their hands near moving parts or other hazards inside the *Robot*.

Additionally, keeping screens and indicator lights visible helps officials diagnose issues efficiently, minimizing downtime and ensuring a smooth competition experience. If the V5 Brain is accessible, *Field* volunteers can help *Teams* troubleshoot time-sensitive issues prior to a *Match*, including switching between Bluetooth and VEXnet radio modes as needed, selecting programs on the V5 Brain in instances that prevent selection via the V5 Controller, etc. *Teams* will also have easier access during any needed <GG4> clause a interactions.

<R10> Firmware. *Teams* must use VEXos version 1.1.5 or newer, found at https://link.vex.com/firmware. Custom firmware modifications are not permitted.

a. The minimum version requirement is subject to change over the course of the season.

b. When the minimum version is updated, *Teams* have a two week (14 calendar day) grace period from the time the minimum version is changed to update their firmware to the latest minimum version.

c. VEX reserves the right to deem any firmware update critical, and remove the allowable grace period.

<R11> Use a "Competition Template" for programming. The *Robot* must be programmed to follow control directions provided by the VEXnet Field Controllers or Smart Field Control system.

During the *Autonomous Period*, *Drive Team Members* will not be allowed to use their V5 Controllers. As such, *Teams* are responsible for programming their *Robot* with custom software if they want to perform in the *Autonomous Period*.

This may be tested in inspection, where *Robots* may be required to pass a functional "enable/disable" test. For more information on this, *Teams* should consult the help guides produced by the developers of their chosen programming software.

<R12> Motors are limited. *Robots* may use any combination of VEX V5 Smart Motors (11W) (276-4840) and Smart Motors (5.5W) (276-4842), within the following criteria:

a. The combined power of all motors (11W & 5.5W) must not exceed 88W. This limit applies to all motors on the *Robot*, even those which are not plugged in.

b. V5 Smart Motors and EXP Smart Motors connected to Smart Ports are the only motors that may be used with a V5 Robot Brain. The 3-wire ports may not be used to control motors of any kind.

Example	A	B	C	D	E
Qty of 11W Motors	8	7	6	5	0
Qty of 5.5W Motors	0	2	4	6	16

This rule is applied differently for VEX U. See Rule <VUR11>.

<R13> Electrical power comes from VEX batteries only. *Robots* may use one (1) V5 Robot Battery (276-4811) to power the V5 Robot Brain.

a. No other sources of electrical power are permitted, unless used as part of a non-functional decoration per <R24e>.

b. There are no legal power expanders for the V5 Robot Battery.

c. V5 Robot Batteries may only be charged by a V5 Robot Battery Charger (276-4812 or 276-4841).

d. V5 Controllers (276-4820) may only be powered by their internal rechargeable battery.

   i. *Teams* are permitted to have an external power source (such as a rechargeable battery pack) plugged into their V5 Controller during a *Match*, provided that this power source is connected safely and does not violate any other rules, such as <R28>.

   ii. Some events may choose to provide *Field* power for V5 Controllers. If this is provided for all *Teams* at the event, then this is a legal power source for the V5 Controllers.

This rule is applied differently for VEX U. See Rule <VUR12>.

<R14> Robots use VEXnet. *Robots* must ONLY utilize the VEXnet system for all wireless *Robot* communication.

a. Electronics from the Cortex, VEX EXP, VEX CTE. VEXpro, VEX RCR, VEXplorer, VEX IQ, VEX GO, or VEX Robotics by HEXBUG product line are prohibited unless otherwise noted in <R17>.

b. *Teams* are permitted to use the Bluetooth® capabilities of the V5 Robot Brain and/or V5 Controller in *Team* pits, practice *Fields*, and *Robot Skills Matches*. However, VEXnet must be used for wireless communication during head-to-head *Matches*.

c. *Teams* are permitted to use the Wi-Fi capabilities of the Vision Sensor in *Team* pits or outside of *Matches*. However, the Vision Sensor must have its wireless transmitting functionality disabled during *Matches*.

This rule is applied differently for VEX U. See Rule <VUR2>, <VUR10> and <VUR12>

<R15> Give the radio some space. The V5 Radio must be mounted such that no metal surrounds the radio symbol on the V5 Radio.

It is fine to loosely encapsulate the V5 Radio within *Robot* structure. The intent of this rule is to minimize radio connection issues by minimizing obstructions between VEXnet devices. Burying a radio deep within a *Robot* may result in *Robot* communication issues. It is also recommended that the LEDs on the radio be visible to aid in troubleshooting.

<R16> One or two Controllers per Robot. No more than two (2) VEX V5 Controllers may control a single *Robot*.

a. No physical or electrical modification of these Controllers is allowed under any circumstances.

   i. Attachments which assist the *Drive Team Member* in holding or manipulating buttons/joysticks on the V5 Controller are permitted, provided that they do not involve direct physical or electrical modification of the Controller itself.

b. No other methods of controlling the *Robot* (light, sound, etc.) are permissible.

   i. Using sensor feedback to augment driver control (such as motor encoders or the Vision Sensor) is permitted.

<R17> Robots are built from the VEX V5 system. *Robots* may be built ONLY using official VEX V5 components, unless otherwise specifically noted within these rules. Product pages on the VEX Robotics website should be used as the official definitive source for determining if a product is a "V5 component."

a. Products from other VEX Robotics product lines that are specifically allowed by a clause of <R20> or "cross-listed" as part of the VEX V5 Product lines are legal for use in the VEX V5 Robotics Competition. For example, Flex Wheels and VersaHubs are VEXpro components that can be found on the VEX "Flex Wheels" page, and specific sizes are thus legal.

b. The following electronics from the VEX Cortex control system are permitted.

SKU	Description
276-2174 / 276-4859	Limit Switch V1 / V2
276-2159	Bumper Switch
276-2156	Optical Shaft Encoder
276-2216	Potentiometer
276-2155	Ultrasonic Range Finder
276-2176	LED Indicator
276-2333	Yaw Rate Gyroscope
276-2332	Analog Accelerometer V1.0
276-2154	Line Tracker
276-1380	Jumper
276-2158	Light Sensor

c. Legacy/discontinued products are only permitted if they are explicitly listed in this game manual, or still listed as V5RC or VRC legal on the VEX Robotics website: https://www.vexrobotics.com/v5-discontinued.html. Any questions or concerns about discontinued parts should be directed to the official Q&A System on RobotEvents.com.

This rule is applied differently for VEX U. See Rule <VUR2>.

<R18> New VEX parts are legal. Additional VEX components released during the competition season on www.vexrobotics.com are considered legal for use unless otherwise noted.

Some "new" components may have certain restrictions placed on them upon their release. These restrictions will be documented in the official Q&A, in a Game Manual update, or on their respective product web pages.

<R19> Prohibited Items. The following types of mechanisms and components are NOT allowed.

a. Those that could potentially damage *Field Elements* or *Blocks*.

b. Those that could potentially damage other competing *Robots*.

c. Those that pose an unnecessary risk of *Entanglement* with other *Robots* or *Field Elements*.

d. Those that could pose a potential safety hazard to *Drive Team Members*, event staff, or other humans.

e. Products from the VEXpro, VEX EXP, VEX IQ, VEX GO, VEX 123, VEX CTE, VEX AIM, VEX AIR, or VEX Robotics by HEXBUG* product lines, unless specifically allowed by a clause of <R17> or "cross-listed" as part of the VEX V5 Product lines (see <R17a>).

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f. The following electronics from the VEX Cortex control system.

SKU	Description
276-2192	VEXnet Joystick
276-1891	VEXnet Partner Joystick
276-2194	VEX ARM® Cortex-based Microcontroller
276-2245 / 276-3245	VEXnet Key 1.0 / 2.0
276-2177	2-Wire Motor 393
276-2162	3-Wire Servo
276-2210	VEX Flashlight
276-2193	Motor Controller 29

g. Components that are unique to the V5 Workcell product line. This includes the following.

SKU	Description
276-7151	Robot Arm Metal
276-7152	Robot Brain Mount
276-7153	Input Output Conveyor
276-7720	Disc Feeder
276-7047	V5 Electromagnet

h. Components obtained from the V5 beta program, including V5 beta firmware.

   i. All V5 beta hardware can be identified by its lighter gray pre-production color. Robot Brains, Robot Batteries, Controllers, and Vision Sensors from the V5 beta have a "BETA TEST" stamp on them. Smart Motors and Radios do not have this stamp, but can still be identified by color.

i. Components from the VEXplorer kit that are not found in modern VEX V5 kits. These include (but may not be limited to) electronics, wheels, non-standard gears, and plastic connectors.

j. Standalone VEX Smart Field Controller Brains (SKU 276-7577).

k. VEX apparel, competition support materials, packaging, or other non-*Robot* products.

l. 3D printed *Robot* parts for any purpose, including non-functional decorations and license plates.

m. Speakers and other audio devices that create sound are not permitted.

3D printed Controller attachments, 3D printed *Robot* alignment tools, and/or other custom 3D printed tools that do not go onto the *Robot* during a *Match* are not considered *Robot* parts, and may be legal for use if they meet the requirements of other pertinent rules.

This rule is applied differently for VEX U. See Rules <VUR2>, <VUR5>, <VUR6>, & <VUR13>.

<R20> Certain non-VEX components are allowed. *Robots* are allowed the following additional "non-VEX" components:

a. Any material strictly used as a color filter or a color marker for a legal sensor, such as the VEX Light Sensor or the VEX V5 Vision Sensor.

b. Any non-aerosol-based grease or lubricating compound, when used in extreme moderation on surfaces and locations that do NOT contact the playing *Field* walls, foam *Field* tiles, *Blocks*, or other *Robots*. Grease or lubricant applied directly to V5 Smart Motors or Smart Motor cartridges is prohibited.

c. Anti-static compound, when used in extreme moderation (i.e., such that it does not leave residue on *Field Elements*, *Blocks*, or other *Robots*).

d. Hot glue when used to secure cable connections.

e. An unlimited amount of rope/string, no thicker than 1/4" (6.35mm).

f. Commercially available items used solely for bundling or wrapping of 2-wire, 3-wire, 4-wire, or V5 Smart Cables, and/or pneumatic tubing are allowed. These items must solely be used for the purposes of cable/tubing protection, organization, or management. This includes but is not limited to electrical tape, cable carrier, cable track, etc. It is up to inspectors to determine whether a component is serving a function beyond protecting and managing cables and tubing.

g. Rubber bands that are identical in length and thickness to those included in the VEX V5 product line (#32, #64, #170, and #117B).

h. Pneumatic components with identical SMC manufacturer part numbers to those listed on the VEX website. For more detail regarding legal pneumatic components, see the Legal VEX Pneumatics Summary document.

i. Zip ties with identical dimensions as those included in the VEX V5 product line, or their metric equivalents. Specific zip tie dimensions listed on the VEX Robotics website are nominal references to hardware sizes found within the VEX V5 product line and/or their metric equivalents. The designated size of the product may differ slightly from the actual measurement.

j. A Micro SD card installed in the V5 Robot Brain.

k. Aerosol-based cooling/freeze spray may be used to assist in cooling motors. *Teams* using freeze spray or similar products in ways that may reasonably be deemed unsafe could be subject to <S1> *Violations*.

l. Cleaners, disinfectants, and/or sanitizers may be used to assist in cleaning *Robots*, parts, components, etc. VEX Robotics recommends the following procedures for cleaning/disinfecting/sanitizing robot parts.

m. See rules <R21> through <R25> for additional legal non-VEX components.

Significant Q&As:

- Q&A 2820 - Premade nets from prior game sets don't count as string, and aren't legal for use on Robots
- Q&A 2906 - Premade nets (e.g., basketball nets) aren't legal; any net must be created with string by the team

This rule is applied differently for VEX U. See Rules <VUR3>, <VUR4>, <VUR7>, <VUR8>, <VUR9>, <VUR12>, <VUR14> & <VUR15>

<R21> **Custom V5 Smart Cables are allowed.** *Teams* who create custom cables acknowledge that incorrect wiring may have undesired results.

a. Official V5 Smart Cable Stock must be used.

b. Use of non-VEX 4P4C connectors and 4P4C crimping tools is permissible.

c. V5 Smart Cables may only be used for connecting legal electronic devices to the V5 Robot Brain.

<R22> **A limited amount of tape is allowed.** *Robots* may use a small amount of tape for the following purposes:

a. To secure any connection between the ends of two (2) VEX cables.

b. To label wires and motors.

c. To prevent leaks on the threaded portions of pneumatic fittings. This is the only acceptable use of Teflon tape.

d. In any other application that would be considered a "non-functional decoration" per <R24>.

e. As an aglet at the end of rope/string to prevent fraying.

<R23> **Certain non-VEX fasteners are allowed.** *Robots* may use the following commercially available hardware:

a. #4, #6, #8, M3, M3.5, or M4 screws up to 2.5" (63.5 mm) long, and M2.5 x 8mm screws.

b. Shoulder screws with a shoulder length no longer than 0.20" and a diameter no larger than 0.176".

c. Any commercially available nut, washer, standoff, and/or non-threaded spacer up to 2.5" (63.5mm) long which fits these screws.

The intent of the rule is to allow *Teams* to purchase their own commodity hardware without introducing additional functionality not found in standard VEX equipment. It is up to inspectors to determine whether the non-VEX hardware has introduced additional functionality or not.
For the purposes of this rule, weight savings is not considered additional functionality.

If a key component of a *Robot's* design relies upon convincing an inspector that a specialized component is "technically a screw," it is probably outside of the spirit and intent of this rule.

All specific dimensions listed in this rule are intended to be 'nominal' references to hardware sizes found within the VEX V5 product line and/or their metric equivalents.

This rule is applied differently for VEX U. See Rule <VUR9>

<R24> **Visual decorations are allowed.** *Teams* may add non-functional decorations, provided that they do not affect *Robot* performance in any significant way or affect the outcome of the *Match*. These decorations must be in the spirit of the competition. Inspectors and *Head Referees* will have final say in what is considered "non-functional." Unless otherwise specified below, non-functional decorations are governed by all standard *Robot* rules.

To be considered "non-functional," any guards, decals, or other decorations must be backed by legal materials that provide the same functionality. For example, if a *Robot* has a giant decal that prevents *Blocks* from falling out of the *Robot*, the decal must be backed by VEX material that would also prevent the *Blocks* from falling out. A simple way to check this is to determine if removing the decoration would impact the performance of the *Robot* in any way.

a. Anodizing and painting of parts is considered a legal nonfunctional decoration.

   Note: As of October 1, 2024, anodizing or color changing of parts (such as painting, etc., which changes the original appearance of parts) is no longer allowed in events in mainland China.

b. Small cameras are permitted as non-functional decorations, provided that any transmitting functions or wireless communications are disabled. Unusually large cameras being used as ballast are not permitted.

c. VEX electronics may not be used as non-functional decorations.

d. Decorations that visually mimic *Field Elements* or *Blocks*, or that could otherwise interfere with an opponent's Vision Sensor, are considered functional and are not permitted. The Inspector and *Head Referee* will make the final decision on whether a given decoration or mechanism violates this rule.

e. Internal power sources (e.g., for a small blinking light) are permitted, provided that no other rules are violated and this source only provides power to the non-functional decoration (i.e., does not directly or indirectly influence any functional portions of the *Robot*).

f. Decorations which provide feedback to the *Robot* (e.g., by influencing legal sensors) would be considered "functional," and are not permitted.

g. Decorations which provide visual feedback to *Drive Team Members* (e.g., decorative lighting) are permitted, provided that they do not violate any other rules and serve no other function (e.g., structural support).

Significant Q&As:

- Q&A 2652 - Soldering LEDs to other wires or components is not allowed

<R25> **A limited amount of custom plastic is allowed.** *Robots* may use custom-made pieces cut from certain types of non-shattering plastic, up to 0.070" thick.

a. Each *Robot* is limited to a maximum of 12 individual pieces cut from non-shattering plastic. This includes non-shattering plastic used in non-functional decorations.

b. Each individual piece of non-shattering plastic cannot be larger than 4" x 8" x 0.070".

c. *Teams* must present and display ALL non-shattering plastic parts during inspection.
   i. Inspectors will verify the total number of plastic pieces. They may use dry-erase markers or other forms or temporary marking to aid in counting.
   ii. Inspectors will verify that no non-shattering piece exceeds the size limitation.

d. Plastic may be mechanically altered by cutting, drilling, bending, etc. It cannot be chemically treated, melted, or cast. Heating non-shattering plastic to aid in bending is acceptable.

e. Legal plastic types are polycarbonate (Lexan), acetal monopolymer (Delrin), acetal copolymer (Acetron GP), POM (acetal), ABS, PEEK, PET, HDPE, LDPE, Nylon (all grades), Polypropylene, PTFE, and FEP.

f. Shattering plastic, such as PMMA (also called Plexiglass, Acrylic, or Perspex), is prohibited.

g. Plastic sheets sold by VEX are considered "plastic" in the context of this rule, and are subject to the same limitations as "off-the-shelf" plastic sheets. Examples include the 276-8340 PET sheets, and the 217-6626 / 217-6627 polycarbonate sheets.

h. This rule does not apply to 3D printed plastic parts. 3D printed parts are not permitted in the VEX V5 Robotics Competition for any purpose, including non-functional decorations.

Note: Teams are strongly encouraged to provide inspectors with 1:1 scale drawings, identical spares, or 1:1 scale tracings of their non-shattering plastic pieces to aid in inspection. Drawings and tracings should accurately reflect ALL shapes and dimensions of each piece.

This rule is applied differently for VEX U. See Rules <VUR3> & <VUR4>

Significant Q&As:

- Q&A 2648 - Teams must replace broken custom plastic that results in temporary, unintentional R25 Violations
- Q&A 2730 - Recommendations for bent plastic and robot inspection
- Q&A 2784 - Cutting a part diagonally across a 4"x8" sheet will require more evidence
- Q&A 2802 - A complex cut/bent part will require more evidence

<R26> **Pneumatics are limited.** A *Robot's* pneumatic subsystem must satisfy all of the following criteria:

a. *Teams* may use a maximum of two (2) legal VEX pneumatic air reservoirs on a *Robot*. The Air Tank 200mL (included in the 276-8750 V5 Pneumatics Kit) and the legacy (pre-2023) reservoir are both considered legal reservoirs.

b. Pneumatic devices may be charged to a maximum of 100 psi.

c. The compressed air contained inside a pneumatic subsystem can only be used to actuate legal pneumatic devices (e.g., cylinders).

Note: From a rules perspective, parts found in the V5 Pneumatics Kit (276-8750) and legacy (pre-2023) pneumatic parts may be used interchangeably. A Legal Pneumatics summary can be found in the VEX Library, which includes additional pneumatics information.

The intent of <R26a> and <R26b> is to limit *Robots* to the air pressure stored in two reservoir tanks, as well as the normal working air pressure contained in their pneumatic cylinders and tubing on the *Robot*. *Teams* may not use other elements for the purposes of storing or generating air pressure.

Using cylinders or additional pneumatic tubing solely for additional storage is in *Violation* of the spirit of this rule. Similarly, using pneumatic cylinders and/or tubing without any air reservoirs is also in *Violation* of the spirit of this rule.
The intent of <R26c> is to ensure that pneumatics are being used safely. Pressurized systems, such as a *Robot's* pneumatic subsystem, have the potential to be dangerous if used incorrectly. This rule ensures the safety of participants, and prevents potentially unsafe uses in the future.

Another way of thinking of <R26c> is that "pneumatics should only be used with pneumatics." *Teams* should not use compressed air as a means of actuating non-pneumatic devices such as screws, nuts, etc. For example, pulling a pin with a pneumatic cylinder is okay, but using air to actuate the pin itself is not.

This rule is applied differently for VEX U. See Rule <VUR14>

<R27> **Most modifications to non-electrical components are allowed.** Physical modifications, such as bending or cutting, of legal metal structure or plastic components are permitted.

a. Internal or external mechanical repairs of VEX Limit and Bumper switches are permitted.
   i. Modifying the metal arm on the Limit Switch is permitted.
   ii. Using components from these devices in other applications is prohibited.
b. Metallurgical modifications that change fundamental material properties, such as heat treating or melting, are not permitted.
c. Pneumatic tubing may be cut to desired lengths.
d. Fusing/melting the end of legal nylon rope/string (see <R20e>) to prevent fraying is permitted.
e. Welding, soldering, brazing, gluing, or attaching parts to each other in any way that is not provided within the VEX platform is not permitted. Rule <R20d> is an exception to this rule.
f. Mechanical fasteners may be secured using Loctite or a similar thread-locking product. This may ONLY be used for securing hardware, such as screws and nuts.

This rule is applied differently for VEX U. See Rules <VUR3>, <VUR12> & <VUR13>

<R28> No modifications to electronic or pneumatic components are allowed. Motors (including the V5 Smart Motor firmware), microcontrollers (including V5 Robot Brain firmware), cables, sensors, controllers, battery packs, reservoirs, solenoids, pneumatic cylinders, and any other electrical or pneumatics component of the VEX platform may NOT be altered from their original state in ANY way.

a. *Teams* may make the following modifications to the V5 Smart Motor (11W)'s user-serviceable features. **This list is all-inclusive**; no other modifications are permitted. Where applicable, the components listed below (in the specific applications listed below) are permissible exceptions to <R20>.
   i. Replacing the gear cartridge with other official cartridges.
   ii. Removing or replacing the screws from the V5 Smart Motor Cap (276-6780).
   iii. Removing or replacing the threaded mounting inserts (276-6781).
   iv. Aesthetic/non-functional labeling (e.g., markers, stickers, paint, etc.).

b. V5 Smart Motors (11W) must use an official VEX V5 gear cartridge. For the purposes of this rule, the gear cartridges found within the V5 Smart Motor are considered "part of the motor." Therefore, any physical or functional modifications to official gear cartridges is not permitted. V5 Smart Motors (11W) may only use official VEX motor cartridges

c. For the purposes of this rule, the V5 Smart Motor Cap is not considered "part of the motor." Therefore, <R27> applies.

d. External wires on VEX 2-wire or 3-wire electrical components may be repaired by soldering or using twist/crimp connectors, electrical tape, or shrink tubing such that the original functionality and length are not modified in any way.
   i. Wire used in repairs must be identical to VEX wire.
   ii. *Teams* make these repairs at their own risk; incorrect wiring may have undesired results.

e. V5 Robot Brain accessories (short flanges, long flanges, and the magnetic screen protector) are considered "part of the V5 Robot Brain" and cannot be modified.

VEX V5 ROBOTICS COMPETITION

PUSH BACK

Section 4
Robot Skills

Section 4 - Robot Skills

Overview

In this challenge, *Teams* will compete in sixty-second (one minute) long *Matches* in an effort to score as many points as possible. These *Matches* consist of *Driving Skills Matches*, which are entirely driver controlled, and *Autonomous Coding Skills Matches*, which are autonomous with limited human interaction. *Teams* will be ranked based on their combined score in the two types of *Matches*.

The Robot Skills Challenge is an optional event for all *Teams*. *Teams* who do not compete will not be penalized in *Qualification Matches* or *Elimination Matches*. However, participation in the Robot Skills Challenge may impact eligibility for judged awards at the event.

At events that include *Qualification Matches*, *Teams* may only participate in the Robot Skills Challenge if they also participate in the *Qualification Matches*. See rule <T20>.

Robot Skills Challenge Definitions

All definitions from previous sections of the manual apply to the Robot Skills Challenge, unless otherwise specified.

Driving Skills Match - A *Driving Skills Match* consists of a sixty-second (one minute) *Driver Controlled Period*. There is no *Autonomous Period*. *Teams* can elect to end their run early if they wish to record a *Skills Stop Time*.

Autonomous Coding Skills Match - An *Autonomous Coding Skills Match* consists of a sixty-second) (one minute) *Autonomous Period*. There is no *Driver Controlled Period*. *Teams* can elect to end their run early if they wish to record a *Skills Stop Time*.

Robot Skills Match - A *Driving Skills Match* or *Autonomous Coding Skills Match*.

Skills Stop Time - The time remaining in a *Robot Skills Match* when a *Team* ends the *Match* early.

a. If a *Team* does not end the *Match* early, they receive a default *Skills Stop Time* of 0.

b. The moment when the *Match* ends early is defined as the moment when the *Robot* is "*Disabled*" by the field control system. See the "Skills Stop Time" section for more details.

c. If a V5 Robot Brain or Tournament Manager display is being used for field control, then the *Skills Stop Time* is the time shown on the display when the *Match* is ended early (i.e., in 1-second increments).

d. If a VEXnet Competition Switch is being used for field control, in conjunction with a manual timer that counts down to 0 with greater accuracy than 1-second increments, then the time shown on the timer should be rounded up to the nearest second. For example, if the *Robot* is *Disabled* and the timer shows 25.2 seconds, then the *Skills Stop Time* should be recorded as 26.

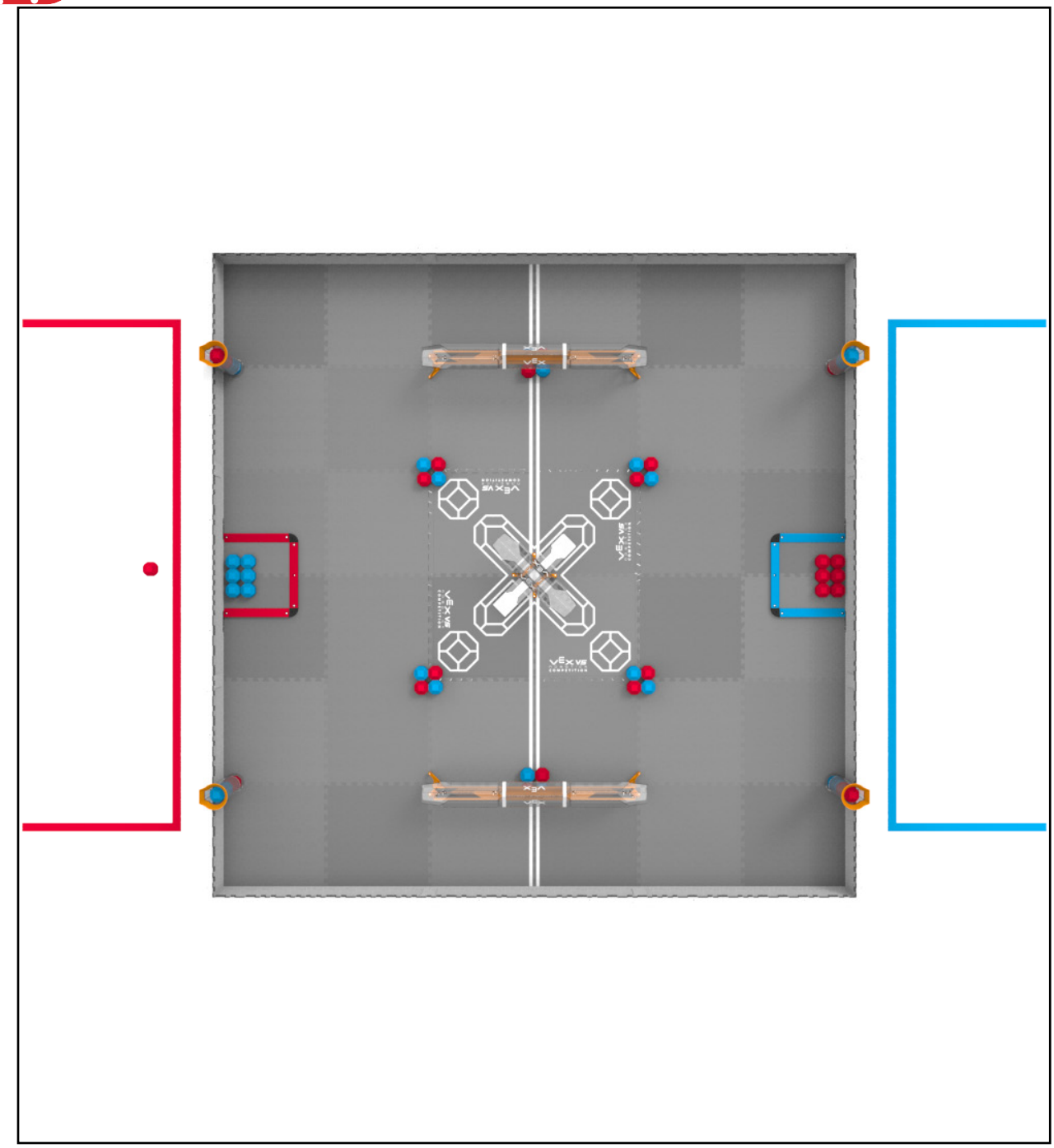

Figure RSC3-1: *The field layout for a V5RC Push Back Robot Skills Match.*

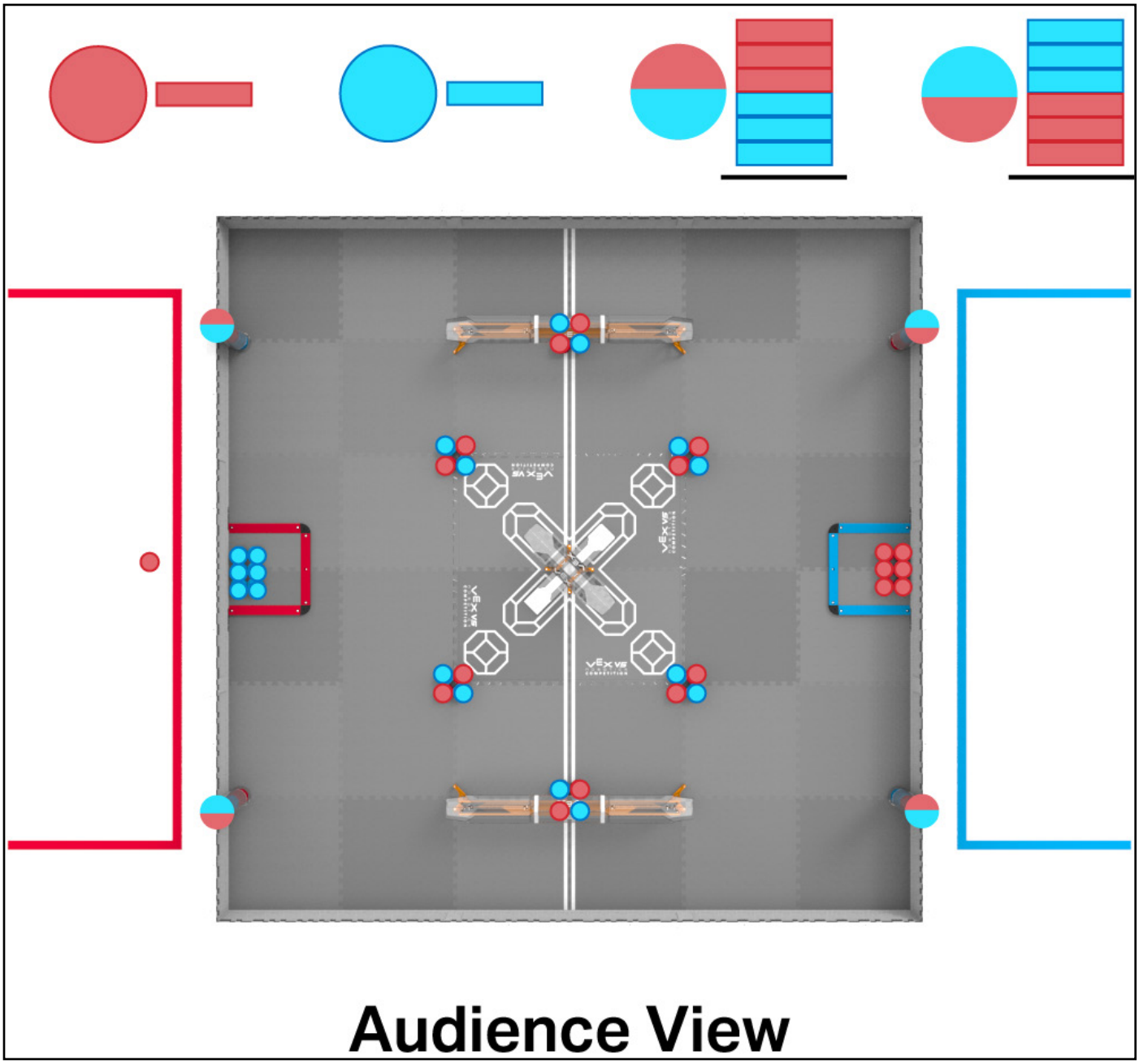

Figure RSC3-2: *An overhead view of a V5RC Push Back Robot Skills Match in its starting configuration, with highlighted Blocks (red / Blue).*

Robot Skills Challenge Rules

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

a. Removing *Blocks* from the *Field* in a *Robot Skills Match* is not a *Violation*. *Blocks* that leave the *Field* cannot be returned.

Violation Note:

- *In the Robot Skills Challenge, the standard definition of Match Affecting does not apply, because there is no winner or loser. When evaluating whether a rule Violation should be classified as a Major Violation or Minor Violation in the context of this criteria, the term "score affecting" can be substituted for "Match Affecting." A Violation is considered "score affecting" if it results in a net increase of that Team's score at the end of the Match.*
- *Violations of <GG>, <SG>, and <RSC> rules that occur during a Robot Skills Match should only affect the outcome of that Match and should not be considered when determining whether a Violation has been repeated during the event.*

Significant Q&As:

- Q&A 2794 - In Skills, there is no Violation if Blocks leave the Field through the top of Loaders

<RSC2> Scoring Robot Skills Matches. For each *Robot Skills Match*, *Teams* are awarded a score based on the following rules and scoring table:

a. *Teams* will receive points for all *Scored Blocks*, regardless of color.
   i. A *Block* is not considered *Scored* if it is in contact with a *Robot* at the end of the *Match*.

b. A *Control Zone* is considered filled if it ends the *Match* containing its maximum number of *Scored Blocks*, and if all *Blocks* in that *Control Zone* are the same color (e.g., all are blue, or all are red).
   i. In a *Robot Skills Match*, a *Center Goal Control Zone* must contain at least seven (7) *Blocks* to be considered filled.
   ii. A *Long Goal* must include one or more of the following to be considered filled in a *Robot Skills Match*:
      1. Three *Blocks* of the same color fully contained between the inner edges of the *Control Zone* tape lines.
      2. Four *Blocks* of the same color fully contained between the outer edges of the *Control Zone* tape lines.

c. The *Team* will earn points for a cleared *Park Zone* if no *Blocks* are in contact with the *Floor* inside the *Park Zone* at the end of the *Match*.

d. The *Team* will earn points for a cleared *Loader* if no *Blocks* are within that *Loader* at the end of the *Match*.

e. The *Team* will earn points for a *Parked Robot* if the *Robot* has moved during the *Match*, is within the red *Alliance Park Zone*, and meets all criteria of rule <SC4> at the end of the *Match*.

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Each *Block Scored* in a *Goal*	1 Point
Each filled *Control Zone* in a *Long Goal*	5 Points
Each filled *Control Zone* in a *Center Goal*	10 Points
Each Cleared *Park Zone*	5 Points
Each Cleared *Loader*	5 Points
Parked Robot	15 Points

Significant Q&As:

- Q&A 2903 - Any movement in or of the Robot counts as having moved during the Match

<RSC3> Robot and Field setup for Skills Matches. The *Robot* and *Field* are set up the same as for a Head-to-Head *Match* (e.g., the *Robot* must meet the requirements of <SG1>), with the following modifications:

a. In *Autonomous Coding Skills Matches*, the VEX GPS code strip must be installed on the *Field*.

b. The *Robot* must start the *Robot Skills Match* in a legal starting position for the red *Alliance*.

c. All *Drive Team Members* must remain in the red *Alliance Station* for the duration of the *Match*.

d. One red *Block* must be used as a Preload in accordance with <SG5>.

e. Revised *Block* layout. 36 *Blocks* begin the *Match* in unscored positions on the *Field* and 24 *Blocks* begin in the *Loaders*, as shown in Figure RSC3-1.

f. *Robots* may move freely about the *Field* after the start of the *Match*.

g. *Robot Skills Matches* do not include *Match Load Blocks*.

This rule is applied differently for VEX U. See Rules <VURS1>, <VURS2> & <VURS3>.

<RSC4> Skills Stop Time. If a *Team* wishes to end their *Robot Skills Match* early, they may elect to record a *Skills Stop Time*. This is used as a tiebreaker for Robot Skills Challenge rankings. A *Skills Stop Time* does not affect a *Team's* score for a given *Robot Skills Match*.

a. *Teams* who intend to attempt a *Skills Stop Time* must "opt-in" by verbally confirming with the *Scorekeeper Referee* prior to the *Robot Skills Match*. If no notification is given prior to the start of the *Match*, then the *Team* forfeits their option to record a *Skills Stop Time* for that *Match*.

   i. This conversation should include informing the *Scorekeeper Referee* which *Drive Team Member* will signal the stop. The *Match* may only be ended early by a *Drive Team Member* for that *Match*.

   ii. If a *Team* runs multiple *Robot Skills Matches* in a row, they must reconfirm their *Skills Stop Time* choice with the *Scorekeeper Referee* prior to each *Match*.

   iii. Any questions regarding a *Skills Stop Time* should be reviewed and settled immediately following the *Match*. <T1> and <T3> apply to *Robot Skills Matches*.

b. If the event is utilizing a V5 Robot Brain or the TM Mobile app for Robot Skills Challenge field control, a *Drive Team Member* may elect to start and stop their own *Robot Skills Matches*.

i. This V5 Robot Brain or other device running the TM Mobile app will be used to start the *Robot Skills Matches* (i.e., "enable" the *Robot*), end the *Robot Skills Match* (i.e., "*Disable*" the *Robot*), and display the official *Skills Stop Time* to be recorded.

ii. This V5 Robot Brain must be running the official field control user program.

iii. For more information regarding the use of a V5 Robot Brain for Robot Skills Challenge field control, and to download the official field control user program, visit this VEX Knowledge Base article.

iv. For more information regarding the use of TM Mobile for field control, see the Tournament Manager documentation.

c. At events which do not have a V5 Robot Brain or the TM Mobile App available for Robot Skills Challenge field control, *Drive Team Members* and field staff must agree prior to the *Match* on the signal that will be used to end the *Match* early.

i. As noted in the definition of *Skills Stop Time*, the moment when the *Match* ends early is defined as the moment when the *Robot* is "*Disabled*" by the field control system.

ii. The agreed-upon signal must be both verbal and visual, such as *Drive Team Members* crossing their arms in an "X" or placing their V5 Controller(s) on the ground.

iii. The signal must be given by a *Drive Team Member* who is standing in the *Alliance Station*.

iv. It is recommended that *Drive Team Members* also provide verbal notice that they are approaching their *Skills Stop Time*, such as by counting out "3-2-1-stop."

d. It is at the *Event Partner's* discretion which method will be used to record *Skills Stop Times* at a given event. The chosen method must be communicated prior to the start of *Matches* (such as during an event meeting), and made equally available to all *Teams*.

i. If an event intends to use a manual timekeeping method, a *Team* may not bring their own V5 Robot Brain just for use during their own *Robot Skills Match*.

ii. If an event intends to utilize a V5 Robot Brain, all *Teams* must use the same V5 Robot Brain for all *Robot Skills Matches* on a given *Field*.

iii. If an event is using multiple *Fields* for *Robot Skills Matches*, the same method must be used at all *Fields*, as described in rule <T21>. Multiple V5 Robot Brains may be used as needed (e.g., a "Field 1 Brain" and a "Field 2 Brain").

iv. The default "Drive" program accessed from a V5 Controller is intended for practice only, and may not be used for an official *Robot Skills Match*.

e. If a *Team* chooses to utilize/record a *Skills Stop Time*, the 5-second grace period described in rule <SC1> does not apply.

Significant Q&As:

- Q&A 2732 - Skills matches can only end early using the process in this rule

VEX V5 ROBOTICS COMPETITION

PUSH BACK

Section 5
The Tournament

Section 5 - The Tournament

Overview

VEX V5 Robotics Competition Head-to-Head *Matches* are played in a tournament format. Head-to-Head Tournaments consist of *Qualification Matches* and *Elimination Matches*. *Qualification Matches* are used to rank *Teams* based on *Win Points* (WP), *Autonomous Points* (AP), and *Strength of Schedule Points* (SP). The top-ranked *Teams* will then form *Alliances* to participate in *Elimination Matches* to determine the tournament champions.

Teams also compete in optional *Robot Skills Matches*, in which *Teams* compete independently in sixty-second *Matches* in an effort to score as many points as possible.

For information about the requirements for tournaments that qualify *Teams* to championship events, visit this article in the REC Library.

Tournament Definitions

Alliance Captain - One of the *Teams* with the privilege of inviting another available *Team* to form an *Alliance* for the *Elimination Matches*. See <T16>.

Alliance Selection - The process of choosing the permanent *Alliances* for the *Elimination Matches*. *Alliance Selection* proceeds as follows:

1. The highest-ranked *Team* at the end of *Qualification Matches* becomes the first *Alliance Captain*.
2. The *Alliance Captain* invites another *Team* to join their *Alliance*.
3. The invited *Team* representative either accepts or declines as outlined in <T16>.
4. The next-highest-ranked *Team* becomes the next *Alliance Captain*.
5. *Alliance Captains* continue to select their *Alliances* in this order until all *Alliances* are formed for the *Elimination Matches*.

Autonomous Points (AP) - The second basis of ranking *Teams*. An *Alliance* who wins the *Autonomous Bonus* during a *Qualification Match* earns ten (10) *Autonomous Points*. In the event of a tie, both *Alliances* will receive five (5) *Autonomous Points*.

Bye - A situation in which an *Alliance* automatically advances to the next round of tournament play without competing.

Elimination Bracket - A schedule of *Elimination Matches* for eight (8) to sixteen (16) *Alliances*. See <T17>.

Elimination Match - A *Match* used in the process of determining the champion *Alliance*. *Alliances* of two (2) *Teams* face off according to the *Elimination Bracket*; the winning *Alliance* moves on to the next round.

Event Partner - The volunteer VEX V5 Robotics Competition 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.

Head Referee - A certified 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. Large events (e.g., Signature Events, World Championships, etc.) might include multiple *Head Referees* at the *Event Partner's* discretion.

Match Schedule - A list of *Matches* that is generated at the start of an event. The *Match Schedule* includes the predetermined, randomly-paired *Alliances* that will be competing in each *Qualification Match*, and the expected start times for these *Matches*. The *Match Schedule* may be subject to change at the *Event Partner's* discretion.

Qualification Match List

Lions Middle School VEX V5 Robotics Competition

Match	Field	Time	Red 1	Red 2	Blue 1	Blue 2
Q1	Field 1	Sat 9:30 AM	1660B	8686R	29651B	29651C
Q2	Field 2	Sat 9:33 AM	33249H	33249C	29651F	33249B
Q3	Field 3	Sat 9:37 AM	13115D	32222A	77240K	1660C
Q4	Field 1	Sat 9:40 AM	13115C	8686D	33249E	40994D
Q5	Field 2	Sat 9:44 AM	40994E	40994C	13115A	13115B
Q6	Field 3	Sat 9:47 AM	1660A	29651Z	8686M	32222J
Q7	Field 1	Sat 9:51 AM	29356Z	97735C	8686G	8686P
Q8	Field 2	Sat 9:54 AM	29651D	29651F	8686R	8686D
Q9	Field 3	Sat 9:58 AM	32222J	29651B	33249H	13115B
Q10	Field 1	Sat 10:01 AM	13115A	33249E	97735C	32222A
Q11	Field 2	Sat 10:05 AM	8686M	29651C	8686P	13115D
Q12	Field 3	Sat 10:08 AM	33249B	40994D	29651D	29651Z
Q13	Field 1	Sat 10:12 AM	13115C	1660C	1660A	33249C
Q14	Field 2	Sat 10:15 AM	40994C	77240K	1660B	29356Z
Q15	Field 3	Sat 10:19 AM	40994E	8686G	29651F	13115D

Figure MS-1: *An example of a Qualification Match Schedule*

Practice Match - A *Match* used to provide time for *Teams* and volunteers to get acquainted with the official playing *Field* and procedures. *Practice Matches* earn *Teams* zero (0) *Win Points*, *Autonomous Points*, and *Strength of Schedule Points*. *Head Referees* should not record or track standard gameplay violations that occur during *Practice Matches*. *Violations* that are egregious, unsportsmanlike and/or unsafe may be recorded and tracked at the discretion of the *Head Referee*.

Qualification Match - A *Match* used to determine *Team* rankings for *Alliance Selection*. Each *Qualification Match* consists of two *Alliances* competing to earn *Win Points*, *Autonomous Points*, and *Strength of Schedule Points*.

Scorekeeper Referee - An impartial volunteer responsible for tallying scores at the end of a *Match*. *Scorekeeper Referees* do not make ruling interpretations, and should redirect any *Team* questions regarding rules or scores to a *Head Referee*.

Strength of Schedule Points (SP) - The third basis of ranking *Teams*. *Strength of Schedule Points* are equivalent to the score of the losing *Alliance* in a *Qualification Match*. In the event of a tie, both *Alliances* receive *Strength of Schedule Points* equal to the tie score. If both *Teams* on an *Alliance* are *Disqualified*, the *Teams* on the not *Disqualified Alliance* will receive their own score as *Strength of Schedule Points* for that *Match*.

Win Points (WP) - The first basis of ranking *Teams*. *Teams* will receive zero (0), one (1), two (2), or three (3) *Win Points* for each *Qualification Match*. Unless a *Team* is *Disqualified*, both *Teams* on an *Alliance* always earn the same number of *Win Points*.

- One (1) *Win Point* is awarded for completing the *Autonomous Win Point* task(s).
- Two (2) *Win Points* are awarded for winning a *Qualification Match*.
- One (1) *Win Point* is awarded for tying a *Qualification Match*.
- Zero (0) *Win Points* are awarded for losing a *Qualification Match*.

Win Percentage (WP) - Replaces *Win Points* in a league event. *Win Percentage* is calculated by the number of wins divided by the number of *Qualification Matches* the *Team* plays. In cases of a tie, the *Team* is given a 0.5 number of "wins" for that *Match*. The *Autonomous Win Point* is also considered 0.5 "wins," added to the total number of wins.

Tournament Rules

<T1> Head Referees have ultimate and final authority on all gameplay and Robot ruling decisions during the competition.

a. *Scorekeeper Referees* score the *Match*, and may serve as observers or advisers for *Head Referees*, but may not determine any *Violations* directly.

b. When issuing a *Major Violation* or *Minor Violation* to a *Team*, *Head Referees* must provide the rule number of the specific rule that has been Violated, and must record the *Violation* on the Match Anomaly Log.

c. *CoC-related Violations* require additional escalation beyond the *Head Referee's* initial ruling, including (but not limited to) investigation by RECF representatives.

d. *Event Partners* may not overrule a *Head Referee's* gameplay or *Robot* decisions.

e. Every *Qualification Match* and *Elimination Match* must be watched by a certified *Head Referee*. *Head Referees* may only watch one *Match* at a time; if multiple *Matches* are happening simultaneously on separate *Fields*, each *Field* must have its own *Head Referee*. *Head Referees* must follow the rules in this game manual and the Q&A, and must make rulings consistent with the intent of the game manual and Q&A.

f. At a minimum, every *Robot Skills Match* must be watched by a trained *Scorekeeper Referee*, who may only watch one *Match* at a time. If multiple *Robot Skills Matches* are happening simultaneously on separate *Fields*, each *Field* must have its own *Scorekeeper Referee*. A certified *Head Referee* must be available at the event to explain a rule, *Disqualification*, *Violation*, or other penalty to *Teams* in *Robot Skills Matches* as needed in support of the *Scorekeeper Referees* at skills *Fields*.

Note from the VEX GDC: The rules contained in this Game Manual are written to be enforced by human *Head Referees*. Many rules have "black-and-white" criteria that can be easily checked. However, some rulings will rely on a judgment call from this human *Head Referee*. In these cases, *Head Referees* will make their calls based on what they and the *Scorekeeper Referees* saw, what guidance is provided by their official support materials (the Game Manual and the Q&A), and most crucially, the context of the *Match* in question.

The VEX V5 Robotics Competition does not have video replay, our *Fields* do not have absolute sensors to count scores, and most events do not have the resources for an extensive review conference between each *Match*.

When an ambiguous rule results in a controversial call, there is a natural instinct to wonder what the "right" ruling "should have been," or what the GDC "would have ruled." This is ultimately an irrelevant question; our answer is that when a rule specifies "*Head Referee's* discretion" (or similar), then the "right" call is the one made by a *Head Referee* in the moment. The VEX GDC designs games, and writes rules, with this expectation (constraint) in mind.

Version 2.2 - Released December 4, 2025

<T2> Head Referees must be qualified. V5RC *Head Referees* must have all of the following qualifications:

a. Be at least 20 years of age.

b. Be approved by the *Event Partner*.

c. Be an REC Foundation Certified V5RC *Head Referee* for the current season. Visit the REC Library for more details.

d. Cannot be the *Event Partner* or a Judge Advisor for the event.

Note: Scorekeeper Referees must be at least 15 years of age, and must be approved by the Event Partner.

Head Referees should demonstrate the following attributes:

- Thorough knowledge of the current game and rules of play
- Effective decision-making skills
- Attention to detail
- Ability to work effectively as a member of a team
- Ability to be confident and assertive when necessary
- Strong communication and diplomacy skills

<T3> Drive Team Members are permitted to immediately appeal a Head Referee's ruling. If *Drive Team Members* wish to dispute a score or ruling, they must stay in the *Alliance Station* until the *Head Referee* from the *Match* talks with them. The *Head Referee* may choose to meet with the *Drive Team Members* 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 their decision has been made final, the issue is over and no more appeals may be made (See rule <T1>).

a. Referees are not permitted to review any photo or video *Match* recordings when determining a score or ruling.

b. *Head Referees* are the only individuals permitted to explain a rule, *Disqualification*, *Violation*, or other penalty to the *Teams* in a Head-to-Head *Match*. *Teams* should never consult other field personnel, including *Scorekeeper Referees*, regarding a ruling clarification.

Communication and conflict resolution skills are an important life skill for *Students* to practice and learn. In VEX V5 Robotics Competitions, we expect *Students* to practice proper conflict resolution using the proper chain of command. *Violations* of this rule may be considered a *Violation* of <G1> and/or the Code of Conduct.

Some events may choose to utilize a "question box" or other designated location for discussions with *Head Referees*. Offering a "question box" is within the discretion of the *Event Partner* and/or *Head Referee*, and may act as an alternate option for asking *Drive Team Members* to remain in the *Alliance Station* (although all other aspects of this rule apply). However, by using this alternate location, *Drive Team Members* acknowledge that they are forfeiting the opportunity to use any contextual information involving the specific state of

the *Field* at the end of the *Match*. For example, it is impossible to appeal whether a *Block* was *Scored* or not if the *Field* has already been reset. If this information is pertinent to the appeal, *Drive Team Members* should still remain in the *Alliance Station*, and relocate to the "question box" once the *Head Referee* has been made aware of the concern and/or any relevant context.

<T4> The Event Partner has ultimate authority regarding all non-gameplay decisions during an event. The Game Manual is intended to provide a set of rules for successfully playing V5RC Push Back; it is not intended to be an exhaustive compilation of guidelines for running a VEX V5 Robotics Competition event. Rules such as, but not limited to, the following examples are at the discretion of the *Event Partner* and should be treated with the same respect as the Game Manual.

- Venue access
- Pit spaces
- Health and safety
- Team registration and/or competition eligibility
- Team conduct away from competition *Fields*

This rule exists alongside <G1>, <S1>, and <G3>. Even though there isn't a rule that says "do not steal from the concession stand," it would still be within an *Event Partner's* authority to remove a thief from the competition.

<T5> Be prepared for minor Field variance. *Field Element* tolerances and *Blocks* may vary from specified locations/dimensions; *Teams* are encouraged to design their *Robots* accordingly. Please make sure to check Appendix A for more specific nominal dimensions and tolerances.

a. *Field Element* tolerances may vary from nominal by up to ±1.0".

b. *Block* placement at the beginning of the *Match* may vary from nominal by up to ±1" (25.4mm). If a *Block* is within tolerance, either on the *Field* or within a *Loader*, it should not be adjusted before the *Match*.

c. *Goal* Heights may vary from nominal by up to ±1" (25.4mm).

d. *Block* weight may vary by up to ± 4g

e. The rotation of *Blocks* is not specified. If a *Block* is within tolerance, either on the *Field* or within a *Loader*, it should not be adjusted before the *Match*.

f. Placement of *Control Zone* tape lines on the *Long Goals* may vary from nominal by up to ± 0.25".

The *Field Perimeter* and Elements are designed to be assembled and disassembled multiple times each year. *Event Partners* store and transport *Fields* between events, and the individuals setting up the *Field* at one event may differ from those at the next. While every effort will be made to ensure minimal variance, *Teams* should expect that any *Field* may be slightly different than another, and prepare accordingly. Just because something works on one *Field* does not fully guarantee it will work on the next, and is not enough evidence alone to determine if a *Field* is out of tolerance.

Significant Q&As:

- Q&A 2787 - Examples of in-tolerance Blocks that should NOT be adjusted before the Match

<T6> Fields may be repaired at the Event Partner's discretion. All competition *Fields* at an event must be set up in accordance with the specifications in Appendix A and/or other applicable Sections. Minor aesthetic customizations or repairs are permitted, provided that they do not impact gameplay (see <T4>).

Examples of permissible modifications include, but are not limited to:

- Applying threadlocker to *Field Element* mounting hardware
- Using non-VEX white electrical tape to add required lines to the *Field*
- Using standard VEX Field tiles in place of the game-specific graphic tiles, for any reason
- Assembling *Loaders* without nut blocks to improve alignment of holes
- Anchoring *Field Elements* directly to *Field* risers instead of the metal plates
- Anchoring the metal plates to the underlying surface with hardware or tape

Examples of prohibited modifications include, but are not limited to:

- Unofficial *Field Perimeter* walls, additional structural elements inside of the *Field Perimeter*, or unofficial/replica *Field Elements*
- Additional VEX structural parts attached to a *Field Element*
- Replacing the opaque *Field* walls on the VEX Portable Competition *Field Perimeter* with transparent panels
- Assembling a VEX Portable Competition *Field Perimeter* without including the securing straps
- Affixing stickers to the foam Field Tiles or otherwise marking object placements for *Field* reset

Any specific repairs and/or modifications which pertain to the current season's game will be documented in this rule and Appendix A, as needed.

Significant Q&As:

- Q&A 2740 - Adding additional tape markings to a Goal is a prohibited modification

<T7> Fields at an event must be consistent with each other. There are many types of permissible aesthetic and/or logistical modifications that may be made to competition *Fields* at the *Event Partner's* discretion. If an event has multiple Head-to-Head competition *Fields*, they must all incorporate the same permissible/applicable modifications. If an event has multiple Robot Skills Challenge *Fields*, they must all incorporate the same permissible/applicable modifications. For example, if one Head-to-Head competition *Field* is elevated, then all Head-to-Head competition *Fields* must be elevated to the same height.

Examples of these modifications may include, but are not limited to:

- Elevating the playing *Field* off of the floor (common heights are 12" to 24" [30.5cm to 61cm])

- Field control systems (see <T8>)
- Field display monitors
- *Field Perimeter* decorations (e.g., LED lights, sponsor decals on polycarbonate panels)
- *Field Perimeter* type (see <T9>)
- Utilizing the VEX GPS Field Code Strips

Note: If an event has dedicated Fields for Skills Challenge Matches, there is no requirement for them to have the same consistent modifications as the Head-to-Head Fields. See <T21> for more details.

<T8> There are three types of Field control that may be used.

1. A VEXnet Field Controller controlled by Tournament Manager, which connects to a Controller's competition port via ethernet cable.
2. A V5 Event Brain controlled by Tournament Manager, which connects to a Controller via Smart Cable.
3. A VEXnet Competition Switch, which connects to a Controller's competition port via Cat-5 cable, may only be used in *Practice Matches*, *Robot Skills Matches*, and Leagues, and only under extreme circumstances.

If an event has multiple *Fields*, then all *Fields* of the same game type must use the same control system, in accordance with <T7> and <T21>. For example, it would be permissible for Head-to-Head competition *Fields* to use V5 Event Brains, and for Skills Challenge *Fields* to use VEXnet Field Controllers. However, it would not be permissible for one Head-to-Head *Field* to use a V5 Event Brain while another Head-to-Head *Field* uses a VEXnet Field Controller.

Note: Official Qualifying Events may only use the official, unmodified version of Tournament Manager for field control, along with approved hardware and networking solutions found in the REC Library.

Note 2: Add-ons that abide by the TM Public API guidelines are permitted. Once add-ons are enabled, the software is no longer supported by the REC Foundation, VEX Robotics, or DWAB Technologies; any necessary troubleshooting will be done at the user's own risk.

<T9> There are two types of Field Perimeter that may be used.

1. VEX Metal Competition Field Perimeter (SKU 278-1501).
2. VEX Portable Competition Field Perimeter (SKU 276-8242).

See Appendix A for more details.

If an event has multiple *Fields*, then all *Fields* of the same game type must use the same *Field Perimeter* type, in accordance with <T7> and <T21>. For example, it would be permissible for Head-to-Head competition *Fields* to use metal *Field Perimeters*, and for Skills Challenge *Fields* to use Portable Field Perimeters. However, it would not be permissible for one Head-to-Head *Field* to use a metal *Field Perimeter*, while other Head-to-Head *Fields* use Portable Field Perimeters.

<T10> Qualification Matches follow the Match schedule. A Qualification *Match Schedule* will be available on the day of competition. The *Match Schedule* will indicate *Alliance* partners, *Match* pairings, and *Alliance* colors for each *Match*. For tournaments with multiple *Fields*, the schedule will indicate which *Field* each *Match* will take place on. The *Match Schedule* is subject to change at the *Event Partner's* discretion.

a. *Practice Matches* may be included in the *Match Schedule* at some events, but are not required. If *Practice Matches* are run, every effort will be made to equalize practice time for all *Teams*.

b. A *Qualification Match* can only start before its scheduled time if all *Teams*, *Robots*, and assigned volunteers are at the *Field* and ready to play.

c. Any multi-division event must be approved by the REC Foundation RSM prior to the event, and divisions must be assigned in sequential order by *Team* number.

<T11> Each Team will have at least six Qualification Matches.

a. When in a tournament, the tournament must have a minimum of six (6) *Qualification Matches* per *Team*. The suggested number of *Qualification Matches* per *Team* for a standard tournament is eight (8) and up to ten (10) for a championship event.

b. When in a league, there must be at least three (3) league ranking sessions, with at least one (1) week between sessions. Each session must have a minimum of two (2) *Qualification Matches* per *Team*. The suggested number of *Qualification Matches* per *Team* for a standard league ranking session is four (4). Leagues will have a championship session where elimination rounds will be played. *Event Partners* may choose to have *Qualification Matches* as part of their championship session.

<T12> Qualification Matches contribute to a Team's ranking for Alliance Selection.

a. When in a tournament, every *Team* will be ranked based on the same number of *Qualification Matches*.

b. When in a league, every *Team* will be ranked based on the number of *Matches* played. *Teams* that participate at least 60% of the total *Matches* available will be ranked above *Teams* that participate in less than 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 scheduled in still constitutes participation for these calculations.

c. 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; *Win Points*, *Autonomous Points*, and *Strength of Schedule Points* for that *Qualification Match* will not impact a *Team's* ranking, and will not affect participation percentage for leagues.

   i. *Teams* are reminded that <G1> is always in effect and *Teams* are expected to behave as if the additional *Qualification Match* counted.

   ii. In leagues, *Teams* may have a different number of *Qualification Matches*. Rankings are determined by the *Win Percentage*, which is the number of wins divided by the number of *Qualification Matches* that *Teams* have played.

<T13> Qualification Match tiebreakers. *Team* rankings are determined throughout *Qualification Matches* as follows:

a. Average *Win Points* (*Win Points* / number of *Matches* played)

b. Average *Autonomous Points* (*Autonomous Points* / number of *Matches* played)

c. Average *Strength of Schedule Points* (*Strength of Schedule Points* / number of *Matches* played)

d. Highest *Match* score

e. Second-highest *Match* score

f. Random electronic draw

<T14> Small tournaments have fewer Alliances. The number of *Alliances* for a given event is determined as follows, except in extraordinary circumstances with the permission of the location's RECF Regional Support Manager:

# of Teams	# of Elimination Alliances
32+	16
24-31	12
16-23	8
<16	# of *Teams* divided by 2, less any remainder

This rule is applied differently for VEX U. See Rule <VUT7>.

<T15> Send a Student representative to Alliance Selection. Each *Team* must send one (1) *Student* representative to the playing *Field* (or other designated area) to participate in *Alliance Selection*. If the *Team* Representative fails to report in for *Alliance Selection*, their *Team* will be ineligible for participation in the *Alliance Selection* process.

Once the *Alliance Selection* begins, *Student* representatives cannot use electronic devices unless they have been demonstrated to be in airplane mode. No electronic communication by or with *Student* representatives is allowed during the *Alliance Selection* process.

Teams are advised to complete their scouting prior to the beginning of *Alliance Selection*, and to come to *Alliance Selection* prepared with a written list of potential *Alliance* Partners. Non-electronic methods of communication are allowed, and rule <G2> and the *Student*-Centered Policy still apply during *Alliance Selection*. Any communication about *Alliance Selection* and specific *Teams* should be limited to *Student Team* Members.

<T16> Each Team may only be invited once to join one Alliance. If a *Team* representative declines an *Alliance Captain's* invitation during *Alliance Selection*, that *Team* is no longer eligible to be selected by another *Alliance Captain*. However, they are still eligible to play *Elimination Matches* as an *Alliance Captain*.

This video includes a full explanation of the *Alliance Selection* process.
For example:

- *Alliance Captain* 1 invites Team ABC to join their *Alliance*.
- Team ABC declines the invitation.
- No other *Alliance Captains* may invite Team ABC to join their *Alliance*.
- However, Team ABC may still form their own *Alliance* if Team ABC is ranked high enough after *Qualification Matches* to become an *Alliance Captain*.

  Note: Alliances must have two Teams, and there are no "do-overs" during Alliance Selection. If enough Teams decline their invitations such that the full number of Alliances cannot be filled, the event will proceed with a reduced number of Alliances.

<T17> Elimination Matches follow the Elimination Bracket. A sixteen (16) *Alliance* bracket plays as shown in Figure T17-1, with *Matches* proceeding in numbered order through each round.

If an event is run with fewer than 16 *Alliances*, then they will use the bracket shown in Figure T17-1, with *Byes* awarded when there is no applicable *Alliance*. For example, in a tournament with 12 *Alliances*, *Alliances* 1, 2, 3, & 4 would automatically advance to the Quarterfinals.

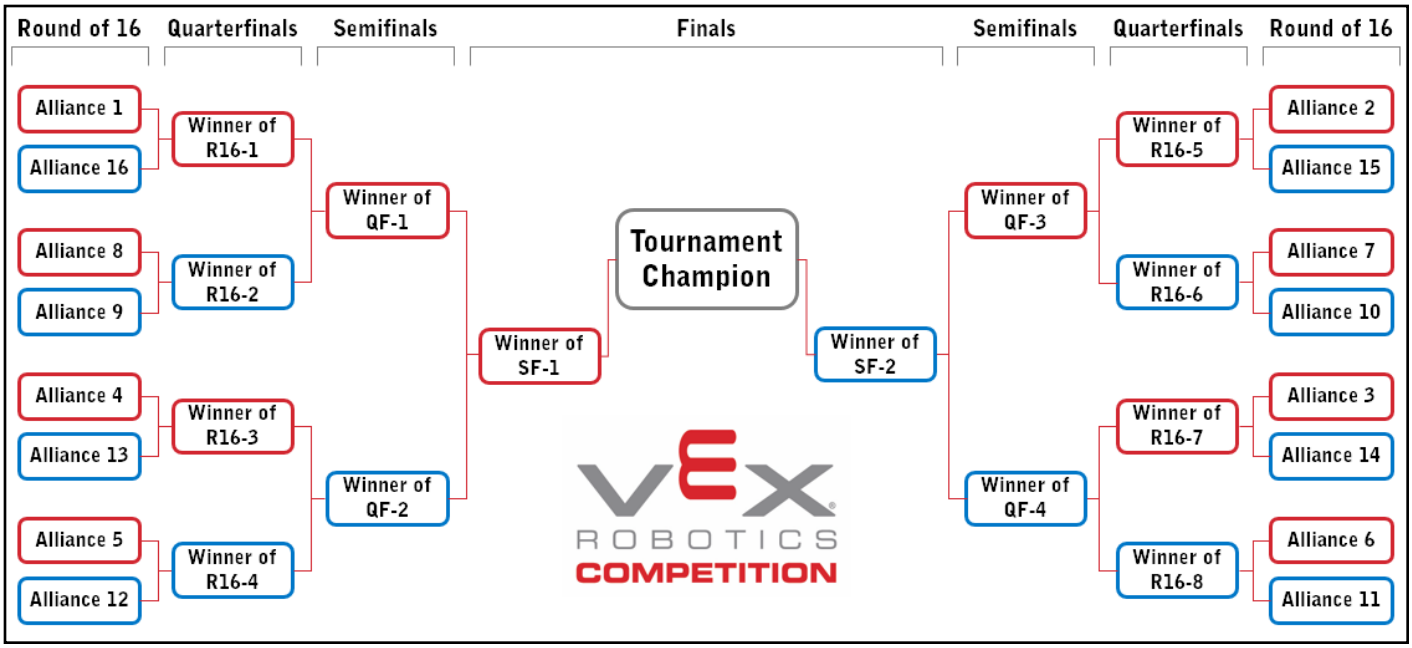

Figure T17-1: *A 16-Alliance bracket*

Thus, an eight (8) *Alliance* bracket would run as shown below:

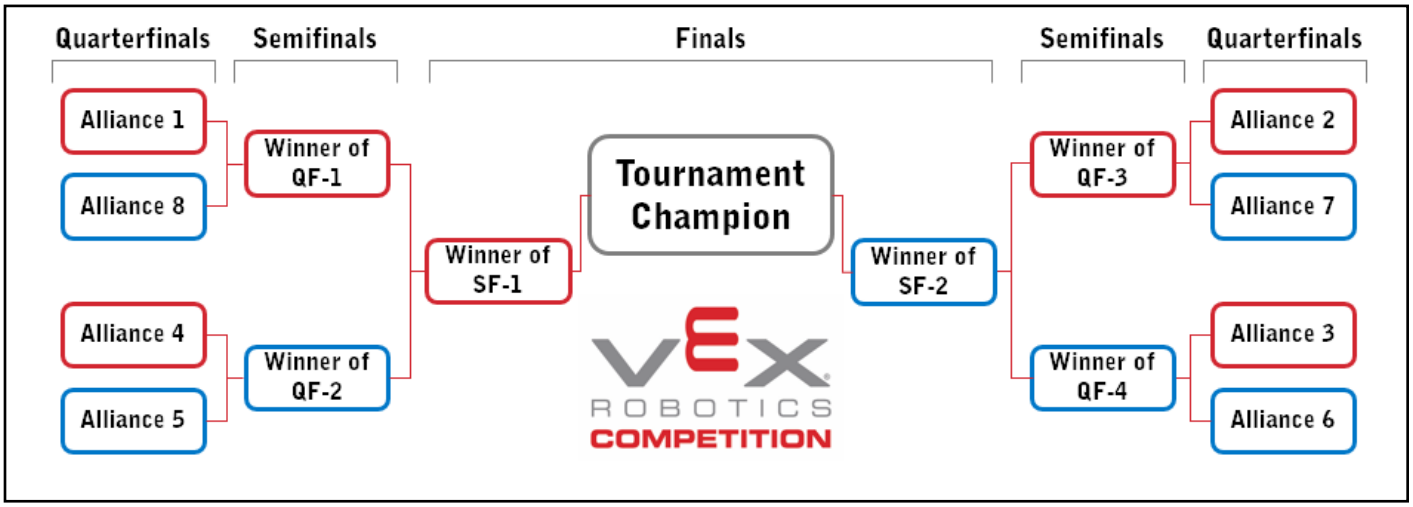

Figure T17-2: *An 8-Alliance bracket*

<T18> **Elimination Matches are a blend of "Best of 1" and "Best of 3."** "Best of 1" means that the winning *Alliance* in each *Match* advances to the next round of the *Elimination Bracket*. "Best of 3" means that the first *Alliance* to reach two wins will advance.

See the flowchart below for more information.

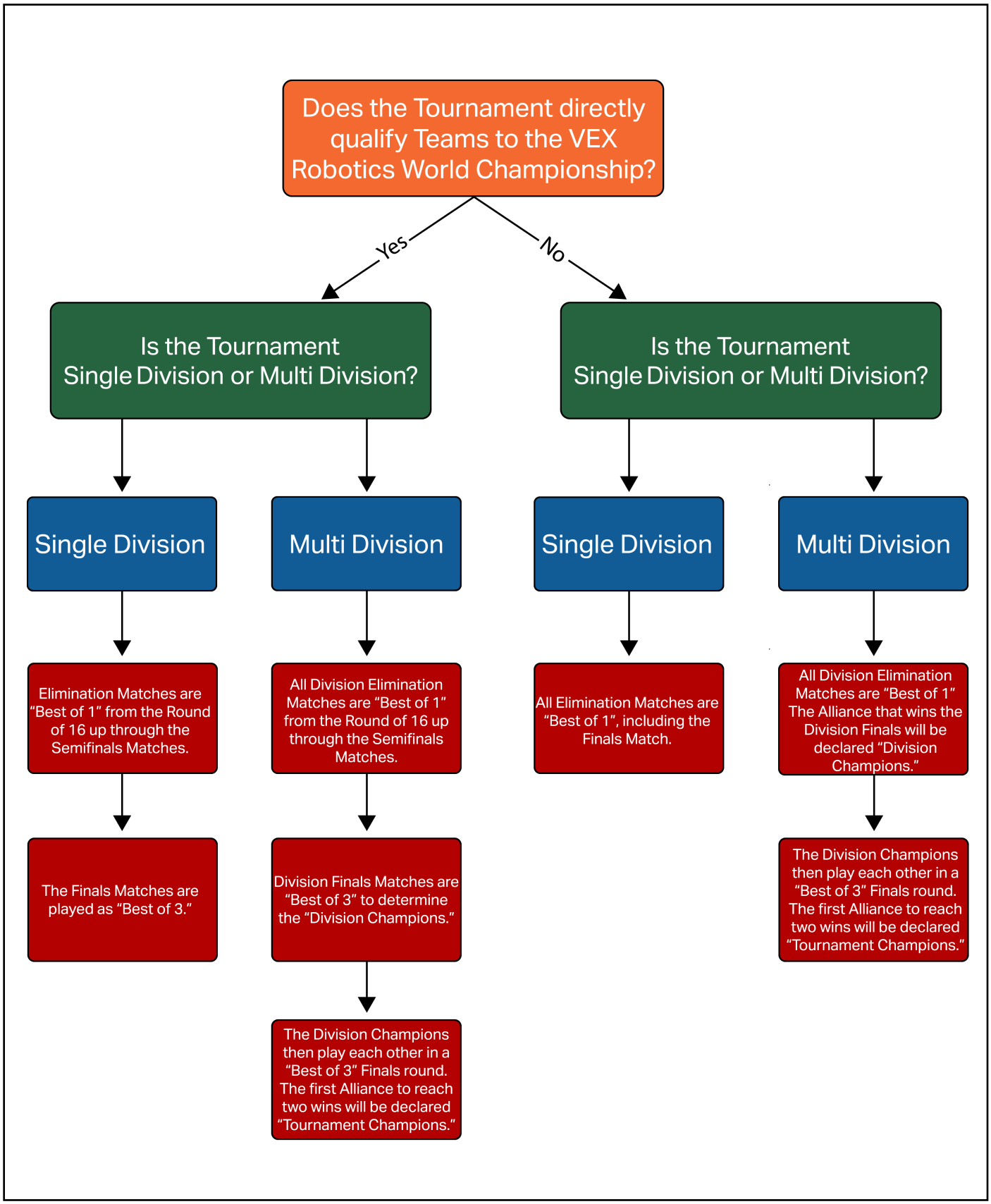

Figure T18-1: *The process for determining how Elimination Matches should be played.*

<T19> Ties in Elimination Matches lead to limited rematches. In the case of tied *Matches* during Elimination Rounds, Tournament Manager will apply the following logic to determine which *Alliance* will progress to the next round.

a. In a "Best of 1" Elimination Round, the higher-seeded *Alliance* will advance and be declared the winner under the following guidelines.
   i. After two (2) ties in a non-Finals *Match*.
   ii. After three (3) ties in a Finals *Match*.
b. For single-division events or within a division: in a "Best of 3" Elimination Round, the higher-seeded *Alliance* will advance and be declared the winner under the following guidelines.
   i. After three (3) ties in a round in which neither *Alliance* has yet won a *Match* (0-0).
   ii. After two (2) ties in a round in which each *Alliance* has won a single *Match* (1-1).
c. For single-division events or within a division: after two (2) ties in a "Best of 3" Elimination Round in which one *Alliance* has won a single *Match* (1-0), the *Alliance* with one (1) win will be declared the winner.
d. For a "Best of 3" overall Finals round at a multi-division event, *Teams* should continue to play tiebreaker *Matches* until one *Alliance* has won two (2) *Matches*.

<T20> Skills Match Schedule. *Teams* play *Robot 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) *Autonomous Coding 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 Challenge 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*.

Details regarding logistics of Skills-Only Events can be found in the REC Foundation Qualifying Criteria document.

a. *Robot Skills Matches* are only available to *Teams* who participate in *Qualification Matches*, unless the event is an approved Skills-Only Event or in cases where a VURC or VAIRC *Team* records skills scores in accordance with this REC Library article. *Teams* who participate in *Qualification Matches* during a specific League Ranking Session are the only *Teams* who can participate in *Robot Skills Matches* at that session.
b. Skills scores recorded by ineligible *Teams* will be deleted from Tournament Manager before the event is finalized on RobotEvents.com.

<T21> There is no requirement that Skills Challenge Fields have the same consistent modifications as the Head-to-Head Fields. For example, there is no requirement that all Skills Challenge *Fields* are elevated to the same height as Head-to-Head *Fields*. However, all Skills Challenge *Fields* at a single

event must use the same type of Field control and *Field Perimeter*, as described in rules <T8> and <T9>. It is strongly recommended/preferred that all Skills Challenge *Fields* are consistent with each other, but this may not be the case in extreme circumstances.

In order to use non-conforming Head-to-Head *Fields* for Skills Challenge runs (e.g. during lunch), the following steps should be taken:

- *Teams* must be informed that the Head-to-Head *Fields* may have some differences from the Skills Challenge *Fields* (e.g., they might not have GPS strips).
- *Teams* must be given an opportunity to select which type of *Field* they want to use, i.e. they cannot be required to use a Head-to-Head *Field* for any Skills Challenge run.

<T22> Skills Rankings at events. *Teams* will be ranked at an event based on the following scores and tiebreakers:

1. Sum of highest *Autonomous Coding Skills Match* score and highest *Driving Skills Match* score.
2. Highest *Autonomous Coding Skills Match* score.
3. Second-highest *Autonomous Coding Skills Match* score.
4. Second-highest *Driving Skills Match* score.
5. Highest sum of *Skills Stop Times* (see rule <RSC4>) from a *Team's* highest *Autonomous Coding Skills Match* and highest *Driving Skills Match* (i.e., the *Matches* in point 1).
6. Highest *Skills Stop Time* from a *Team's* highest *Autonomous Coding Skills Match* (i.e., the *Match* in point 2).
7. Third-highest *Autonomous Coding Skills Match* score.
8. Third-highest *Driving Skills Match* score.
9. If a tie cannot be broken after all above criteria, then the following ordered criteria will be used to determine which *Team* had the "best" *Autonomous Coding Skills Match*:
    a. Points earned for filled *Control Zones*.
    b. Number of *Blocks Scored* in *Goals*.
    c. Points earned for *Parking*
10. If the tie still isn't broken, the same process in Step 9 will be applied to each *Team's* best *Driving Skills Match*.
11. If the tie still isn't broken, events may choose to allow *Teams* to have one more deciding *Driving Skills Match*, to be ranked according to the standard criteria above, or declare both *Teams* the Robot Skills Challenge Winner.

<T23> Skills Rankings Globally. *Teams* will be ranked globally based on their Robot Skills scores from Tournaments and Leagues that upload results to RobotEvents.com, according to the following tiebreakers:

1. Highest Robot Skills score (combined *Autonomous Coding Skills Match* and *Driving Skills Match* Score from a single event).
2. Highest *Autonomous Coding Skills Match* score (from any event).
3. Highest sum of *Skills Stop Times* (see rule <RSC4>) from the *Robot Skills Matches* used for point 1.
4. Highest *Skills Stop Time* from the *Autonomous Coding Skills Match* used for point 2.
5. Highest *Driving Skills Match* score (from any event).
6. Highest *Skills Stop Time* from the *Driving Skills Match* score used for point 5.
7. Earliest posting of the Highest *Autonomous Coding Skills Match* score.
    a. The first *Team* to post a score ranks ahead of other *Teams* that post the same score at a later time, all else being equal.
8. Earliest posting of the Highest *Driving Skills Match* score.
    a. The first *Team* to post a score ranks ahead of other *Teams* that post the same score at a later time, all else being equal.

<T24> Robot Skills at League Events. At league events in which *Teams* may submit Robot Skills Challenge scores across multiple sessions, the Robot Skills scores (combined highest *Autonomous Coding Skills Match* and *Driving Skills Match* scores) used for rankings will be calculated from *Matches* within the same session.

For example, consider the following scores for a hypothetical *Team* across two league event sessions:

	Autonomous Coding Skills Match	Driving Skills Match	Robot Skills Score
Session 1	40	60	100
Session 2	50	100	150

This *Team* would have a Robot Skills score of 150 for this event, and their scores from Session 2 would be used for the Event and Global tiebreakers listed in <T22> and <T23>.

VEX V5 ROBOTICS COMPETITION

PUSH BACK

Section 6
VEX U Robotics Competition

Section 6 - VEX U Robotics Competition

Introduction

While many colleges and universities already use the VEX V5 system in their academic classes, many more have extensive manufacturing capabilities beyond the standard "VEX metal" library. Fabrication techniques like machining and 3D printing are more common than ever in collegiate engineering programs, and we can't wait to see what VEX U Robotics Competition *Teams* from around the world are able to create under these more advanced rules.

As in past years, the season will include a culminating VEX U event at the VEX Robotics World Championship, along with regional tournaments across the world. Participating schools will get the chance to prove their abilities in front of thousands of future engineers and show off what truly makes their school remarkable. The VEX U Robotics Competition is the perfect project-based supplement to many university level engineering programs, and gives *Students* the unique opportunity to demonstrate their real-world skills to potential employers (such as event sponsors).

Game, Robot, and Tournament Rules

The VEX U Robotics Competition uses the VEX V5 Robotics Competition Push Back *Field* with some minor modifications. Anyone that has a V5RC Push Back *Field* can use it for a VEX U event or *Team*. Please consult earlier sections of this game manual for the basic set of competition rules and details.

All of the standard rules apply, except for the modifications listed in this document. In the event of a conflict between rules, the rules listed in this Section of the game manual and any rulings on the official VEX U Q&A take precedence.

VURC Definitions

Additional Electronics - Any *Sensor*, processor, or other electronic component used in *Robot* construction, and connected to the V5 Robot Brain, that is not sold by VEX Robotics. Examples include commercially-available devices (e.g., Raspberry Pi) or custom devices designed and fabricated by the *Team*. See <VUR12> and <VUR13> for more details.

Alliance - A grouping of two (2) *Robots* from the same *Team* that have been chosen by the *Students* to play together during a given *Match*.

Electromechanical Assembly - A complex system composed of multiple off-the-shelf components, which may include *Sensors*, mechanical parts, and actuators.

External Processor - A computing device or microcontroller that independently processes *Sensor* data before sending it to the VEX V5 Brain.

Fabricated Part - Any component used in *Robot* construction that is fabricated by *Team* members. See <VUR3>, through <VUR7> for more details.

Neutral Zone - An area of the *Field* defined by and including white tape lines, which encompasses the *Center Goals* and their surrounding space. See VURS-1.

Raw Stock - Stock materials purchased from third-party vendors that may be used to create *Fabricated Parts*. See <VUR4> and <VUR5>.

Sensor - A device that detects and responds to changes in the environment, providing data to the *Robot's* control system.

VEX U Student - A *Team* member that meets all criteria listed in rule <VUT6>.

Rule Modifications: Field Setup

The VURC playing *Field* is set up differently than a Head-to-Head VEX V5 Robotics Competition Push Back *Match*, with the following modifications.

- The VEX GPS code strip must be installed on the *Field*
- Modified *Field* layout
- Modified tape lines

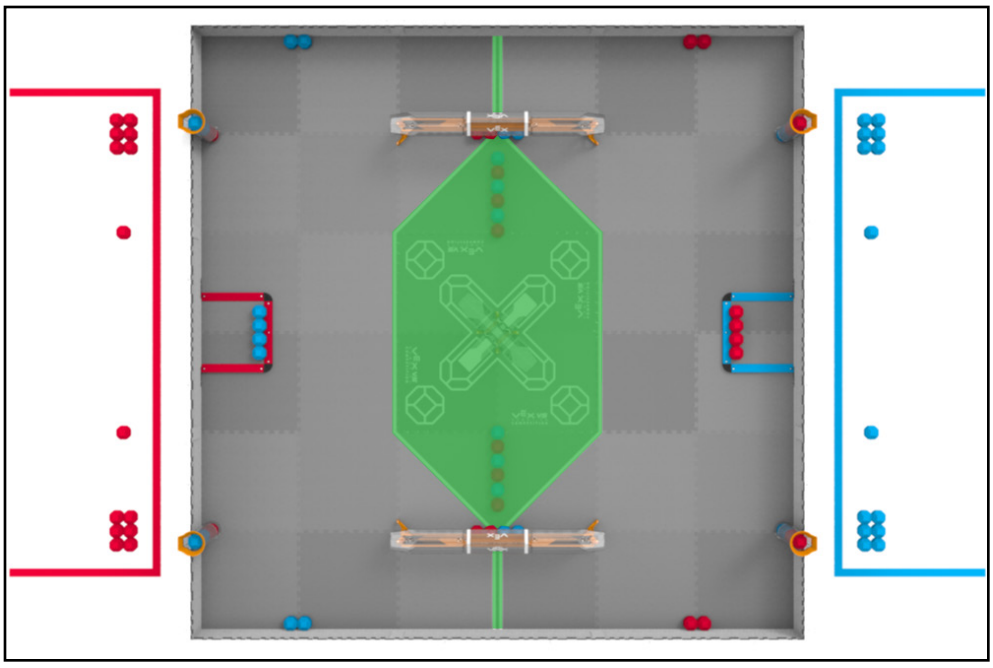

Figure VURS-1: *The starting Field configuration for VEX U Matches, with the Neutral Zone highlighted green.*

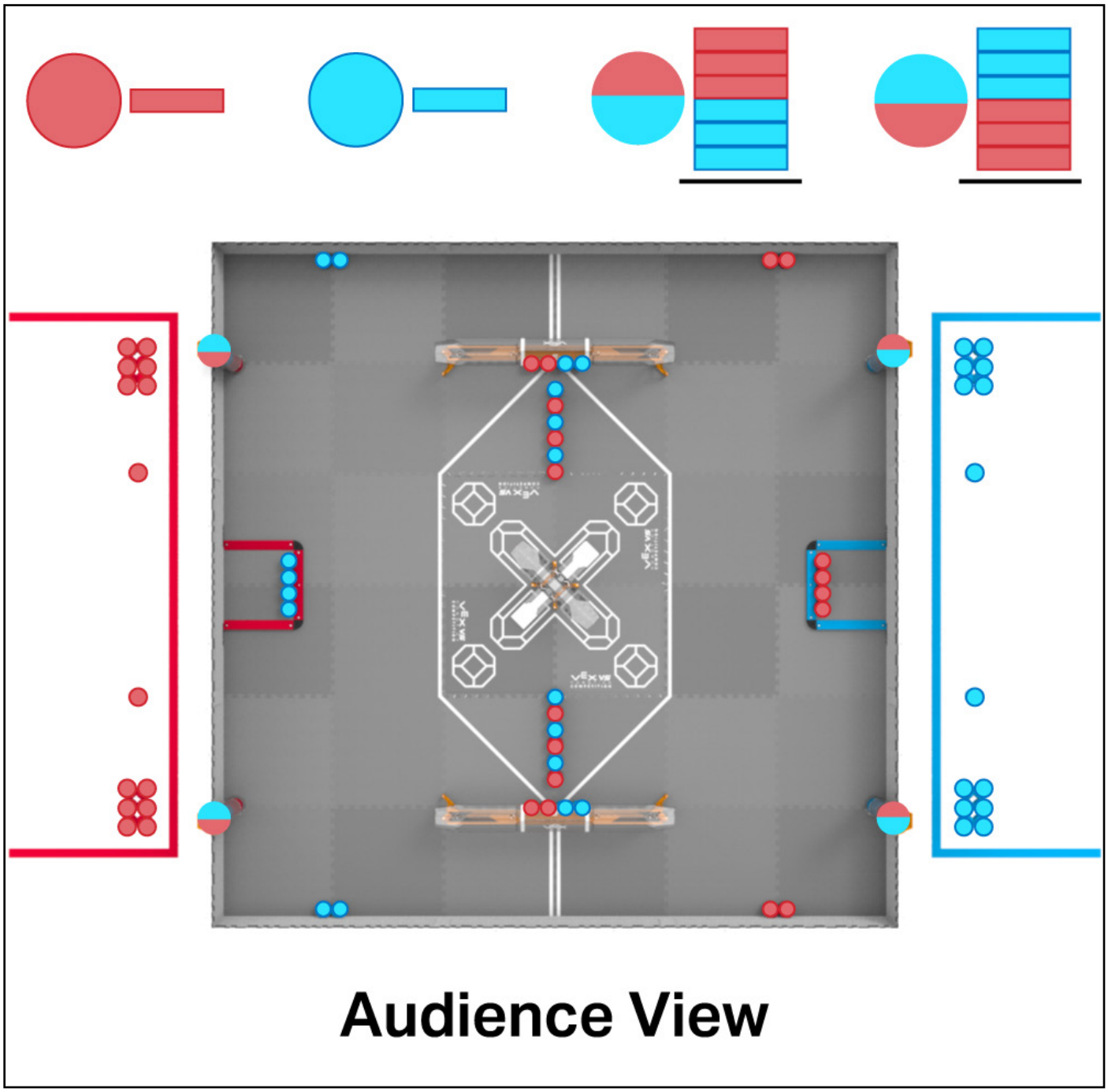

Figure VURS-2: *The starting Field configuration for VEX U Matches, with Blocks highlighted (Red / Blue).*

Rule Modifications: Game

<VUG1> Different Robot placement than rule <GG10>. The red *Team* has the right to place one *Robot* on the *Field* first, followed by both blue *Robots*, and ending with the 2nd red *Robot*. This applies in *Qualification Matches* and *Elimination Matches*. If this right is used, once a *Team* has placed a *Robot* on the *Field*, its position cannot be readjusted prior to the *Match*.

<VUG2> Different expansion. The designated 24" *Robot* may expand horizontally and/or vertically up to a maximum size of 24" x 24" x 24" at any time during the *Match*.

<VUG3> Different availability of Loaders. *Drive Team Members* may add *Match Load Blocks* to the *Loaders* adjacent to their *Alliance Station* during the *Autonomous Period* and *Driver Controlled Period* of the *Match*.

<VUG4> Different Autonomous Win Point criteria. An *Autonomous Win Point* is awarded to any VEX U *Team* that ends the *Autonomous Period* with all of the following tasks completed:

1. At least 12 *Blocks* of the *Alliance's* color are *Scored*.
2. At least three (3) different *Goals* include at least one (1) *Scored Block* of the *Alliance's* color.
3. The six (6) *Blocks* of the *Alliance's* color that begin the *Match* in the *Loaders* adjacent to their *Alliance Station* have been removed.
4. At least one *Robot* is *Parked* in the *Park Zone*.

<VUG5> Don't cross the Autonomous Line, and don't interfere with your opponents' actions. In VEX U *Matches*, <SG7> applies to foam tiles, *Blocks*, *Field Elements*, and interactions on the opposing *Alliance's* side of the *Autonomous Line* and on the opponent's side of the *Field* beyond the *Neutral Zone*. Interactions outside of the *Neutral Zone* should still be primarily *Offensive*, and must meet the guidelines and limitations in rule <SG7>.

a. *Blocks* that begin the *Match* in contact with the *Autonomous Line* or within the *Neutral Zone* are not considered to be on either side, and may be utilized by either *Alliance* during the *Autonomous Period*.

<VUG6> Engage with the Autonomous Line and Neutral Zone at your own risk. This rule replaces the first paragraph of <SG8>. Any *Robot* that engages with *Blocks* or *Goals* that begin the *Match* or are located on the *Autonomous Line* or within the *Neutral Zone* should be aware that opponent *Robots* may also choose to do the same.

Robots entering the *Neutral Zone* should expect contact with other *Robots*, and should take this into consideration when designing and building. However, Rule <GG14> still applies within the *Neutral Zone*, and *Teams* can receive a *Disablement* or *Major Violation* for actions that a *Head Referee* deems intentionally damaging or egregious.

The *Neutral Zone* and the *Goals* and *Blocks* within it are intended to be utilized by either *Alliance* during the *Autonomous Period*. This will inevitably result in *Robot*-on-*Robot* interactions, both incidental and intentional. The overarching intent of <VUG6> is for the vast majority of these interactions to result in no rule *Violations* and/or penalties for either *Alliance*, just as no rules *Violations* occur in 99% of Driver Controlled interactions.

<VUG7> **Some electronic devices may be in motion or moving at the beginning of the Match.** This includes active cooling fans, spinning LIDAR modules, and/or other similar sensors or *Additional Electronics*. These electronic devices should not initiate any form of motion for the entire *Robot* or any of its subsystems, and may not directly interact with game pieces and/or other *Robots*.

Rule Modifications: Robot Skills Challenge

All rules apply from V5RC Section 4: Robot Skills Challenge, with no modifications other than those noted below.

<VURS1> VEX U *Robot Skills Matches* use the same *Field* layout, object placements, and tape lines as VEX U Head-to-Head *Matches*.

a. If a VURC *Team* runs *Robot Skills Matches* at a V5RC event, they may choose from the following options:
   i. Choose to run their *Matches* on a *Field* with the V5RC tape lines.
   ii. Work with the *Event Partner* to replace the tape lines on a Skills *Field* to match the VURC tape layout. This option may not be available at all events, and the VURC *Team* should communicate with the *Event Partner* in advance to discuss options. The VURC *Team* might need to provide their own tape.

<VURS2> Both *Robots* must start the *Robot Skills Match* in legal starting positions for the red *Alliance*. All other portions of rule <SG1> apply.

<VURS3> *Teams* are permitted to use both *Robots* in their VEX U Robot Skills Challenge *Matches*, per <VUT1> and <VUR1>.

Rule Modifications: Tournament

<VUT1> Instead of a 2-*Team Alliance* format, VURC Head-to-Head *Matches* will be played 1-*Team* vs. 1-*Team*. Each *Team* will use two (2) *Robots* in each *Match*.

a. *Teams* are allowed to build and bring as many *Robots* as they would like, but only two (2)—one of each size as described in <VUR1>—may be brought from the pit to the playing *Field* for any *Match*.

b. All *Robots* must pass inspection before they are allowed to compete.

<VUT2> *Qualification Matches* will be conducted in the same manner as in a V5RC tournament, but in the revised 1v1 format described in <VUT1>.

<VUT3> *Elimination Matches* will be conducted in the same manner as in a V5RC tournament, but without an *Alliance Selection*. At the end of the competition, one *Team* will emerge as the tournament champion.

<VUT4> The *Autonomous Period* at the beginning of each Head-to-Head *Match* will be 30 seconds.

a. Human interaction with *Robots* during the *Autonomous Period* is strictly prohibited.

b. If both *Teams* complete their routines before 30 seconds have elapsed, they have the option to signal that they wish to end the *Autonomous Period* early. Both *Teams* and the *Head Referee* must all agree on the "early stop." This is not a requirement, and the option must have been established for all *Teams* at the event, such as during the event meeting.

<VUT5> The *Driver Controlled Period* is shortened to 90 seconds and immediately follows the *Autonomous Period*.

<VUT6> *VEX U Student* eligibility.

a. All VEX U *Team* members MUST be matriculated in a post-secondary school OR have earned a post-secondary education diploma, certificate, or other equivalent during the six (6) months preceding the VEX Robotics World Championship. The intent of this rule is to permit *VEX U Students* graduating mid-year to still be able to finish their competition season.

b. Professionals not enrolled in post-secondary education are not eligible to participate on a VEX U *Team*.

c. *Students* who are dual-enrolled in both a secondary school and in post-secondary courses are not eligible to participate on a VEX U *Team*.

d. *VEX U Students* may only be on exactly one (1) VEX U *Team* for the season. See <G5>.

e. If at least one member of a VEX U Robotics *Team* is aged 18 or older, rule <S2> does not apply.

<VUT7> VURC tournaments have fewer *Teams* in Eliminations. The number of *Teams* in Eliminations for a given event is determined as follows, except in extraordinary circumstances with the permission of the RECF Regional Support Manager. A number of *Teams* below 16 will result in one or more *Byes* for highest-ranking *Teams*.

# of Teams	# of Elimination Teams
16+	16
<16	# of *Teams*

Rule Modifications: Robot

<VUR1> *Teams* may use **two (2) Robots** in each *Match*.

a. Both *Robots* may only be built from the following materials:
   i. Official VEX Robotics products (see <VUR2>)
   ii. *Fabricated Parts* made by the *Team* (see <VUR3> through <VUR7>)
   iii. Commercially-available springs, fasteners, and bearings (see <VUR8>, <VUR9>, and <VUR15>)
   iv. A legal electronics system (see <VUR10> and <VUR11>)
   v. Any legal *Additional Electronics* (see <VUR12>)
   vi. A legal pneumatics system (see <VUR14>)
   vii. Unmodified legal *Raw Stock* (see <VUR4> and <VUR5>)

b. One *Robot* must be no larger than 24" (609.6 mm) x 24" (609.6 mm) x 24" (609.6 mm) at the start of the *Match*.

c. One *Robot* must be no larger than 15" (381 mm) x 15" (381 mm) x 15" (381 mm) at the start of the *Match*.

<VUR2> *Teams* may use **any official VEX Robotics products**, other than the exceptions listed in the tables below, to construct their *Robot*. This includes those from the VEXpro, VEX EXP, VEX IQ, VEX GO, VEX 123, VEX CTE, and VEX Robotics by HEXBUG* product lines. Rule <R28> applies, but most modifications to non-electrical components are allowed.

SKU	Description
217-8080	Talon SRX
217-9191	Victor SPX
217-9090	Victor SP
217-4243	Pneumatic Control Module
217-4244	Power Distribution Panel
217-4245	Voltage Regulator Module

SKU	Description
217-4347	775pro
217-2000	CIM Motor
217-3371	Mini CIM Motor
217-3351	BAG Motor
217-6515	Falcon 500

This rule takes precedence over all other rules regarding *Raw Stock* and/or *Fabricated Parts*, such as <VUR5>.

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As of November 2025, all VEXpro parts are discontinued. To maintain a level playing field and ensure all VURC *Teams* have access to the same library of parts, functionally equivalent, drop-in part substitutes for VEXpro parts may be considered to meet the intent of <VUR2>.

In order to meet our intent, each functionally equivalent, drop-in part must:

a. Match the form, fit, and function of the VEXpro part it is replacing.
b. Not provide a discernable or perceivable advantage over the comparable VEXpro part.
c. Comply with all other applicable VURC *Robot* rules.

Teams should be prepared to demonstrate or defend their part substitutes in inspection as necessary, when possible.

The GDC understands that this may be difficult in the immediate future, as the VEXpro website no longer hosts documentation on VEXpro parts, including but not limited to part descriptions, drawings, pictures, etc. The GDC is working with VEX Robotics to explore and identify a better long-term solution to this problem. In the interim, we ask all *Teams*, referees, inspectors, and the entire VURC community to:

1. Work collaboratively, understanding that the intent of this clarification is to allow *Robots* to compete with minimal to no modification, not to prevent participation.
2. Apply <G1>, <G3>, and the RECF Code of Conduct when interpreting this guidance. We recognize this may temporarily result in a challenging inspection environment; good faith is essential.
3. Refrain from exploiting this allowance. We intentionally and meaningfully chose to attempt to maintain product legality and competitive fairness while products are discontinued. Deliberately pushing boundaries may force the GDC to entirely reassess the legality of all VEXpro components.

<VUR3> **Fabricated Parts** may be made by applying the following manufacturing processes to legal *Raw Stock*:

a. Additive manufacturing processes, such as 3D printing.

b. Subtractive manufacturing processes, such as cutting, drilling, routing, or machining.

c. Bending, such as sheet metal braking or thermoforming.

d. Attaching materials to one another, such as welding or chemically bonding (e.g., epoxy).

e. Molding of non-metals, such as injecting polyurethane into a 3D printed mold.

<VUR4> *Fabricated Parts* must be made from legal **Raw Stock**. To be considered *Raw Stock*, the material must be obtained in one of the following forms before undergoing the fabrication processes listed in <VUR3>:

	Type	Shape / Profile	Examples
1	Sheet	Flat Plane	• Sheet metal • ⅛" polycarbonate sheet • Plywood
2	Solid Billet	"Thick" rectangular beam / block	• 4" x 4" x 6" solid aluminum billet • 2" x 2" x 2" acetal block
3	Solid Bar	"Thin" rectangular beam	• 2x4 wood planks • ¼" x 3" aluminum bars
4	Hollow Bar	Hollow rectangular beam	• 1" x 1", 1/32" wall aluminum box tube

5	Solid Rod	Cylinder, Hexagonal or Rounded Hexagonal Stock	• ¼" steel rod • ¼" acetal rod • VEXpro Hex Shaft
6	Hollow Rod / Tube	Hollow Cylinder, Drilled/Threaded Hexagonal or Rounded Hexagonal Stock	• Copper tubing • PVC pipe • VEXpro ThunderHex Stock
7	Angle	90° "L" shape	• 1" x 1", 1/16" thickness aluminum angle
8	U- / C-Channel	"U" or "C". See this Q&A.	• 1/4" High x 1" Wide Aluminum U-Channel
9	Non-Metal 3D Printer Filament	Thin cylinder	• PLA or TPU filament • Composite nylon filament (e.g. Markforged OnyxTM)
10	Synthetic Polymer used for Molding	Liquid	• Polyurethane • Silicone
11	Solid Sphere	Solid (not hollow) uniformly rounded stock	• Steel ball bearing • Shaped wood finial

Teams are not required to exhaustively define the specific material type for each component of every *Fabricated Part* in their Engineering Notebook, as it should be obvious from the engineering drawings required by <VUR7>. However, unusual parts should be expected to receive increased scrutiny.

If any materials do not easily fall into one of these categories, then that is probably an indication that it is not intended to be a legal type of *Raw Stock*. If a *Team* cannot demonstrate that the component was made from a legal type of *Raw Stock*, then they will be asked to remove it from their *Robot*.

Significant Q&As:

- Q&A 2654 - Turned, ground, and/or polished round shafting is legal Raw Stock; final product is more important than manufacturing process when considering legality
- Q&A 2660 - Unmodified legal Raw Stock can be used on Robots without modification
- Q&A 2804 - Composite materials that fit these definitions are legal if they don't violate VUR6
- Q&A 2805 - O-rings aren't legal Raw Materials, and aren't legal for use
- Q&A 2856 - Externally-threaded rod is legal raw stock

<VUR5> The following material types are **not considered Raw Stock**, and are therefore not permitted:

	Type	Examples
1	Any otherwise-legal *Raw Stock* that has been post-processed by drilling, machining, or otherwise removing material	• Angle aluminum with regularly-spaced holes or slots • Perforated sheet metal
2	Extrusions that do not fall under one of the categories listed in <VUR4>	• Non-rectangular aluminum extrusions, such as 80/20, T-slot, or Octanorm • Gear stock
3	Assembled items (or pre-arranged kits of unassembled items) that form a single, more complex component	• Gearboxes • Claw mechanisms • Swerve drive modules
4	Commercial Off-the-Shelf items that are intended to be used with minimal modification	• Wheels • Gears • Timing belts and pulleys
5	Materials that are intended to be cast or sintered	• Resin / powdered-bed 3D printing • Molten aluminum used for sand casting

Note: <VUR2> takes precedence over this rule. Materials purchased from VEX Robotics that fall under one of these categories (e.g., VersaFrame pre-drilled extrusion) are permitted.

In industry, terms like "raw stock," "raw material," and "material stock" are often used interchangeably and cover an extremely broad scope of physical goods. The lists in <VUR4> and <VUR5> are intended to explain what specific material types and profiles fall under the defined term "*Raw Stock*" in the context of the VEX U competition.

Significant Q&As:

- Q&A 2857 - Non-VEX anti-slip mat is not legal for use on VURC Robots

<VUR6> *Fabricated Parts* cannot be made from *Raw Stock* which poses a **safety or damage risk** to the event, other *Teams*, or *Field Elements*. Examples of prohibited materials include, but are not limited to:

a. Any material intended to produce flames or pyrotechnic effects.

b. Any material that is liquid at the time of the *Match*. Examples include hydraulic fluids, oils, greases, liquid mercury, and tire sealant.

   i. This does not include fabrication processes that involve the use of liquids, such as milling coolant or epoxy.

c. Any matter that shatters or otherwise presents an excessive *Field*/safety hazard upon failure. Examples include fiberglass, acrylic, and carbon fiber sheet/tube stock.

   i. This rule refers specifically to material legality itself. Any potentially unsafe mechanisms made from legal *Raw Stock* may still be addressed by <S1> and <R19>.

   ii. 3D printer filaments that include carbon fiber (or similar) additives or carbon fiber (or similar) inlay are exempt from this exception, and are considered legal for use in *Fabricated Parts*.

<VUR7> **Fabricated Parts must be made by Team members.** Any *Fabricated Parts* must be accompanied by documentation that demonstrates the *Team's* design and construction process for that *Fabricated Part*.

a. The minimum acceptable form of documentation is an engineering drawing with multiple views for the part in question. These drawings may be included in a *Team's* Engineering Notebook or in a standalone appendix to the Engineering Notebook.

b. Any *Fabricated Part* must have been entirely designed and produced by *Team* members. For example, parts ordered by the *Team* and 3D printed by a third party would be prohibited.

c. *Teams* will be required to provide this documentation as requested by inspectors, *Head Referees*, or judges at any time at an event. Failure to provide acceptable documentation will result in the part being deemed illegal for use; therefore, <R3>, <R4>, and/or <G1> will apply.

<VUR8> *Teams* may use **commercially-available springs** on their *Robots*. For the purposes of this rule, a "spring" is any device used for storing and releasing elastic potential energy. Examples include, but are not limited to:

a. Compression, tension, torsion, constant force, or conical springs made from spring steel.

b. Springs made from elastic thread or rubber, such as surgical tubing, bungee cords, or stretchable braided rope.

c. Closed-loop (pneumatic) gas shocks.
Note: Gas shocks are not considered pneumatic devices in the context of <VUR14>. Gas shocks may not be modified in any way.

<VUR9> *Teams* may use **commercially available fastener hardware** on their *Robot*. Examples include (but are not limited to):

- Screws, nuts, rivets, and heatset inserts.
- Hinges, pins, rod ends, threaded rods, and hose clamps.
- Ancillary fastener accessories, such as washers or spacers.
- Adhesives such as epoxy, glue, or tape (only when used to join together two parts).

If the primary function of the part is not "fastening", then <VUR5>, <VUR6>, and/or <VUR7> take precedence over this rule. Illegal examples include (but are not limited to):

- A prefabricated non-VEX wheel, even though it may technically connect tread to a shaft
- 80/20 extrusion; other items get "fastened to it", it is not the part doing the "fastening"
- Using grip tape to improve wheel traction

Significant Q&As:

- Q&A 2649 - Primary function should be determined by the part's use on the Robot
- Q&A 2703 - Brackets, shaft hubs, and shaft collars aren't fasteners; the screws used to hold them on are fasteners

<VUR10> Each *Robot* must utilize exactly **one (1) V5 Robot Brain and at least one (1) V5 Robot Radio** connected to a V5 Controller.

a. *Teams* must abide by the power rules noted in <R13> and <VUR12d>.

b. Wireless communication between *Robots* is permitted if using legal V5 Robot Brains and V5 Robot Radios. No other types of wireless communication protocols (e.g., radio, Bluetooth, Wi-Fi) are permitted.

<VUR11> There is **no restriction on the number of V5 Smart Motors (11W) [276-4840] and/or Smart Motors (5.5W) [276-4842]** that *Robots* may use. No other motors, servos, or electronic actuators are permitted, including those sold by VEX (e.g., the 2-Wire 393 Motor).

Note 1: Rule <R28> still applies in VEX U. Teams may not modify Smart Motors, and must use official/unmodified gear cartridges.

Note 2: Commercially available pneumatic actuators and pneumatic solenoids are permitted within the guidelines of <VUR14>.

Note 3: Legal Additional Electronics may include their own motor, servo, or actuator, per <VUR12>.

<VUR12> There is **no restriction on commercially available Sensors, External Processors, or Additional Electronics** that *Robots* may use for sensing and processing, except as follows:

a. *Sensors* and *External Processors* MUST be connected to the V5 Robot Brain via any of the externally accessible ports (i.e., without any modification to the commercially available electronics). A *Sensor* may be connected to an *External Processor* which then connects to the V5 Robot Brain.

b. *Sensors*, *External Processors*, and *Additional Electronics* CANNOT directly electrically interface with VEX motors and / or solenoid.

c. *Sensors* and *Additional Electronics* may only receive power from any of the following:

   i. Directly from the V5 Robot Brain via any externally accessible port.

   ii. From an additional lithium ion, lithium iron, or nickel metal hydride battery pack (only one (1) additional battery can be used for *Sensor*/processing power). This additional battery pack must operate at a maximum of 12 volts nominal.

   iii. Directly from an *External Processor*

d. Only the V5 Battery can power the V5 Brain.

e. *Sensors*, *External Processors*, and/or *Additional Electronics* which include a low-powered motor as an integral part of their primary sensing/processing function, such as an *External Processor's* cooling fan or a spinning *Sensor*, are permissible.

   i. Standalone motors which serve no additional sensing or processing functionality (e.g., using a commercially-available brushless motor in a drivetrain) are not considered legal *Additional Electronics*, and would be considered a *Violation* of <VUR11>.

f. Pneumatic solenoids are the only types of solenoids that are permitted as *Additional Electronics*. Solenoids used for any purpose other than opening and closing a pneumatic valve are considered an actuator and therefore prohibited, per <VUR11>.

g. <R28> still applies in VEX U, *Teams* may not alter or modify electronic parts from the VEX product lines.

Significant Q&As:

- Q&A 2855 - Standalone cooling fans are not legal for use on Robots; fans that are built into legal components are

<VUR13> Commercially available **Electromechanical Assemblies are not legal** for use on *Robots*.

a. For the purposes of this rule, any system that integrates *Sensors* with other mechanical parts that are fabricated by anyone other than *Team* members and which serve more use than the basic definition of a *Sensor* would be considered an *Electromechanical Assembly*, and is therefore not legal.

b. Examples may include but are not limited to: odometry pods.

c. Commercially available *Sensors* with simple plastic housings that do not have any use beyond protecting internal components and aiding in mounting of the *Sensor* are not considered *Electromechanical Assemblies*.

The intent of this rule is to remind teams to focus their efforts on integrating custom parts with the VEX Robotics ecosystem. The VEX U Competition operates within a semi-closed system, not an open-build system. *Teams* should make efforts to use VEX Robotics parts where possible. Parts like additional sensors (LIDAR, encoders, etc.) should generally be considered okay, but assemblies/systems from other robotics suppliers that remove the challenge of systems integration should not be considered a legal part.

Significant Q&As:

- Q&A 2637 - Teams can't use off-the-shelf products that combine electronics and fabricated parts into a single packaged solution
- Q&A 2639 - Releasing air to move or block scoring elements or Robots is not allowed

<VUR14> *Teams* may utilize an **unlimited amount of the following commercially available pneumatic components:** cylinders, actuators, valves, gauges, storage tanks, regulators, manifolds, tubing, and solenoids.

a. Pneumatic devices may only be charged to a maximum of 100 psi

b. Compressors or any other forms of "on-*Robot*" charging are not permitted

c. All commercial components must be rated for 100 psi or higher. *Teams* should be prepared to provide documentation that verifies these ratings to inspectors if requested

d. Components must not be modified from their original state, other than the following exceptions:
    i. Cutting pneumatic tubing or wiring to length; assembling components using pre-existing threads, brackets, or fittings; or minor cosmetic labels
e. If commercially available 12V solenoids are used, these are considered *Additional Electronics* and must therefore satisfy all conditions listed in <VUR12>. 12V solenoids may be either powered by an additional power source (per <VUR12d>), or by a 5V-12V step-up converter from the V5 Robot Brain. If an external power source (or other *Additional Electronics* device) is used to interface with the solenoid, *Teams* MUST be able to demonstrate that there is no way for the solenoid to receive power while the *Robot* is receiving a *Disabled* state from the field controller

<VUR15> Teams may use commercially available bearings on their Robot. For the purpose of this rule, a 'bearing' is a part that supports external loads, reduces friction, and improves efficiency by facilitating smooth dynamic motion between components. Legal examples include (but are not limited to):

- Parts supporting rotational motion: radial bearings, roller bearings, thrust bearings, needle bearings, one-way bearings, bushings, etc.
- Parts supporting linear motion: linear bearings, linear slides, drawer slides, etc.

Significant Q&As:

- Q&A 2777 - Commercial linear guides with integrated rails are legal when used as linear bearings/slides

Team Composition

We want to see Universities face off in a global head-to-head competition. Schools are not limited to one *Team*, and a *Team* may consist of multiple colleges, but we hope that each *Team* identifies with and proudly represents one (1) post-secondary institution. (e.g., "Clarkson University" vs. "UC Santa Barbara"). Of course, college-level "club" *Teams* and mixed composition *Teams* are encouraged to join! However, as noted in <VUT7>, *Students* who have not yet graduated secondary school are not eligible to participate in VEX U, even if they are "dual-enrolled" or taking post-secondary courses. A *Student* cannot be a member of a V5RC and a VURC *Team* simultaneously, regardless of eligibility.

VEX V5 ROBOTICS COMPETITION

PUSH BACK

Section 7
VEX AI Robotics Competition

Section 7 - VEX AI Robotics Competition

Introduction

Artificial intelligence (AI) is becoming a staple in today's industry. The VEX AI Robotics Competition (VAIRC) gives *Teams* of *Students* a chance to compete in this growing field. With just a few additional sensors, *Teams* will be playing in one-vs-one *Matches* using two *Robots* per *Team* (i.e., four *Robots* on the *Field*) that are fully autonomous. *Robots* function without input from *Drive Team Members* and instead are communicating with each other as the *Match* progresses through two minutes. VAIRC is the perfect project-based supplement to many high school and university-level engineering programs, and gives *Students* the unique opportunity to demonstrate their real-world AI skills to potential employers (such as REC Foundation sponsors).

The 2025-2026 season should provide expanded opportunities for VAIRC competitors, such as VAIRC divisions at select VURC events and ways for *Teams* to submit Robot Skills Challenge scores at local V5RC events.

Game, Robot, and Tournament Rules

The VEX AI Robotics Competition uses the VEX V5 Robotics Competition Push Back *Field* with some minor modifications. Anyone that has a V5RC Push Back *Field* can use it for a VEX AI event or *Team*. Please consult earlier sections of this game manual for the basic set of competition rules and details. Many VAIRC rules that don't match the standard V5RC rules are based on the VURC rules, which can be found in Section 6. As such, all standard VURC Game, Robot, & Tournament rules apply, except for the modifications listed in this section. In the event of a rules conflict, the rules listed in this section and rulings on the VAIRC Q&A system takes precedence.

All of the standard rules apply, except for the modifications listed in this document. In the event of a conflict between rules, the rules listed in this Section of the game manual and any rulings on the official VEX U Q&A take precedence.

Note: The VAIRC rules may be modified in upcoming major game manual releases in ways that affect Robots and Match play, including but not limited to revised Field layouts, revised robot rules, and the addition of visual markers to aid AI in detecting Field Elements. This version of the rules is intended to give VAIRC Teams an idea of our intentions for this game, and a starting point to begin planning Robot design and Match strategy.

VAIRC Definitions

Bullseye - The square at the center of the printed Block images on the Push Back graphic field tiles. (See Figure BE-1.) Only used in VAIRC *Robot Skills Matches*.

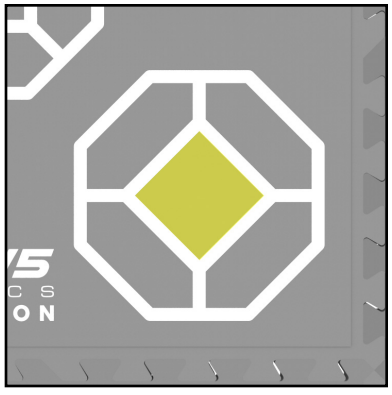


Figure BE-1: *A Bullseye*

Control Bonus – One of four bonuses that can be earned by having a *Block* of your *Team's* color *Scored* as the outermost *Block* in one end of a *Long Goal* and the nearest corresponding end of a *Center Goal* (see figure CB-1).

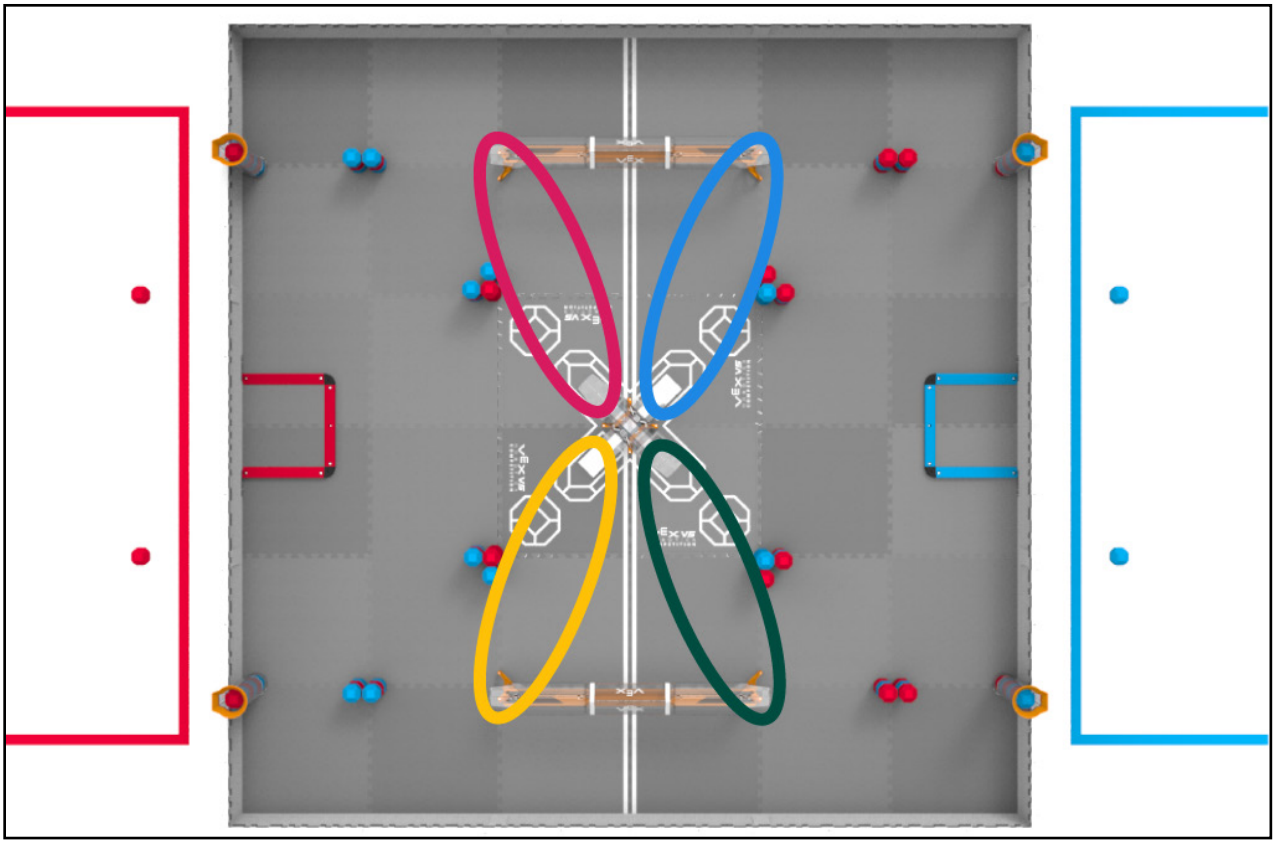


Figure CB-1: *A diagram of the VAIRC Field, showing the four pairs of goal-ends needed to receive a Control Bonus.*

Interaction Period – The one-minute 45-second (1:45) time period that follows the *Isolation Period* after the winner of the *Isolation Period* has been determined. *Robots* react only to sensor inputs and to commands pre-programmed by the *Students* into the *Robot* control system and can interact with the entire *Field* during the *Interaction Period*. The *Interaction Period* replaces the *Driver Controlled Period* that occurs in V5RC and VURC *Matches*.

Isolation Bonus – A point bonus awarded to the *Team* that has earned the most points at the end of the *Isolation Period*. The *Isolation Bonus* replaces the *Autonomous Bonus*. See rule <VAISC3>.

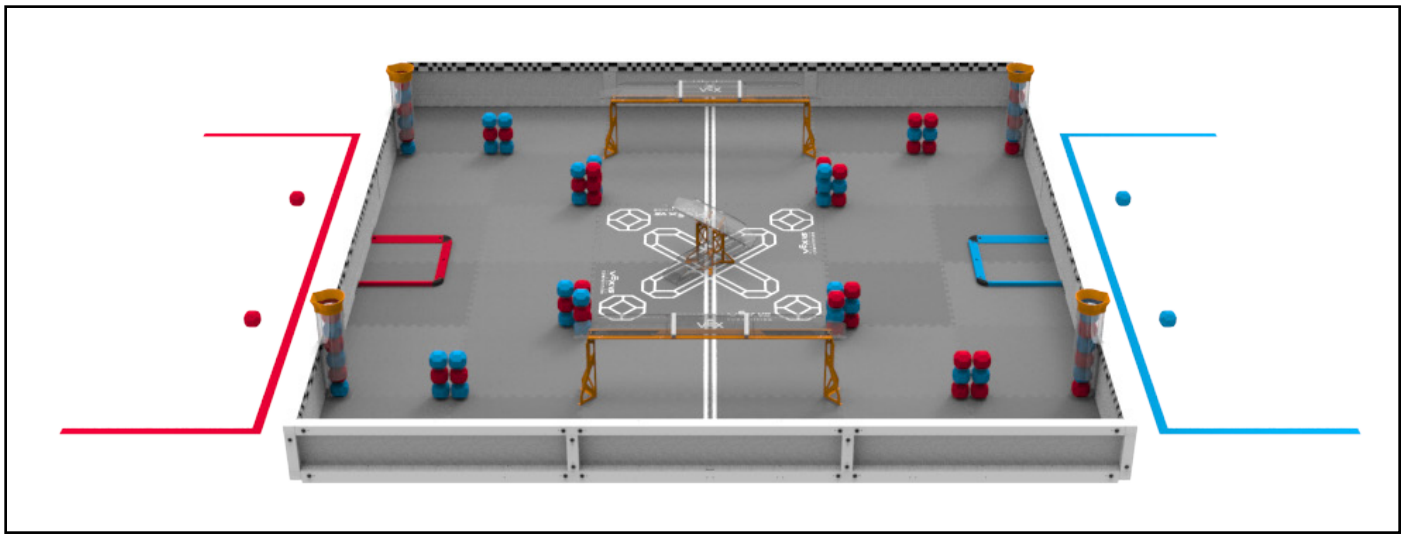
Isolation Period – A 15-second (0:15) time period during which *Robots* operate only on their side of the *Field* and react only to sensor inputs and to commands pre-programmed by the *Students* into the *Robot* control system. This *Isolation Period* replaces the *Autonomous Period* normally found in a VURC *Match*.

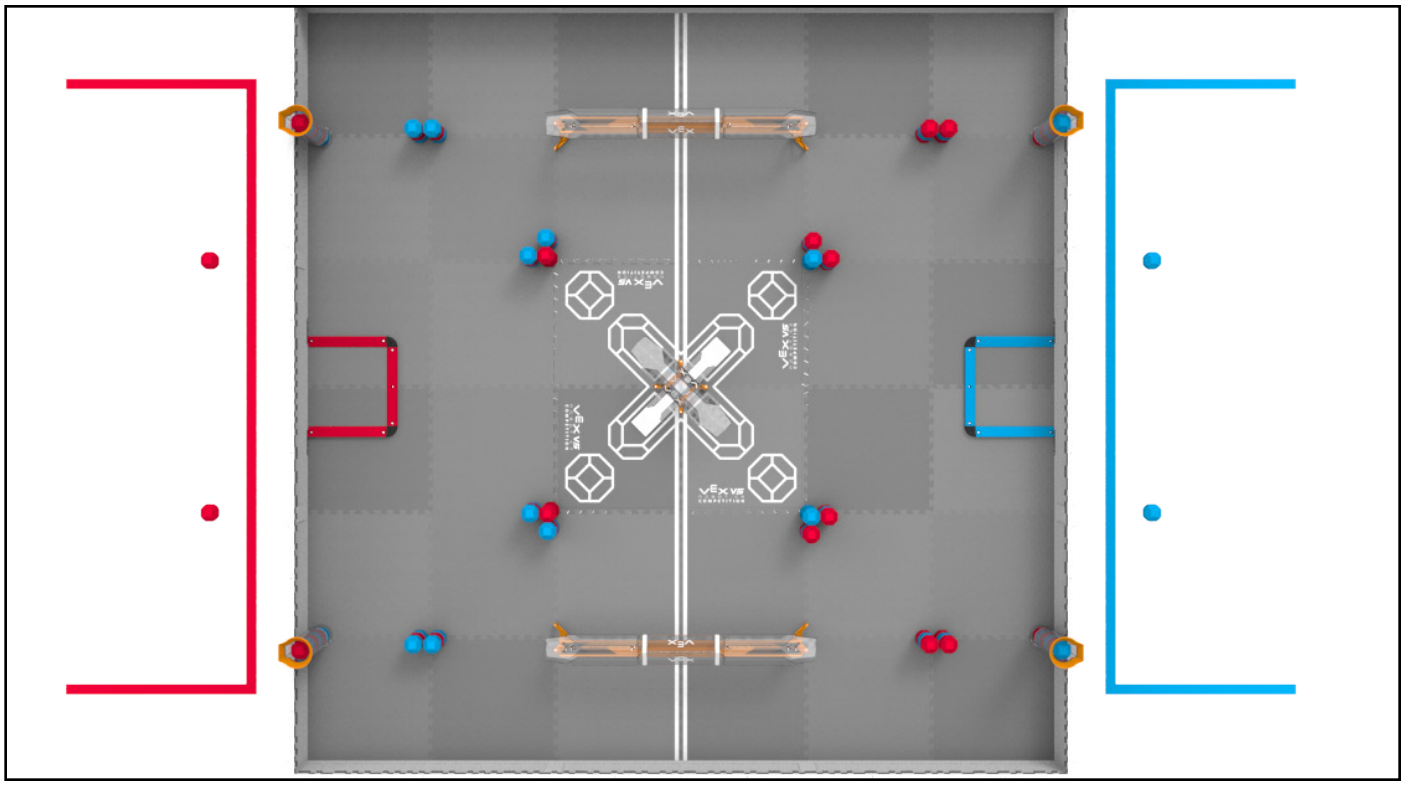
Isolation Win Point – One (1) *Win Point* (WP) given to an *Alliance* that has completed the *Isolation Win Point* criteria set forth in rule <VAISC4>. The *Isolation Win Point* replaces the *Autonomous Win Point*.

Rule Modifications: Field Setup

The VAIRC playing *Field* is set up differently than a Head-to-Head VEX V5 or VEX U Robotics Competition Push Back *Match*, with the following modifications.

- The VEX GPS code strip must be installed on the *Field*
- Opaque field panels (standard on the V5RC Portable Field Perimeter)
- Modified *Field* layout
- Same tape lines as V5 Robotics Competition Push Back





Rule Modifications: Scoring

Isolation Bonus	10 Points
Each *Block Scored*	3 Points
Each *Control Bonus*	10 Points
Parked 24" Robot	10 Points

<VAISC1> A *Team* receives a **Control Bonus** if the outermost *Block Scored* in one end of a *Long Goal* and the nearest corresponding end of a *Center Goal* are the same color as the *Team*.

a. A *Block* must be considered *Scored* in a *Goal* (see <SC2>) to count toward a *Control Bonus*.

b. A *Block* that is entirely within the space defined by the outer edges of the two white tape lines of a *Long Goal* does not count toward the *Control Bonus* (see figure VAISC1-1).

c. In a *Center Goal*, the *Scored Block* that is closest to that end of the *Goal* will count toward the *Control Bonus* (see figure VAISC1-2). If only one *Block* is *Scored* in a *Center Goal*, it will count toward both of the *Control Bonuses* which include that *Goal*.

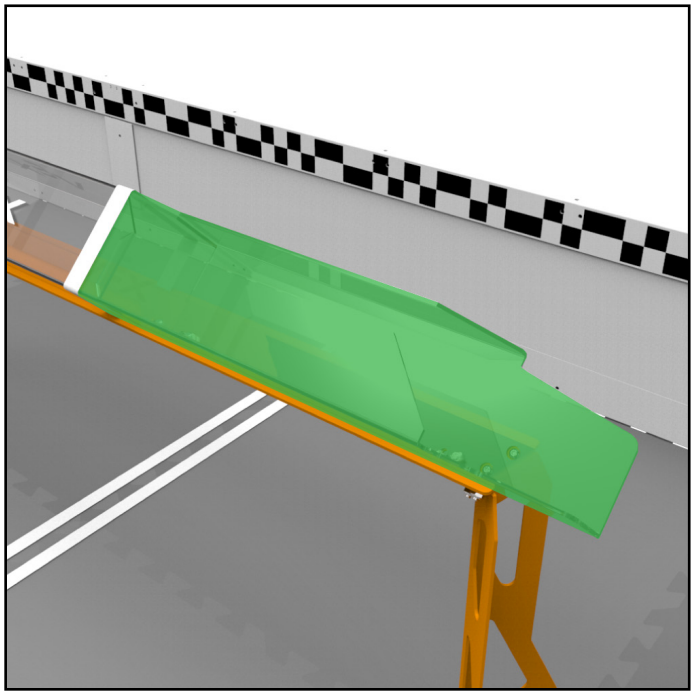


Figure VAISC1-1: *Portion of the Long Goal that can count toward that Control Bonus.*

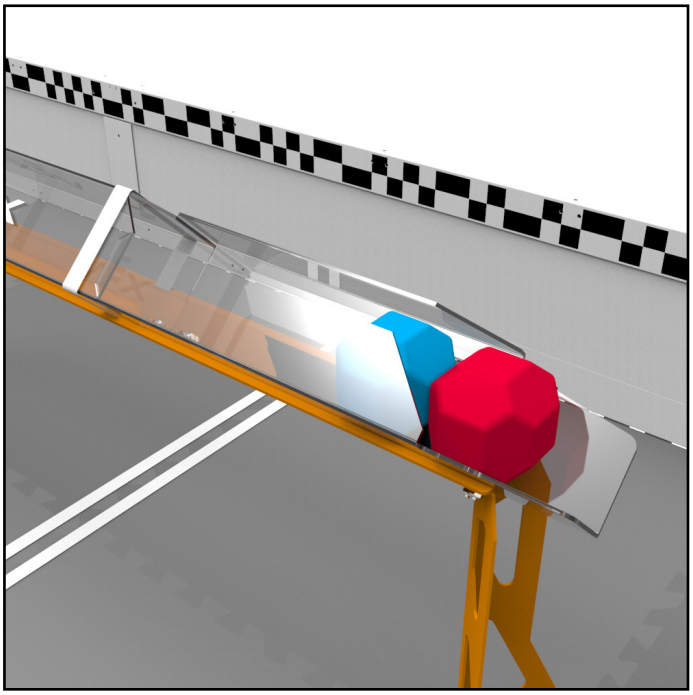


Figure VAISC1-2: *The red Block would count toward the Control Bonus.*

<VAISC2> A VAIRC *Robot* is considered **Parked** at the end of the *Match* if it meets all of the following criteria:

a. The *Robot* is designated as the *Team's* 24" *Robot* for the current *Match*.

b. The *Robot* meets all criteria of rule <SC4>.

<VAISC3> Scoring of the **Isolation Bonus** is evaluated immediately after the *Isolation Period* ends (i.e., once all *Blocks*, *Field Elements*, and *Robots* on the *Field* come to rest).

a. Points for *Parked Robots* are not included in the calculation of a *Team's* score for the purposes of determining the *Isolation Bonus*.

b. If the *Interaction Period* ends in a tie, including a zero-to-zero tie, each *Team* will receive an *Isolation Bonus* of five (5) points.

c. Any *Violations*, Major or Minor, committed during the *Isolation Period* will result in the *Isolation Bonus* being automatically awarded to the opposing *Team*. See <GG13>.

d. Per rule <GG13>, if both *Teams* commit *Violations* during the *Interaction Period* that would have affected the outcome of the *Isolation Bonus*, then no *Isolation Bonus* will be awarded.

<VAISC4> **Isolation Win Point criteria.** An *Isolation Win Point* is awarded to any VEX AI *Team* that ends the *Isolation Period* with all of the following tasks completed:

1. At least nine (9) *Blocks* of the *Team's* color are *Scored*.
2. At least three (3) different *Goals* include at least one *Scored* (1) *Block* of the *Team's* color.
3. Neither *Robot* is contacting the *Park Zone* barrier.

Rule Modifications: Game

<VAIG1> **Standard game rules apply.** All <Gx> and <Sx> rules apply as written. All other rules apply as written, except for those V5 rules that are modified below or by VEX U rules.

Note: All references assume that the terms "Autonomous Period" and "Driver Controlled Period" are replaced with "Isolation Period" and "Interaction Period", respectively.

<VAIG2> **Autonomous means "no humans."** As noted by <GG12>, *Drive Team Members* are not permitted to interact with their *Robots* in any way while they are operating autonomously (i.e., during the entirety of a VAIRC *Match*). The following exceptions are permitted:

a. Using a V5 Controller to disable a *Robot* which is engaging in reckless or unsafe behavior, with the *Head Referee's* permission. *Robots* which are *Disabled* may not be re-enabled for the rest of the *Match*.

<VAIG3> **Teams are responsible for the actions of their Robots.** Just as V5RC and VURC *Teams* are responsible for the actions of their *Robots* during the *Autonomous Period*, VAIRC *Teams* are responsible for the actions of their *Robots* throughout the entirety of a VAIRC *Match*. Excessive or egregious *Violations* of the following rules may result in a *Major Violation / Disqualification*, as well as the *Head Referee* directing a *Team* to *Disable* their *Robot*:

a. <GG14> - Don't destroy other *Robots*

b. <GG17> - No *Holding* for more than a 3-count

c. <SG7> - Don't cross the *Autonomous Line*, and don't interfere with your opponents' actions.

In the context of this rule, "excessive or egregious" refers to a *Violation* or interaction that the *Head Referee* has judged to be out of the *Robot's* control and/or is not showing any signs of improvement. Examples may include, but are not limited to:

- *Holding* an opponent for 15+ seconds
- Repeated *Violations* of <SG7> across multiple *Matches*

<VAIG4> Different expansion. In addition to the expanded sizes described in rules <SG2> and <VUG2>, each VAIRC *Robot* may also extend up to 3' vertically during the *Match* to provide expanded visual perspectives for *Robots* within the following conditions:

a. Any extensions or combinations of extensions above 22" for the 15" *Robot* or above 24" for the 24" *Robot* must fit within a vertical cylinder 2" in diameter, with the exception that one camera or vision sensor per *Robot* may be attached to the top of the vertical extension.

b. This expanded vertical extension cannot be used to manipulate, lift, contain, or move *Blocks*.

c. This vertical extension rotates with the *Robot*, and it should not be considered a *Violation* if an extended *Robot* accidentally tips over during a *Match*.

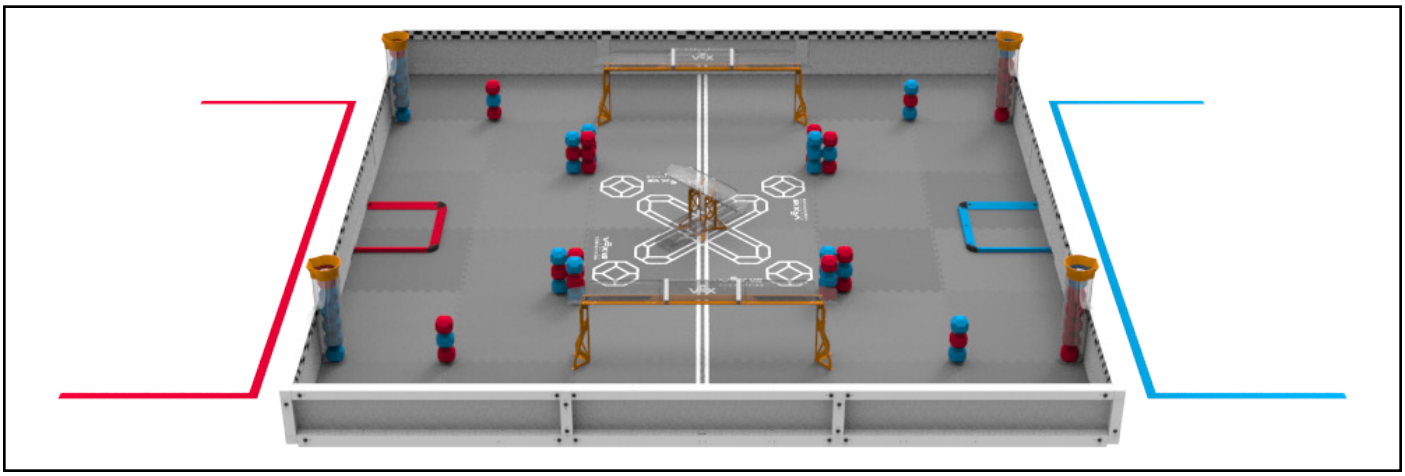
<VAIG5> Different availability of Loaders. In VAIRC head-to-head *Matches*, *Blocks* can only be added to *Loaders* when they must be reintroduced after leaving the *Field* (see rule <SG4>). This rule takes precedence over the guidance in rules <SG9> and <VUG3>.

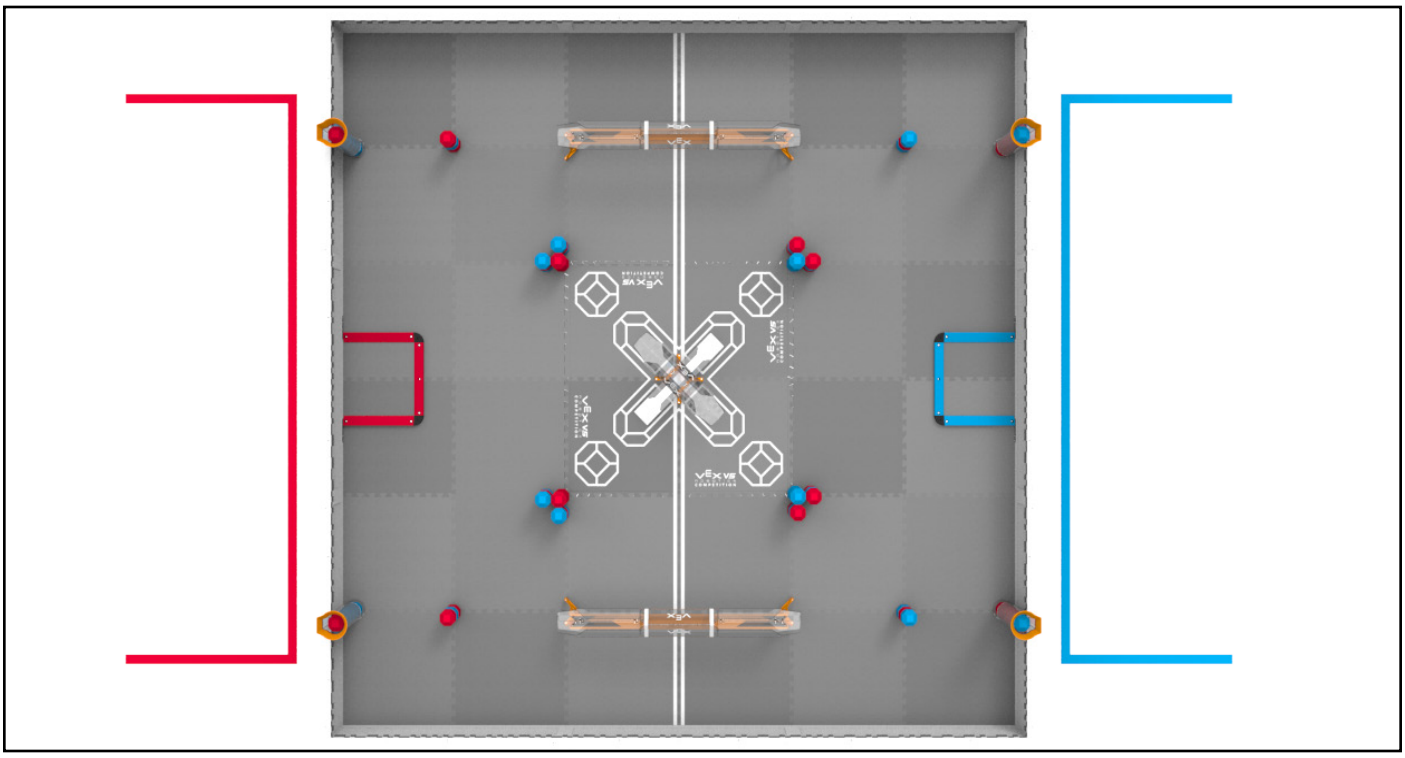
Rule Modifications: Robot Skills Challenge

<VAIRS1> Standard rules from the V5RC and VURC sections of the game manual apply in most cases, unless otherwise specified in this section or when V5RC rules are modified in the VURC section.

<VAIRS2> Rule <VURS3> applies as written, and VAIRC *Teams* are permitted to use two *Robots* in their *Robot Skills Matches*.

<VAIRS3> VAIRC Robot Skills *Matches* use the same tape lines as VAIRC and V5RC head-to-head *Matches*, but a revised *Field* layout as shown below. VAIRC Skills *Fields* are required to use the set of four (4) Push Back graphic field tiles.





<VAIRS4> A 24" *Robot* in a VAIRC Robot Skills *Match* begins the *Match* in a *Parked* position in the blue *Park Zone*. A 15" *Robot* in a VAIRC Robot Skills *Match* begins the *Match* in a *Parked* position in the red *Park Zone*. *Robots* do not begin the *Match* with Preloads.

<VAIRS5> In VAIRC Robot Skills *Matches*, *Blocks* can be added to *Loaders* by *Robots*. *Blocks* cannot be added to *Loaders* by *Drive Team Members*.

<VAIRS6> *Blocks* that leave the *Field* during a VAIRC Robot Skills *Match* must remain outside the *Field* for the remainder of the *Match*, and cannot be reintroduced.

<VAIRS7> Scoring VAIRC Robot Skills *Matches*. For each VAIRC Robot Skills *Match*, *Teams* are awarded a score based on the following rules and scoring table:

a. The *Team* will receive points for one color of *Block* per *Goal*, determined by which color represents the majority of *Blocks Scored* in that *Goal* at the end of the *Match* (e.g., if there are 7 red *Blocks* and 5 blue *Blocks* in a *Long Goal*, the *Team* will only receive points for the red *Blocks*). If an equal number of red and blue *Blocks* is *Scored* in a *Goal*, none of those *Blocks* will receive points.

b. The *Team* will receive points for each *Bullseye* with one or more *Blocks* at least partially within its vertical projection at the end of the *Match*. (See Figure VAIRS7-1.) *Blocks* that are deemed "too close to call" by the referee should be counted as being within the vertical projection.

c. The *Team* will receive points for each blue *Block* that ends the *Match* in one of the *Loaders* adjacent to the blue *Park Zone*, and for each red *Block* that ends the *Match* in one of the *Loaders* adjacent to the red *Park Zone* (up to six per *Loader*).

    i. A *Loader* that ends the *Match* containing six *Blocks* that match the color of the adjacent *Park Zone* will receive additional points.

d. The *Team* will earn points for a *Parked Robot* as follows:

    i. A 24" *Robot* can only use the red *Park Zone*, and must meet all criteria of rule <SC4> at the end of the *Match*.

    ii. A 15" *Robot* can only use the blue *Park Zone*, and must meet all criteria of rule <SC4> at the end of the *Match*.

e. *Control Zones* and *Control Bonuses* are not considered in VAIRC Skills *Matches*.

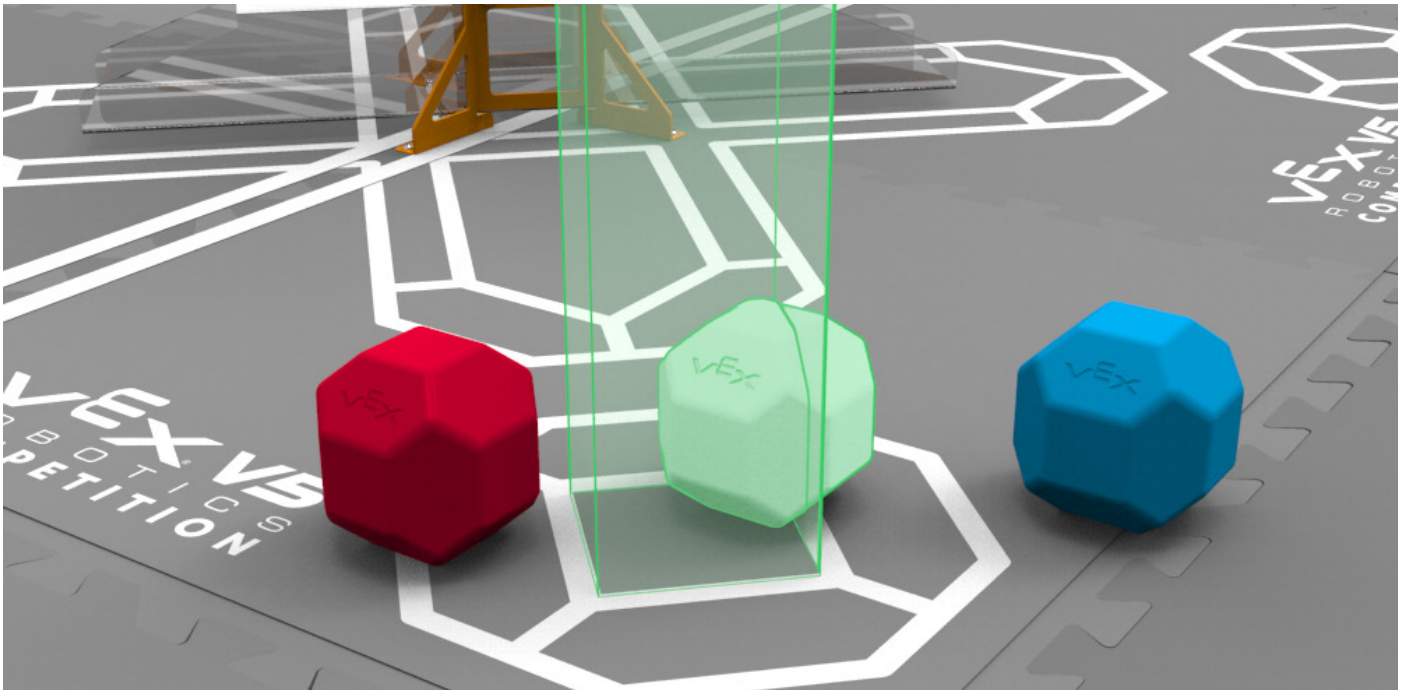


Figure VAIRS7-1: *The Block that is highlighted green is at least partially within the vertical projection of the Bullseye, resulting in a Scored Bullseye worth 3 points.*

Each *Block* of the majority color *Scored* in a *Goal*	3 Points
Each *Scored Bullseye*	3 Points
Each *Block* in a *Loader* that matches the adjacent *Park Zone*	3 Points
Each *Loader* that is filled with the color of the adjacent *Park Zone*	5 Points
Parked Robot	5 Points

Rule Modifications: Tournament

<VAIT1> The following VURC rules apply as written:

- <VUT1> - *Matches* are played 1-*Team* vs 1-*Team*, with two *Robots* each.
- <VUT2> - *Qualification Matches* are a 1v1 version of a standard V5RC tournament.
- <VUT3> - *Elimination Matches* are a 1v1 version of a standard V5RC tournament.
- <VUT7> - Numbers of *Teams* in *Elimination Matches*.

The following VURC rules apply, replacing the terms "*Autonomous Period*" and "*Driver Controlled Period*" with "*Isolation Period*" and "*Interaction Period*", respectively:

- <VUT4> - The *Isolation Period* is 15 seconds. The option to end the *Isolation Period* early is available by default if both *Teams* and the *Head Referee* agree, and does not need to be established during the event meeting.
- <VUT5> - The *Interaction Period* is one minute 45 seconds. *Teams* have the option to signal that they wish to end the *Interaction Period* early. Both *Teams* and the *Head Referee* must all agree on the "early stop." This is not a requirement, and the option is available in all *Matches* by default.

<VAIT2> VEX AI Robotics Competition *Teams* may consist of *Students* that fall into one of the following categories. This rule takes precedence over rule *<VUT6>*.

a. *High School Students*, as described by the definition of *Student*. This includes *Middle School Students* who are "playing up" and competing as *High School Students*.

b. Post-secondary *Students*, as defined by rule <VUT6>.

Note: The same Team may not consist of Students that fall into both categories (i.e., a blended High School and University Team).

<VAIT3> Each *Student* may only participate on one (1) VAIRC *Team* in a given season. However, a VAIRC *Student* can also be a member of a V5RC or VURC *Team* in the same season.

Note: See <VAIRM3> for more details regarding how this rule pertains to Robots.

Rule Modifications: Robot

<VAIRM1> All <VURx> rules apply as written. All <Rx> rules apply as written, except for those modified below or by <VURx> rules.

<VAIRM2> Any components used for AI vision processing, such as those found in the VEX AI kit (276-8983), are considered standard *Additional Electronics* and must abide by <VUR12> as written.

<VAIRM3> VAIRC *Teams* may also participate in the V5RC or VURC programs. *Robots* used in those programs can be used as-is or modified for use in the VAIRC program provided they pass all VAIRC inspection rules, and the *Students* on the VAIRC *Team* are the same as on the V5RC or VURC counterpart *Team*.

The intent of this rule is to allow *Teams* who compete in both programs to potentially utilize the same *Robots* and/or subsystems. In other words, <R1> does not "cross programs."

Teams participating in both programs should be aware that this does not grant any exemption from any rules that might differ between programs. For example, the motor limit that is removed in VAIRC still applies for *Teams* and *Robots* participating in a V5RC event.

VEX V5 ROBOTICS COMPETITION

PUSH BACK

Appendix A
Field Overview

Appendix A - Field Overview

Game Field Introduction

This document will provide Bill of Materials (BOM) information and detailed specifications for the Official Competition Field.

Please note: this *Field* can utilize both the VEX Portable Competition Field Perimeter (276-8242 and the VEX Competition Field Perimeter (278-1501) developed by VEX Robotics. Instructions and specifications for these field perimeters are available in separate documents and are important for the field assembly.

This document is divided up into three sections:

1. *Field* Overview
2. *Field* BOM
3. *Field* Specifications

There is also an accompanying STEP file which can be imported into most 3D modeling programs (e.g., Inventor, Sketchup, Solidworks, etc.). This 3D model shows the “official” setup of a VEX V5 Robotics Competition - Push Back competition field, as well as detailed models of individual *Field Elements*.

For additional game-play detail, please refer to the VEX V5 Robotics Competition Push Back Game Manual.

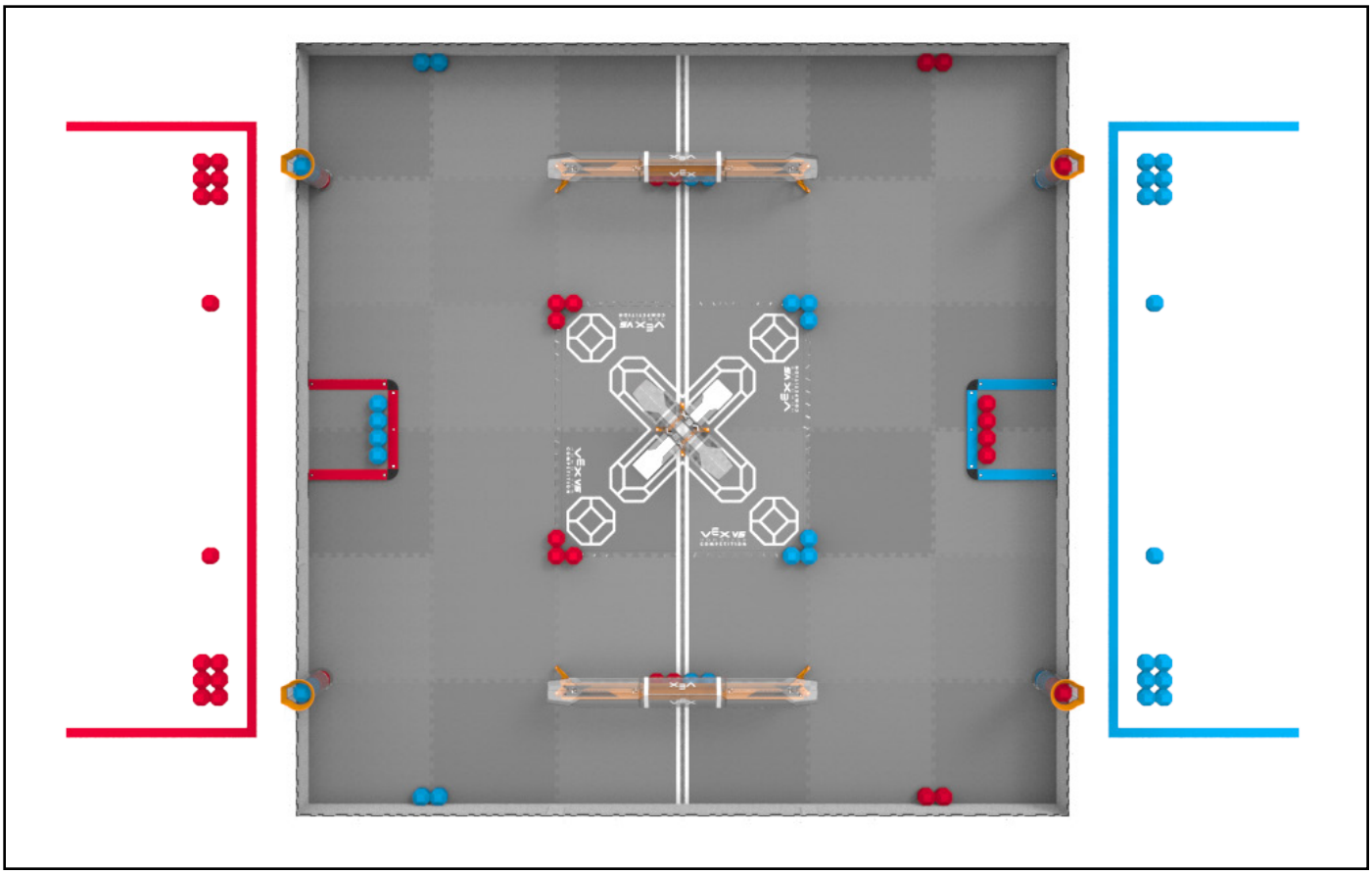
Version 2.2 - Released December 4, 2025

Field Overview

V5RC Push Back is played on a 12ft x 12ft foam mat, surrounded by a perimeter, with four (4) *Goals*, and two (2) *Park Zones* on the *Field*.

The V5RC Push Back *Field* consists of eighty-eight (88) *Blocks*, four (4) *Loaders*, four (4) *Goals*, and two (2) *Park Zones*.

For more details and specific gameplay rules, please refer to the V5RC Push Back Game Manual.



Version 2.2 - Released December 4, 2025

Game Objects & Field Bill of Materials

All of these items are available for purchase from www.vexrobotics.com

Generic Field Elements - Reusable Each Year

Part Number	Description
278-1501	Field Perimeter Frame & Hardware
276-8242	Portable Competition Field Perimeter
276-6905	Anti-Static Field Tiles (18-Pack)
275-1401	VEXnet Field Controller

Official VEX V5 Robotics Competition Push Back Specific Elements

Part Number	Description	Quantity per Full Field
276-9142	V5RC 2025-26 Full Field & Game Element Kit	
276-9143	V5RC 2025-26 Game Element Kit	1
276-9144	V5RC 2025-26 Field Element Kit 1	1
276-9145	V5RC 2025-26 Field Element Kit 2	1
276-9146	V5RC 2025-26 Field Element Kit 3	1
276-9091	V5RC Field Element Plates (4-Pack)*	1

*Optional. Only needed if Field Element Plates are not already owned.

Practice Elements

Part Number	Description
276-9143	V5RC 2025-26 Game Element Kit
276-9147	V5RC 2025-26 Scoring Element Kit

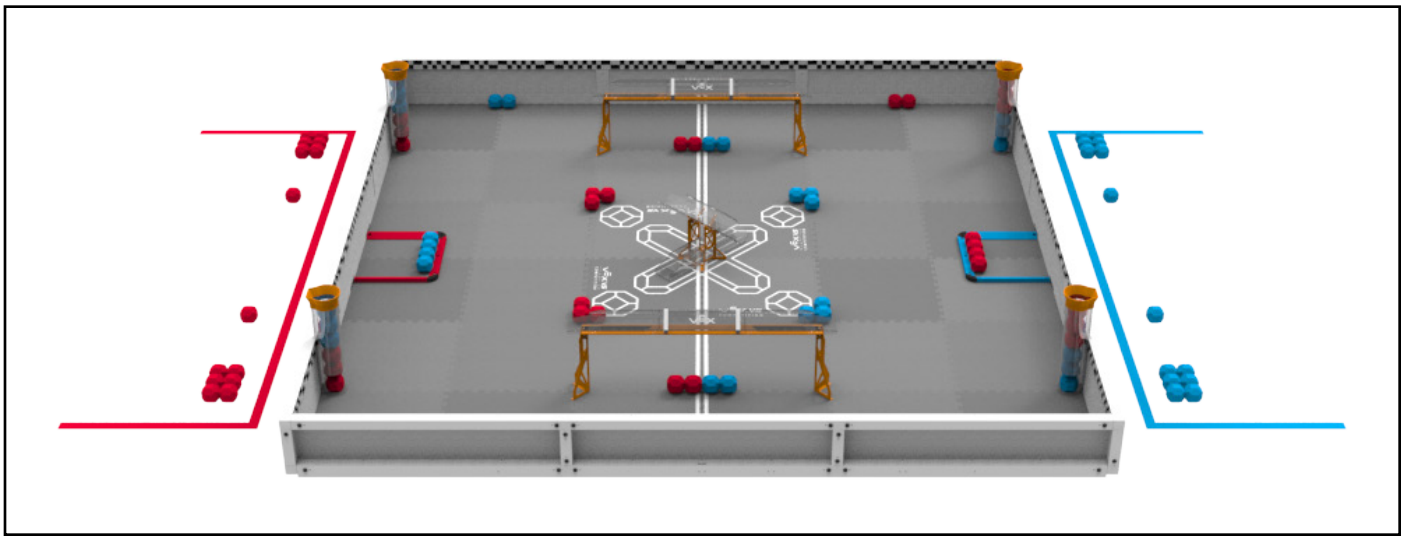
Version 2.2 - Released December 4, 2025

Field Specifications Introduction

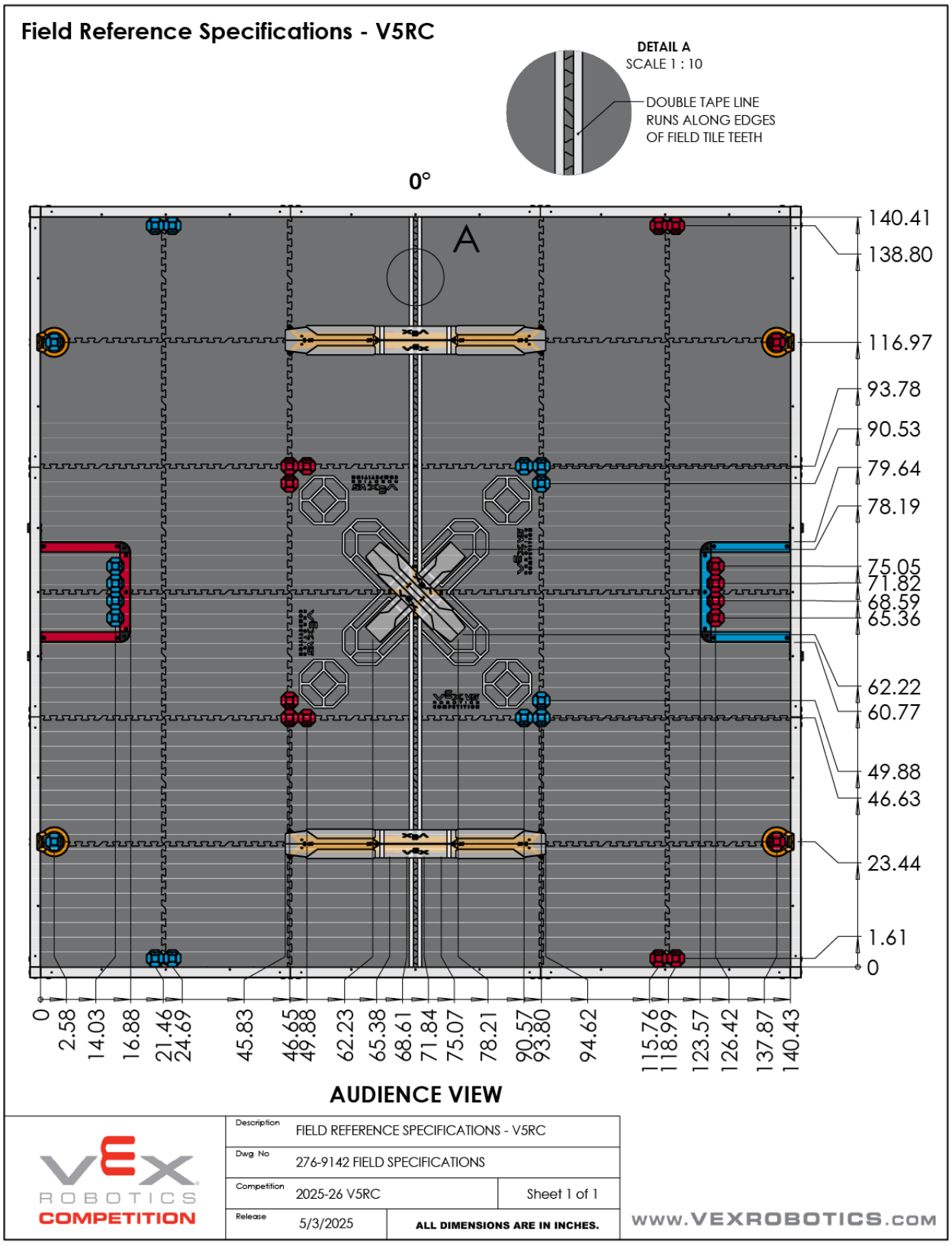
This section will outline the specifications that are most important to *Teams* designing a *Robot* to compete in VEX V5 Robotics Competition Push Back. Though many of the critical dimensions are included in this section, it may be necessary to consult the separate assembly guide and 3D CAD models of the *Field* for an additional level of detail. If you can't find a dimension in the specifications, we include a full model of the field to "virtually" measure whatever dimension is necessary.

Field components may vary slightly from event to event. This is to be expected; *Teams* will need to adapt accordingly. It is good design practice to create mechanisms capable of accommodating variances in the *Field* and *Blocks*.

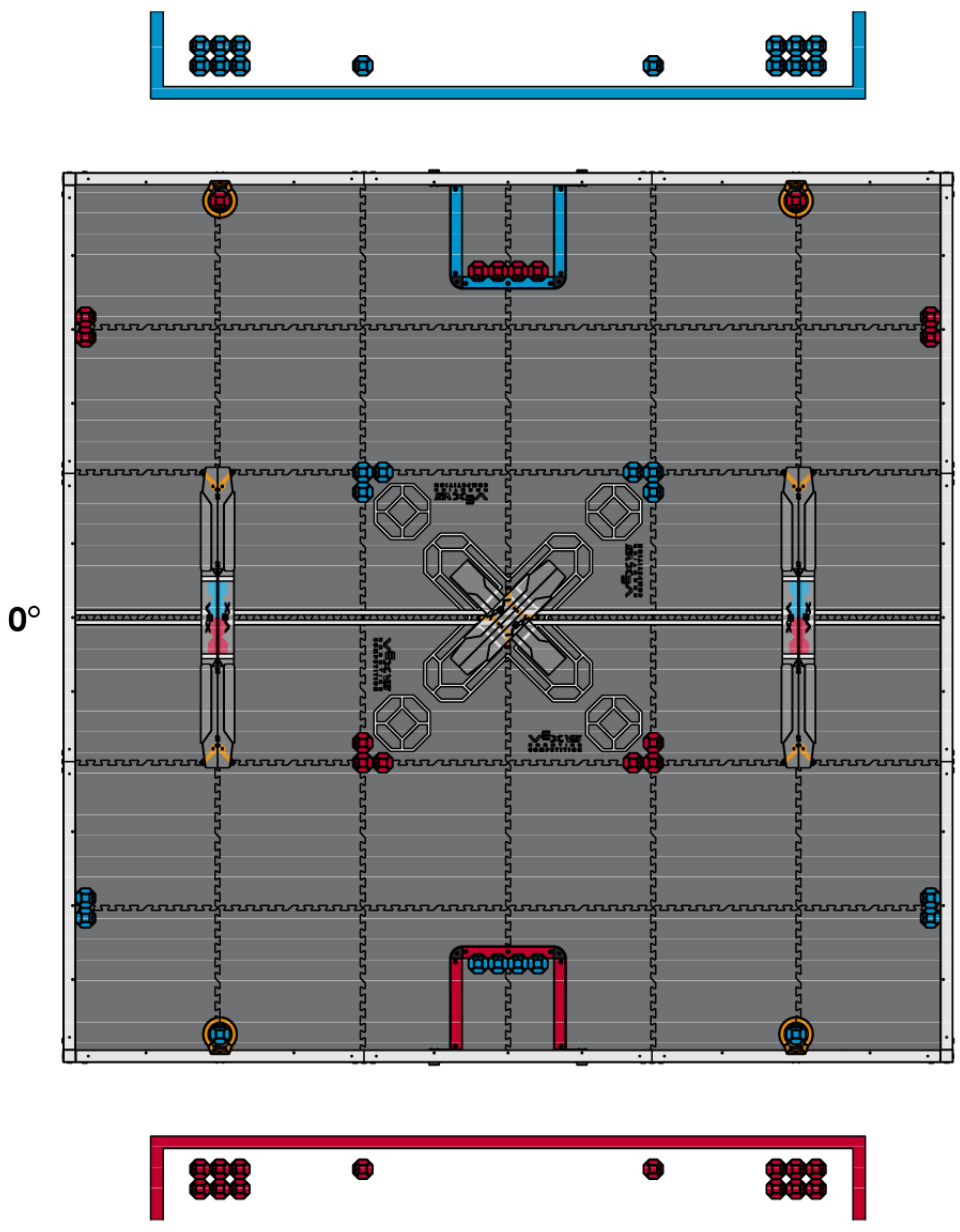
Note: Minor Field repairs are permissible, provided that the repairs do not affect gameplay. Examples of minor Field repairs include (but are not limited to) threadlocker applied to Field Element mounting hardware. Be sure to check the Official Q&A for specific examples or to get an official clarification.



Field Reference Specifications - V5RC



Object Placement (Top View) - V5RC



Note: Select field elements hidden for visual clarity.

VEX ROBOTICS COMPETITION	Description	OBJECT PLACEMENT (TOP) - V5RC	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/4/2025	ALL DIMENSIONS ARE IN INCHES.

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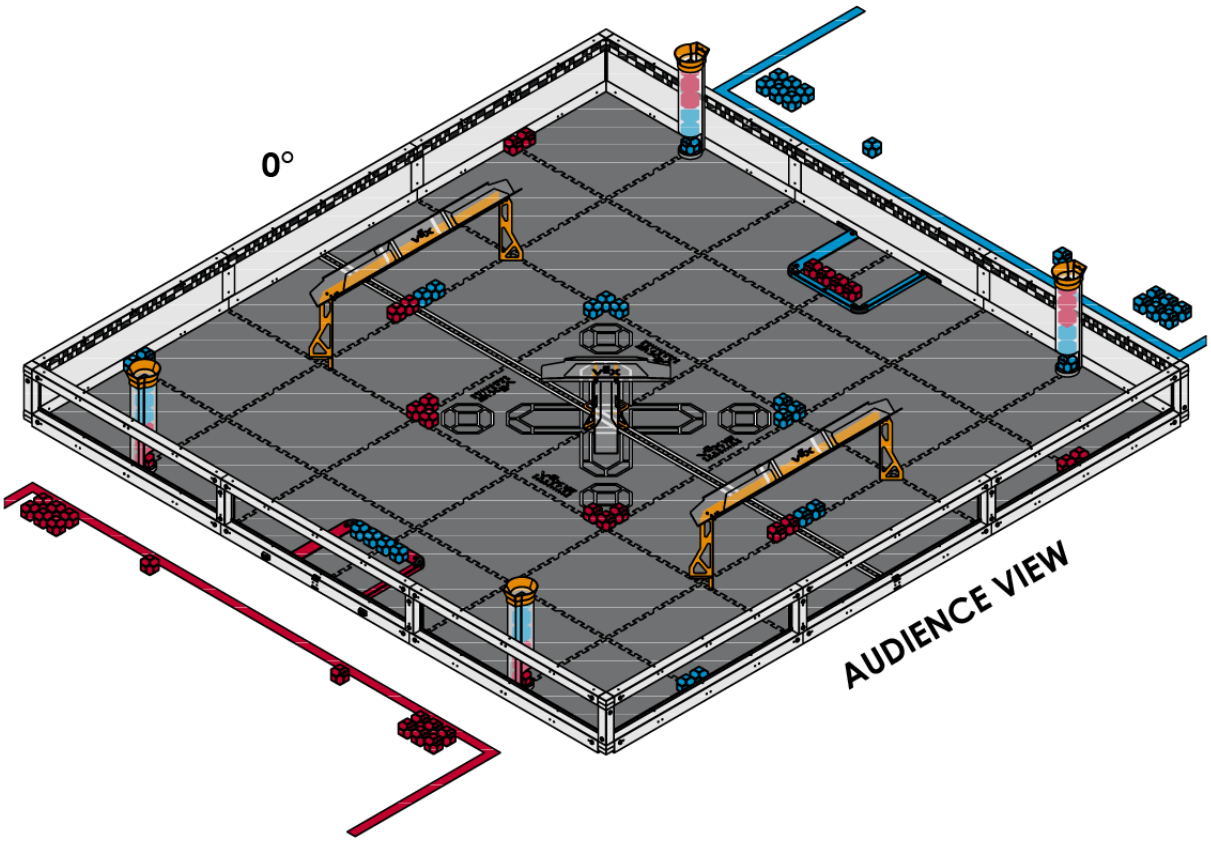
Object Placement Reference- V5RC



Note: Select field wall panels hidden for visual clarity.

VEX ROBOTICS COMPETITION	Description	OBJECT PLACEMENT REFERENCE- V5RC	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/4/2025	ALL DIMENSIONS ARE IN INCHES.

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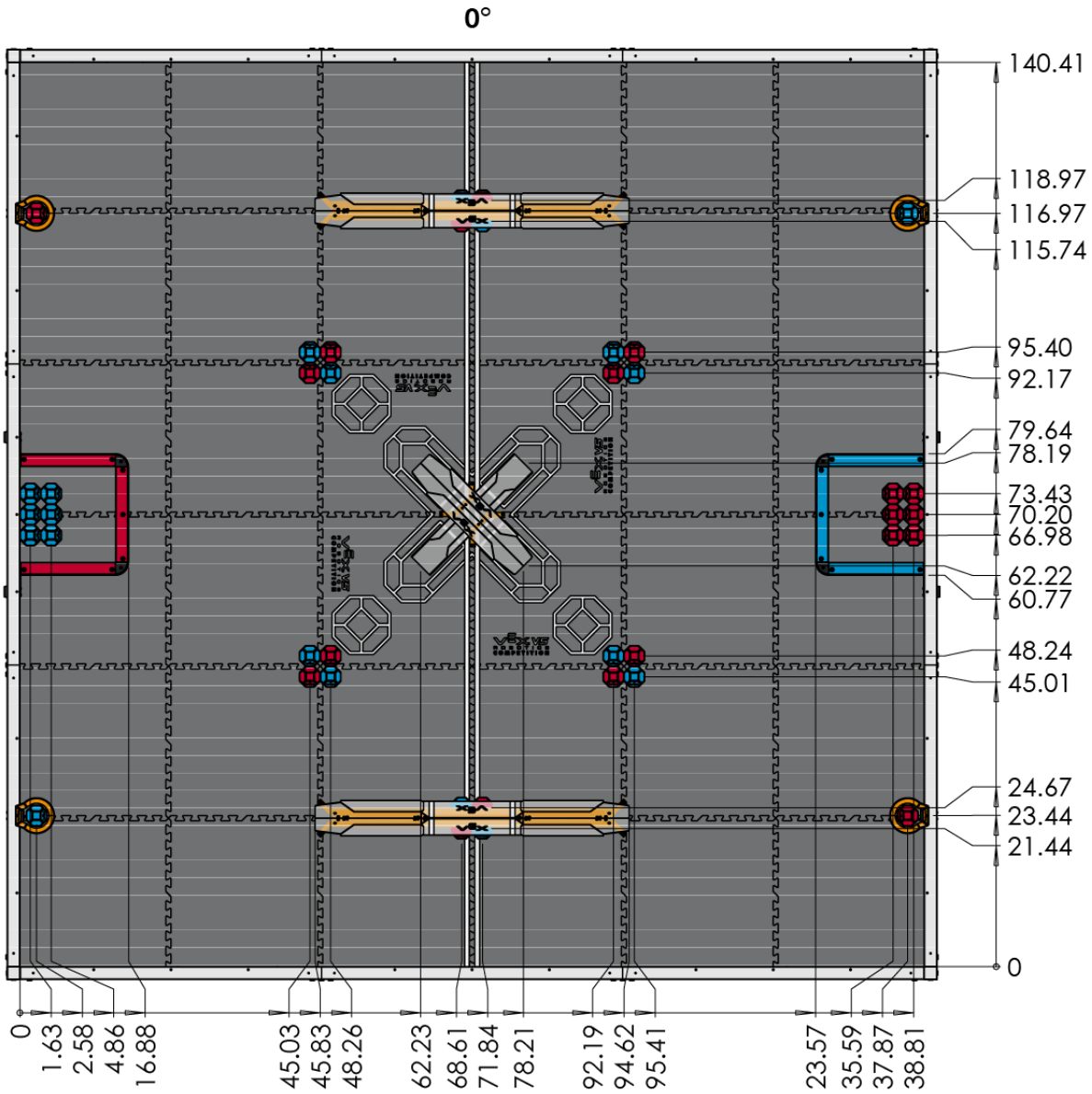
Field Reference Specifications - V5RC Skills



VEX ROBOTICS COMPETITION	Description	FIELD REFERENCE SPECIFICATIONS - V5RC SKILLS	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/1/2025	ALL DIMENSIONS ARE IN INCHES.

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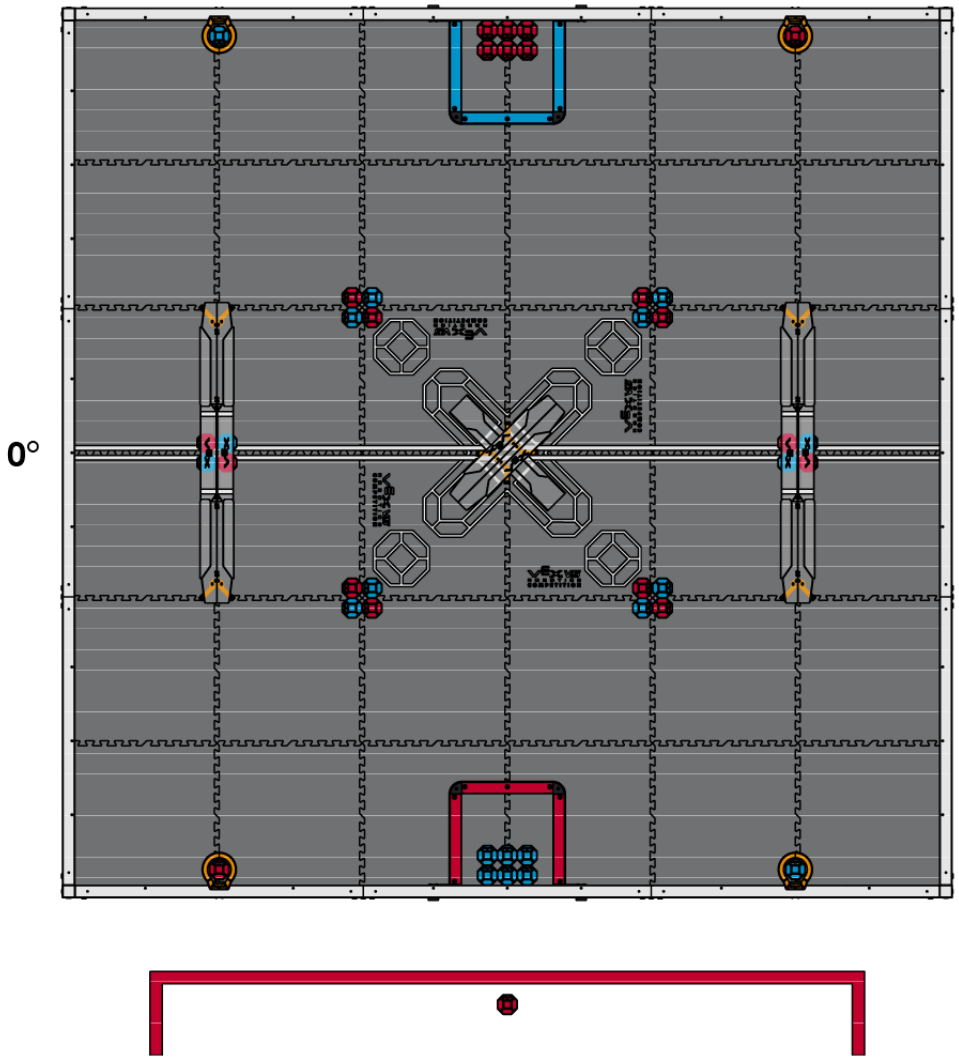
Object Placement (Top View) - V5RC Skills



Note: Select field elements hidden for visual clarity.

VEX ROBOTICS COMPETITION	Description	OBJECT PLACEMENT (TOP) - V5RC SKILLS	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/4/2025	ALL DIMENSIONS ARE IN INCHES.

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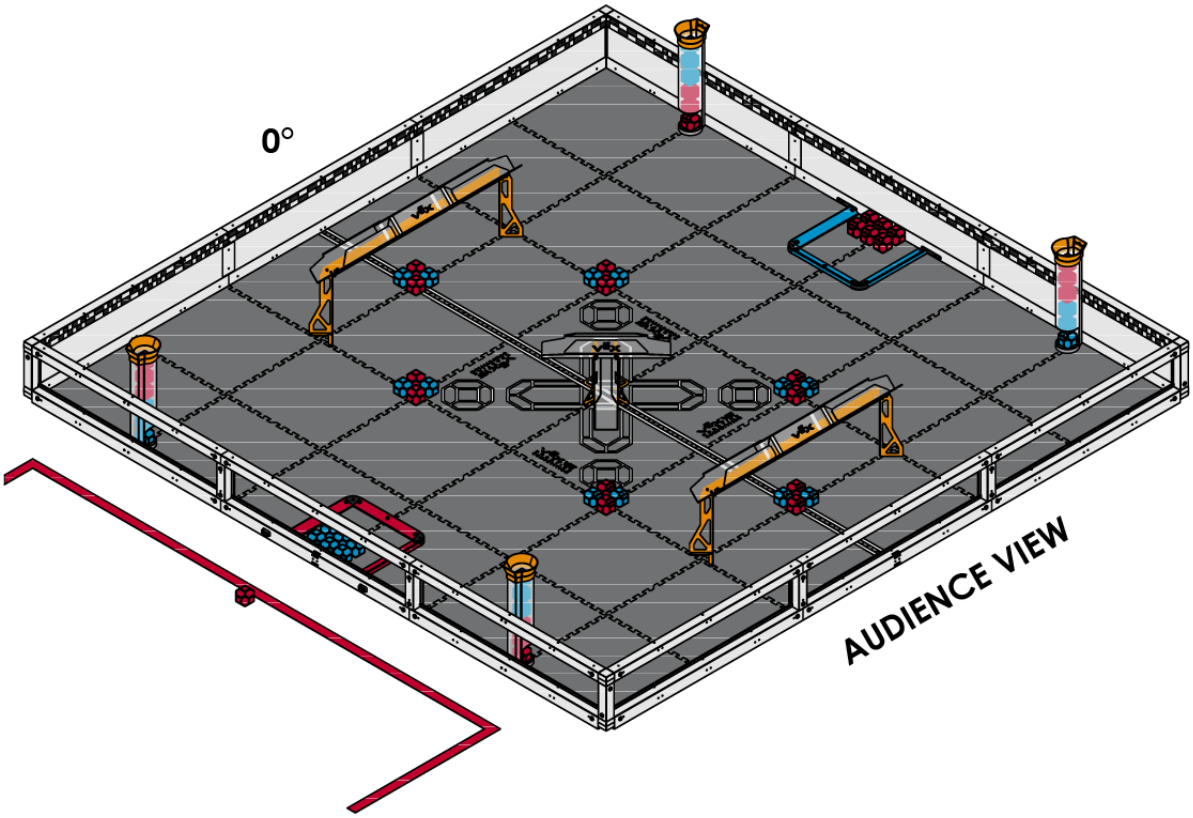
Object Placement Reference- V5RC Skills



Note: Select field wall panels hidden for visual clarity.

VEX ROBOTICS COMPETITION	Description	OBJECT PLACEMENT REFERENCE- V5RC SKILLS	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/4/2025	ALL DIMENSIONS ARE IN INCHES.

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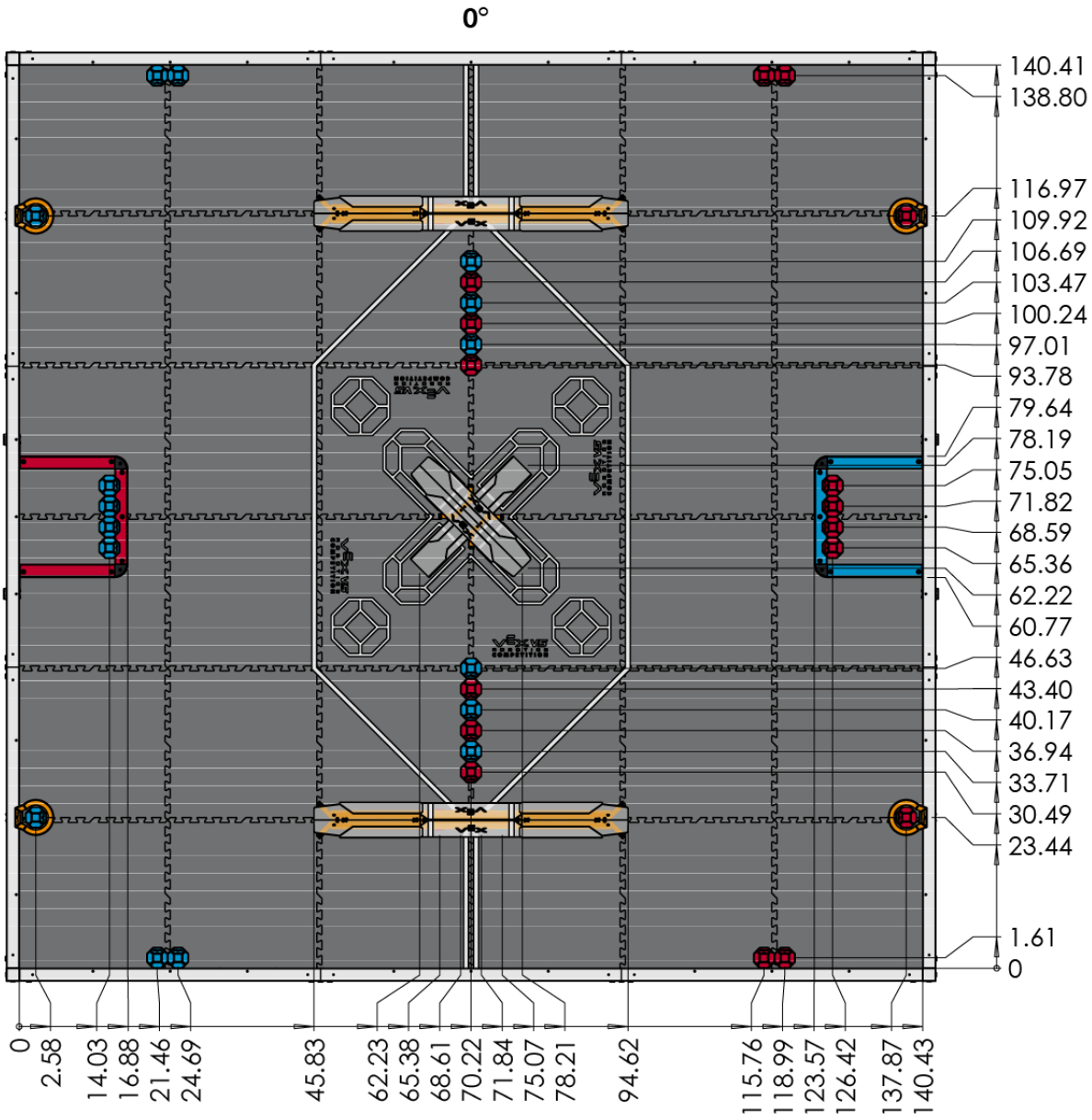
Field Reference Specifications - VURC



VEX ROBOTICS COMPETITION	Description	FIELD REFERENCE SPECIFICATIONS - VURC	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/1/2025	ALL DIMENSIONS ARE IN INCHES.

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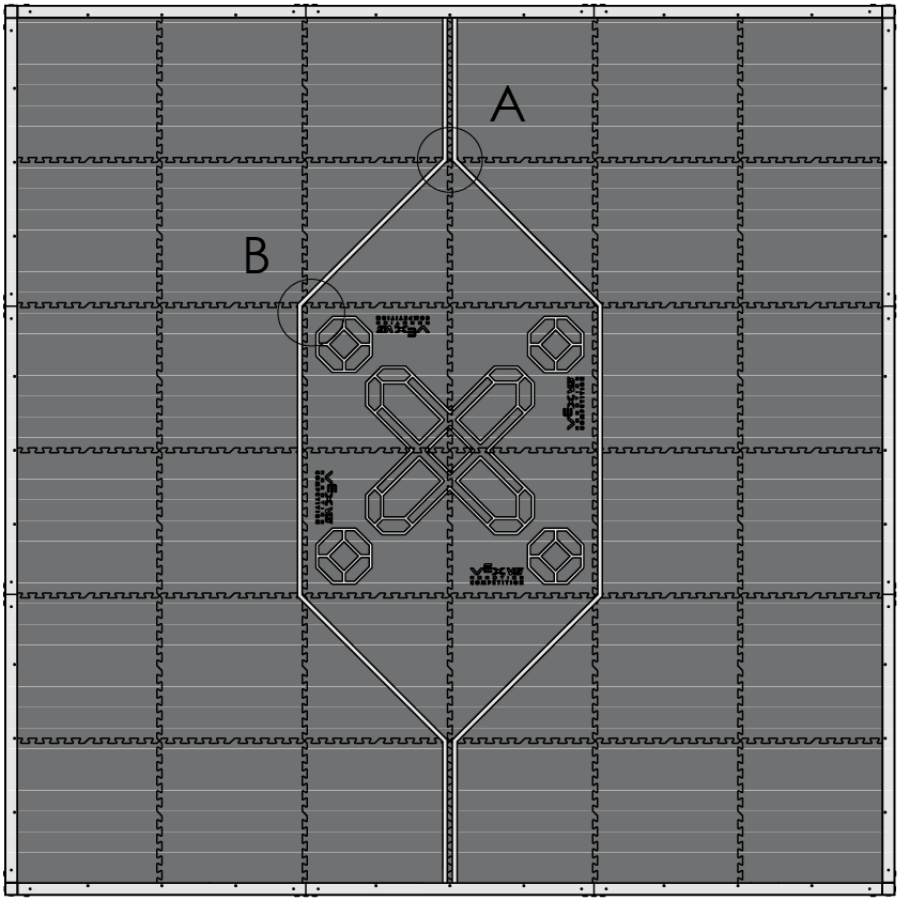
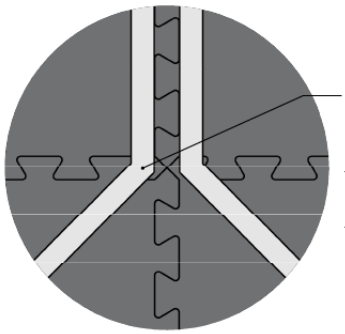
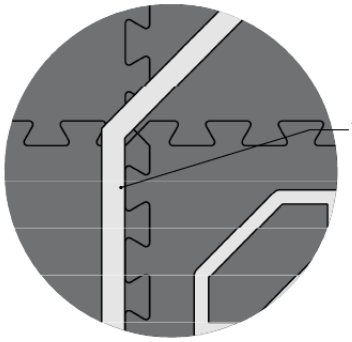
Field Tape Specifications - VURC





DOUBLE TAPE LINE RUNS ALONG EDGES OF FIELD TILE TEETH. AT CENTER POINT OF THE FOUR TILES, LINES SPLIT OFF AT 45° ANGLES.

DETAIL A
SCALE 1 : 5



TAPE LINE RUNS ALONG OUTSIDE EDGES OF CENTRAL FIELD TILE TEETH.

DETAIL B
SCALE 1 : 5

VEX ROBOTICS COMPETITION	Description	FIELD TAPE SPECIFICATIONS - VURC	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/4/2025	ALL DIMENSIONS ARE IN INCHES.

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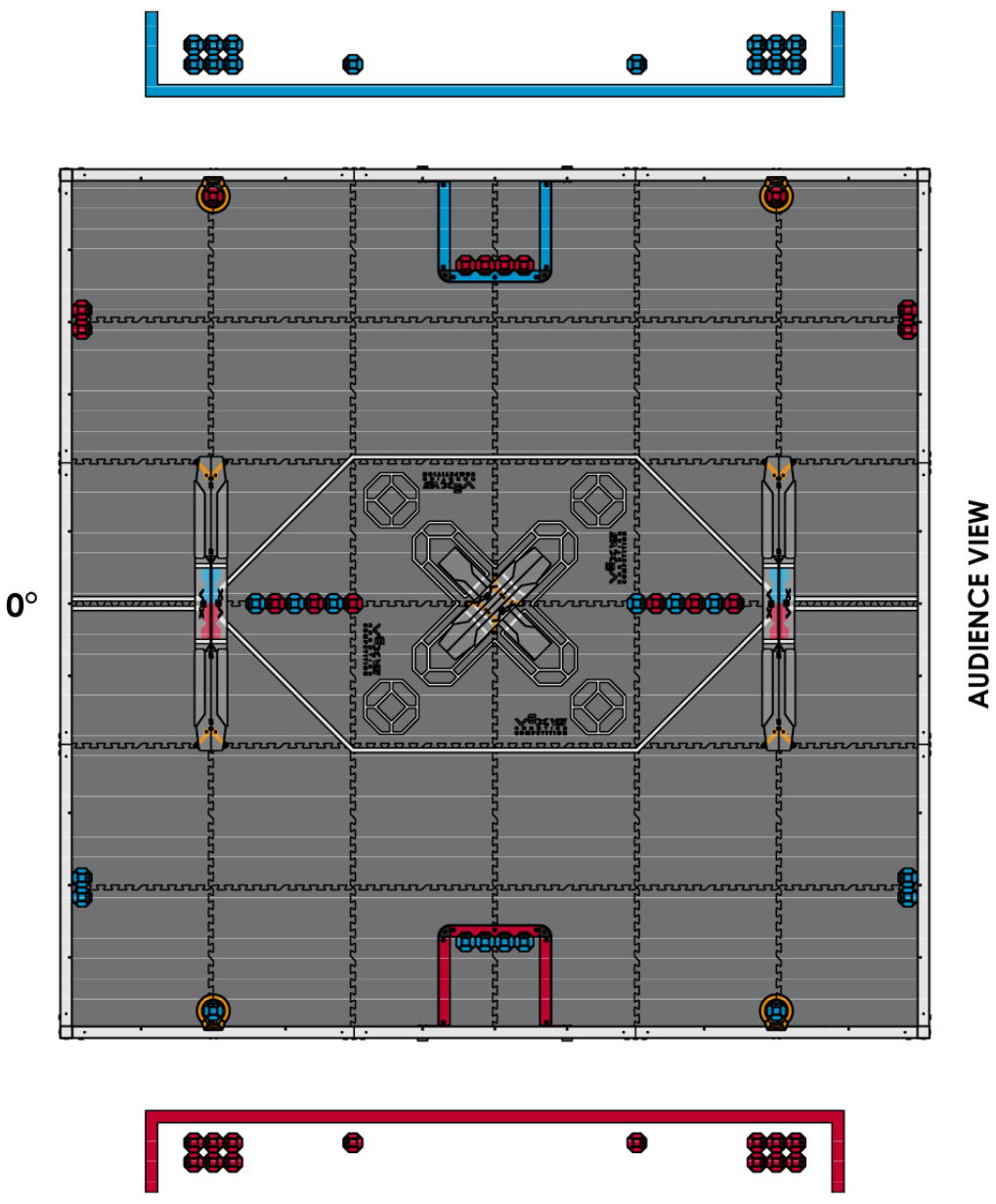
Object Placement (Top View) - VURC



Note: Select field elements hidden for visual clarity.

VEX ROBOTICS COMPETITION	Description	OBJECT PLACEMENT (TOP) - VURC	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/4/2025	ALL DIMENSIONS ARE IN INCHES.

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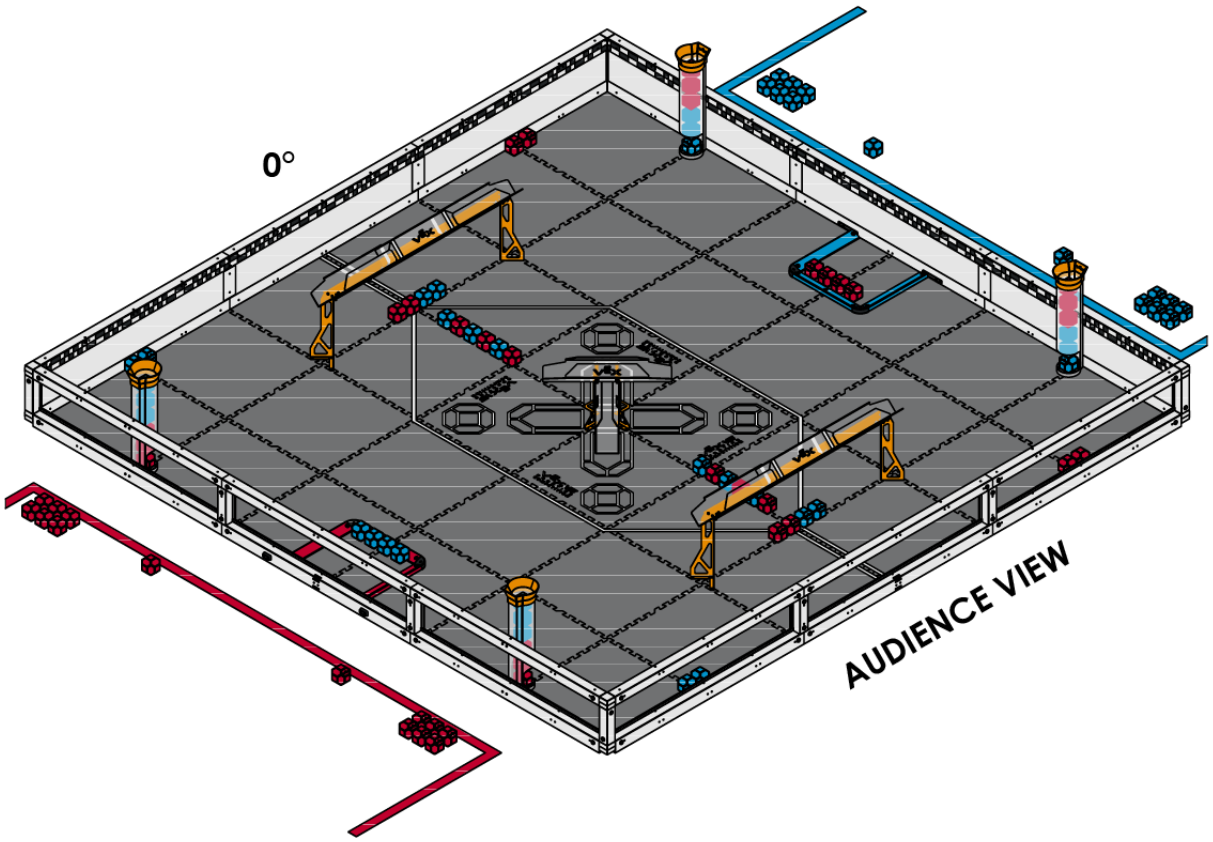
Object Placement Reference- VURC



Note: Select field wall panels hidden for visual clarity.

VEX ROBOTICS COMPETITION	Description	OBJECT PLACEMENT REFERENCE- VURC	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/4/2025	ALL DIMENSIONS ARE IN INCHES.

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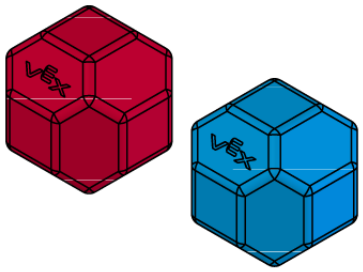
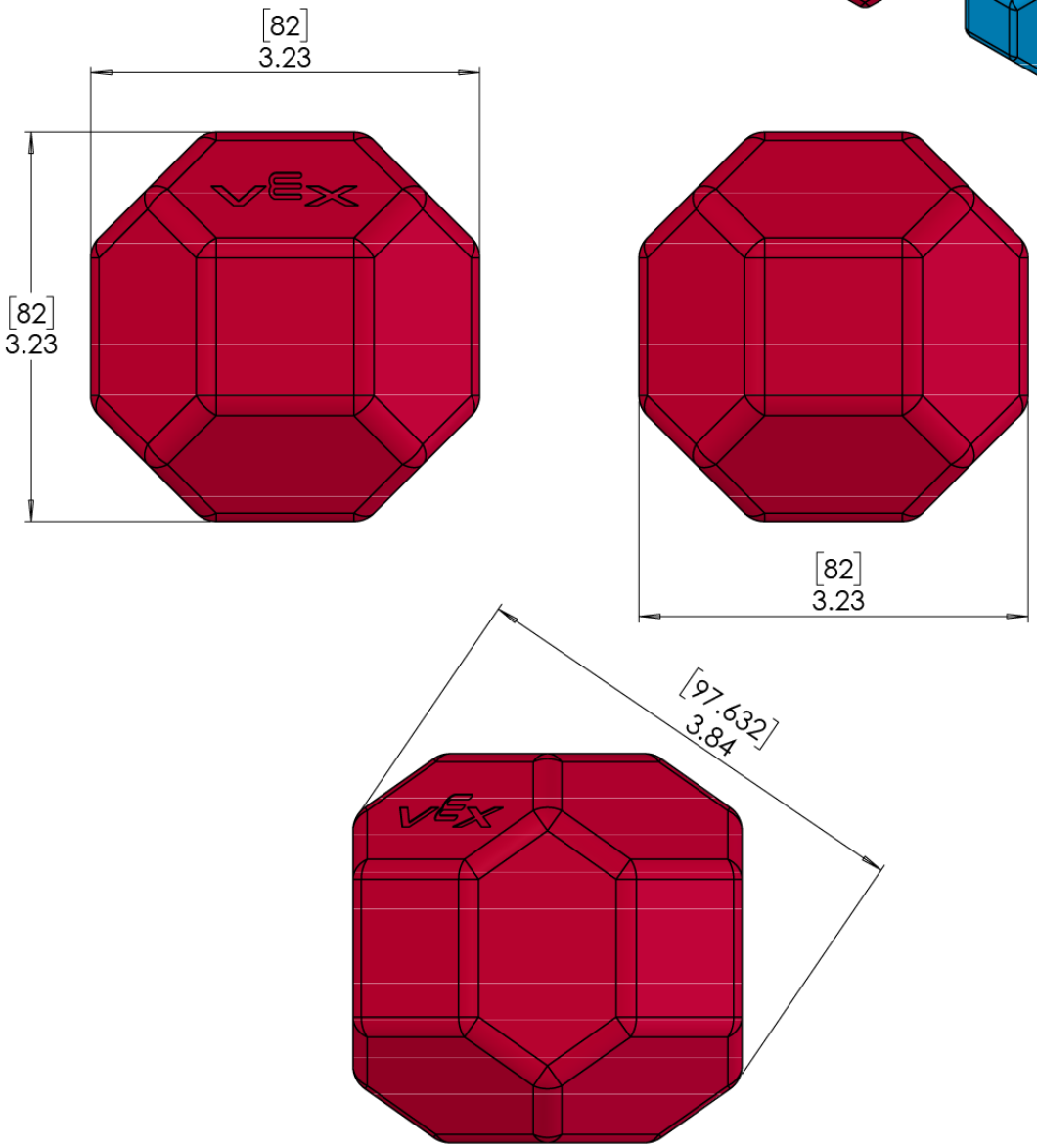
Block Specifications





Mass = 40 ± 4 grams

VEX ROBOTICS COMPETITION	Description	Block Specifications	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/3/2025	ALL DIMENSIONS ARE IN INCHES [MILLIMETERS].

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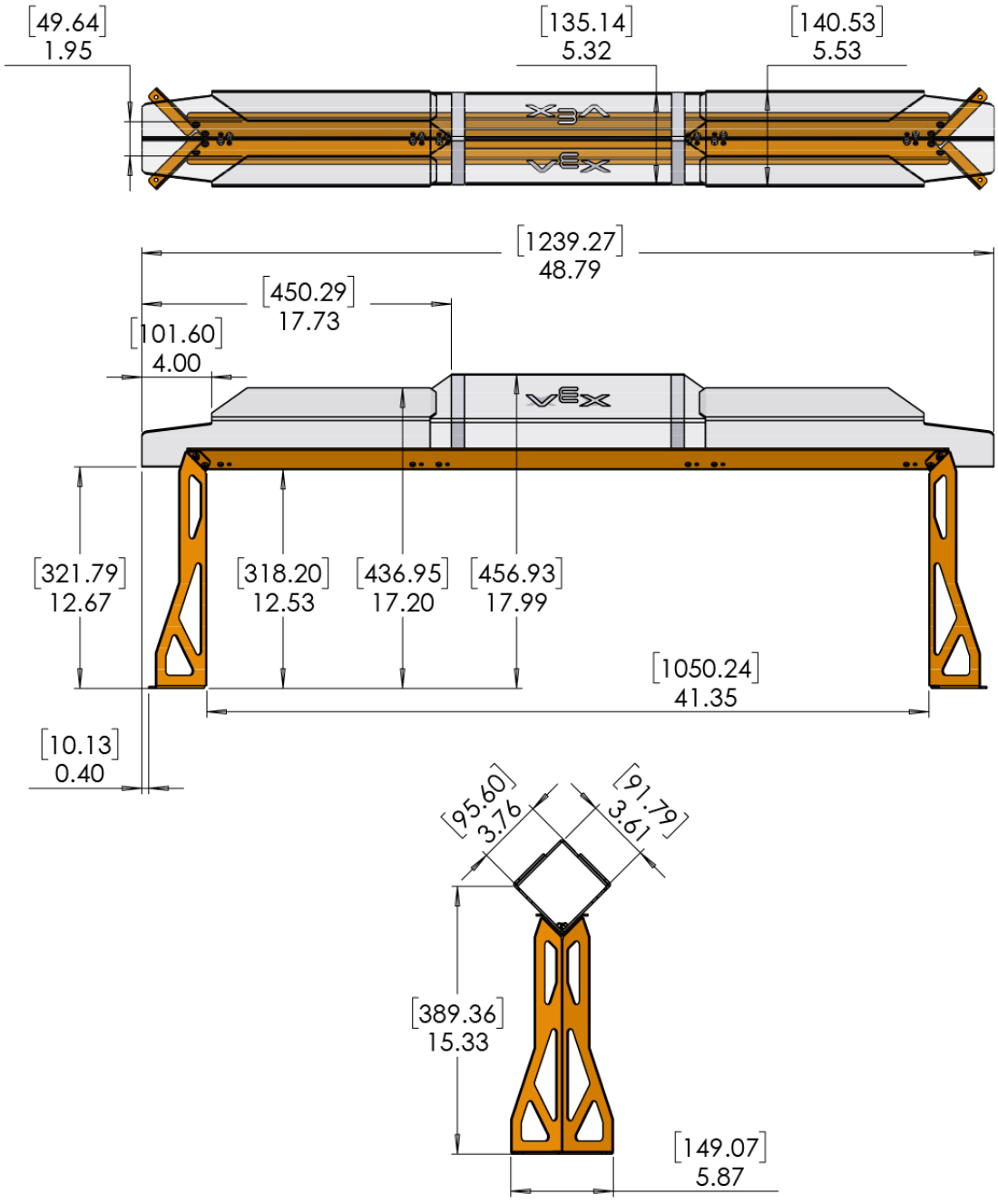
Long Goal Specifications



VEX ROBOTICS COMPETITION	Description	LONG GOAL SPECIFICATIONS	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/3/2025	ALL DIMENSIONS ARE IN INCHES [MILLIMETERS].

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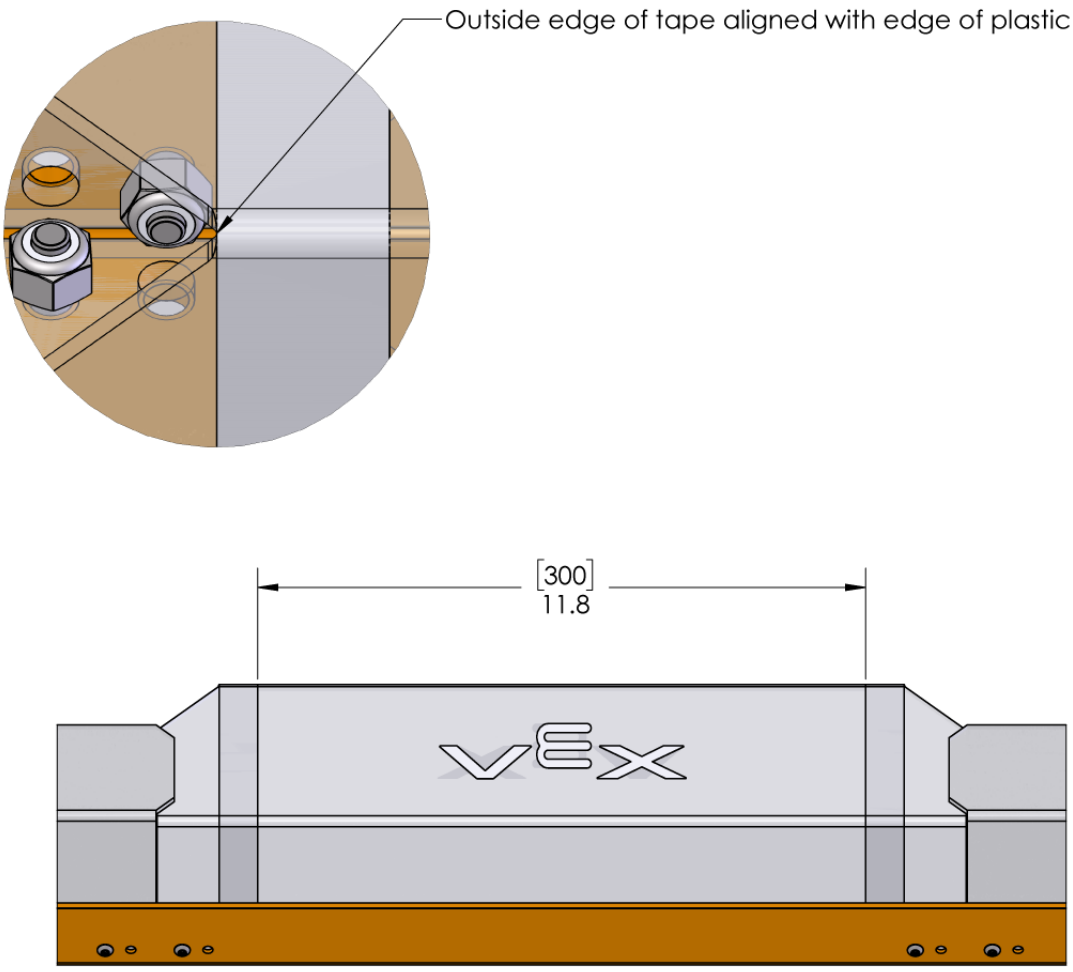
Control Zone Tape Specifications



VEX ROBOTICS DESIGN SYSTEM	Description	CONTROL ZONE TAPE SPECIFICATIONS	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Project	2025-26 V5RC	Sheet 1 of 1
	Release	8/6/2025	ALL DIMENSIONS ARE IN INCHES [MILLIMETERS].

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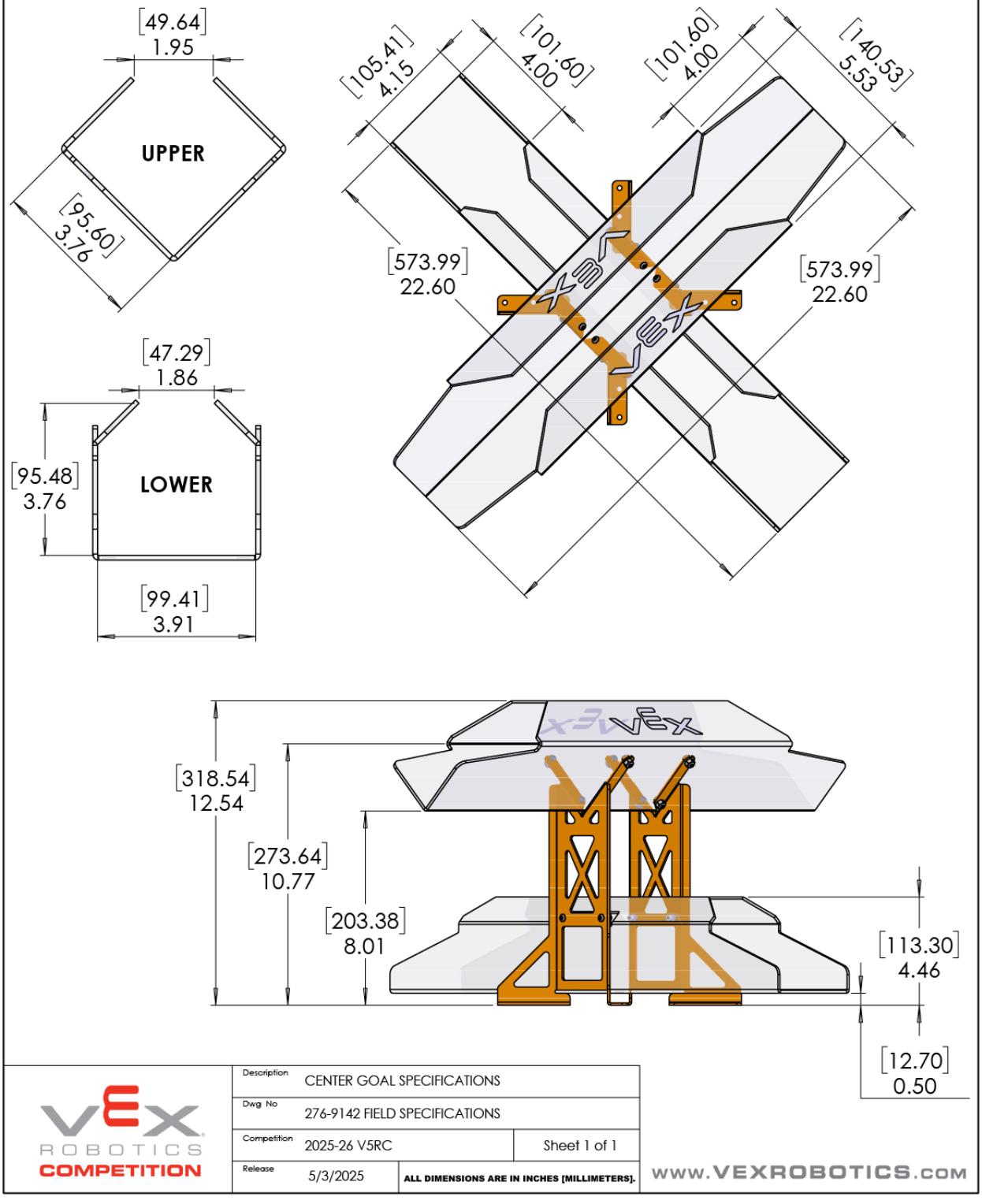
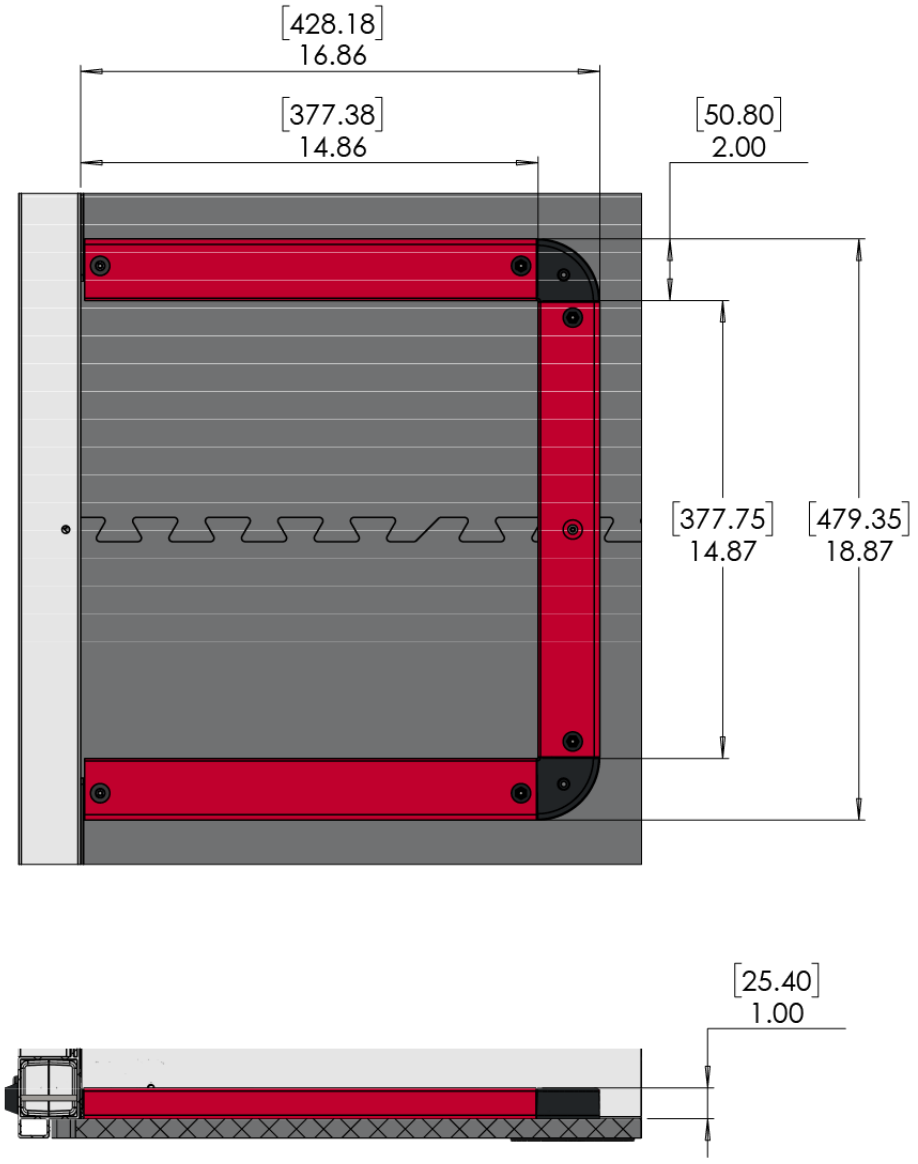
Center Goal Specifications



Park Zone Specifications



VEX ROBOTICS COMPETITION	Description	PARK ZONE SPECIFICATIONS	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/2/2025	ALL DIMENSIONS ARE IN INCHES [MILLIMETERS].

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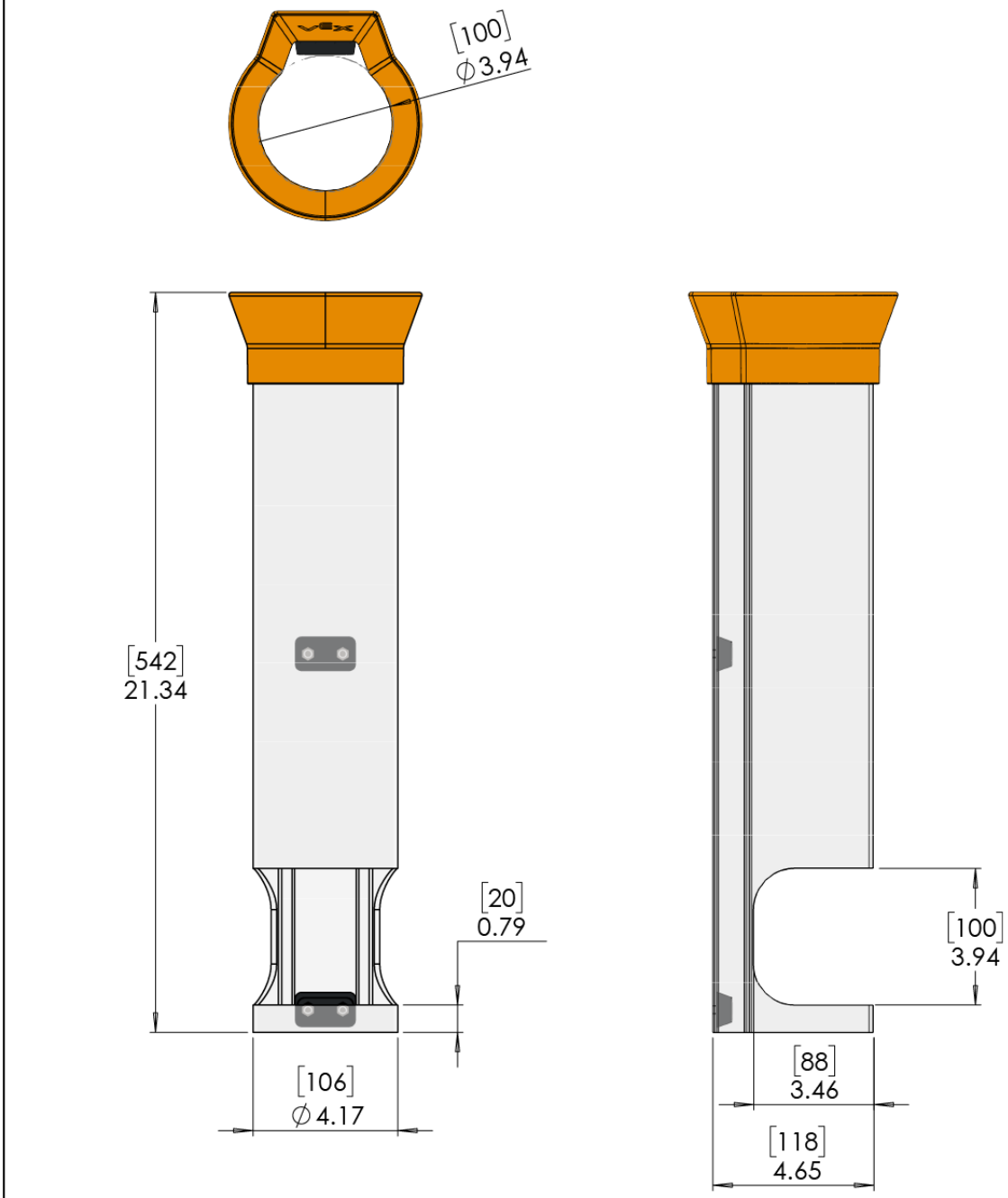
LOADER SPECIFICATIONS



Description	LOADER SPECIFICATIONS		
Dwg No	276-9142 FIELD SPECIFICATIONS		
Competition	2025-26 V5RC	Sheet 1 of 1	
Release	5/3/2025	ALL DIMENSIONS ARE IN INCHES [MILLIMETERS].	

VEX ROBOTICS COMPETITION

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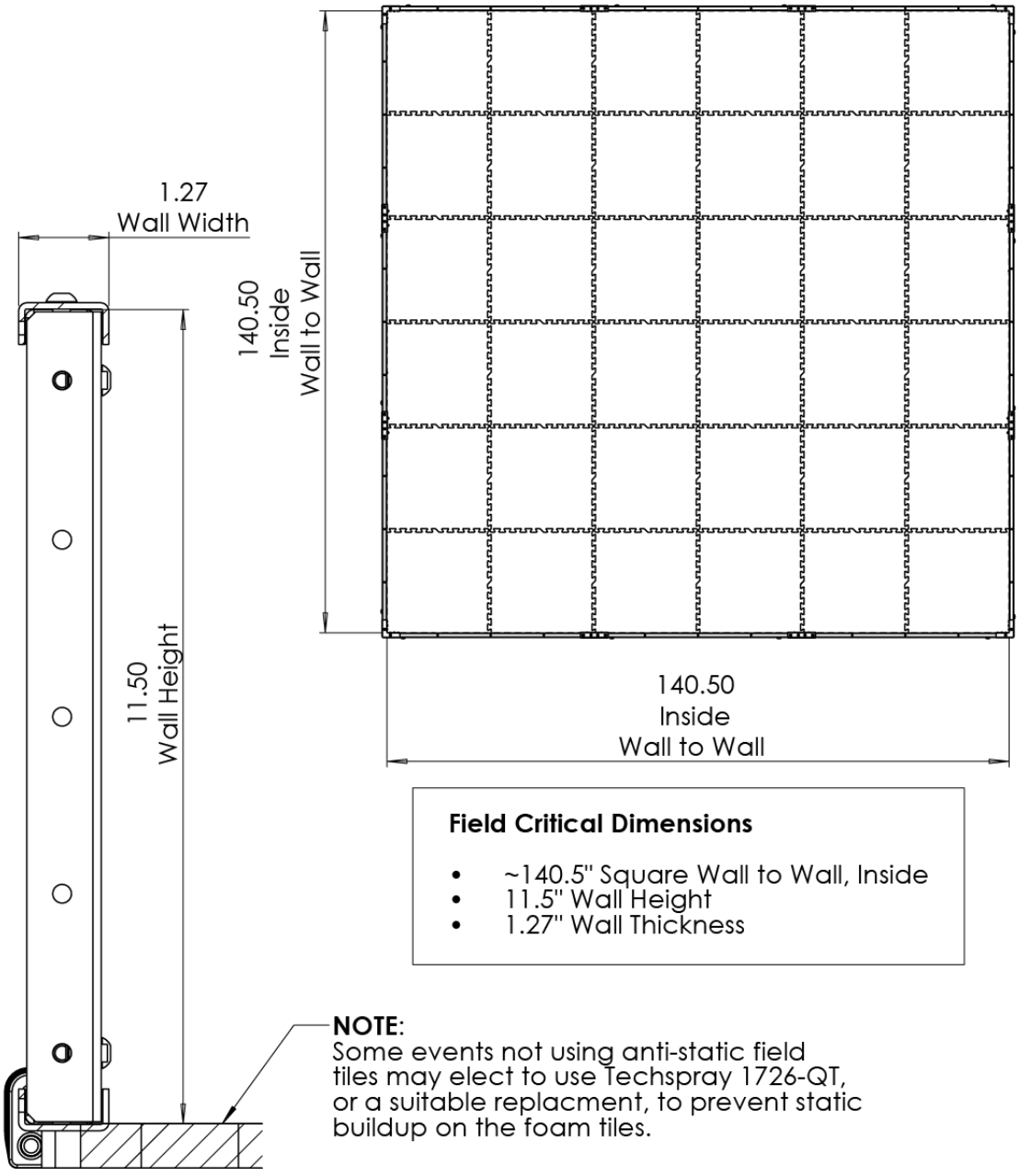
Field Critical Specs (278-1501):



Field Critical Dimensions

- ~140.5" Square Wall to Wall, Inside
- 11.5" Wall Height
- 1.27" Wall Thickness

NOTE:
Some events not using anti-static field tiles may elect to use Techspray 1726-QT, or a suitable replacment, to prevent static buildup on the foam tiles.

VEX ROBOTICS COMPETITION	Description	METAL FIELD PERIMETER SPECIFICATIONS	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	Sheet 1 of 1
	Release	5/2/2025	ALL DIMENSIONS ARE IN INCHES.

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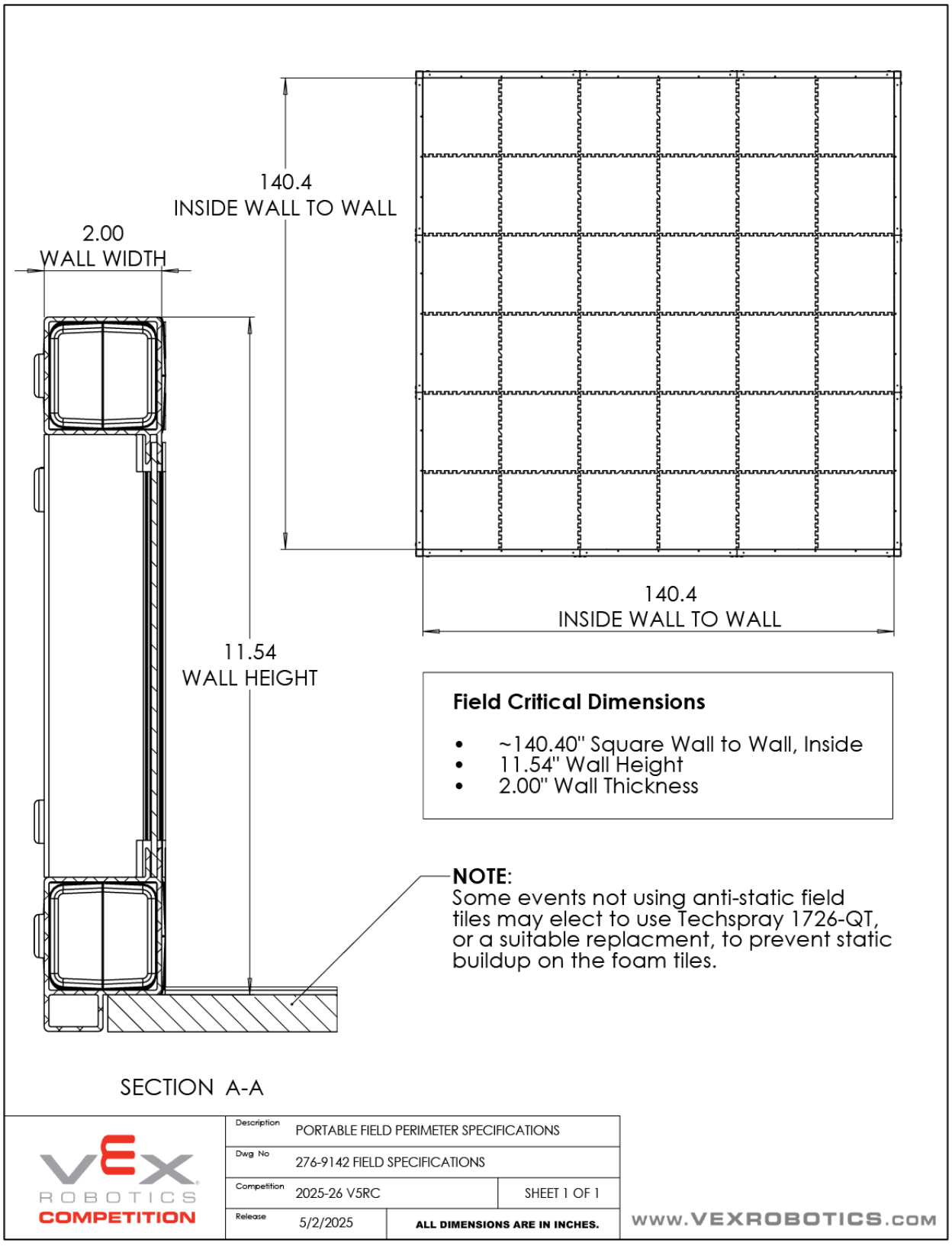

Field Critical Dimensions

- ~140.40" Square Wall to Wall, Inside
- 11.54" Wall Height
- 2.00" Wall Thickness

NOTE:
Some events not using anti-static field tiles may elect to use Techspray 1726-QT, or a suitable replacment, to prevent static buildup on the foam tiles.

VEX ROBOTICS COMPETITION	Description	PORTABLE FIELD PERIMETER SPECIFICATIONS	
	Dwg No	276-9142 FIELD SPECIFICATIONS	
	Competition	2025-26 V5RC	SHEET 1 OF 1
	Release	5/2/2025	ALL DIMENSIONS ARE IN INCHES.

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Permitted Field Modifications

- Applying threadlocker to *Field Element* mounting hardware
- Using non-VEX white electrical tape to add required lines to the *Field*
- Using standard VEX Field tiles in place of the game-specific graphic tiles, for any reason
- Assembling *Loaders* without nut blocks to improve alignment of holes
- Anchoring *Field Elements* directly to *Field* risers instead of the metal plates