VEX: Change Up Rules	Sullivan French	23	7/27/2020
VEX: Change Up Rules	Paul Kupfer	24	7/28/2020
VEX: Change Up Rules	Paul Kupfer	25	7/28/2020
Field Specifications	Connor Dampier	26	8/02/2020
Field Specifications	Connor Dampier	27	8/02/2020
Team Goals	Paul Kupfer	28	8/07/2020
Intake and Scoring Mechanism Brainstorming	Sullivan French	29	9/24/2020
Intake Brainstorming (Cont.)	Tate McPhail	30	9/24/2020

VEX: Change Up Game Definitions-

Adult- Anyone who is not a *Student*.

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

Alliance Home Row- The three (3) *Goals* in each *Alliance's Home Zone.*

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

Autonomous Bonus- A point bonus of six (6) points awarded to the *Alliance* that has earned the most points at the end of the *Autonomous Period.*

> Note: If the *Autonomous Period* ends in a tie, including a zero-to-zero tie, each *Alliance* will receive an *Autonomous Bonus* of three (3) points.

Autonomous Line- The pair of white tape lines that run across the center of the field. Per <SG2>, *Robots* may not contact the foam field tiles on the opposite *Alliance's* side of the *Autonomous Line* during the *Autonomous Period.*

Ball- A hollow plastic spherical-shaped, dimpled object, with a diameter of 6.3" (160mm), that can be Scored in *Goals*.

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

Connected Row- A *Row* where all three (3) *Goals* in the *Row* are *Owned* by the same *Alliance.*

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

Disablement- A penalty applied to a *Team* for a rule violation. A *Team* that is Disabled is not allowed to operate their *Robot* for the remainder of the *Match*, and the *Drive Team Members* will be asked to place their controller(s) on the ground.

Disqualification: A penalty applied to a *Team* for a rule violation. A *Team* that is Disqualified in a Qualification *Match* receives zero (0) *Win Points*, *Autonomous Win Point*, *Autonomous Points*, and *Strength of Schedule Points*. When a *Team* is Disqualified 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 *Disqualifications* for a single *Team* may lead to its *Disqualification* for the entire tournament.

Drive Team Members: A *Student* who stands in the *Alliance Station* during a *Match* for each *Team* per <G7> . Only *Drive Team Members* are permitted to stand in the *Alliance Station* and allowed to touch the controls during the *Match* or interact with the *Robot* as per <G9>. *Adults* are not allowed to be *Drive Team Members*.

Entanglement: A *Robot* status. A *Robot* is Entangled if it has grabbed, hooked, or attached to an opposing *Robot* or a *Field Element*.

Field Element: The foam field tiles, field perimeter, white tape, *Goal*, and all supporting structures or accessories (such as driver station posts, field monitors, etc).

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

Match- A *Match* consists of an *Autonomous Period* followed by a *Driver Controlled Period* for a total time of two minutes (2:00).

- **Autonomous Period:** A fifteen second (0:15) time period during which *Robots* operate and react only to sensor inputs and to commands pre-programmed by the *Students* into the *Robot* control system.
- **Driver Controlled Period:** The one minute and forty-five second (1:45) time period during which *Drive Team Members* operate their *Robots*.

Match Affecting- A rule violation status determined by the head referee. A rule violation is *Match Affecting* if it changes the winning and losing *Alliances* in the *Match*. Multiple rule violations within a *Match* can cumulatively become *Match Affecting*.

Owned- A *Goal* status. A *Goal* is considered *Owned* by an *Alliance* if its colored *Ball* is the vertically highest *Scored Ball* in that *Goal*.

Possession- A *Robot* is considered to be *Possessing* a *Ball* if a *Ball* is in an unscored position and any one of the following criteria are met:

- The *Robot* is carrying, holding or controlling the movement of a *Ball* such that if the *Robot* changes direction, the *Ball* will move with the *Robot*. Pushing/plowing *Balls* is not considered *Possession*, however using concave portions of your *Robot* to control the movement of *Balls* is considered *Possession*.
- The *Robot* is blocking opposing *Robots'* access to *Balls*, such as by expanding horizontally and restricting access to a portion of the field (e.g. a “wallbot”).
- *Robots* on the same *Alliance* working in tandem to block access to *Balls* would share the *Possession* of the *Balls*.

Note: *Balls* that are *Scored* in *Goals* cannot be considered *Possessed* until the *Robot* removes the *Ball* from that *Scored* position and is carrying, holding, controlling or blocking opposing *Robots'* access to that *Ball*.

Preload- The *Ball*, one (1) per *Robot*, that must be placed on the field such that it satisfies the conditions in <*SG1*> prior to the start of the *Match*.

Note: The red *Alliance* always uses red *Balls* as their *Preloads*. The blue *Alliance* always uses blue *Balls* as their *Preloads*.

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

Robot- A machine that has passed inspection, designed to execute one or more tasks autonomously and/or by remote control from a human operator.

Row- Three (3) *Goals* that make up a straight line. There are a total of eight (8) *Rows* including two (2) Alliance Home Rows.

Scored- A *Ball* status. A *Ball* is considered *Scored* in a *Goal* if it is not touching a *Robot* of the same color as the *Ball* and meets all of the following criteria.

- The *Ball* is fully or partially within the outer edge of the *Goal*.
- The *Ball* is fully below the upper edge of the *Goal*.
- The *Ball* is not contacting the foam tiles outside of the *Goal.*

Note: In the act of removing a *Ball* from the bottom of a *Goal* with three *Scored Balls* inside, it is possible for the top *Ball* to momentarily break criteria 2 above. If this occurs at the end of the *Match*, this *Ball* should still be considered *Scored*. The intent of this note is to avoid unintended de-scoring via the top of the *Goal*. The intent is not to encourage *Teams* to seek unique scenarios that would not typically be considered Scored. This would be considered a violation of rule <*SG5*>.

Student- A person is considered a *Student* if he/she meets both of the following criteria:

1. Anyone who is earning or has earned credit toward a high school diploma/certificate or its equiva-lent 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, 2001 (i.e. who will be 19 or younger at VEX Worlds 2021). 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, 2005 (i.e. who will be 15 or younger at VEX Worlds 2021). *Middle School Students* may “play up” and compete as a *High School Student.*
- **High School Student:** Any eligible *Student* that is not a *Middle School Student.*

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

Trapping– A *Robot* status. A *Robot* is *Trapping* if it has restricted an opposing *Robot* into a small, confined area of the field, approximately the size of one foam field tile or less, and has not provided an avenue for escape. *Trapping* can be direct (e.g. pinning an opponent to a field perimeter wall) or indirect (e.g. preventing a Robot from escaping from a corner of the field).

Note: If a *Robot* is not attempting to escape, that *Robot* has not been *Trapped*.

VEX Change Up Rules -

Safety Rules:

<S1> **Be safe out there.** If at any time the *Robot* operation or *Team* actions are deemed unsafe or have damaged any *Field Elements* or Game Objects, the offending *Teams* may be Disabled and/or Disqualified at the discretion of the *Head Referee*. The *Robot* will require re-inspection before it may take the field again.

<S2> **Stay inside the field.** If a *Robot* is completely out-of-bounds (outside the playing field), it will be Disabled for the remainder of the *Match*.

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

<S3> **Wear safety glasses.** All *Drive Team Members* must wear safety glasses or glasses with side shields while in the *Alliance Stations* during *Matches*. While in the pit area, it is highly recommended that all *Team* members wear safety glasses.

General Game Rules:

<G1> **Treat everyone with respect.** All *Teams* are expected to conduct themselves in a respectful and professional manner while competing in VEX 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 be Disqualified from a current or upcoming *Match*. *Team* conduct pertaining to may also impact a *Team's* eligibility for judged awards. Repeated or extreme violations of could result in a *Team* being Disqualified from an entire event, depending on the severity of the situation.

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

This rule exists alongside the REC Foundation Code of Conduct. Violation of the Code of Conduct can be considered a violation of and can result in *Disqualification* from a current *Match*, an upcoming *Match*, an entire event, or (in extreme cases) an entire competition season.

For the 2020-2021 season, some events may establish additional Health & Safety guidelines beyond the scope of this Game Manual. These guidelines will be communicated to all *Teams* in advance via Health & Safety notes associated with the event registration in RobotEvents. All *Teams* (including *Students* or any *Adults* associated with the *Team*) must abide by these guidelines as written. Violation of an event-specific Health & Safety rule may be considered a violation of and/or the REC Foundation Code of Conduct.

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

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

<G4> **Robots begin the Match in the starting volume.** At the beginning of a *Match*, each *Robot* must be smaller than a volume of 18” (457.2 mm) long by 18” (457.2 mm) wide by 18” (457.2 mm) tall. Using *Field Elements*, such as the field perimeter wall, to maintain starting size is only acceptable if the *Robot* would still satisfy the constraints of and pass inspection without the *Field Element*. *Robots* in violation of this limit will be removed from the field prior to the start of the *Match*, at the *Head Referee’s* discretion.

<G5> **Keep your Robots together.** *Robots* may not intentionally detach parts during the *Match* or leave mechanisms on the field.

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

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

a. *Team* members may move from one *Team* to another for non-strategic reasons outside of the *Team’s* control.

i. Examples of permissible moves may include, but are not limited to, illness, changing schools, conflicts within a *Team*, or combining / splitting *Teams*.

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

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

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 Drivers or *Programmers* for the team.

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

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

<G7> **Only Drivers, and only in the Alliance Station.** During a *Match*, each *Team* may have up to three (3) *Drive Team Members* in their *Alliance Station* and all *Drive Team Members* must remain in their *Alliance Station* for the duration of the *Match*. *Drive Team Members* are not allowed to use any sort of communication devices while in the *Alliance Station*. Devices with communication features turned off (e.g. a phone in airplane mode) are allowed.

Note 1: *Drive Team Members* are the only *Team* members that are allowed to be in the *Alliance Station* during a *Match*.

Note 2: During a *Match*, *Robots* may be operated only by the *Drive Team Members* and/or by software running on the *Robot's* control system, in accordance with and . Violations or refusal to comply with this rule could be considered a violation of and is up to the discretion of the *Head Referee.*

<G8> **Controllers must stay connected to the field towers.** Prior to the beginning of each *Match*, *Drive Team Members* must plug their VEXnet Joystick or V5 Controller into the VEXnet Field Controller's Cat-5 cable via their controller's competition port. 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*.

Minor violations of these rules that do not affect the *Match* will result in a warning. *Match Affecting* offenses will result in a *Disqualification*. *Teams* that receive multiple warnings may also receive a *Disqualification* at the *Head Referee's* discretion.

Note: 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.

<G9> **Hands out of the field.** *Drive Team Members* may only touch the *Team's* controls and *Robot* at specified times during a *Match* as per <G9a>. *Drive Team Members* are prohibited from making intentional contact with any Game Object, *Field Element*, or *Robot* during a *Match*, apart from the contact specified in <G9a>.

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 and/or power expander.
iii. Plugging in a VEXnet Key or V5 Robot Radio.
iv. Touching the V5 Robot Brain screen, such as to start a program.

b. *Drive Team Members* are not permitted to break the plane of the field perimeter at any time during the *Match*, apart from the actions described in <G9a>.
c. Transitive contact, such as contact with the field perimeter that causes the field perimeter to contact *Balls* inside of the field, would be considered a violation of this rule.

Minor violations of these rules that do not affect the *Match* will result in a warning. *Match Affecting* offenses will result in a *Disqualification*. *Teams* that receive multiple warnings may also receive a *Disqualification* at the *Head Referee's* discretion.

Note: Any concerns regarding the *Ball*(s) starting positions should be raised with the *Head Referee* prior to the *Match*; *Team* members may never adjust the *Balls* or *Field Elements* themselves.

<G10> **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 VEXnet Joysticks or V5 Controllers.
- Unplugging or otherwise manually interfering with the field connection in any way.
- Triggering sensors (including the Vision Sensor) in any way, even without touching them.

Minor violations of this rule will result in a Warning. Violations of this rule that affect the outcome of the Autonomous winner or disrupt the autonomous routine of their opponent will result in the *Autonomous Bonus* being awarded to the opposing *Alliance*. *Teams* that receive multiple warnings may also receive a *Disqualification* at the *Head Referee's* discretion.

<G11> **All rules still apply in the Autonomous Period.** Any infractions committed during the *Autonomous Period* that are not *Match Affecting*, but do affect the outcome of the *Autonomous Bonus*, will result in the *Autonomous Bonus* being automatically awarded to the opposing *Alliance*.

a. *Teams* are responsible for the actions of their *Robots* at all times, including during the *Autonomous Period*. Any infractions committed during the *Autonomous Period* that are *Match Affecting* can result in a *Disqualification*, if warranted by the rule.
b. If both *Alliances* cause infractions during the *Autonomous Period* that would have affected the outcome of the *Autonomous Bonus*, then no *Autonomous Bonus* will be awarded.

<G12> **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 Robotics Competition and are not allowed. If the tipping, *Entanglement*, or damage is ruled to be intentional or egregious, the offending *Team* may be Disqualified from that *Match*. Repeated offenses could result in *Disqualification* from the entirety of the competition.

a. VEX Robotics Competition Change Up is intended to be an offensive game. Teams that partake in solely defensive or destructive strategies will not have the protections implied by <G12> (see <G13>). However, defensive play which does not involve destructive or illegal strategies is still within the spirit of this rule.
b. VEX Robotics Competition Change Up is an interactive game. Some incidental tipping, *Entanglement*, and damage may occur as a part of normal gameplay without violation. It will be up to the *Head Referee's* discretion whether the interaction was incidental or intentional.
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.

Note: A *Robot* which has expanded horizontally in an effort to obstruct the field, or is legally covering the top of a *Goal* in a solely defensive manner, should expect vigorous interactions from opponent Robots. Damage that is caused by opponent *Robots* pushing, tipping, or *Entangling* with them would not be considered a violation of <G12>. Gratuitous damage or dangerous mechanisms may still be considered a violation of <R4>, <S1>, or <G1> at the *Head Referee's* discretion.

<G13> **Offensive Robots will get the "benefit of the doubt".** In the case where referees are forced to make a judgment call regarding a destructive interaction between a defensive and offensive *Robot*, or an interaction which results in a questionable rules violation, the referees will err on the side of the offensive *Robot*.

<G14> **You can't force an opponent into a penalty.** Intentional strategies that cause an opponent to violate a rule are not permitted, and will not result in an infraction on the opposing *Alliance*. Minor violations of this rule that do not affect the *Match* will result in a warning. *Match Affecting* offenses will result in a *Disqualification*. *Teams* that receive multiple warnings may also receive a *Disqualification* at the *Head Referee's* discretion.

Note: <G3> should be used when enforcing this rule. In most cases, if a *Robot* causes their opponent to break a rule, the referee will simply not enforce the penalty on that opponent. Only in extreme cases, where the act of forcing the opponent into breaking a rule changes the outcome of the match for the benefit of the *Robot*, should that *Robot* who caused the opponent to break a rule receive a *Disqualification*.

<G15> **No Trapping for more than five seconds (0:05).** A *Robot* may not *Trap* an opposing *Robot* for more than five seconds (0:05) during the *Driver Controlled Period*. A *Trap* is officially over once the *Trapping Robot* has moved away and the *Robots* are separated by at least two (2) feet (approximately one [1] foam tile). After ending a Trap, a *Robot* may not Trap the same *Robot* again for a duration of five seconds (0:05). If a *Team* does Trap the same *Robot* again, the count will resume from where it left off when the *Trapping Robot* initially backed off.

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

<G16> **Don't clamp your Robot to the field.** *Robots* may not intentionally grasp, grapple or attach to any *Field Elements*. Strategies with mechanisms that react against multiple sides of a *Field Element* in an effort to latch or clamp onto said *Field Element* are prohibited. The intent of this rule is to prevent *Teams* from both unintentionally damaging the field and/or from anchoring themselves to the field.

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

<G17> **Let go of Game Objects after the Match.** *Robots* must be designed to permit easy removal of *Balls* from any mechanism without requiring the *Robot* to have power after a *Match*.

<G18> **It's not over until it's over.** Scores will be calculated for all *Matches* immediately after the *Match* ends, once all *Balls*, *Field Elements*, and *Robots* on the field come to rest.

a. The determination of the *Autonomous Bonus* will occur for all *Matches* immediately after the *Autonomous Period* ends, after all *Balls*, *Field Elements*, and *Robots* come to rest.
b. The determination of any Autonomous Win Point(s) will occur for all *Matches* immediately after the *Autonomous Period* ends, after all *Balls*, *Field Elements*, and *Robots* come to rest.

<G19> **Be prepared for minor field variance.** *Field Element* tolerances may vary from nominal by ±1.0”, unless otherwise specified. *Ball* tolerances and weights may vary from nominal to ±0.10” and 10 grams respectively. *Ball* placement at the beginning of *Matches* may vary from nominal to ±1.5”. The bottom opening of *Goals* between the lowest two rings has a dimensional tolerance of -0.0 / +0.5”. *Teams* are encouraged to design their *Robots* accordingly. Please make sure to check Appendix A for more specific nominal dimensions and tolerances.

Note: The field perimeter must always be resting upon the Field Perimeter Rubber Feet, regardless of whether or not the tabs have been cut from the foam field tiles.

<G20> **Match Replays are allowed, but rare.** Match Replays, i.e. playing a match over again from its start, are at the discretion of the *Event Partner* and *Head Referee*, and will only be issued in the most extreme circumstances listed but not limited to the following:

a. Field Fault issues that have directly affected *Match* play.
    i. Game Elements not in correct positions.
    ii. Tape lines lifting
    iii. *Field Elements* detaching or moving beyond normal tolerances that is not a result of team play violations.
    iv. *Autonomous Period* or *Driver Controlled Period* ending early.
    v. Field Control disconnecting and disabling *Robots*. Not to be confused with a *Robot* that trips its own PTC and has to reboot to reconnect the robot to a controller, or teams with controllers that have bent pins that affect only their alliance Field Control tower.
b. Game Rule issues that affect the outcome of a match.
    i. Referee disables a robot for a misinterpretation of a rule violation.
    ii. Referee starts the *Driver Controlled Period* without determining the outcome of the Autonomous winner.
    iii. The field is reset before a score is determined.

Specific Game Rules:

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

a. Contacting its *Home Zone.*
b. Not contacting the gray foam field tiles outside of the *Alliance’s Home Zone.*
c. Not contacting any *Balls* other than the *Preload.*
d. Not contacting another *Robot*.
e. Contacting exactly one (1) *Preload.*
    i. The *Preload* must be contacting exactly one (1) *Robot.*
    ii. The *Preload* must be fully within the field perimeter.
    iii. The *Preload* must not be breaking the vertical projection of the *Goal*, i.e. the *Preload* must not be inside or above the *Goal*.

Note: If a *Robot* is not present for their *Match*, then their *Preload* will instead be placed in the center of the gray foam tile that is closest to the double tape line that bisects the *Home Zone* and is opposite the half of the *Home Zone* from the placed *Robot* as shown below.

<SG2> **Stay on your side in Autonomous.** During the *Autonomous Period*, *Robots* may not contact the foam tiles or *Balls* which are on the opposing *Alliance's* side of the *Autonomous Line. Robots* may not contact the *Goals* that are in the opposing *Alliance's Home Zone*.

Violations of this rule will result in the Autonomous Bonus being awarded to the opposing *Alliance*. Intentional, strategic, or egregious violations, such as intentional contact with an opposing *Robot* while completely across the *Autonomous Line*, will result in a *Disqualification*.

Note: The three (3) *Goals* contacting the *Autonomous Line* are not considered to be on either side, and may be utilized by either *Alliance* during the *Autonomous Period*. If attempting to utilize these *Goals*, *Teams* should be cognizant of the possibility that opponent *Robots* may attempt to do the same. <SG7>, <G10>, <G11>, and <G12> will be taken into account when these types of *Robot* interactions occur.

<SG3> **Keep Balls on your side in Autonomous.** *Balls* that start fully on one side of the *Autonomous Line* may not contact the foam tiles on the opposite side of the *Autonomous Line* during the *Autonomous Period.*

Incidental violations of this rule and have no impact on the opposing *Alliance* will result in a Warning. Violations of this rule that affect the opposing *Alliance's* autonomous routine will result in the *Autonomous Bonus* being awarded to the opposing *Alliance*. Examples of affecting the opposing *Alliance* could include, but are not limited to, a *Ball* moving another *Ball* or getting in the path of a *Robot*.

Note: *Balls* that start on the *Autonomous Line* are not included in this rule.

<SG4> **Keep Game Objects to yourself.** *Robots* may not intentionally drop or place *Game Objects* on an opponent *Robot*.

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

<SG5> **Balls may not be de-scored from the top of Goals.** *Balls* that are *Scored* may not be lifted by any means such that the *Ball* goes above the top edge of the *Goal*.

It is expected that while removing *Balls* from the bottom of the *Goal*, this may cause the top *Ball* to momentarily go above the top edge of the *Goal*. This would not be a violation of this rule and is considered to be normal game play.

If the *Match* ends while a *Robot* is removing a *Ball* from the bottom of the *Goal* that contains three (3) *Balls* and the top *Ball* remains partially above the top edge of the *Goal*, that *Ball* will be considered *Scored* and no penalty to the *Team* will be assessed.

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

<SG6> **Keep Balls in the field.** *Teams* may not intentionally remove *Balls* from the field. While *Balls* may accidentally leave the field when attempting to *Score*, doing so intentionally or repeatedly would be a violation of this rule. *Balls* that leave the field during *Match* play, intentionally or unintentionally, will be returned to the field at the location nearest the point at which they exited. Referees will return the *Balls* to the field when it is deemed safe to do so, at the leisure of the referee.

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

<SG7> **Use Balls to play the game.** *Balls* may not be used to accomplish actions that would be otherwise illegal if they were attempted by *Robot* mechanisms (e.g., Interfering with an opponent's Autonomous Period per <SG2>.)

<SG8> **Possession is limited.** *Robots* may not have greater-than-momentary *Possession* of more than three (3) Balls of its opposing *Alliance's* color at once. When two *Robots* from the same *Alliance* are working in tandem and blocking *Balls*, those *Robots* may not possess a total of more than six (6) *Balls* of its opposing *Alliance's* color at once.

Robots that violate this rule must stop all *Robot* actions except for those actions that are attempting to remove the excess *Ball*.

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

Inspection Rules:
<R1> **One Robot per Team.** Only one (1) *Robot* will be allowed to compete per *Team* in the VEX Robotics Competition. Though it is expected that *Teams* will make changes to their *Robot* at the competition, a *Team* is limited to only one (1) *Robot*. As such, a VEX *Robot*, for the purposes of the VEX 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: Additional mechanisms (and associated motors) that allow manipulation of game objects or navigation of field obstacles.

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

a. *Teams* may not compete with one *Robot* while a second is being modified or assembled.
b. *Teams* may not have an assembled second *Robot* to be used to repair or swap parts to the first *Robot*.
c. *Teams* may not switch back and forth between multiple *Robots* during a competition. This includes using different *Robots* for Skills Challenge, Qualification 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 *Teams* may compete with it for the duration of the competition season.

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

<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.

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.
c. *Teams* may be requested to submit to random spot-inspections by event personnel. Refusal to submit will result in *Disqualification*.
d. *Robots* which have not passed inspection (i.e. who are in violation of one or more *Robot* rules) will not be permitted to play in any *Matches* until they have done so. <T3> will apply to any *Matches* that occur until the *Robot* has passed inspection.
e. If a *Robot* has passed inspection, but is later found to be in violation of a *Robot* rule during a *Match*, then they will be *Disqualified* from that *Match* and <R2d> will apply until the violation is remedied and the *Team* is re-inspected.

<R4> **Robots must be safe.** The following types of mechanisms and components are NOT allowed:

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

<R5> **Robots must fit in a sizing box.** At the beginning of any *Match*, *Robots* must be smaller than 18” (457.2 mm) long by 18” (457.2 mm) wide by 18” (457.2 mm) tall.

a. *Robots* may expand beyond their starting size constraints after the start of a *Match*.
b. 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*.

<R6> **Robots are built from the VEX V5 or Cortex system.** *Robots* may be built ONLY using official VEX V5 and Cortex components, unless otherwise specifically noted within these rules. *Teams* are responsible for providing documentation proving a part's legality in the event of a question. Examples of documentation include receipts, part numbers, official VEX websites, or other printed documentation.

a. Products from the VEXpro, VEX IQ, or VEX Robotics by HEXBUG product line cannot be used for *Robot* construction, unless specifically allowed by a clause of <R7> or cross-listed as part of the VEX V5 or Cortex Product lines. For example, the Rubber Shaft Collar (228-3510) is a VEX IQ component that can be found on the VEX "Shafts & Hardware" page, and is thus legal.
b. VEX IQ pins used solely for the purpose of attaching VEX Team Identification Number Plates are permitted.
c. Official VEX V5 and Cortex components which have been discontinued are still legal for competition use. *Teams* must be cognizant of <R6> if attempting to use a discontinued part.
d. Any parts which are identical to legal VEX parts are permitted. For the purposes of this rule, products which are identical in all ways except for color are permissible. It is up to inspectors to determine whether a component is "identical" to an official VEX component.
e. Components obtained from the V5 beta program, including V5 beta firmware, are not legal for competition use.

> 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.

<R7> **VEX products come from VEX Robotics or VEX Robotics Resellers.** Official VEX products are ONLY available from VEX Robotics & official VEX Resellers.

<R8> **Certain non-VEX components are allowed.** *Robots* are allowed the following additional "nonVEX" components:

a. Any material strictly used as a color filter or a color marker for a VEX Light 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 surface, *Balls*, or other *Robots*.
c. Anti-static compound, when used in extreme moderation (i.e. such that it does not leave residue on playing field walls, the foam field surface, *Balls*, or other *Robots*).
d. Hot glue when used to secure cable connections.
e. An unlimited amount of 1/8" (or local metric equivalent), braided, nylon rope.
f. Commercially available items used solely for bundling or wrapping of 2-wire, 3-wire, 4-wire, or V5 Smart Cables, and pneumatic tubing are allowed. These items must solely be used for the purposes of cable 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.
<R9> **Give the radio some space.** The V5 Radio or VEXnet Key 2.0 must be mounted such that no metal surrounds the radio symbol on the V5 Radio or touches the VEXnet logo on the VEXnet Key 2.0.

Teams may use a USB extension cable for the sole purpose of remote mounting of a VEXnet Key 2.0 to a VEX ARM® Cortex®-based Microcontroller.

<R10> **A limited amount of custom plastic is allowed.** *Robots* may use non-shattering plastic from the following list; polycarbonate (Lexan), acetal monopolymer (Delrin), acetal copolymer (Acetron GP), POM (acetal), ABS, PEEK, PET, HDPE, LDPE, Nylon (all grades), Polypropylene, FEP; as cut from a single 12” x 24” sheet up to 0.070” thick.

a. Shattering plastic, such as PMMA (also called Plexiglass, Acrylic, or Perspex), is prohibited.
b. Plastic may be mechanically altered by cutting, drilling, bending etc. It cannot be chemically treated, melted, or cast. Heating polycarbonate to aid in bending is acceptable.

<R11> **A limited amount of tape is allowed.** *Robots* may use a small amount of tape when used for the following purposes:

a. For the sole purpose of securing any connection between the ends of two (2) VEX cables.
b. For labeling wires and motors.
c. For covering the back of License Plates (i.e. the “wrong color”).
d. For the purposes of preventing leaks on the threaded portions of pneumatic fittings. This is the only acceptable use of Teflon tape.
e. For securing and retaining a VEXnet Key 2.0 to the VEX ARM® Cortex®-based Microcontroller. Using tape in this manner is highly recommended to ensure a robust connection.
f. In any other application that would be considered a “non-functional decoration” per <R13>.

<R12> **Certain non-VEX screws, nuts, and washers are allowed.** *Robots* may use any commercially available #4, #6, #8, M3, M3.5, or M4 screw up to 2” (50.8mm) long (nominal), and any commercially available nut, washer, and/or spacer (up to 2” / 50.8mm long) to fit these screws.

<R13> **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 will have final say in what is considered “non-functional”. Unless otherwise specified below, non-functional decorations are governed by all standard *Robot* rules.

In order to be “non-functional,” any guards, decals, or other decorations must be backed by legal materials that provide the same functionality. For example, if your *Robot* has a giant decal that prevents *Balls* from falling out of the *Robot*, the decal must be backed by VEX material that would also prevent the *Balls* from falling out.

a. Anodizing and painting of parts is considered a legal nonfunctional decoration.
b. If using the VEX speaker (276-1504), the chosen audio must not be distracting and must be in good taste. The Head Inspector and *Head Referee* will make the final decision on the appropriateness of the audio.
c. 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.
d. VEX electronics may not be used as non-functional decorations.
e. Decorations that visually mimic field elements or could otherwise interfere with an opponent’s Vision Sensor are considered functional and are not permitted. This includes lights, such as the VEX Flashlight. The Head Inspector and *Head Referee* will make the final decision on whether a given decoration or mechanism violates this rule.
f. 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 (e.g. does not directly or indirectly influence any functional portions of the *Robot*).
g. Decorations which provide feedback to the *Robot* (e.g. by influencing legal sensors) or to *Drive Team Members* (e.g. status indicators) would be considered “functional” and are not permitted.

<R14> **No Wi-Fi.** The Vision Sensor must have its wireless transmitting functionality disabled.

<R15> **New VEX parts are legal.** Additional VEX components released during the competition season on www.vexrobotics.com are considered legal for use.

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

<R16> **Robots have one microcontroller.** Robots must ONLY use one (1) VEX V5 Robot Brain (276- 4810), or one (1) VEX ARM ® Cortex ®-based Microcontroller (276-2194).

a. 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 VEXpro, 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.

<R17> **Robots use VEXnet.** *Robots* must ONLY utilize the VEXnet system for all *Robot* communication.

a. VEX 75Mhz Crystal Radios are prohibited. (Some events may allow the use of 75Mhz Crystal Radios, please see the Special Event Rule Modifications later in this section.)
b. Electronics from the VEXpro, VEX RCR, VEXplorer, VEX IQ, VEX GO, or VEX Robotics by HEXBUG product line are prohibited.
c. Mixing and matching of VEXnet transmitters and receivers is prohibited. The VEXnet Joystick may only be used in conjunction with a VEX ARM® Cortex®-based Microcontroller. A VEXnet upgraded 75MHz Transmitter may only be used in conjunction with a PIC Microcontroller. A V5 Controller may only be used in conjunction with a V5 Robot Brain.

Teams are permitted to use the Bluetooth® capabilities of the V5 Robot Brain and/or V5 Controller in team pits or outside of Matches. However, VEXnet must be used for wireless communication during *Matches*.

<R18> **Robots use one control system.** *Robots* may use exactly one (1) of the following four (4) options:

- Option 1: A VEX ARM® Cortex®-based Microcontroller, up to ten (10) 2-Wire Motors or VEX Servos (in any combination up to ten) and a legal VRC pneumatic system.
- Option 2: A VEX ARM® Cortex®-based Microcontroller, up to twelve (12) 2-Wire Motors or VEX Servos (in any combination up to twelve) and no pneumatic components, excluding pneumatic tubing.
- Option 3: A V5 Robot Brain, up to six (6) V5 Smart Motors, and a legal VRC pneumatic system.
- Option 4: A V5 Robot Brain, up to eight (8) V5 Smart Motors, and no pneumatic components, excluding pneumatic tubing.

a. 2-Wire Motors must be controlled by a 2-Wire Motor Port, either directly on a VEX microcontroller, or on a VEX Motor Controller 29 module (276-2193).
b. *Teams* may NOT use multiple 2-wire Motor Ports, 3-wire PWM Motor Ports, or Motor Controller 29 modules on a single motor.

V5 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.

<R19> **One motor or Y cable per motor port.** If using a VEX ARM® Cortex®-based Microcontroller, a maximum of one (1) VEX Y-cable can be used per Motor Port of the Microcontroller or Power Expander, i.e. you cannot “Y off a Y” to have more than two (2) motors controlled by the same Motor Port.

a. *Teams* using the VEX ARM® Cortex®-based Microcontroller may only power one (1) 2-wire Motor per each of the two 2-wire motor ports on the Microcontroller. It is illegal to “Y” off a 2-wire Motor Port.
b. *Teams* may not “Y” off of a Motor Controller 29 (276-2193).

<R20> **Electrical power comes from VEX batteries only.** The only allowable source(s) of electrical power are as follows:

a. If using a VEX ARM® Cortex®-based Microcontroller, robots may use (1) VEX 7.2V Robot Battery Pack of any type.
    i. *Robots* utilizing the VEX Power Expander may use a second VEX 7.2V Robot Battery of any type. *Robots* are permitted to use a maximum of one (1) VEX Power Expander.
    ii. The only legal means for charging a VEX 7.2V Battery Pack is via one of the following VEX Battery Chargers: Smart Charger (276-1445); Smart Charger v2 (276-2519); 276-2221 (discontinued), 276-2235 (discontinued). All other chargers are strictly prohibited.
    iii. *Teams* must connect a charged 9V backup battery to their VEXnet system using the VEXnet Backup Battery Holder (276-2243).
    iv. VEXnet Joysticks must only be powered by AAA batteries.
    v. Some events may provide field power for VEXnet Joysticks. If this is provided for all *Teams* at the event, this is a legal source of power for VEXnet Joysticks.
b. If using a V5 Robot Brain, robots may use (1) V5 Robot Battery (276-4811).
    i. There are no legal power expanders for the V5 Robot Battery.
    ii. V5 Robot Batteries may only be charged by the V5 Robot Battery Charger (276-4812) or (276-4841).
    iii. V5 Wireless Controllers may only be powered by their internal rechargeable battery.
c. 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 <G8> or <R22>.

<R21> **One or two controllers per Robot.** No more than two (2) VEX wireless remotes may control a single *Robot* during the tournament.

a. No modification of these transmitters is allowed of ANY kind.
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 acceptable.
c. Teams may not “mix-and-match” wireless remote types, such as using a VEXnet Joystick and V5 Controller at the same time.

Note: This rule does not prohibit objects attached to the controller that assist the Driver in holding the controller or manipulating buttons/joysticks on the controller.

<R22> **No modifications to electronic components are allowed.** Motors (including the internal PTC or Smart Motor firmware), microcontrollers (including V5 Robot Brain firmware), extension cords, sensors, controllers, battery packs, reservoirs, solenoids, pneumatic cylinders, and any other electrical component or pneumatics component of the VEX platform may NOT be altered from their original state in ANY way.

a. External wires on VEX electrical components may be repaired by soldering, using twist/crimp connectors, electrical tape or shrink tubing such that the original functionality / length is not modified in any way. Wire used in repairs must be identical to VEX wire. *Teams* may make these repairs at their own risk; incorrect wiring may have undesired results.
b. *Teams* must use the latest official VEXos firmware updates, found at www.vexrobotics.com. Custom firmware modifications are not permitted.
c. *Teams* may change or replace the gears in the “2-Wire 393” or “2-Wire 269” motors with the corresponding official VEX Replacement Gears.
d. *Teams* may make the following modifications to the V5 Smart Motor. No other modifications are permitted.
    i. Changing or replacing the gear cartridge with other official replacement cartridges.
    ii. Replacing the V5 Smart Motor Cap (276-6780).
    iii. Replacing the threaded mounting inserts (276-6781).

<R23> **Most modifications and repairs to non-electrical components are allowed.** Physical modifications such as bending or cutting are permitted and may be done to legal VEX Robotics Competition metal structure or plastic components.

a. Physical modifications to electrical components such as a legal microcontroller or radio is prohibited unless otherwise explicitly permitted, per <G21>.
b. Internal or external mechanical repairs of VEX Limit and Bumper switches are permitted. Modifying the metal arm on the Limit Switch is permitted. Using components from these devices in other applications is prohibited.
c. Metallurgical modifications that change fundamental material properties, such as heat treating, are not permitted.
d. *Teams* may cut pneumatic tubing to a desired length.
e. *Teams* are permitted to fuse/melt the end of the 1/8” nylon rope to prevent fraying.
f. Welding, soldering, brazing, gluing, or attaching in any way that is not provided within the VEX platform is NOT permitted.

<R24> **Custom V5 Smart Cables are allowed.** *Teams* must use official V5 Smart Cable Stock but may use commodity 4P4C connectors and 4P4C crimping tools. *Teams* who create custom cables acknowledge that incorrect wiring may have undesired results.

<R25> **Keep the power switch accessible.** The *Robot* on/off switch or button must be accessible without moving or lifting the *Robot*. All microcontroller lights and/or screens must also be easily visible by competition personnel to assist in diagnosing *Robot* problems.

<R26> **Pneumatics are limited.** Pneumatic devices may only be charged to a maximum of 100 psi. *Teams* may only use a maximum of two (2) legal VEX pneumatic air reservoirs on a *Robot*.

<R27> **Only registered Teams may compete in the VEX Robotics Competition.** To participate in an official VEX Robotics Competition (VRC) event, a *Team* must first register on robotevents.com. Upon registering they will receive their VRC Team Number and four (4) VRC License Plates. *Teams* may choose to use the VRC License Plate Kit that comes in the VRC Team Welcome Kit, or may create their own, including one made from 3D printed parts. Plates must follow the following requirements.

a. *Robots* must use the colored plates that match their *Alliance* color for each *Match* (i.e. red *Alliance Robots* must have their red plates on for the *Match*). It must be abundantly clear which color *Alliance* the *Robot* belongs to.

Note: If the plates are attached to opposite-color plates, then the incorrect color must be covered, taped over, or otherwise obscured to ensure that the correct *Alliance* color is abundantly clear to *Head Referees* during a *Match*. Since License Plates are considered non-functional decorations, this is a legal non-functional use of tape.

b. License Plates must fulfill all *Robot* rules (i.e. they must fit within the 18” cube per <R4>, they cannot cause entanglement, not functionally change the stability of rigidity of the *Robot*, etc.)
c. Plates must be at least 2.48 inches (63.2mm) tall and 4.48 inches (114mm) wide, i.e. at least the size of the plates in the VRC License Plate Kit ignoring thickness.

<R28> **Use the “Competition Template” for programming.** The *Robots* must be programmed to follow control directions provided by the VEXnet Field Controllers.

During the *Autonomous Period*, *Drive Team Members* will not be allowed to use their hand-held controllers. As such, *Teams* are responsible for programming their *Robot* with custom software if they want to perform in the *Autonomous Period*. *Robots* must be programmed to follow control directions provided by the VEXnet Field Controllers (i.e. ignore wireless input during the *Autonomous Period*, disable at the end of the *Driver Controlled Period*, etc).

Teams must use a provided “competition template”, or functional equivalent, to accomplish this. All *Robots* will be required to pass a functional enable/disable test as part of inspection. For more information on this, *Teams* should consult the help guides produced by the developers of their chosen programming software.

<R29> **There is a difference between accidentally and willfully violating a Robot rule.** Any violation of *Robot* rules will result in a *Team* being unable to play until they pass inspection (per <R3d>). In addition, *Teams* who intentionally 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 may be considered a violation of <G1> and/or the REC Foundation Code of Conduct.

<R30> **Special event modifications.** Some events may choose to make the following rule exceptions to fit their unique circumstances:

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

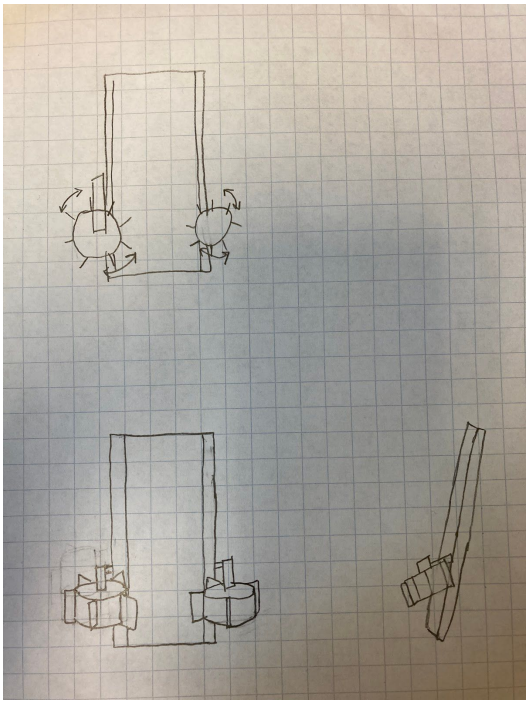
Note: If an event makes these changes, they must inform all attending *Teams*. It is especially important that any 75 MHz events make sure their *Teams* are using the correct communication type.

Field Specifications:

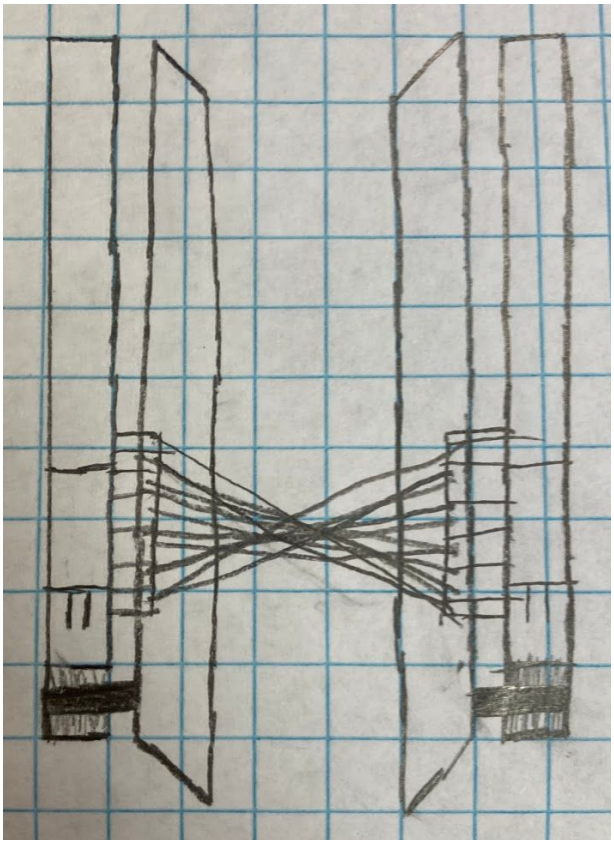
Team Goals:

Our goal for this season is to be able to have a functional robot, compete in at least one competition, and hopefully qualify for the state championship. We hope to finish our robot by the end of November and to be revising it throughout the remainder of November and December. We want to attend a competition in January after doing through drivers training and hopefully will qualify for the state competition. Ideally, we would like to qualify for the Worlds competition at state as well.

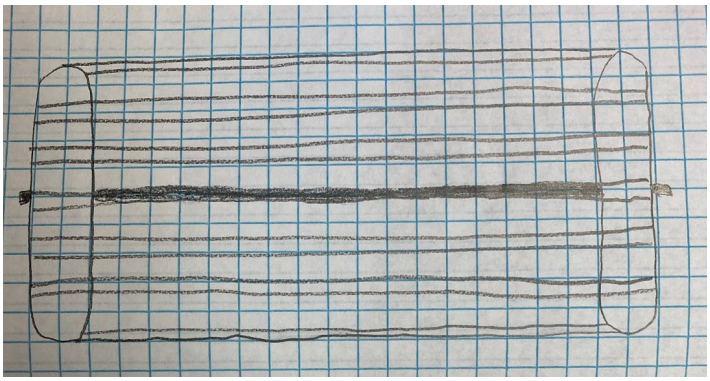
Intake and Scoring Mechanism Brainstorming:



This design shows a design for the lift and the intake. The idea is that we would use circular rollers to draw in the ball and load it onto the flat tray. From there we would take in up to three balls onto the tray, then lift the tray and unload all three balls directly into the goals. - Sullivan

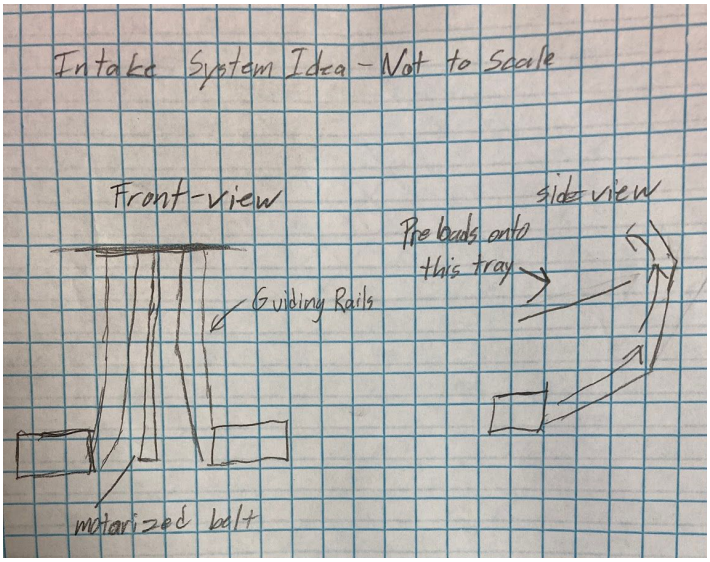


The design to the right shows a different potential intake and tray design where an over-the-tray rubber band intake would load balls onto the tray and then we could raise the tray and unload all the balls simultaneously. The image below shows a more in-depth look at the rubber band intake. - Paul



The image to the right shows a final idea in which we have two tank tread intakes - one on either side - that intake balls onto rails that guide it up and onto a track. - Tate

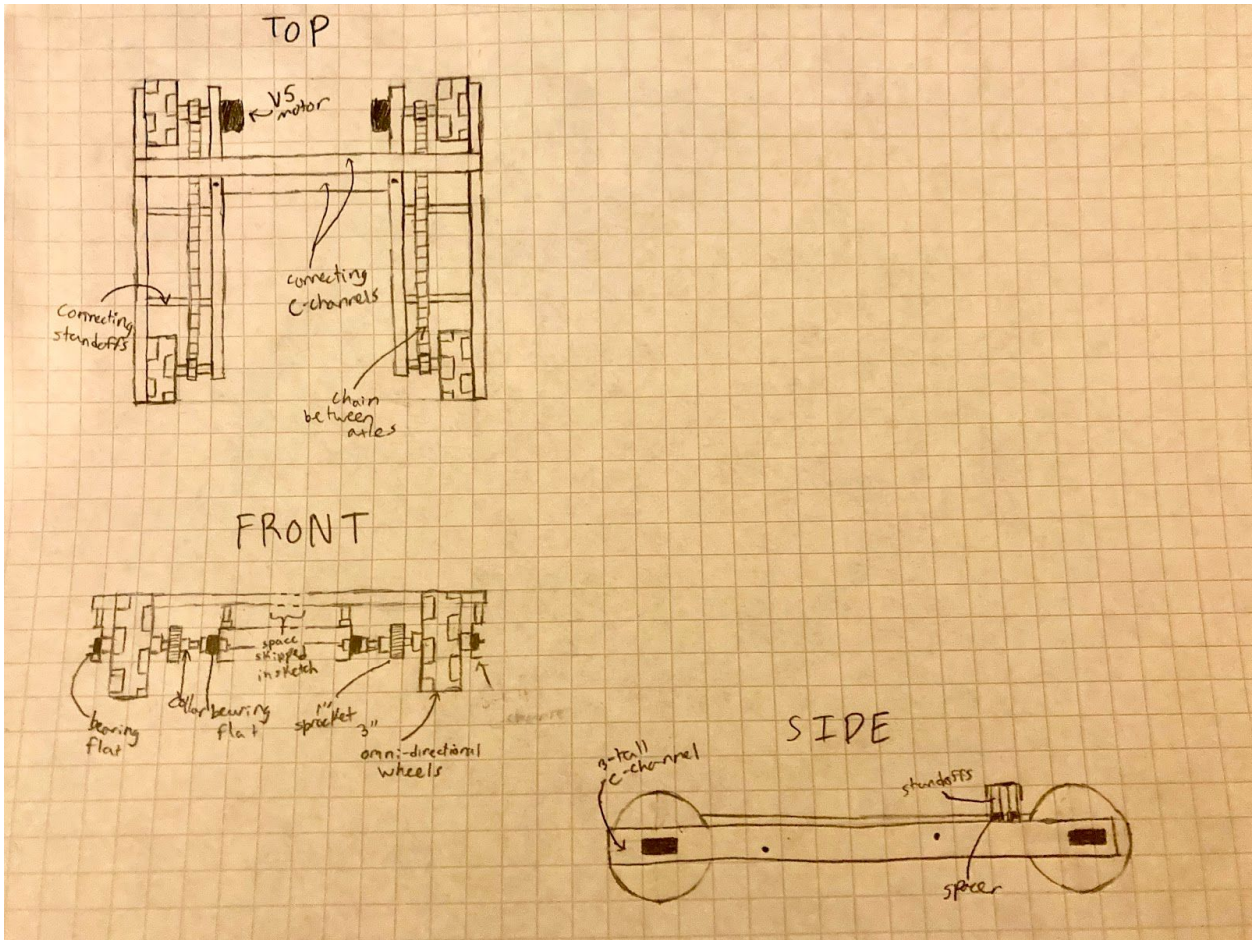
Intake Design (Cont.)

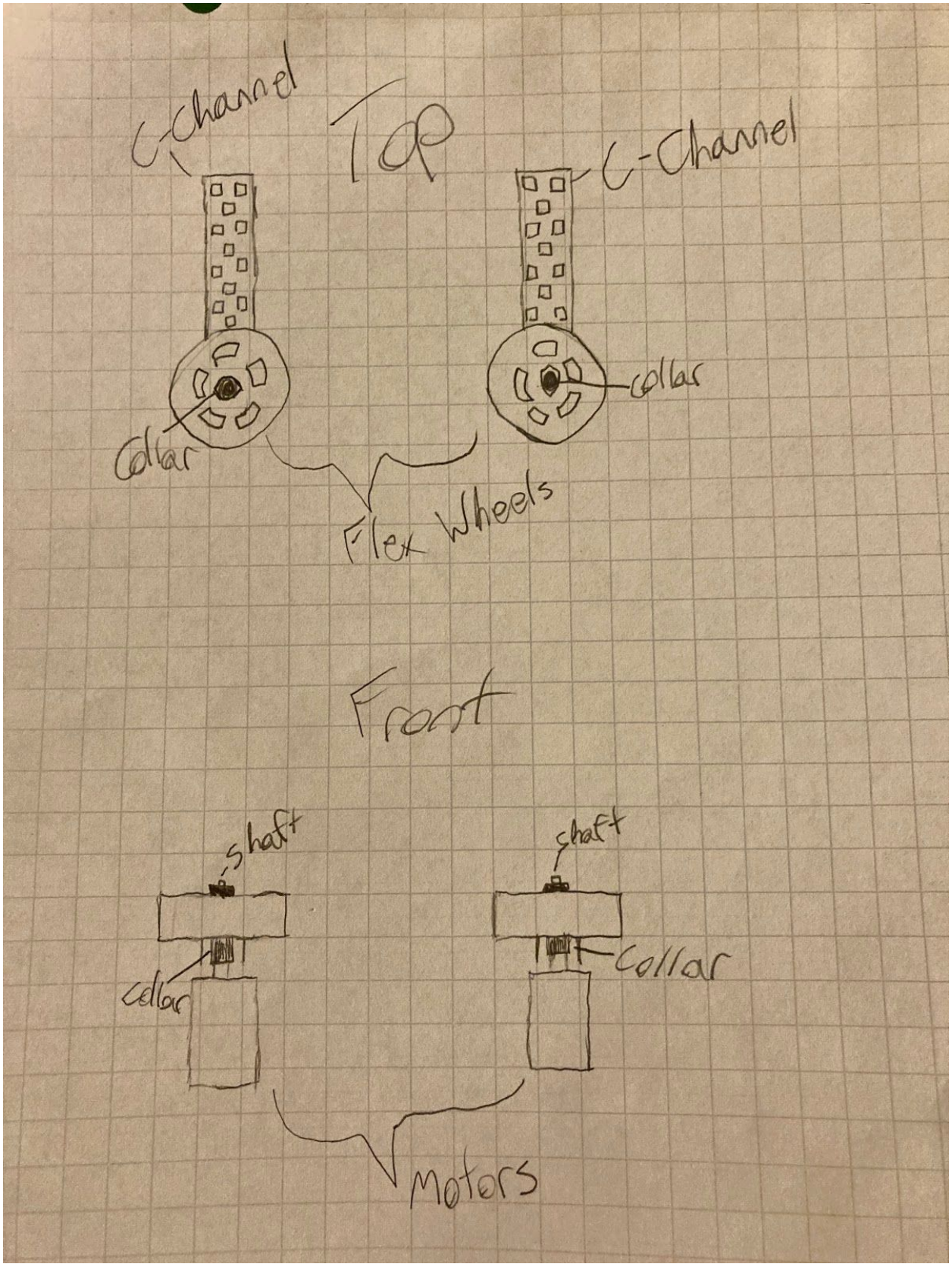


Design #	Intake Efficiency (Worst 1, Best 3)	Scoring Efficiency (Worst 1, Best 5)	Can Hold Up To 3 Balls (Yes: 2, No :1)	Total (Up to 10pts)
Design 1 (Sullivan)	1	3	2	6
Design 2 (Paul)	3	2	2	7
Design 3 (Tate)	1	5	2	8

We made a decision matrix to choose which of our designs would be best for our robot. Tate's scoring mechanism design had the best overall score but we found that Paul's design had the most efficient intake. We tried to create a new design which combines the best parts of each of the designs to make the best design.

Various sketches


TOP
V5 motor
connecting C-channels
connecting standoffs
chain between axles
FRONT
space skipped in sketch
bearing flat
collar
bearing flat
1" sprocket
3"
omni-directional wheels
SIDE
9-tall C-channel
standoffs
spacer


C-channel
Top
C-channel
collar
collar
Flex Wheels
Front
shaft
shaft
collar
collar
Motors