# Engineering Notebook

NOTEBOOK NO. One

CONTINUED FROM NOTEBOOK NO. _____ CONTINUED TO NOTEBOOK NO. _____

ASSIGNED TO

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Team Profile

**Emma Meihofer**

Age: 17
Grade: 11th
Jobs: Team Leader, Engineering Notebook
Activities: Beta Club, Science Team, Academic Team, National Honor Society, Young Women in Engineering
Hobbies: Piano, Cooking, Gardening, Reading

**Alex Daichendt**

Age: 16
Grade: 10th
Job: Lead Builder, Driver
Activities: DFHS Swim Team Varsity, Beta Club
Hobbies: Car Enthusiast

**Charles Camden Spehl**

Age: 16
Grade: 11th
Job: Lead Programmer, Builder, Drive Coach, Web Developer
Activities: Beta Club, National Honor Society
Hobbies: Programming (Java, Python, HTML, CSS, C#, JavaScript), running, fixing phones

**Eduardo Cea**

Age: 17
Grade 11th
Job: Builder, Programmer, Drive Coach
Activities: National Honor Society, Cea Company Employee
Hobbies: programming (Java, Python, HTML, CSS, C#), Guitar, Trumpet, Saxophone, Bass Guitar, Ukulele, Piano, basketball

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VEX Change Up Overview

Two Alliances – one “red” and one “blue” – composed of two Teams each, compete in each Match.

The object of the game is to attain a higher score than the opposing Alliance by Scoring Balls and Connecting Rows.

An Autonomous Win Point is awarded to any Alliance that completes a Connected Row using their Alliance Home Row at the end of the Autonomous Period.

A point bonus is awarded to the Alliance that has the most points at the end of the Autonomous Period.

To earn points, a team must build and program a functional robot that picks up balls and scores them into towers.  These robots may also have the ability to descore balls of the opposing alliance’s color, in order to eliminate those points for the other team.

More points are awarded when a row of three is made.

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Design Process:  Challenge - Rules

Safety Rules

1) 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 team 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.
2) 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.
3) 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

1) 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 may also impact a Team's eligibility for judged awards.  Repeated or extreme violations could result in a Team being Disqualified from an entire event, depending on the severity of the situation.
2) 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.
3) Use common sense.  When reading and applying the various rules, remember that common sense always applies in the VEX Robotics Competition.
4) 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 constraints 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.
5) Keep your Robot together.  Robots may not intentionally detach parts during the Match or leave mechanisms on the field.
6) 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

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

7) Only Drivers, and only Drive Coaches 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.
8) Controllers must stay connected to the field towers. Prior to the beginning of each Match, Drive Team Members must play 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.
9) Hands out of the field. Drive Team Members may only touch the Team's controls and Robot at specified times during a Match. Drive Team Members are prohibited from making intentional contact with any Game object, Field element, or Robot during a Match, unless specified.
10) 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 sevors in any way, even without touching them
11) 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.
12) 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.

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13) Offensive Robots get the “benefit of the doubt”.  In the case where referees are forced to make a judgement call regarding a destructive interaction between a defensive and offensive Robot, or any interaction which results in a questionable rules violation, the referees will err on the side of the offensive Robot.
14) 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.
15) 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.
16) 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.
17) 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.
18) 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.
19) 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.
20) 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.
    b) Game Rule issues that affect the outcome of a match.

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Design Process:  Challenge - Rules

Specific Game Rules

1) 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.
2) 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.
3) 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.
4) Keep Game Objects to yourself. Robots may not intentionally drop or place Game Objects on an opponent Robot.
5) 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.
6) 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.
7) 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)
8) 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.

Inspection Rules

1) 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:

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   a) 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.
   b) 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.
   c) Subsystem 3: Additional mechanisms (and associated motors) that allow manipulation of game objects or navigation of field obstacles.
2) 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.
3) 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.
4) 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
5) 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.
6) 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.
7) VEX products come from VEX Robotics or VEX Robotics Resellers. Official VEX products are ONLY available from VEX Robotics & official VEX Resellers. To determine whether a product is "official" or not, consult www.vexrobotics.com. A complete list of authorized VEX Resellers can be found at https://www.vexrobotics.com/how-to-order
8) Certain non-VEX components are allowed. Robots are allowed the following additional "nonVEX" components:
   a) Any material strictly used as a color filter or 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.

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   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.
9) 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.
10) 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.
11) A limited amount of tape is allowed. Robots may use a small amount of tape when used for the following purposes:
   a) For the purpose of securing connections between the ends of two 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”
12) 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.
13) 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

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Design Process: Challenge - Rules

14) No Wi-Fi. The Vision Sensor must have its wireless transmitting functionality disabled.
15) New VEX parts are legal. Additional VEX components released during the competition season on www.vexrobotics.com are considered legal for use.
16) 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).
17) Robots use VEXnet. Robots must ONLY utilize the VEXnet system for all Robot communication.
18) Robots use one control system. Robots may use exactly one (1) of the following four (4) options:
    a) 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.
    b) 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.
    c) Option 3: A V5 Robot Brain, up to six (6) V5 Smart Motors, and a legal VRC pneumatic system.
    d) Option 4: A V5 Robot Brain, up to eight (8) V5 Smart Motors, and no pneumatic components, excluding pneumatic tubing.
19) 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.
20) 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.
    b) If using a V5 Robot Brain, robots may use (1) V5 Robot Battery (276-4811).
    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
21) One or two controllers per Robot. No more than two (2) VEX wireless remotes may control a single Robot during the tournament.
22) 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.

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Design Process: Challenge - Rules

23) 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.
24) 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.
25) 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.
26) Pneumatics are limited. Pneumatic devices may only be charged to a maximum of 100 psi. Teams may only use a maximum of two VEX pneumatic air reservoirs on a Robot.
27) 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.
28) Use the “Competition Template” for programming. The Robots must be programmed to follow control directions provided by the VEXnet Field Controllers.
29) 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 ). 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 and/or the REC Foundation Code of Conduct.
30) 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.

<u>Tournament Rules</u>

1) The Head Referee has ultimate authority on ruling decisions during the competition.
2) The Drive Team is permitted to immediately appeal the Head Referee’s ruling. If the Drivers wish to dispute a score or ruling, those Drivers must stay in the Alliance Station until the Head Referee talks with them. Once the Head Referee announces that his or her decision has been made final, the issue is over and no more appeals may be made. The Event Partner may not overrule the Head Referee’s decision.

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3) The Team's Robot or a Drive Team Member should attend every Match. A Robot or a Student member of the Team must report to the field for the Team's assigned Match. If no Student Team members report to the field, the Team will be considered a "no-show" and receive zero (0) Win Points, Autonomous Points, and Strength of Schedule Points.
4) Robots at the field must be ready to play. Teams must bring their Robots to the field prepared to play. Teams who use VEX pneumatics must have their systems charged before they place the Robot on the field.
5) Practice Matches may be run at some events. If Practice Matches are run, they will be conducted on a first-come, first-served basis with every effort made to equalize practice match time for all Teams.
6) The red alliance, or the highest seed, places last. In Qualification Matches, the red Alliance has the right to place its Robots on the field last. In Elimination Matches, the higher (better) seeded Alliance has the right to place its Robots on the field last. Once a Team has placed its Robot on the field, its position cannot be readjusted prior to the Match. If a Team violates this rule, the opposing Alliance will be given the opportunity to reposition their Robots promptly.
7) Qualification Matches follow the Qualification Match schedule. A Qualification Match schedule will be available on the day of competition. The Qualification Match schedule will indicate Alliance partners, Match pairings, and Alliance color. For tournaments with multiple fields, the schedule will indicate which field the Match will take place on.
8) Each Team will be scheduled Qualification Matches as follows.
    a) When in a tournament, it must have a minimum of four Qualification Matches per Team. The suggested amount of Qualification Matches per Team for a standard tournament is six and up to ten for a championship event.
    b) When in a league, there must be at least three (3) league ranking sessions and each session must have a minimum of two (2) Qualification Matches per Team. The suggested amount of Qualification Matches per Team for a standard league ranking session is four (4). Leagues will have a league finals session where elimination rounds will be played. Event Partners may choose to have Qualification Matches as part of their league finals session.
9) Team rankings are determined during Qualification Matches as outlined below.
    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 in at least 60% of the total Matches available will be ranked above Teams that participate in less than 60% of the total Matches available.  Being a no-show to a match that a Team is scheduled in still constitutes participation for these calculations.

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   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 and will not impact the Team's ranking, Win Points, Autonomous Points or Strength of Schedule Points for that Qualification Match (and will not affect participation percentage for leagues).

10) 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
11) Disqualifications. When a Team is DQ in a Qualification Match, they receive zero Win Points, Autonomous Win Point, Autonomous Points, and Strength of Schedule Points.
12) Send a Team Representative to Alliance Selection. Each Team must send one (1) Team Representative to the playing field for Alliance Selection. If the Team Representative fails to report to the playing field for Alliance Selection, their Team will be ineligible for participation in the Alliance Selection process.
13) Each Team may only be invited once to join an 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.
14) Each Alliance gets one Timeout. Each Alliance may request one (1) Time Out during the elimination Bracket between Elimination Matches, as permitted by the Head Referee and Event Partner. Alliances may not use their Time Outs during a Match.
15) Elimination Matches are a blend of "Best of 1" and "Best of 3".
16) Small tournaments may have fewer Alliances. Events with 32 or more teams must use 16-team alliances when starting Elimination Matches. Events with fewer than 32 Teams (i.e. the requisite amount for sixteen full Alliances) must limit the number of Alliances by dividing the number of Teams by two, less any remainder.
17) Fields may be raised or on the floor. Some tournaments may choose to place the playing field on the floor, or elevated off the floor (common heights are 12" to 24" [30.5cm to 61cm]). No Drive Team Members may stand on any sort of object during a Match, regardless of whether the field is on the floor or elevated.
18) Students must be accompanied by an Adult. - No Student may attend a VRC event without a responsible Adult supervising them.

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Design Process:  Challenge - Rules

Live Remote Tournament Game Rules

1) The following rules from the Robot Skills Challenge Appendix, pertaining to a Remote Skills-Only event, also apply to Live Remote Tournaments events:
    a) An Adult Team contact must be present in all Matches.
    b) Teams will complete a full Robot inspection in accordance with <R3>.
    c) All Team camera footage must be streamed live, from one camera feed, with no “cuts”.
    d) A Team’s camera must be placed on the “audience side” of the field, i.e. the Red Alliance Station on the left side of the screen.
    e) Matches must include some live interaction between the Team and the Head Referee.
    f) Match replays are at the discretion of the Head Referee.
2) During a Live Remote Tournament Match, Drive Team Members must still stand in the Alliance Station associated with their Alliance color.
3) During a Live Remote Tournament Match, a Drive Team Member’s V5 Controller must be plugged into the computer being used for the remote competition interface via a USB cable for the duration of the Match.
4) Balls that leave the field during Match play, intentionally or unintentionally, will not be returned to the field. Intentionally, strategically, or repeatedly removing Balls from the field may still be considered a violation at the Head Referee’s discretion.
5) There is no limit to the number of Balls, of either color, that a Team may Possess at any given time.
6) If a Goal is being contacted by a Robot at the end of a Match, then it is considered Doubled.
7) In a Live Remote Tournament Match, Teams must set up their own field in accordance with the layouts, tolerances, and specifications found in the Game Manual and Appendix A.
8) In a VEX U Live Remote Match, each Team plays with two Robots. The two Robots play on one field at the same time. Each Alliance is still made up of two Teams. Therefore, there are eight Robots, four Teams, and four fields in each Match.

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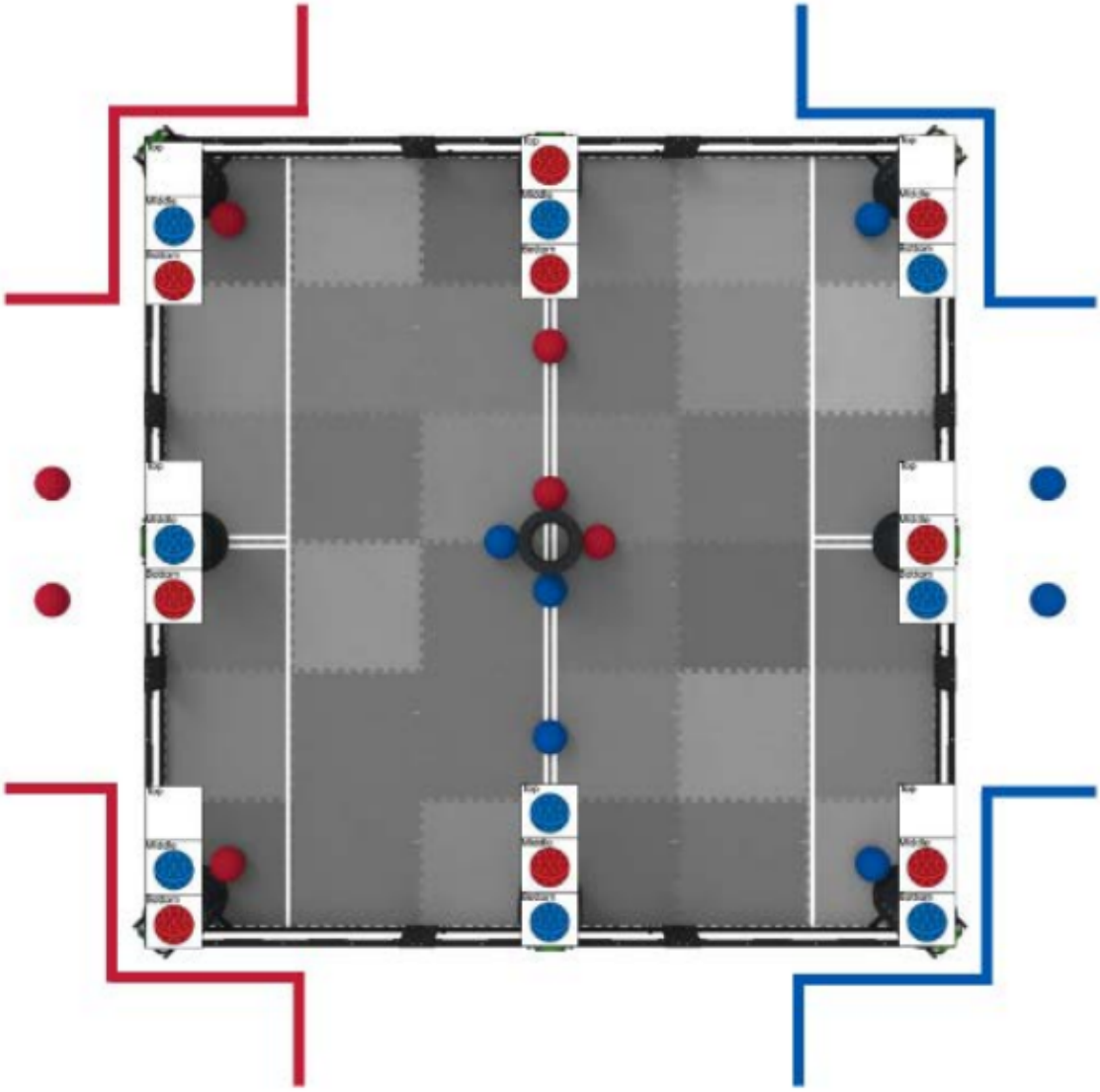
Design Process:  Challenge - Field



The image above depicts the set up of the field for a live game before the match has started. The three boxes over each goal depicts the color of balls that are stacked in each goal and the order these balls are stacked in.  The two balls outside of the field on each side are the pre-loads given for each team.  The red and blue tape along the outside of the field designates the areas in which the alliance teams can stand while driving their robot.

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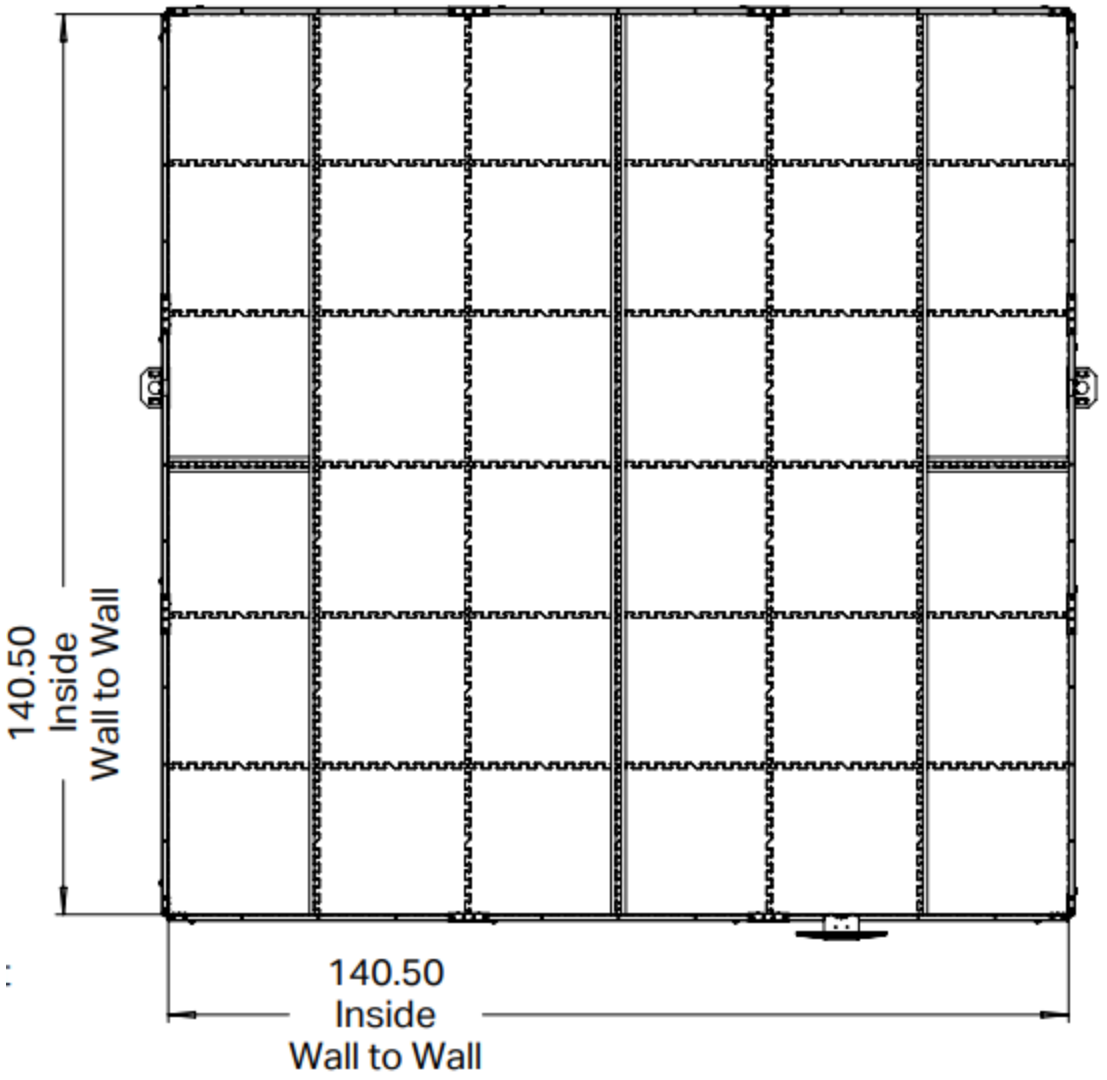
Design Process:  Challenge - Field Specifications




This is the dimensions of the whole field, including the tile mats.

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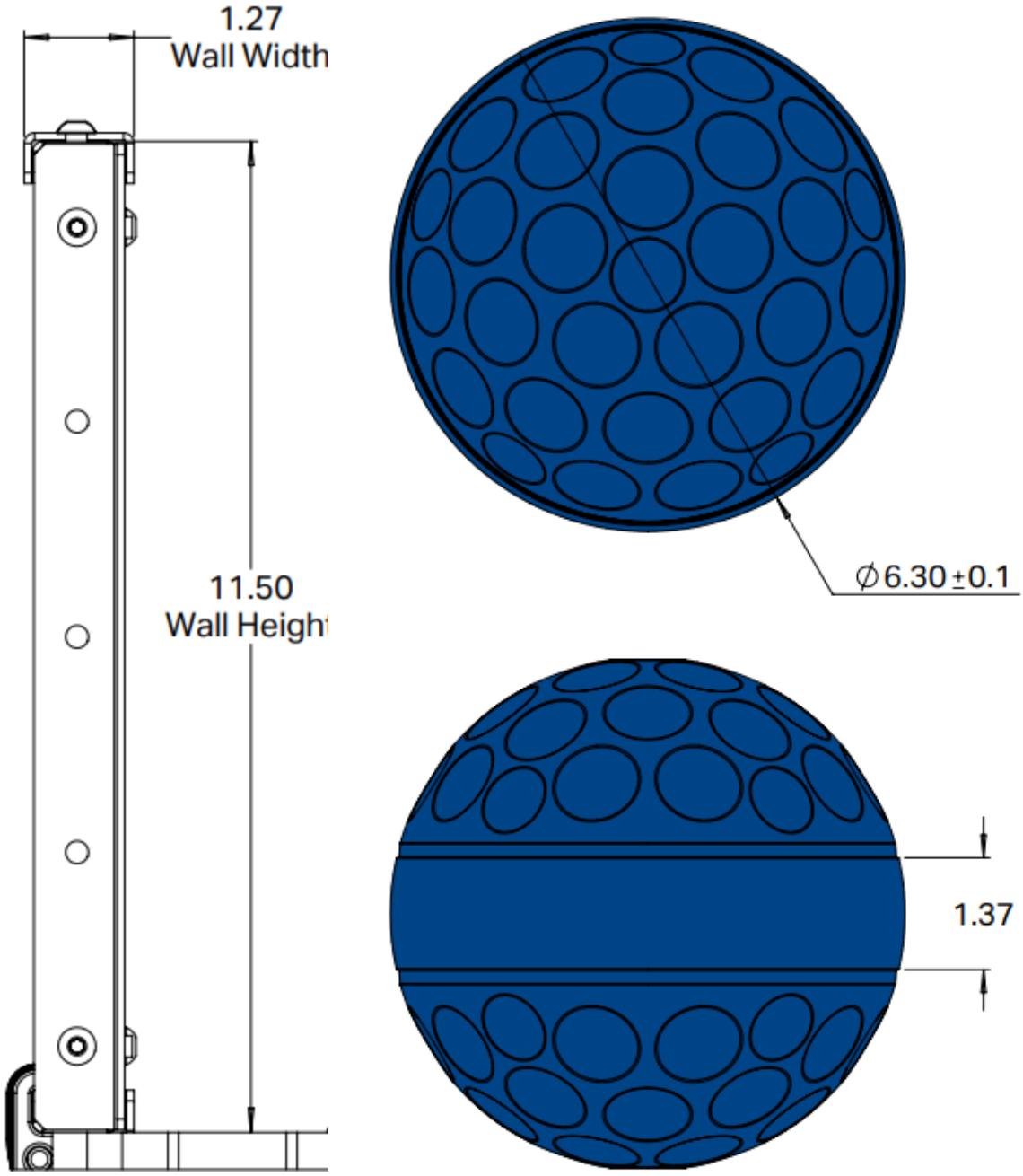
Design Process:  Challenge - Field Specifications




The image to the left are the dimensions of the walls of the field.  The image to the right is of the dimensions of the balls used in the game.  The balls have a mass of 168 ± 10 grams.

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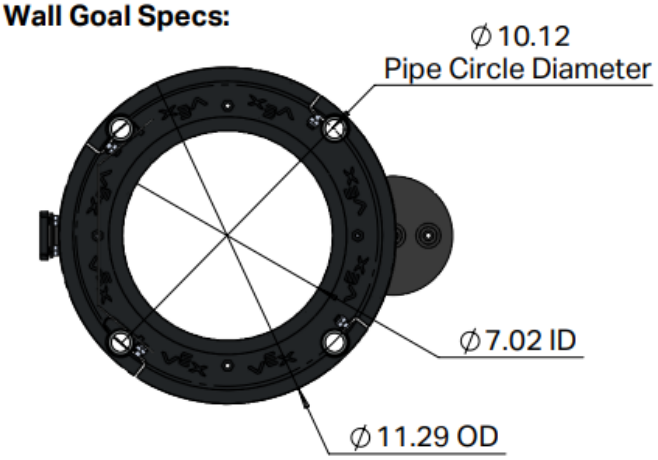
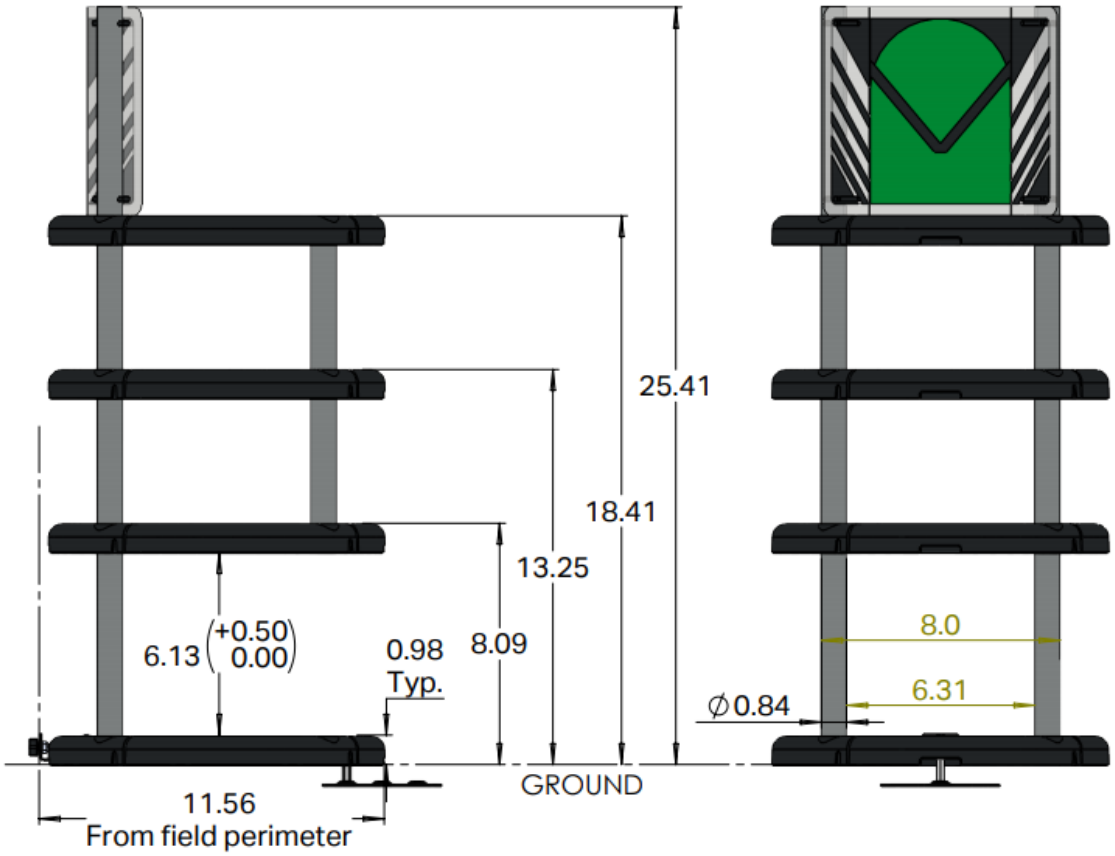
Design Process:  Challenge - Field Specifications

**Wall Goal Specs:**




The image above designates the dimensions of the goals located in the middle of the sides of the field.

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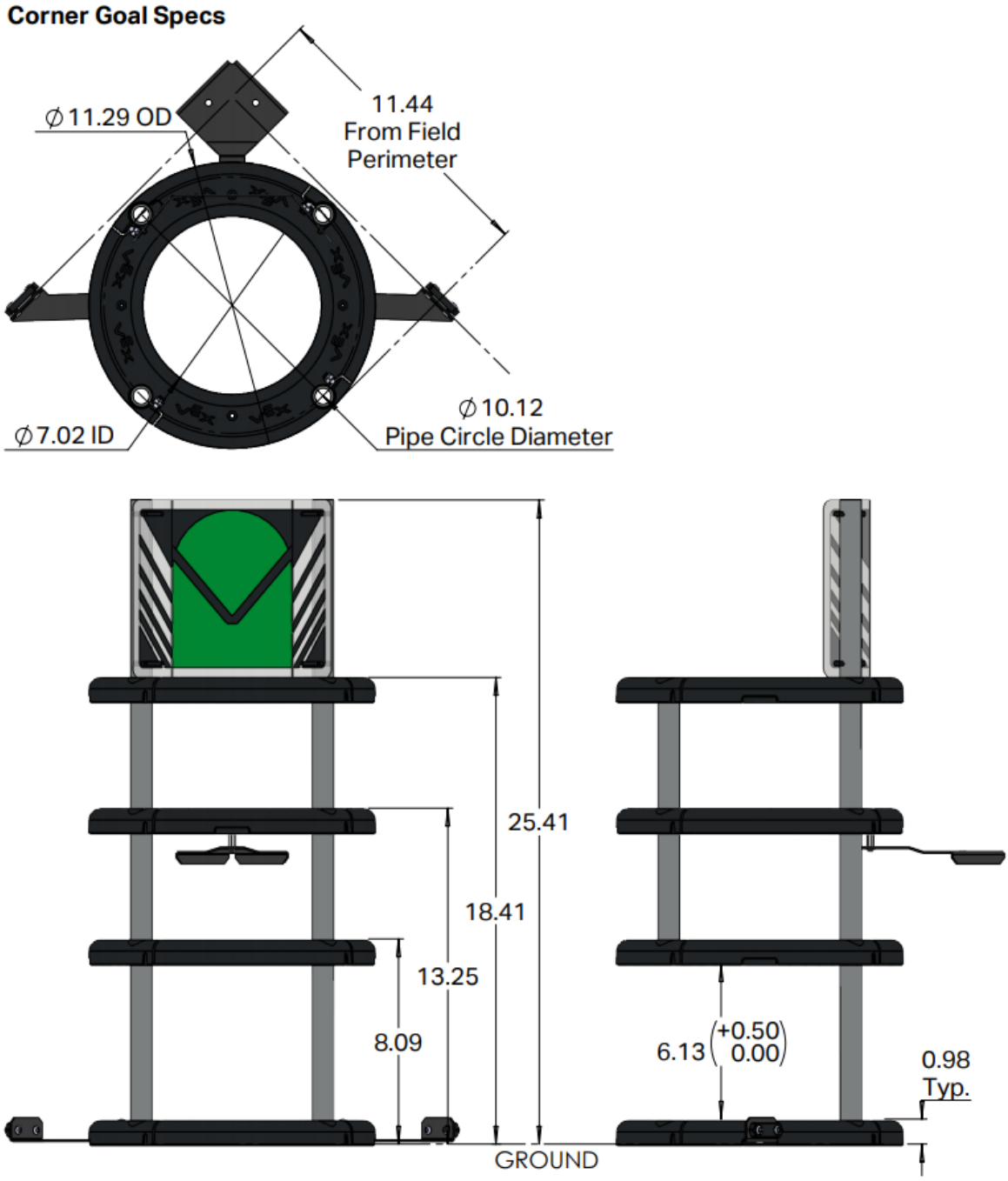
Design Process:  Challenge - Field Specifications




The image above designates the dimensions of the goals located in the corner of the field.

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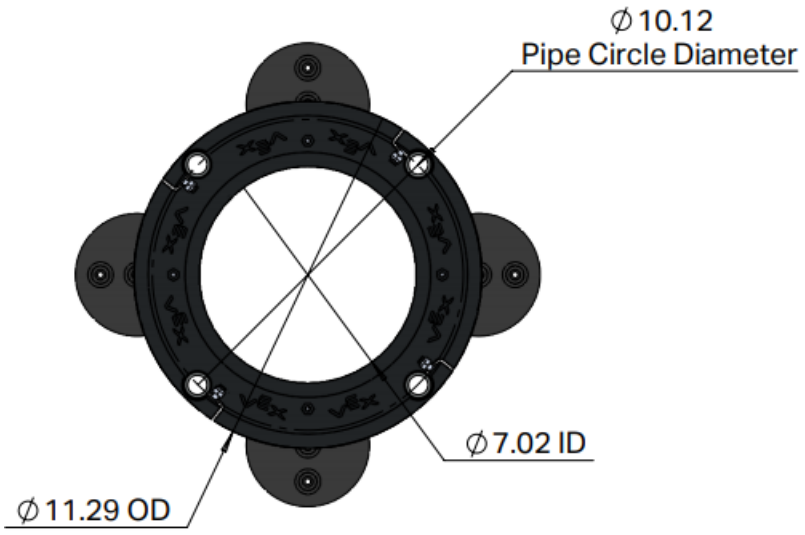
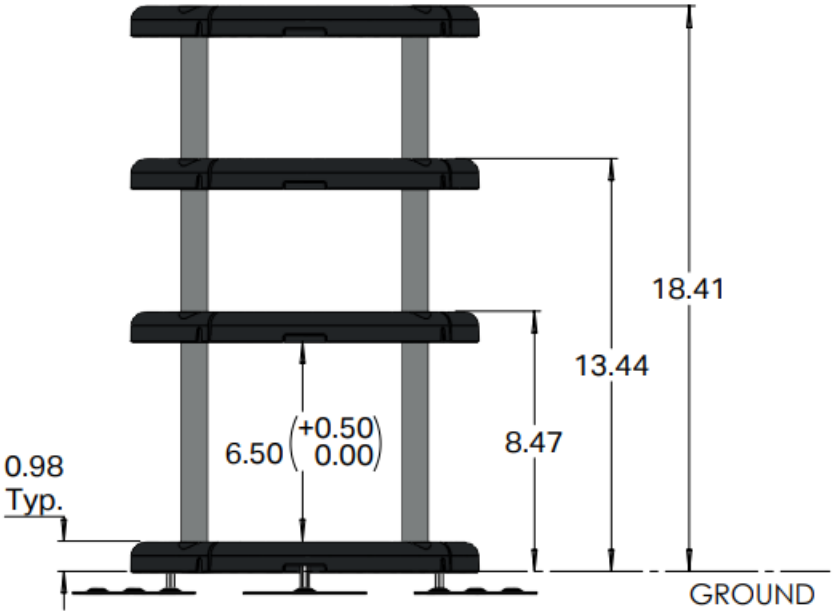
Design Process:  Challenge - Field Specifications

**Middle Goal Specs:**




The image above designates the dimensions of the goal located in the center of the field.

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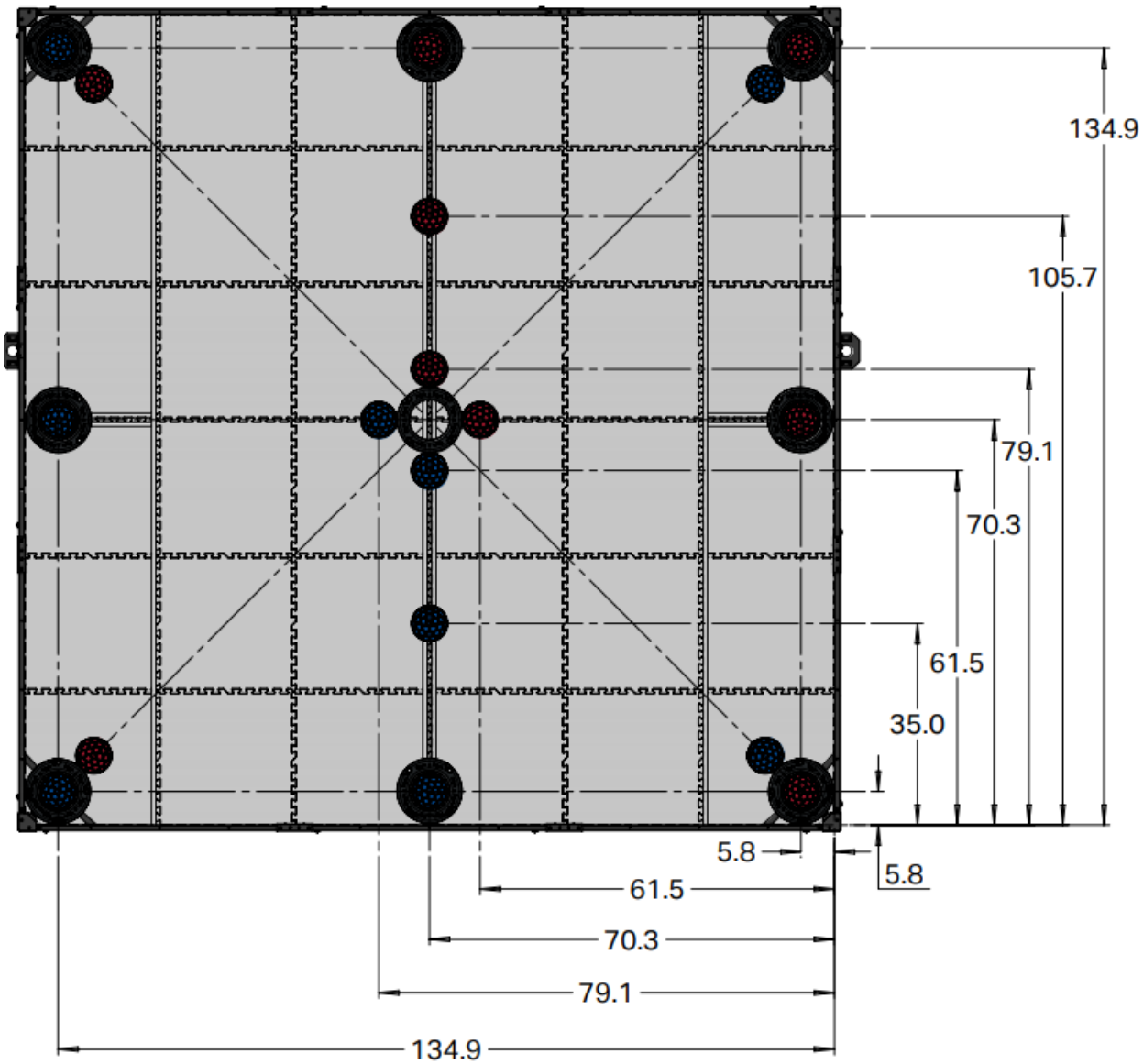
Design Process:  Challenge - Field Specifications

**Field Reference Specs**




The image above provides the reference points and dimensions between each of the goals around the field.  The image also provides reference points and dimensions between the goals and balls.

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Design Process:  Challenge - Skills Rules

Robot Skills Challenge Rules

1) Robots may start the Robot Skills Match in either Home Zone with the Drive Team Members standing in the Alliance Station that corresponds with that Home Zone.
2) In Robot Skills Matches, Teams play as if they are on the red Alliance Scoring only red Balls and Owning only red Goals
3) Rules <SG2> and <SG3> do not apply in Programming Skills Matches.

Remote Skills-Only Event Rules

1) The Remote Skills Only environment (i.e. digital platform) may be chosen at Event Partner discretion.
2) Registered Teams will be assigned scheduled times to complete Robot Inspection and up to (3) Programming Skills Matches and (3) Driving Skills Matches over a live, online environment.
3) The minimum event staff must include one (1) Event Partner and at least one (1) certified Head Referee. A dedicated Tournament Manager operator is also recommended, but not required, if the Head Referee and/or Event Partner wish to fulfill this role.
4) At all times, there must be a minimum of (2) Adults over the age of 18 in the remote meeting environment before Students are allowed to connect. One of those Adults must be the Event Partner.
5) The Team's Primary Contact, or another designated Adult Team contact (over the age of 18), must be present in the remote meeting environment throughout the duration of the scheduled time for that Team. The Team's Primary Contact will be responsible for providing the Adult representative's contact information to the Event Partner prior to the event.
6) Teams will complete a full Robot inspection live with the Head Referee prior to their first Robot Skills Match. This inspection process should follow the checklist on a standard inspection sheet, including a demonstration of sizing compliance.
7) All Team camera footage must be streamed live, from one camera feed, with no "cuts".
8) Live, Remote Robot Skills Matches must include some live interaction between the Team and the Head Referee.
9) Match replays are at the discretion of the Head Referee. In addition, live video circumstances (such as a video cutting out, or a Match timing error) could warrant a Match replay at the Head Referee's discretion.
10) Any violation of any rules will result in the Match score being recorded as zero. That Match will count as one of the Team's allotted Matches.

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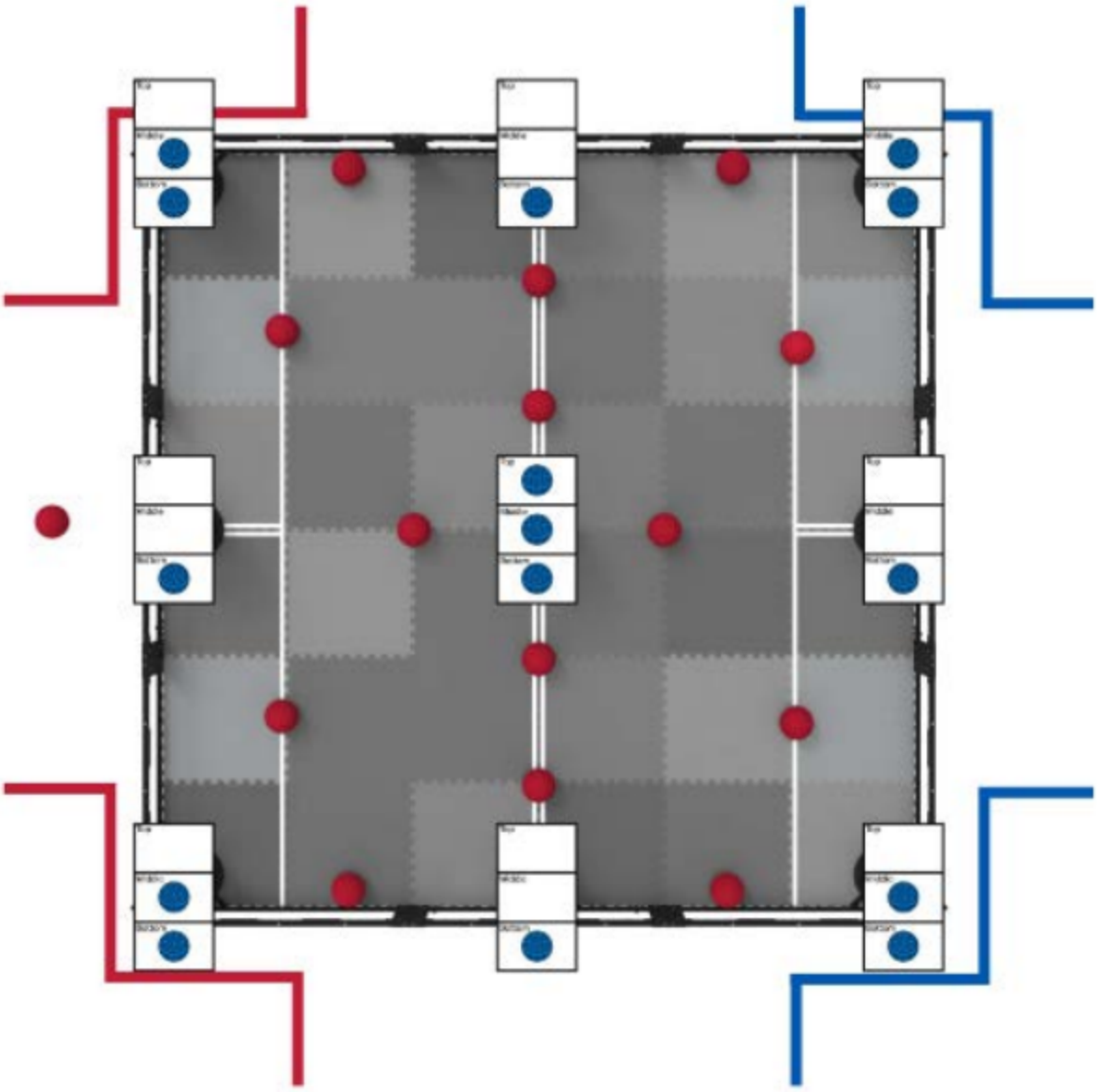
Design Process:  Challenge - Skills Field Sketch



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Design Process:  Challenge - Scoring

Game Scoring

- A Ball Scored in a Goal is worth one (1) point for the Alliance of the color of the Ball.
- A Connected Row is worth six (6) points for that Alliance.
- The winner of the Autonomous Bonus receives a six (6) point bonus. In the case of a tie, both Alliances receive a three (3) point bonus.

Robot Skills Challenge Scoring

- Teams receive points according to the same Scoring rules in VEX Robotics Competition Change Up when Scoring for the red Alliance.
- Additionally, Teams receive points for any blue Balls that are removed from their starting positions in Goals. These points are equal to how many points would have been “de-scored” from the blue Alliance by removing that Ball.
- To calculate this, all Balls will be scored at the end of a Robot Skills Match for their respective Alliance, with the same scoring rules as a standard VRC Change Up Match. The Team’s Robot Skills Match score will then be calculated as follows:
- (Red Alliance Score) - (Blue Alliance Score) + 63

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