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FIRST® GAME CHANGERSSM powered by Star Wars: Force for Change
2020-2021 *FIRST® Tech Challenge*

Game Manual Part 2 – Remote Events



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Revision History			
Section	Revision	Date	Description
N/A	1	8/31/2020	Program Delivery Partner Limited Release
Sponsors	1.1	9/12/2020	Updated Sponsor lockup
Section 4	1.1	9/12/2020	<ul style="list-style-type: none"> Section 4 – Various – Changed Ultimate GoalSM to ULTIMATE GOALSM Section 4.6.2 – Added orange box to rule <G7>
Section 4	1.2	10/27/2020	<ul style="list-style-type: none"> Section 4.5.1 – Added where remaining Rings are placed during pre-match Section 4.5.1 – 1) a) Added that Drive teams place their robot as well as a possessed scoring element Section 4.5.2 and 4.5.4 – Clarified that Power Shot Targets requiring direct contact with a Ring to be scored Section 4.6.3 - <GS13> Power Shot Targets must be scored by direct contact with a Ring. See rule for full details
Section 4	1.3	11/24/2020	Section 4.3 – Updated images to correct pre-match wobble goal placement Section 4.4 – Added exception for Human Player
Sponsors	1.2	2/3/2021	Updated Sponsor lockup
Appendix B	1.1	2/3/2021	Figure B-2 and B-3, updated images with correct dimensions

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1.0 Introduction

1.1 What is FIRST® Tech Challenge?

FIRST® Tech Challenge is a student-centered program that focuses on giving students a unique and stimulating experience. Each year, teams engage in a new game where they design, build, test, and program autonomous and driver operated robots that must perform a series of tasks. To learn more about FIRST® Tech Challenge and other FIRST® Programs, visit www.firstinspires.org.

1.2 FIRST Core Values

We express the FIRST® philosophies of *Gracious Professionalism®* and *Coopertition®* through our Core Values:

- **Discovery:** *We explore new skills and ideas.*
- **Innovation:** *We use creativity and persistence to solve problems.*
- **Impact:** *We apply what we learn to improve our world.*
- **Inclusion:** *We respect each other and embrace our differences.*
- **Teamwork:** *We are stronger when we work together.*
- **Fun:** *We enjoy and celebrate what we do!*

2.0 Gracious Professionalism®

FIRST® uses this term to describe our programs' intent.

Gracious Professionalism® is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.

Watch Dr. Woodie Flowers explain *Gracious Professionalism* in this [short video](#).

3.0 How to Use This Document

The Game Manual Part 2 – Remote Events is a resource for all FIRST® Tech Challenge *Teams* competing in a remote event format. There are two types of event formats a *Team* might experience this season; traditional events and remote events. This manual describes the game and rules for remote events. Remote events were developed to mimic traditional FIRST Tech Challenge events, while practicing social distancing guidelines. Since *Teams* are not able to gather and compete in the traditional head-to-head competition format, the season's official full *Playing Field* has been adapted to allow *Teams* to play *Matches* as a single *Team*. Remote *Teams* may order an official half version of this season's field or compete using a low-cost version of the field.

The intent of this manual is that the text means exactly, and only, what it says. Please avoid interpreting the text based on assumptions about intent, implementation of past rules, or how a situation might be in "real life". There are no hidden requirements or restrictions. If you have read everything, you know everything.

Key words that have a specific meaning within this document are defined in the Game Definitions section and are indicated with the first letter capitalized, and the entire word in *Italics*.

4.0 The Game

4.1 Introduction

This document describes ULTIMATE GOALSM presented by Qualcomm, the FIRST® Tech Challenge remote game for the 2020-2021 season. We recommend viewing the traditional events game animation prior to reading this manual to gain a general understanding of the game. The animation is not intended as a replacement for official game rules. Remote event documentation and the game animation can be accessed on our website <https://www.firstinspires.org/resource-library/ftc/game-and-season-info>

Teams must comply with all rules and requirements stated in this document and in the Game Manual Part 1 – Remote Events. Clarifications to the game rules are issued on the Question & Answer section of the forum at ftcforum.firstinspires.org. Forum rulings take precedence over information in the game manuals.

4.2 Game Description

Matches are played on a *Playing Field* initially set up as illustrated in Figure 4.3-1 below. The object of the game is to *Deliver Wobble Goals* to a randomly selected *Target Zone*, place in or *Launch Rings* into the *Tower Goal*, and *Launch Rings* to knock over *Power Shot Targets*.

The *Match* starts with a 30-second *Autonomous Period* in which a *Robot* operates using only pre-programmed instructions and sensor inputs. During the *Autonomous Period*, a *Team* earns points by: *Delivering Wobble Goals* to a randomly selected *Target Zone*, *Parking In* the *Launch Line*, *Launching* or placing *Rings* into the *Tower Goal*, and *Launching Rings* to knock over *Power Shot Targets*.

The two-minute *Driver-Controlled Period* follows the *Autonomous Period*. During the *Driver-Controlled Period*, a *Team* earns points by *Launching* or placing *Rings* into the *Low*, *Medium*, and *High Goals* on the *Tower Goal*.

The final 30 seconds of the *Driver-Controlled Period* is called the *End Game*. In addition to the previously listed *Driver-Controlled Period Scoring* activities, a *Team* earns points by *Delivering a Wobble Goal* to the *Start Line* or to the *Drop Zone*, *Placing Rings* on the *Wobble Goals*, and *Launching Rings* to knock over *Power Shot Targets*.

4.2.1 Game Narrative

In every game we play, we set out to make ourselves a collaborative teammate, a respected competitor, and a stronger person. No expectations are greater than those we place on ourselves.

While we revel in the big plays and vital scores, the real lessons we learn are when we fail and work with our teammates to recover. And each time our team steps up to a new challenge, we establish bolder goals, fueling our ambitions to work together, enhance our skills, and transcend all boundaries.

It's the passion that drives us forward. As game changers, we use our strengths to outscore the competition and legendary players that have come before us. Together we are teammates at the top of our game, competing in a thrilling sport – to score, to win and to leave a legacy that lasts.

No matter the outcome, we stand up in the face of competition, pushing each other to do better, work harder, and exceed our team and personal potentials.

It's time to set the records straight by breaking them. Are you up to the challenge?

4.3 Remote Playing Field Illustrations

The following illustrations identify the *Game Elements* and give a general visual understanding of the game. Teams should refer to andymark.com/FTC for the exact *Game Element* dimensions. The official *Playing Field* documents, including the official Field Setup Guide – Remote Events, are available at <https://www.firstinspires.org/resource-library/ftc/game-and-season-info>. Please Note: The following illustration shows the *Playing Field* with optional perimeter wall as the *Playing Field Boundary*.

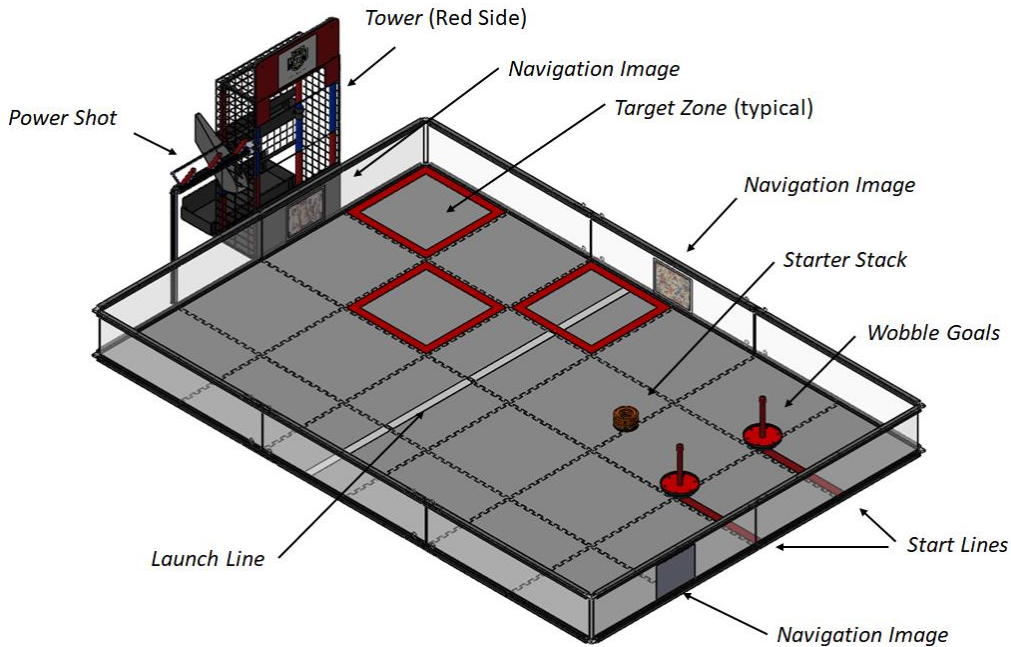


Figure 4.3-1 – Isometric view of the *Playing Field* (red)

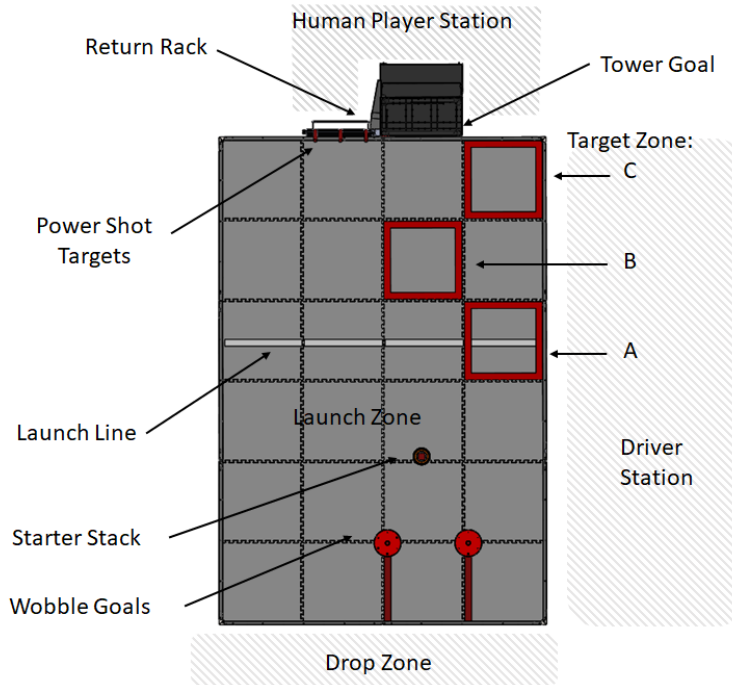


Figure 4.3-2 – Top view of the *Playing Field* (red)

4.4 Game Definitions

The following definitions and terms are used for the Remote game version of ULTIMATE GOALSM presented by Qualcomm:

Alliance Station – The designated *Team Area* adjacent to the *Playing Field* where the *Drivers* and *Coach* stand during a *Match*.

Area – The space defined by the vertical projection of the outside edge of a region's boundary (for example, gaffer tape, goal, *Playing Field Boundary*). The boundary element (tape, markings, etc.) is part of the *Area* for the purposes of determining *Inside* and *Outside*.

Autonomous Period – A thirty-second *Match* period in which the *Robot* operates and reacts only to sensor inputs and to commands pre-programmed by the *Team* onto the onboard *Robot* control system. Human control of the *Robot* is not permitted during this time.

Barrier – An approximate 12 inch (30.5 cm) tall structure that separates the *Playing Field* from the *Drop Zone*. The *Barrier* can be constructed from a range of materials including an AndyMark perimeter, Do-It-Yourself wall, cardboard, etc.

Coach – A student *Team* member or adult mentor designated as the *Drive Team* advisor during the *Match*.

Competition Area – The *Area* where the *Playing Field* is located.

Control / Controlling – An object is *Controlled* by a *Robot* if the object is following the movement of the *Robot*. Objects that are *Controlled* by a *Robot* are part of the *Robot*. See *Possess / Possessing* to learn about a related term. Examples include, but are not limited to:

- *Carrying* – holding one or more *Game Elements* inside or outside of a *Robot*.
- *Herd*ing – pushing or impelling one or more *Game Elements* to a desired location or direction that gains a strategic advantage beyond moving the *Robot* around the *Playing Field*.
- *Holding* – *Trapping* one or more *Scoring Elements* against a *Game Element* or *Playing Field Boundary* to shield or guard them.
- *Launching* – see definition below.

Examples of interaction with *Game Elements* that are not *Controlled* include, but are not limited to:

- *Plowing* – *Inadvertent* contact with *Game Elements* while in the path of the *Robot* moving about the *Playing Field*.
- *Deflecting* – *Inadvertent* contact with a *Launched Game Element* as it bounces off the *Playing Field* or a *Robot*.

Delivery - A *Scoring* achievement where a *Robot* deposits a *Wobble Goal*.

Disable / Disabled – A *Robot* that is no longer active for the remainder of the *Match* due to a *Robot* failure.

Drive Team – Up to four representatives; two (2) *Drivers*, one (1) *Coach*, and one (1) *Human Player*.

Driver – A pre-college student *Team* member responsible for operating and controlling the *Robot*

Driver-Controlled Period – The two-minute *Match* time period in which the *Drivers* operate their *Robot*.

Driver Station – Hardware and FIRST supplied software used by a *Drive Team* to control their *Robot* during a *Match*. A detailed description of *Driver Station* is listed in Game Manual Part 1 – Remote Events.

Drop Zone – The Area Outside the *Playing Field Boundary*, between the plane formed by the front *Playing Field Boundary* and the audience, where the *Robot Delivers Wobble Goals* during the *End Game*.

End Game – The last thirty seconds of the two-minute *Driver-Controlled Period*.

End of the Period/Match - The moment when the *Match* timer reaches 2:00 for the *Autonomous Period* or 0:00 for the *Driver-Control Period* and which coincides with the start of the sound that designates the *End of the Period*.

Field Personnel – People selected by the *Team* to help run an official Remote competition *Match*. Typical activities performed by *Field Personnel* include preparing the *Playing Field* for a *Match*, adjusting the number of randomly selected *Rings* in the *Starter Stack*, retrieving *Rings* that leave the *Playing Field Boundary*, keeping track of the *Match Score*, running the cloud-based scoring system, and providing as needed technical assistance to the *Drive Team* during pre-*Match* setup. One person may fill several roles. At a Traditional competition, these activities are performed by trained volunteers. *Teams* may select anyone except for the *Drive Team* to be *Field Personnel*. Some *Field Personnel* roles require specialized knowledge. For example, the person scoring the *Match* should be able to recall rules and *Penalties* in real time while watching an official *Match*.

Game Element – Any item a *Robot* or *Human Player* interacts with to play the game. *Game Elements* for this year's game include:

Game Element	Quantity
<i>Rings</i>	10
<i>Wobble Goals</i>	2
<i>Power Shot Targets</i>	3
<i>Tower Goal</i>	1
<i>Return Rack</i>	1

Human Player – A pre-college student *Team* member who supplies *Rings* to the *Playing Field* and resets *Power Shot Targets*.

It is preferred that the *Human Player* is a student competing on the *Team*. However, for the 2020-2021 season, exceptions can be made to allow an adult mentor, coach, parent, etc. to fill the role as *Human Player* if there are strict social distancing guidelines that do not allow more than a *Team* of one student to meet and participate in official *Matches*.

Human Player Station – The Area where the *Human Player* stands during a *Match*.

In (Inside) / Completely In (Completely Inside) – An object that has crossed into the upwards vertical (i.e., at a right angle to the *Playing Field Floor*) extension of a defined *Area's* boundary is *Inside* the *Area*. An object that is entirely within the upwards vertical extension of a defined *Area's* boundary is *Completely Inside* the *Area*. The boundary element (tape, wall, markings, etc.) is part of the *Area* for the purposes of determining *Inside* and *Outside*, unless otherwise specified.

Inadvertent – An outcome that is not a planned strategy and not the predictable result of persistent or repeated actions. Unforced or unexpected *Robot* actions based on software commands are not considered to be *Inadvertent*.

Inconsequential – An outcome that does not influence *Scoring* or gameplay.

Launching – Propelling *Game Elements* with enough force such that they move independent of contact with the *Robot* or *Human Player*. Movement due to gravity is not *Launching*.

Launch Line - A two (2) inch wide, white gaffer tape line extending from the *Alliance Station* boundary to the opposite boundary that defines the *Launch Zone Area*. The *Launch Line* should be considered to be a

continuous line even though there may be breaks in the tape at the *Tile* interfaces and at the *Target Zone* tape.

Launch Zone – The part of the *Playing Field* bounded by the front and side boundaries, and the *Launch Line*. The *Launch Line* is considered to be part of the *Launch Zone*.

Match – A *Match* consists of a thirty-second *Autonomous Period* followed by a two-minute *Driver-Controlled Period* for a total time of two minutes and thirty seconds.

Match Manager – Any person selected by the *Team* to oversee an official *Match* and *Field Personnel*. The *Match Manager* cannot be a part of the *Drive Team*.

Navigating – An *Autonomous Period Scoring* task where a *Robot* is *Parked* In a specified *Area*.

Navigation Image - Three (3) unique images positioned on the *Playing Field Boundary* that the *Robot* can use to navigate around the *Playing Field*. Images are printed on standard letter size paper, 8 1/2 inches x 11 inches (216 mm x 279 mm) or A4 (210 mm x 297 mm) paper. For detailed locations please see the official Field Setup Guide, as well as Appendix F for general image locations.

Off – Not physically in contact with or *Supported* by an object, surface, etc. Objects that are *Off* are also considered *Completely Off*.

On / Completely On – An object that is physically in contact with and at least partially *Supported* by an object, surface, etc. is considered *On*. An object that is entirely *Supported* by another object, surface, etc. is *Completely On*.

Out / Outside – An object that has not crossed into any part of a defined *Area* is *Outside* the *Area*.

Park / Parked – The condition where a *Robot* is motionless.

Penalty – The consequence imposed for a rule or procedure violation. When a *Penalty* occurs, points will be deducted from the *Score*. *Penalties* are further defined into *Minor Penalties* (ten (10) points) and *Major Penalties* (thirty (30) points).

Playing Field – The *Area* that includes the 12 ft. x 8 ft. (3.66 m x 2.44 m) field and where the *Game Elements* are located, and the *Robot* plays *Matches*. There are two equivalent official versions of the *Playing Field*: Red and Blue, that are mirror images of each other.

Playing Field Boundary – A taped line or a wall that marks the *Area* where a *Robot* operates

Playing Field Damage – A physical change to a *Game Element* or *Playing Field* that affects gameplay or an action that causes harm to the playability of a *Game Element* or *Playing Field*.

Playing Field Floor – The top surface of the *Area* inside the *Playing Field Boundary*.

Possess / Possessing – An object is in *Possession* by a *Robot* if, as the *Robot* moves or changes orientation (for example, moves forward, turns, backs up, spins in place), the object remains in approximately the same position relative to the *Robot*. Objects in *Possession* by a *Robot* are considered to be *Controlled*, and they are part of the *Robot*. See also *Control/Controlling*.

Power Shot / Power Shot Target – A *Game Element* containing three (3) *Targets*. The *Targets* have two states:

- **Forward** - The *Targets* are oriented towards the interior of the *Playing Field*.
- **Back** – The *Targets* are oriented away from the interior of the *Playing Field*.

Pre-Load - A *Game Element* that the *Drive Team* positions during pre-*Match* setup so that it touches a *Robot* or is *Possessed* by a *Robot* at the start of the *Autonomous Period*.

Return Rack – A *Game Element* attached to the *Tower Goal* that is used by the *Human Player* to introduce a *Ring* into the *Playing Field*.

Ring – An approximate 5-inch diameter torus-shaped, orange colored, *Scoring Element* that a *Robot* *Launches* or places into a goal. A *Match* is played with a total of ten (10) *Rings*.

Robot – Any mechanism that has been built to compete in the game challenge and complies with the *Robot* rules outlined in Section 7 of Game Manual Part 1 – Remote Events.

Scoring / Score – A *Robot* earns points by interacting with *Scoring Elements* and *Parking* in specific *Areas* of the *Playing Field*. *Scoring Elements* still in contact with a *Robot* have zero score value, unless stated otherwise in Section 4.5 or 4.6.

Scoring determination is done by one of three methods: “*Scored Live*”, “*Scored at End of the Period*”, and “*Scored at Rest*.” The specific method for each *Scoring* achievement will be stated in the achievement’s description in Section 4.5.

Scored Live: The achievement is considered *Scored* the moment it is successfully completed, i.e. all criteria are met.

Scored at End of the Period: The achievement’s *Scoring* status is determined based on the *Robot* or *Scoring Element*’s position at the *End of the Period*.

Scored at Rest: The achievement is considered *Scored* based on the position of the *Robot* or *Scoring Element* when the entire field has come to rest after the *Match Period* ends.

Scoring Elements – Objects that a *Robot* manipulates to earn points for their *Team*. The *Scoring Elements* for ULTIMATE GOALSM are *Rings* and *Wobble Goals*.

Start Line – An approximate 22.75-inch (57.8 cm) long x 2 inch (5.1 cm) wide strip of colored gaffer tape where a *Robot* is setup to start a *Match*.

Starter Stack Area – The *Playing Field* location where zero (0), one (1), or four (4) *Rings* are placed during pre-*Match* setup.

Starter Stack – A pre-placed stack of *Rings* that corresponds to a selected *Target Zone*. Zero (0), one (1), or four (4) *Rings* correspond to *Target Zone Goals* A, B, or C respectively.

Support / Supported / Completely Supported – An object (i.e. *Robot*, *Scoring Element*, *Game Element*, etc.) is *Supported* by another object if the second object is bearing at least some of the weight of the first object. If the second object is bearing all the weight of the first object, it is *Completely Supported* by the second object.

Target Zone Goal – An approximate 22.75 inch (57.8 cm) by 22.75 inch (57.8 cm) *Autonomous Period* *Scoring Area* where a *Robot* *Delivers Wobble Goals*. There are three *Target Zone Goals*. Each *Zone* is indicated by gaffer tape on the *Playing Field Floor*.

Team – Mentors, supporters, and pre-college-aged students affiliated with an entity registered with *FIRST* and for the competition.

Tile – An approximate 24 inch x 24 inch (609.6 mm x 609.6 mm) foam rubber mat.

Tower Goal – A *Playing Field* element containing three vertically stacked goals named the *Low*, *Mid*, and *High Goals*.

Wobble Goal – A moveable *Goal* for *Scoring Rings* and a location-based *Scoring Element*.

4.5 Gameplay

Prior to the start of the *Match*, the *Drive Team* performs some basic *Robot* setup steps that are described in section 4.5.1. *Matches* are made-up of several periods totaling two minutes and thirty seconds. There is a thirty-second *Autonomous Period*, followed by a two-minute *Driver-Controlled Period*. The last thirty seconds of the *Driver-Controlled Period* is called the *End Game*.

4.5.1 Pre-Match

The *Playing Field* is set up as depicted in Figure 4.3-1. The two (2) *Wobble Goals* are placed adjacent to their *Start Lines*, a stack of four (4) *Rings* is placed on the *Playing Field Floor Starter Stack Area*, and three (3) *Rings* are placed into the *Low Goal* for the *Human Player* to use during the *Driver-Controlled Period*.

The *Robot* is set up on the *Playing Field* with the following required constraints:

- 1) **Starting Location** - The *Team* selects their *Robot's* starting location.
 - a) The *Robot* and its *Possessed Scoring Elements* may be placed in any orientation and must be *Completely Inside* the *Playing Field Boundary*.
 - b) The *Robot* must touch or break the plane of the front facing (i.e. opposite from the *Tower Goal*) *Playing Field Boundary*.
 - c) The *Robot* must be *Parked In one of the Start Lines*.
- 2) **Wobble Goal** - A *Robot* is required to *Pre-Load* exactly one (1) of their *Wobble Goals*. *During set-up*, the *Drive Team* may move their *Pre-Loaded Wobble Goal* from its initial *Field set-up* position. The remaining *Wobble Goal* that is not *Pre-Loaded* by the *Team* must stay in its setup position.
- 3) **Pre-Load Rings** – A *Robot* may *Pre-Load* up to three (3) *Rings*. *Rings* that are not *Pre-Loaded* have no *Score* value for the *Autonomous Period* and they are placed into the *Low Goal* for the *Human Player* to use during the *Driver-Controlled Period*. *Rings* cannot be loaded onto the *Wobble Goal*.
- 4) **Op Mode** – The *Drive Team* uses their *Driver Station* Android device to select an *Op Mode*. Pressing the *Driver Station* Init button is not required unless it is needed for the *Robot* to satisfy the *Match* start size constraint.

The *Drive Team* may position themselves anywhere *In* their *Alliance Station*. When the *Robot* and *Drive Team* is in position, the *Human Player* must also be *In* their *Human Player Station* and stay there for the remainder of the *Match*.

Once the *Match Manager* gives the set-up complete signal:

- 1) The *Drive Team* may no longer touch their *Robot* until the conclusion of the *Match*.
- 2) The *Drive Team* may not touch their *Driver Station* or controllers until the *Autonomous Period* has ended, except to initialize and/or start their *Autonomous* program using the *Driver Station* Android device screen. A *Robot* that requires *Autonomous* program initialization to satisfy the *Robot* starting size constraint must be initialized before *Match Manager* gives the set-up complete signal.

After the *Robot* set-up process is complete, *Field Personnel* will randomize the field into one of the three (3) configurations. The pre-placed stacks of *Rings* will be adjusted to either zero (0), one (1), or four (4), corresponding to the selected *Target Zone Goal* (A, B, or C). Excess *Rings* will be dropped into the *Low Goal*.

4.5.2 Autonomous Period

The *Match* starts with a thirty-second *Autonomous Period* where the *Robot* is operated via pre-programmed instructions only. The *Team* is not allowed to control *Robot* behavior with the *Driver Station* or any other actions during the *Autonomous Period*. The *Driver Station* is placed in a hands-off location during the *Autonomous Period* so that it is evident that there is no human control of the *Robot*. The only exception is to allow the *Drive Team* to start their *Robot* with “init” and/or “start” commands issued on the *Driver Station* Android device. The *Team* must use the built-in thirty-second timer.

Following a countdown by *Field Personnel*, the *Autonomous Period* begins. The *Drive Team* may issue *Robot* start commands with their *Driver Station* Android device to run the *Autonomous Op Mode* selected during pre-*Match* setup. Failure to adhere to this procedure may subject the *Team* to a *Penalty* as specified in the game rules in section 4.6.2. The *Drive Team* is not required to start executing an *Op Mode* during the *Autonomous Period*.

Illegally *Scored Rings* and *Power Shot Targets* earn points for the *Team* but also earn an offsetting *Penalty* per rules <GS12> and <GS13>.

Autonomous points are awarded for the following achievements:

- 1) **Wobble Goal Delivery to a Target Zone** – At the *End of the Period*, every *Wobble Goal* that is *Completely In* its *Target Zone* (as identified by the size of the *Starter Stack*) earns fifteen (15) points.
- 2) **Robot Navigating** – A *Robot* that is *Parked* at the *End of the Period* with any portion of the *Robot In* the *Launch Line* earns five (5) points.
- 3) **Tower Goal** – Each *Ring* that enters the *Low, Mid, or High Goal* earns points. Stuck *Rings* removed from *Inside* a *Tower Goal* by the *Human Player* count as *Scored*. *Rings* in *Tower Goals* are *Scored Live* and recorded as *Scored* the moment the *Rings* are *Completely In* the *Tower Goal*, are not in contact with a *Robot* or *Human Player*, and do not exit back out through the front of the *Goal*. *Rings Launched* prior to the *End of the Period* are still eligible to be *Scored*.
 - a) **Low Goal** - Each *Ring* that is placed or *Launched* by a *Robot* into the *Low Goal* earns three (3) points. The *Scoring Robot* can be anywhere *Inside* the *Playing Field*.
 - b) **Mid Goal** – Each *Ring Launched* into the *Mid Goal* by a *Robot* earns six (6) points. The *Scoring Robot* must be *Completely In* the *Launch Zone*.
 - c) **High Goal** – Each *Ring Launched* by a *Robot* into the *High Goal* earns twelve (12) points. The *Scoring Robot* must be *Completely In* the *Launch Zone*.
- 4) **Power Shot** – A *Power Shot Target* that is changed from *Forward* to *Back* by direct contact with a *Launched Ring* earns points for the *Team*. The *Scoring Robot* must be *Completely In* the *Launch Zone*. *Rings Launched* prior to the *End of the Period* are still eligible to be *Scored*.
 - a) Each *Scored Power Shot Target* earns fifteen (15) points.
 - b) *Power Shot Targets* can be *Scored* in any sequence.

c) *Power Shot Targets* are Scored at Rest.

The intent of the *Mid Goal*, *High Goal* and *Power Shot Scoring* achievements is for *Robots* to be *Completely In* the *Launch Zone*. Small, *Inconsequential Robot* extension *Outside* the *Launch Zone* while *Launching* a *Ring* is allowed.

4.5.3 Driver-Controlled Period

Directly following the end of the *Autonomous Period*, the *Drive Team* has five (5) seconds plus a "3-2-1-go" countdown to prepare their *Driver Station* for the start of the *Driver-Controlled Period*. On the countdown word "go," the *Driver-Controlled Period* starts, and *Drive Team* presses their *Driver Station* start button to resume playing the *Match*.

During the *Driver-Controlled Period*, the *Human Player* is expected to return *Rings* to the *Playing Field* via the *Return Rack* and reset *Scored Power Shot Targets* back to an *un-Scored* state (i.e., *Forward*). *Power Shot Targets* that start the *End Game* already in the *Back* position are not eligible to be counted as *Scored* during the *End Game*.

The *Driver-Controlled Score* is based on completing *Tower Goal* tasks as outlined below. Stuck *Rings* removed from *Inside* a *Tower Goal* by the *Human Player* count as *Scored*. *Rings* in *Tower Goals* are *Scored Live* and recorded as *Scored* the moment the *Rings* are *Completely In* the *Tower Goal*, are not in contact with a *Robot* or *Human Player*, and do not exit back out through the front of the *Goal*. *Rings Launched* prior to the *End of the Period* are still eligible to be *Scored*.

Illegally *Scored Rings* and *Power Shot Targets* earn points for the *Team* but also earn an offsetting *Penalty* per rules <GS12> and <GS13>.

Points are awarded for the following achievements:

- 1) **Low Goal** - Each *Ring* that is placed or *Launched* by a *Robot* into the *Low Goal* earns two (2) points. The *Scoring Robot* can be anywhere *Inside* the *Playing Field*.
- 2) **Mid Goal** - Each *Ring Launched* into the *Mid Goal* by a *Robot* earns four (4) points. The *Scoring Robot* must be *Completely In* the *Launch Zone*.
- 3) **High Goal** - Each *Ring Launched* into the *High Goal* earns six (6) points. The *Scoring Robot* must be *Completely In* the *Launch Zone*.

The intent of the *Tower Scoring* achievements is for *Robots* to be *Completely In* the *Launch Zone* to *Score* in the *Mid* and *High Goals*. Small, *Inconsequential Robot* extension *Outside* the *Launch Zone* is allowed.

4.5.4 End Game

The last thirty seconds of the *Driver-Controlled Period* is called the *End Game*. *Driver-Controlled Period Scoring* can still take place during the *End Game*. *End Game* tasks started and/or completed prior to the start of the *End Game* will earn zero (0) points for those tasks.

Points are awarded for the following *End Game* achievements:

- 1) **Wobble Goal Delivery** – At the start of the *End Game*, *Wobble Goals In* a *Target Zone* or not located in the *Launch Zone* are eligible for the following achievements:
 - a) **Start Line** – Each *Wobble Goal In* a *Start Line* at the *End of the Match* earns five (5) points. To earn the points, the *Wobble Goal* must break the vertical plane of any side of the *Start Line*.

- b) **Drop Zone** - Each *Wobble Goal* placed over a *Barrier* and *Supported* by the *Drop Zone* at the *End of the Match* earns twenty (20) points. The *Wobble Goal* is not required to be *Completely Supported* by its domed base (i.e., a tipped over *Wobble Goal* counts as *Scored*).

The intent of the *Drop Zone* achievement is that the *Robot* *Delivers* a *Wobble Goal* without damaging the floor outside the *Playing Field*. *Robot* designs for *Delivering* a *Wobble Goal* to a *Drop Zone* should take into account that flooring may vary from competition to competition. Flooring could be robust (e.g., carpet, foam tile, etc.) or easily damaged (e.g., polished wood basketball floor).

- 2) **Wobble Goal Rings** – Each *Ring* *Completely Supported* by a *Wobble Goal* or another *Ring* *Completely Supported* by the *Wobble Goal* at the *End of the Period* earns five (5) points. Any *Wobble Goal* location and orientation are allowed for this achievement.
- 3) **Power Shot** – A *Power Shot Target* that is changed from *Forward* to *Back* by direct contact with a *Launched Ring* earns points for the *Team*. The *Scoring Robot* must be *Completely In* the *Launch Zone*.
- Each *Scored Power Shot Target* earns fifteen (15) points.
 - Power Shot Targets* that start the *End Game* already *Back* are not eligible to be *Scored*. The *Human Player* has a 10 second grace period following the start of *End Game* to reset the *Targets*.
 - Power Shot Targets* are allowed to be *Scored* in any sequence.
 - Power Shot Targets* are *Scored at Rest*.

4.5.5 Post Match

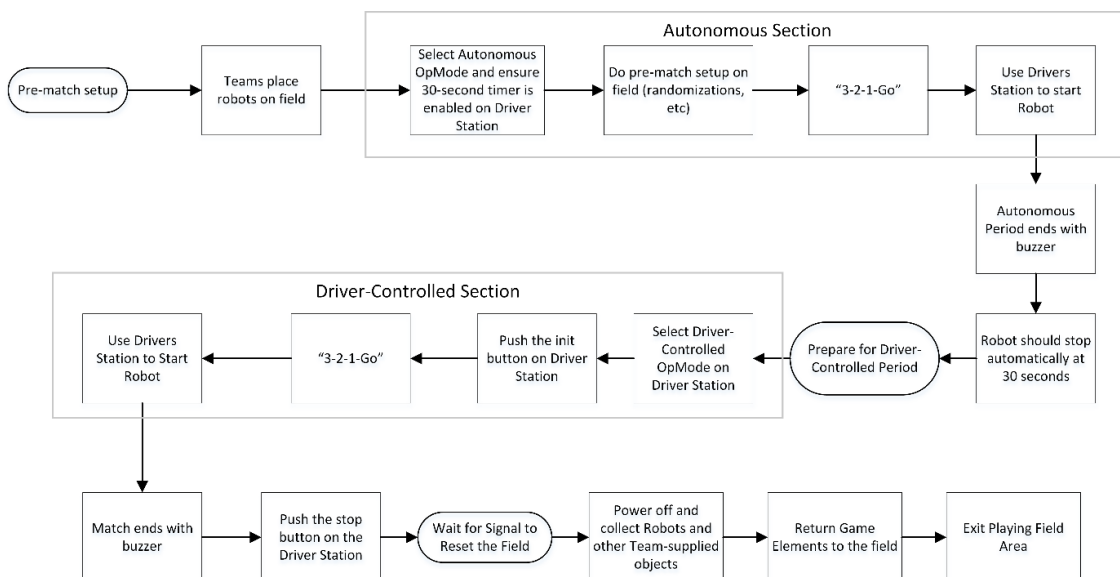
After the *Match*, *Field Personnel* will finalize the *Score*. The *Match Manager* will signal for the *Drive Team* to enter the *Playing Field* and retrieve their *Robot*. The *Drive Team* should return any *Rings* and/or *Wobble Goals* that are *Possessed* by the *Robot* to the *Playing Field*. The *Playing Field* reset crew will set up the *Playing Field* for the next *Match*.

4.5.6 Penalty Scoring

Penalty points are subtracted from the offending *Team's Score* at the *End of the Match*. *Minor Penalties* subtract ten (10) points per occurrence. *Major Penalties* subtract thirty (30) points per occurrence.

4.5.7 Flowchart of Match Play

The following figure shows the flow of the *Match* and the actions taken on the *Driver's Station* Android device.



4.6 Rules of Gameplay

Gameplay is restricted by the Safety rules (<S#>), the General rules (<G#>), and the Game-Specific rules (<GS#>). Other rules to pay close attention to are the *Robot* rules and the tournament rules defined in the Game Manual Part 1 – Remote Events. Violation of rules may lead to *Penalties* and/or *Disqualification* of the offending *Team* from a *Match*. Rules apply to all periods of play unless specifically called out otherwise. If rules are in conflict, Safety rules take precedence over all rules and Game-Specific rules take precedence over General rules. The official FIRST Tech Challenge Question & Answer Forum rulings take precedence over all information in the game manuals.

There are rules in the Game Manual Part 2 – Traditional Events, that do not apply to *Teams* competing remotely. Those rules have been removed from this manual; however, the numbering of the rules has been kept the same for consistency. The remaining rules may have modifications as appropriate for single *Robot* gameplay.

4.6.1 Safety Rules

<S1> Unsafe Robot or Playing Field Damage – If at any time the *Robot* operation is deemed unsafe or has damaged the *Playing Field* the offending *Robot* may be *Disabled*.

<S2> Robot Extension Outside the Playing Field Boundary – For safety reasons, no portion of the *Robot* may contact anything *Outside* the *Playing Field Boundary*. A *Major Penalty* will be assessed per occurrence. See the game definitions in section 4.4 for a complete description of the *Playing Field Boundary*.

The intent of this rule is for safe or *Inadvertent Robot* extension *Outside* the *Playing Field Boundary*. Intentional *Robot* extension *Outside* the *Playing Field* is not permitted, except as allowed by Game-Specific rules listed in section 4.6.3

<S3> Safety Gear – *Matches* must not be played until all members of the *Drive Team* are wearing approved eye protection and shoes with closed-toes and a closed-back.

4.6.2 General Game Rules

<G1> Autonomous to Driver-Controlled Period Transition – At the conclusion of the *Autonomous Period*, the *Robot* will remain in a hands-off state. *Field Personnel* will not enter the field and will not touch the *Robot* on the field during the *Autonomous to Driver-Controlled* transition. The scoring system display will provide visual and audio cues for *Drive Teams* to pick up their *Driver Stations*. *Drive Teams* will have 5 seconds to pick up and prepare their *Driver Station*. After the 5 seconds, there will be a “3-2-1 go” countdown and the *Driver-Controlled Period* of the *Match* will begin.

<G2> Certifying the Score at Match End – Scores will be tracked by *Field Personnel* throughout the *Autonomous* and *Driver-Controlled Periods* of the *Match*. At the *End of the Match*, the final *Score* will be certified as quickly as possible. A change in state of a *Game Element* or *Robot* at the *End of the Match* after its final *Score* is recorded will not change an already-recorded *Score*. *Scoring Elements* will not be recounted at the *End of the Match* unless specified by a Game-Specific rule.

<G4> Robot Manipulation of Scoring Elements – *Scoring Elements* that are *Controlled* or *Possessed* by a *Robot* are part of the *Robot* except when determining the location of the *Robot* or otherwise specified by a Game-Specific rule.

For Example: If a *Robot Possesses* a *Scoring Element*, and only that *Scoring Element* breaks the plane of a *Scoring Area*, the *Robot* does not receive points for being *In* that *Area*.

<G5> Robot or Scoring Elements In Two or More Scoring Areas – A *Robot* or *Scoring Elements* that are *In* two or more *Scoring Areas* earn points only for the highest value achievement. If the achievement values are equal, only one achievement counts as *Scored*. Exceptions to this general rule may be specified in the Gameplay section (4.5) or in the Game-Specific rules.

<G6> Disabled Robot Eligibility - A *Disabled Robot* is not eligible to *Score*, earn points, or incur *Penalties* for the remainder of the *Match*. Game-Specific rule(s) listed in section 4.6.3 take precedence over this general game rule.

<G7> Playing Field Tolerances – *Playing Field* and *Game Elements* will start each *Match* with tolerances that may vary by as much as +/-1.0 inch (25.4 mm). *Teams* must design their *Robots* accordingly.

Commercial Off The Shelf and Do It Yourself *Playing Fields* and *Game Elements* are expected to be manufactured, assembled, and set up using a high standard for dimensional and location accuracy. The intent of the generous +/- 1.0 inch tolerance is to accommodate unintentional size and location variations that may occur. The tolerance is not an excuse for intentional or imprecise accuracy in construction or setup.

<G8> Match Replay – Once started, *Matches* are not paused or replayed.

<G9> Inadvertent and Inconsequential - *Robot* actions that violate a rule may be ruled to be *Inconsequential* and *Inadvertent*, and will not be *Penalized*.

<G10> Scoring Elements in Contact with a Robot – *Scoring Elements* in a *Scoring Area* that are in contact with or *Controlled* by a *Robot* for the *Scoring Area* have zero *Score* value. Game-Specific rule(s) listed in section 4.6.3 that allow *Robot* contact with *Scoring Elements* take precedence over this general game rule.

<G11> Drive Team – The *Drive Team* shall include up to two *Drivers*, one *Coach*, and one *Human Player*.

<G12> Playing Field Access – *Drive Team* members cannot enter the *Playing Field* for any reason other than to place or retrieve their *Robot*. A *Minor Penalty* is assessed for violation of this rule.

If a *Team* feels the *Playing Field* is not set up correctly, *Teams* should notify *Field Personnel* prior to the start of the *Match*.

<G13> Pre-Match Robot Placement – At the beginning of a *Match*, the *Robot* must be set up on the *Playing Field* according to section 4.5.1 *Pre-Match*. After the *Robot* is set up on the *Playing Field*, the *Drive Team* must stand *Inside* the *Alliance Station* or *Human Player Station*.

<G14> Robot Starting Volume – Before the start of a *Match*, the *Robot* in its starting location must not exceed a volume of 18 inches (457.2 mm) by 18 inches (457.2 mm) by 18 inches (457.2 mm) unless otherwise allowed or restricted by Game-Specific rules detailed in section 4.6.3. A *Pre-Loaded Scoring Element* may extend *Outside* the 18-inch (457.2 mm) cube volume constraint. *Match* play must not begin until the *Robot's* starting volume constraint is satisfied.

After the start of a *Match*, the *Robot* may extend in any dimension unless restricted by the Game-Specific rules detailed in section 4.6.3.

<G15> Robot Setup/Alignment – The *Drive Team* may align its *Robot* during pre-*Match* setup if they do so with legal components that are part of the *Robot* and can be reset to be within the 18-inch (457.2 mm) cube starting volume constraint. A single member of the *Drive Team* may also align the *Robot* by sight if they are next to the *Robot* and their action does not delay the start of a *Match*. A *Minor Penalty* will be assessed to the *Team* for violation of this rule.

<G16> Alliance Station and Human Player Station – During a *Match*, the *Drivers*, *Coach*, and *Human Player* must remain *In* their *Stations*.

- a) The first instance of leaving the *Station* will result in a warning, with any following instances during the *Match* resulting in a *Minor Penalty*. Leaving the *Station* for safety reasons will not result in a warning or *Penalty*.

- b) The *Drive Team* may be anywhere in their respective *Alliance Station* and *Human Player Station*. The *Human Player* should not obstruct the view of *Field Personnel* scoring the *Match*.

The intent of this rule is to prevent *Drive Team* members from leaving their assigned *Station* during a *Match* to gain a competitive advantage. For example, moving to another part of the *Field* for better viewing, reaching into the *Field*, etc. Simply breaking the plane of the *Station* during normal *Match* play is not a *Penalty*. It is reasonable for the *Human Player* to leave the *Human Player Station* to retrieve *Rings*.

<G17> Post-Match Removal of the Robot – The *Robot* must be designed to permit easy removal of *Game Elements* from the *Robot* after the *Match*. The *Robot* should also be able to be removed from the *Playing Field* without damaging the *Playing Field*. A *Minor Penalty* will be assessed for violations of this rule.

The intent of this rule is to have timely removal of *Robots* from the *Playing Field* following a *Match*. *Drive Teams* are expected to stage their *Robots* for a *Match*, and remove them from the *Playing Field* afterwards, safely and swiftly. *Drive Team* efforts that either intentionally or unintentionally delay the start of a *Match* or the *Playing Field* reset are not allowed. Examples include, but are not limited to:

- 1) Failing to exit the *Playing Field* once instructed by *Field Personnel*.
- 2) Failing to remove *Driver Stations* in a timely manner.

<G18> Starting Gameplay Early – A *Robot* that starts playing the game (*Autonomous* or *Driver-Controlled Period*) prior to the start of a *Match Period* receives a *Minor Penalty*. *Field Personnel* have the option of issuing a *Major Penalty* in place of the *Minor Penalty* if the early start results in an advantage for the offending *Team*.

<G19> Late Start of the Autonomous Period – A *Team* participating in the *Autonomous Period* is expected to press the "start with 30-second" button on their *Driver Station* Android device and then place the *Driver Station* in a hands-off location without delay when *Field Personnel* signal the start of the *Autonomous Period*. A *Minor Penalty* is assessed for violating this rule. *Field Personnel* have the option of issuing a *Major Penalty* in place of the *Minor Penalty* if the late start results in an advantage for the offending *Team*.

<G20> Parked at End of the Period – The *Robot* must *Park* at the end of the *Autonomous* and *Driver-Controlled Periods*. The *Drive Team* should make its best effort to stop gameplay immediately when the *End of the Period* game sound begins. A *Robot* that is not *Parked* at the conclusion of the game sound receives a *Minor Penalty* and the actions of the *Robot* do not count towards their *Team's Score*. *Field Personnel* have the option of issuing a *Major Penalty* in place of the *Minor Penalty* if the late stop results an advantage (other than *Scoring*) for the offending *Team*.

Scoring Elements that were *Launched* (unless disallowed by Game-Specific rules) before the *End of the Period* are eligible to be counted as *Scored*. Other *Robot Scoring* achievements that occur after the announced end of the *Autonomous Period* and before the start of the *Driver-Controlled Period* do not count towards the *Score* for the *Autonomous* or *Driver-Controlled Periods*.

<G21> Robot Control During Autonomous Period - During the *Autonomous Period*, the *Drive Team* may not directly or indirectly control or interact with their *Robot* or *Driver Station*. Early stopping of the *Robot* while running its *Autonomous* code is not allowed, except in cases of personal or equipment safety. A *Major Penalty* will be assessed for violating this rule.

<G22> Drive Team Contact with the *Playing Field* or *Robot* – During a *Match*, the *Drive Team* is prohibited from making contact with the *Playing Field*, the *Robot*, or any *Game Element* (except for allowed *Human Player* activities). The first instance of contact will result in a warning, with any following instances resulting in a *Minor Penalty*. Contact with the *Playing Field*, a *Game Element*, or a *Robot* for safety reasons will not result in a warning or *Penalty*.

For example, a *Game Element* is *Launched* from a *Robot* on the *Playing Field* and it *Inadvertently* hits a *Team* member in the *Alliance Station* and is deflected back onto the field. The *Team* would not receive a *Penalty* because the *Team* member was protecting him/herself (safety). However, if that same *Game Element* is caught and/or directed to a specific location on the *Playing Field*, the *Team* may be issued a *Penalty*.

<G23> Drive Team Coach Driver Station Control – During the *Driver-Controlled Period*, a *Robot* must be remotely operated only by the *Drivers* using the Gamepads connected to the *Team's Driver Station* and/or by software running on the on-board *Robot* control system. The first instance of *Coach* controlling a *Robot* (for example, operating a Gamepad) will result in a warning, with any following instances resulting in a *Major Penalty*. During the *Driver-Controlled Period*, the *Drive Team Coach* and/or *Drivers* are allowed to hold the *Team's Driver Station* Android device and interact with it to select an Op Mode, view information displayed on the screen, and initialize, start, stop, and reset the *Robot*.

<G24> Robot Deliberately Detaching Parts – A *Robot* may not deliberately detach parts during a *Match* or leave mechanisms on the *Playing Field* unless permitted by a Game-Specific rule. *Possessed* or *Controlled Scoring Elements* are not considered to be a part of the *Robot* for the purpose of this rule. The consequence of deliberately detaching a part is a *Minor Penalty per occurrence*. A *Robot* will receive a *Minor Penalty* each time gameplay is affected by the deliberately detached component or mechanism. *Robot* parts that are released but remain connected by a tether are considered detached for the purposes of this rule.

Tethered components that move independently of the main *Robot* are considered a detached component and are illegal.

<G25> Robot Grasping Game Elements – A *Robot* may not grab, grasp and/or attach to any *Game Element*, or structure other than *Scoring Elements*, unless specifically allowed by Game-Specific rule(s) listed in section 4.6.3. The first instance will result in a warning with any following violations during the tournament resulting in a *Major Penalty*.

<G26> Destruction, Damage, Tipping, etc. – *Robot* actions aimed at the destruction, damage, tipping over, or entanglement of *Game Elements* are not in the spirit of the FIRST Tech Challenge and are not allowed unless permitted by Game-Specific rules. Some tipping, entanglement, and damage may occur as a part of normal gameplay. If the tipping, entanglement, or damage is ruled to be deliberate or chronic, the *Team* will receive a *Major Penalty*.

<G27> Removing Game Elements from the *Playing Field* – A *Robot* may not deliberately remove *Game Elements* from the *Playing Field* during a *Match*. *Game Elements* that *Inadvertently* fall *Outside* the *Playing Field* will be returned to the *Playing Field* by *Field Personnel* at the earliest safe and convenient opportunity at a non-*Scoring* location approximately where it left the field. *Game Elements* removed from the *Playing Field* in an attempt to *Score* are also not subject to this *Penalty*. A *Team* that deliberately removes *Game Elements* from the *Playing Field* will incur a *Minor Penalty per Game Element* removed from the *Playing Field*. Game-Specific rules listed in section 4.6.3 that address the removal of specified *Scoring Elements* from the *Playing Field* take precedence over this general game rule.

<G29> Illegal Usage of Game Elements – A *Robot* may not deliberately use *Game Elements* to ease or amplify the difficulty of any *Scoring* or game activity. A *Major Penalty* will be assessed for violations of this rule.

4.6.3 Game-Specific Rules

<GS1> Robot extension outside the *Playing Field Boundary* – A *Robot* may safely extend outside the *Playing Field Boundary* for *Scoring Rings* in the *Low Tower Goal* (back *Boundary*) and during the *End Game* for *Scoring a Wobble Goal* in the *Drop Zone* (front *Boundary*). All other extensions outside the *Playing Field Boundary* will be handled per rule <S2>.

<GS2> Human Player Station – The *Human Player* may change position *Inside* the *Human Player Station* while actively collecting *Rings*, placing *Rings* into the *Team's Return Rack*, and resetting *Power Shot Targets*. It is reasonable for the *Human Player* to leave the *Human Player Station* to retrieve *Rings*.

<GS3> Grasping Scoring Elements – A *Robot* may grasp *Rings* and *Wobble Goals*.

<GS4> Human Player Ring Handling – The *Human Player* may introduce *Rings* *Onto* the *Playing Field Floor* with the constraints listed below. After a *Field Personnel* issued warning, subsequent violations of these constraints within the tournament result in a *Minor Penalty* per occurrence.

- a) A *Human Player* may not introduce *Rings* into the *Playing Field* before the start of the *Driver-Controlled Period*.
- b) A *Human Player* may only introduce *Rings* into the *Playing Field* using the *Return Rack*. The *Drive Team* may not bring tools (except for <GS4>g) or devices to the *Playing Field* for handling *Rings*. Accommodations and exceptions for a *Human Player* with disabilities or extenuating circumstances can be made but must take into consideration all safety, general, and Game-Specific rules.
- c) Storing a supply of *Rings* by a *Human Player* is not allowed during the *Driver-Controlled Period*. *Rings* should be returned to the *Playing Field* as quickly as practical. *Penalties* will be assessed per *Ring* with additional *Penalties* per *Ring* for every five seconds the violation continues.
- d) The *Human Player* may not extend *Inside* the *Playing Field Boundary*.
- e) The *Human Player* is allowed to reach into the *Tower Goal* to retrieve stuck *Rings* when the *Robot* is at least 24 inches (609.6 mm) from the *Tower Goal*.
- f) The *Human Player* may hold more than one *Ring* at a time.
- g) The *Human Player* may use a tool to remove *Rings* that are stuck in the *Return Rack*.

<GS5> Drive Team Touching the Robot or Driver Station after Starter Stack Randomization – The *Drive Team* is not allowed to touch or interact with their *Robot* or *Driver Station* once *Field Personnel* have begun the randomization process. If this occurs, a *Minor Penalty* will be assessed, and the *Robot* is not eligible to earn the *Wobble Goal Delivery Score* in the *Autonomous Period*.

<GS6> Control/Possession Limits of Scoring Elements –

- 1) **Rings** – A *Robot* may *Control* or *Possess* a maximum of three (3) *Rings*. A *Launched Ring* is considered *Controlled* until it makes contact with something else (e.g. *Playing Field Floor*, net, *Tower Goal*).
 - a) *Plowing* through any quantity of *Rings* is allowed but *Herding* or directing *Rings* above the allowed limit to gain a strategic advantage (i.e., *Scoring*, accessibility) is not allowed. The *Penalty* for *Controlling* or *Possessing* more than the allowed quantity is an immediate *Minor Penalty* for each *Ring* above the limit plus an additional *Minor Penalty* per *Ring* in excess of the limit for each 5-second interval that this situation continues. An additional *Minor Penalty* will be assessed for each *Ring* that is *Scored* while a *Robot Controls* or *Possesses* more than the allowed quantity.

- b) *Controlling or Possessing a Ring by a Robot before the Ring has been Supported by the Playing Field Floor will earn a Minor Penalty for each occurrence. Violation of this Rule will escalate to a Major Penalty.*
- c) *Rings Supported by a Wobble Goal are exempt from the Control/Possession Limit.*

Rings that may become Possessed Inadvertently still earn a Penalty. Teams should design their Robots to minimize the possibility of accidentally Possessing a stray Ring.

- 2) **Wobble Goals** - A Robot may Control or Possess a maximum of one (1) Wobble Goal. Inconsequential Control of Wobble Goals above the limit is allowed. The Penalty for Controlling or Possessing more than the allowed quantity is an immediate Minor Penalty for each Wobble Goal above the limit plus an additional Minor Penalty per Wobble Goal for each five second interval that this situation continues. A Major Penalty will be assessed for each Wobble Goal in excess of the limit that is Scored while a Robot Controls or Possesses more than the allowed quantity.

<GS7> **Launching of Game Elements –**

- 1) **Rings** – A Robot may Launch Rings during any Match Period. Any Ring Launched over a Boundary that is not the Tower Goal Boundary will receive a Minor Penalty.
- 2) **Wobble Goals** – Launching Wobble Goals is not allowed. A Major Penalty will be assessed for violating this rule and the Wobble Goal will not earn points for the period (Autonomous or Driver-Controlled) when the violation occurred.

The intent of this rule is not to Penalize Inadvertent Launching of Rings over the Tower while attempting to Score.

<GS9> **Wobble Goal Constraint** – The Robot may not place Rings onto Wobble Goals except during the End Game. A Minor Penalty will be assessed for each Ring.

<GS12> **Illegal Tower Goal Scoring** – A Robot Outside the Launch Zone that places or Launches a Ring into a Mid or High Tower Goal receives a Major Penalty per Ring.

<GS13> **Illegal Power Shot Scoring** – Power Shot Targets may only be Scored by direct contact with a Ring Launched by a Robot Completely In the Launch Zone. A Robot Outside the Launch Zone that Scores a Power Shot Target by its actions (e.g. Launching a Ring, contact with the Power Shot assembly, etc.) or Completely In the Launch Zone and Scores a Power Shot Target through indirect contact (e.g. Rings contacting Power Shot assembly, etc.) is assessed a Major Penalty per Scored Power Shot Target.

4.7 Scoring Summary

The following table shows the possible *Scoring* achievements and their point values. The table is a quick reference guide and not a substitute for a thorough understanding of the game manual.

Scoring Achievement	Autonomous Points	Driver-Controlled Points	End Game Points	Reference	When Scored
<i>Wobble Goals Delivered</i> (each)					
• <i>Target Zone</i>	15	-	-	4.5.2.1	<i>End of Period</i>
• <i>Start Line</i>	-	-	5	4.5.4.1	
• <i>Drop Zone</i>	-	-	20		
<i>Robot Navigating</i> (each)	5	-	-	4.5.2.2	<i>End of Period</i>
<i>Rings Scored In Tower Goal</i> (each)					
• <i>Low</i>	3	2		4.5.2.3	<i>Scored Live</i>
• <i>Mid</i>	6	4		4.5.3	
• <i>High</i>	12	6			
<i>Power Shot</i>					
• <i>Target moved from Forward to Back</i> (each)	15	-	15	4.5.2.4 4.5.4.3	<i>Scored at Rest</i>
<i>Wobble Goal Rings</i> (each)	-	-	5	4.5.4.2	<i>End of Period</i>

4.8 Rule Summary

The following table shows the possible rule violations and their consequences. The table is a quick reference guide and not a substitute for a thorough understanding of the complete rule descriptions in section 4.6.

Rule #	Rule	Consequence	Warning Disable	Minor Penalty	Major Penalty
Safety Rules					
<S1>	Unsafe <i>Robot</i> or Damage to the <i>Playing Field</i> .	<i>Disable</i> if unsafe operation is likely to persist.	D*		
<S2>	Contact <i>Outside</i> the <i>Playing Field Boundary</i> .	<i>Major Penalty</i> for each occurrence.			1x
<S3>	<i>Drive Team</i> missing safety gear.	<i>Match</i> must not start until the entire <i>Drive Team</i> is wearing all the required safety gear.			
General Rules – Further definitions, no Penalties earned					
<G10>	<i>Scoring Elements</i> in contact with the <i>Robot</i> .	Points are not earned for any <i>Scoring Elements</i> in a <i>Scoring Area</i> that are also in contact with the <i>Robot</i> .			
General Rules – Pre-Match Penalties					
<G12>	<i>Drive Team</i> enters the <i>Playing Field</i> for purpose other than placing or retrieving their <i>Robot</i> .	<i>Minor Penalty</i> for each offense.		1x	

Rule #	Rule	Consequence	Warning Disable	Minor Penalty	Major Penalty
<G15>	Robot setup alignment devices.	Minor Penalty for each offense.		1x	
<G16>a	Drive Team member(s) leaving the Alliance Station.	Warning for the first instance with any following instances resulting in a Minor Penalty.	W	1x	
<G17>	Post-Match Removal of the Robot	A Minor Penalty will be assessed.		1x	
General Rules – Gameplay Penalties					
<G18>	Starting Gameplay Early.	Minor Penalty with the option of a Major Penalty if the early start results in a competitive advantage.		1x	1x*
<G19>	Late Start of the Autonomous Period.	Minor Penalty with the option of a Major Penalty if the late start results in a competitive advantage.		1x	1x*
<G20>	Robot is not Parked at the end of period.	Minor Penalty and the actions of the Robot that occur after the end of gameplay do not count towards their Score. Major Penalty if the late stop results in a competitive advantage.		1x	1x*
<G21>	Robot control during Autonomous Period / Early stopping of the Autonomous code.	Major Penalty.			1x
<G22>	Drive Team contact with the Playing Field, Game Element, or Robot.	Warning for the first instance with any following instances resulting in a Minor Penalty.	W ^T	1x	
<G23>	Drive Team Coach Driver Station control.	Warning for the first instance with any following instances resulting in a Major Penalty.	W ^T		1x
<G24>	Robot deliberately detaching parts.	Minor Penalty plus a Minor Penalty each time gameplay is affected.		1x	
<G25>	Robot illegally grasping Game Elements.	Warning for the first instance with any following instances resulting in a Major Penalty.	W ^T		1x
<G26>	Destruction, damage, tipping, etc.	Deliberate or chronic violations of this rule will receive a Major Penalty.			1x
<G27>	Deliberately removing Game Elements from the Playing Field.	Minor Penalty per Game Element deliberately removed from the Playing Field.		1x	

Rule #	Rule	Consequence	Warning Disable	Minor Penalty	Major Penalty
<G29>	Illegal Use of Game Elements to ease or amplify Scoring.	Major Penalty.			1x
Game-Specific Rules – Gameplay Penalties					
<GS4>	Human Player Ring Handling.	Warning followed by a Minor Penalty per occurrence for violating constraints.	W ^T	1x	
<GS5>	Drive Teams touching their Robot or Driver Station after Randomization.	A Minor Penalty will be assessed, and the Robot is not eligible to earn the Wobble Goal Delivery Score.		1x	
<GS6>1	Control/Possession Limits for Rings.	a) Minor Penalty per excess Ring plus a Minor Penalty for each excess Ring every five seconds. Additional Minor Penalty for each Ring Scored while in violation. b) Minor Penalty for Controlling or Possessing a Ring before it has been Supported by the Playing Field Floor.		1x+ 1x	
<GS6>2	Control/Possession Limits for Wobble Goals	Minor Penalty per excess Wobble Goal plus a Minor Penalty for each excess Wobble Goal every five seconds. Additional Major Penalty for each Wobble Goal Scored while in violation.		1x+	1x if Wobble Goal Scored
<GS7>	Launching Game Elements.	1) Launching Ring over front or side Playing Field Boundary. 2) Launching Wobble Goal.		1x per Ring	1x plus no Score per Wobble Goal for that period
<GS9>	Wobble Goal Constraint.	A Minor Penalty will be assessed for each Ring.		1x	
<GS12>	Illegal Tower Goal Scoring	Major Penalty per Ring.			1x
<GS13>	Power Shot Scoring	Major Penalty per Power Shot Target.			1x

Table Key	
W: Warning	1x: Penalty at single cost
W ^T : Tournament Warning	1x+: Penalty at single cost every 5 seconds
D: Robot Disabled	2x: Penalty at double cost

* indicates optional

Appendix A – Resources

Game Forum Q&A

<https://ftcforum.firstinspires.org/>

Anyone may view questions and answers within the *FIRST*® Tech Challenge game Q&A forum without a password. To submit a new question, you must have a unique Q&A system username and password for your team.

FIRST Tech Challenge Game Manuals

Part 1 and 2 - <https://www.firstinspires.org/resource-library/ftc/game-and-season-info>

FIRST Headquarters Pre-Event Support

Phone: 603-666-3906

Mon – Fri

8:30am – 5:00pm

Email: Firsttechchallenge@firstinspires.org

FIRST Websites

FIRST homepage – www.firstinspires.org

[FIRST Tech Challenge Page](#) – For everything *FIRST* Tech Challenge.

[FIRST Tech Challenge Event Schedule](#) – Find *FIRST* Tech Challenge events in your area.

FIRST Tech Challenge Social Media

[FIRST Tech Challenge Twitter Feed](#) - If you are on Twitter, follow the *FIRST* Tech Challenge Twitter feed for news updates.

[FIRST Tech Challenge Facebook page](#) - If you are on Facebook, follow the *FIRST* Tech Challenge page for news updates.

[FIRST Tech Challenge YouTube Channel](#) – Contains training videos, game animations, news clips, and more.

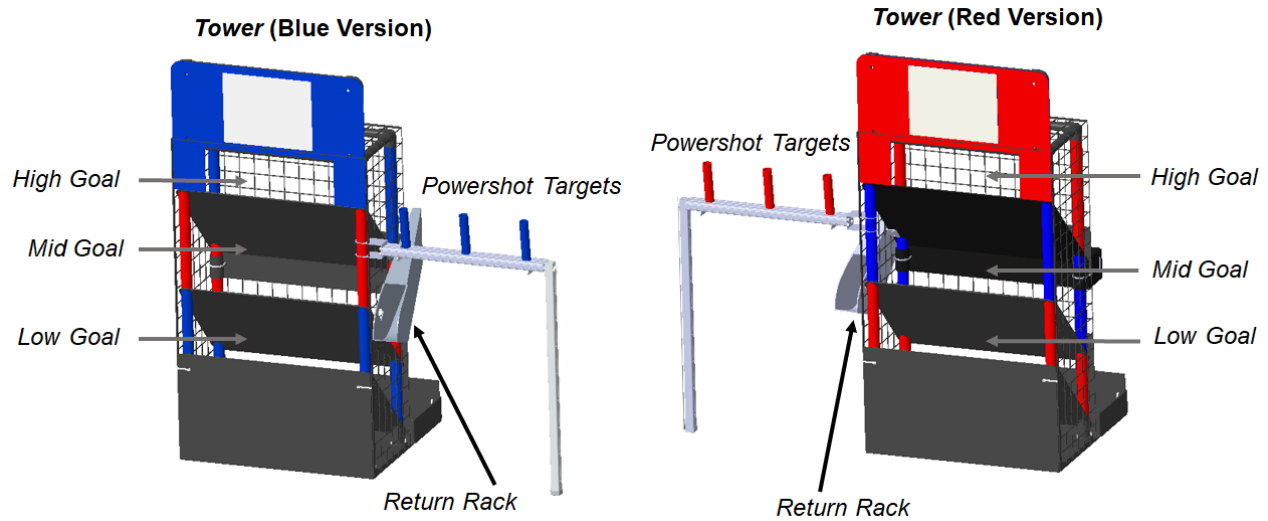
[FIRST Tech Challenge Blog](#) – Weekly articles for the *FIRST* Tech Challenge community, including outstanding volunteer recognition!

[FIRST Tech Challenge Team Email Blasts](#) – contain the most recent *FIRST* Tech Challenge news for teams.

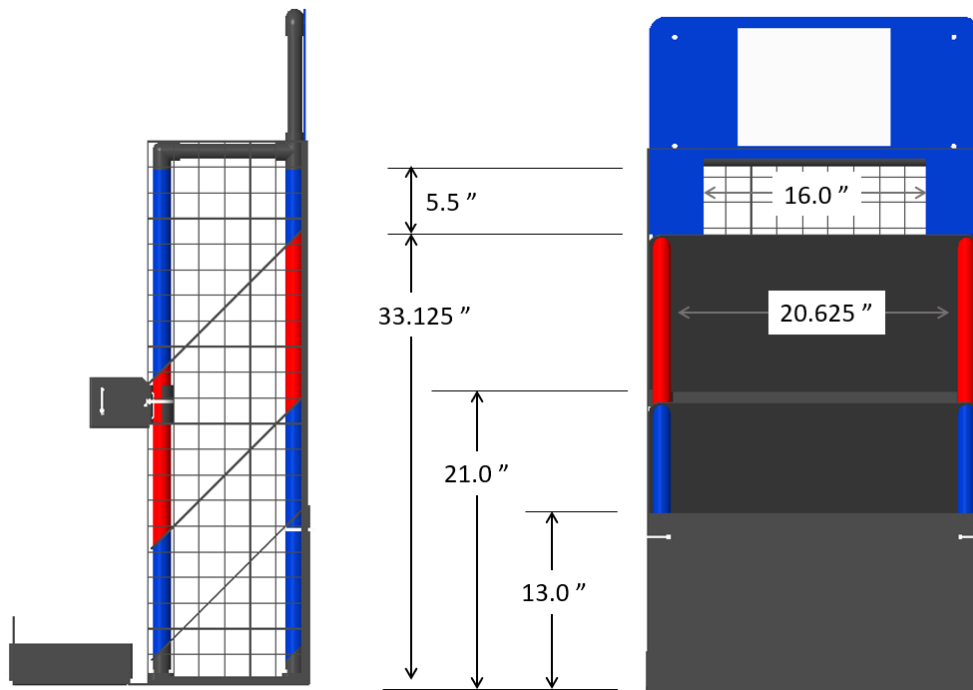
Feedback

We strive to create support materials that are the best they can be. If you have feedback about this manual, please email firsttechchallenge@firstinspires.org. Thank you!

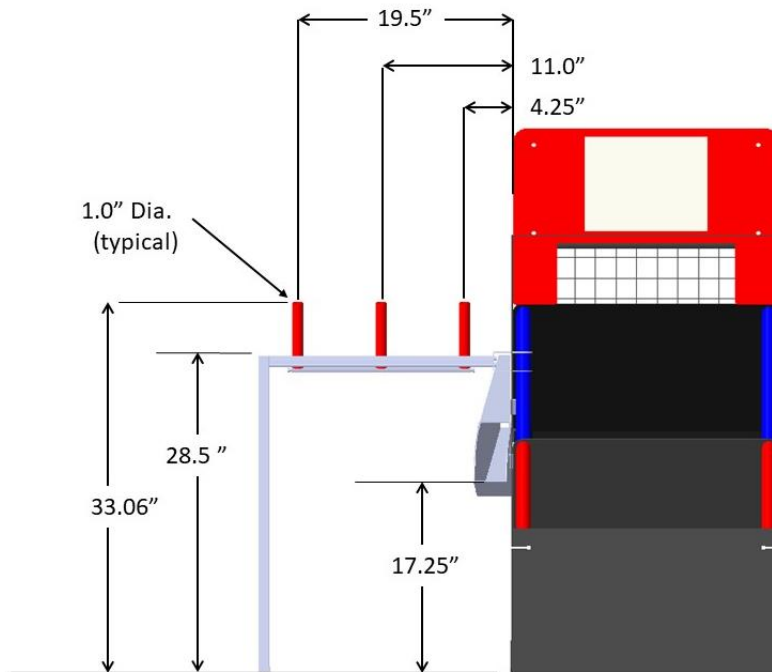
Appendix B – Playing Field Details



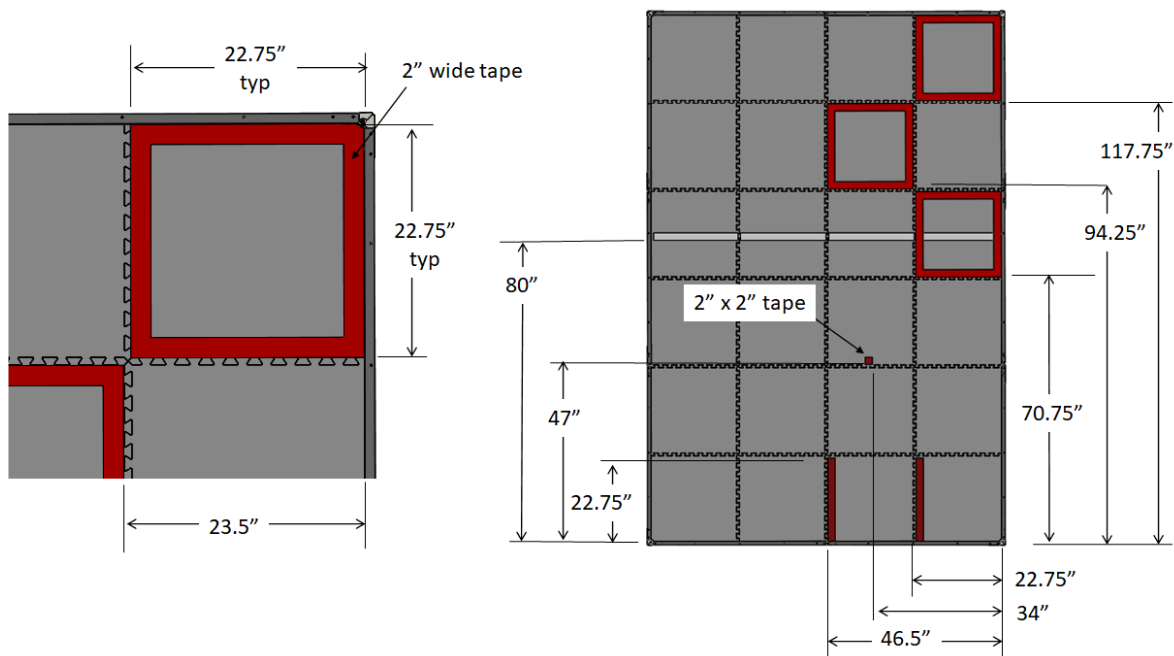
B-1 Tower Goals



B-2 Tower Goal Dimensions



B-3 Power Shot Dimensions



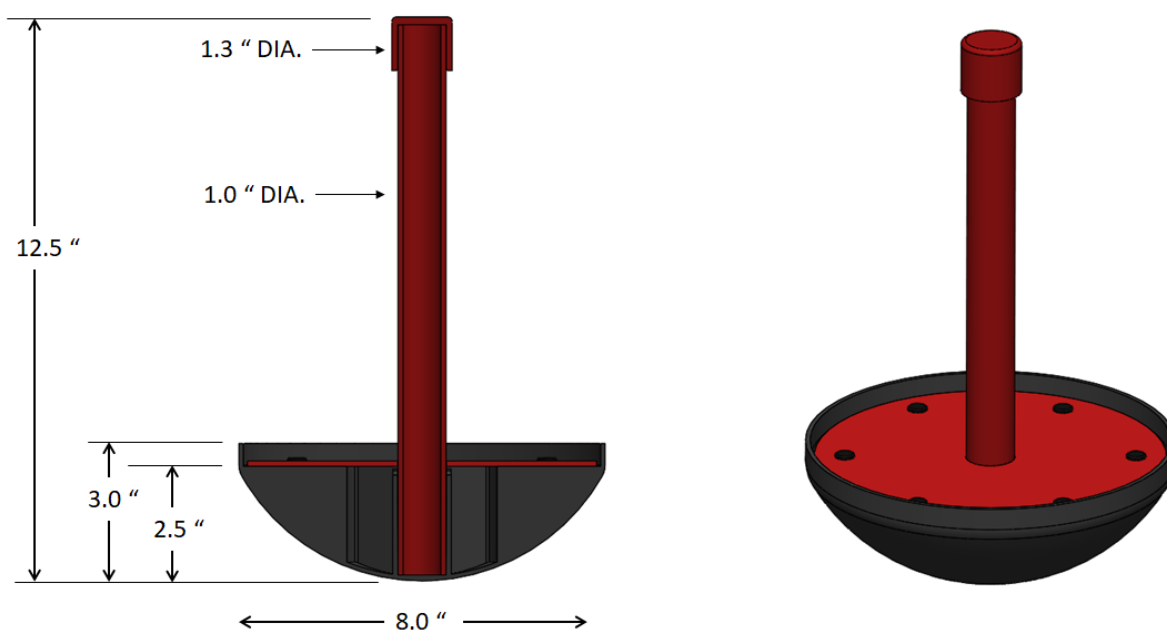
B-4 Playing Field Tape Dimensions

Note:

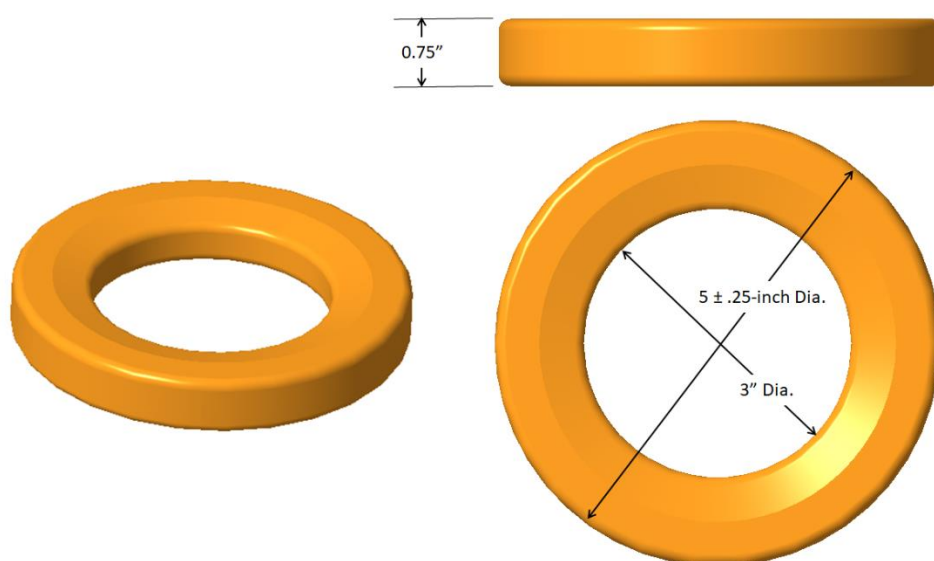
1) These dimensions are approximate. Refer to the Set-up Guide for exact placement. For fields that use *Tiles*, the tape runs along the tabs of the *Tile* and the tape square is centered along one side of the *Tile*.

2) This diagram shows dimensions for a field that is set up with the *Red Tower Goal*. A *Blue Tower Goal* setup will be a mirror image.

Appendix C – Scoring Elements

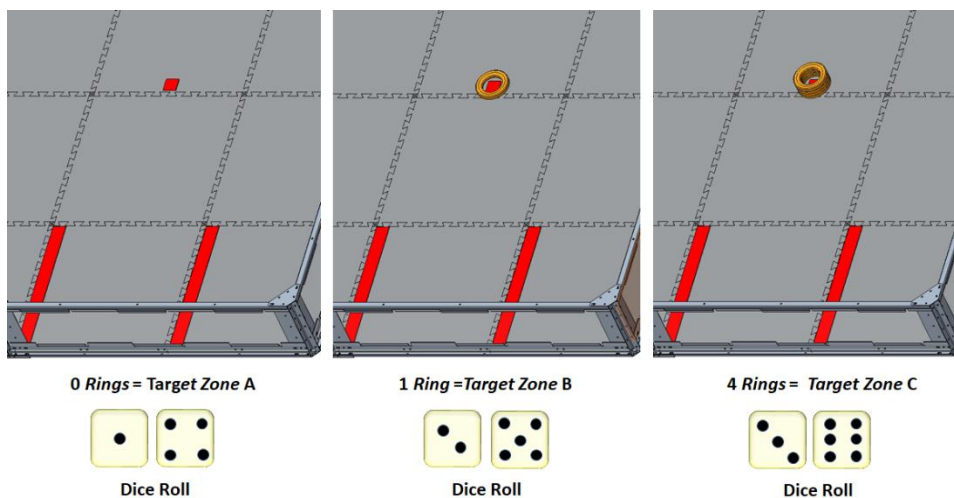


C-1 Wobble Goal



C-2 Ring

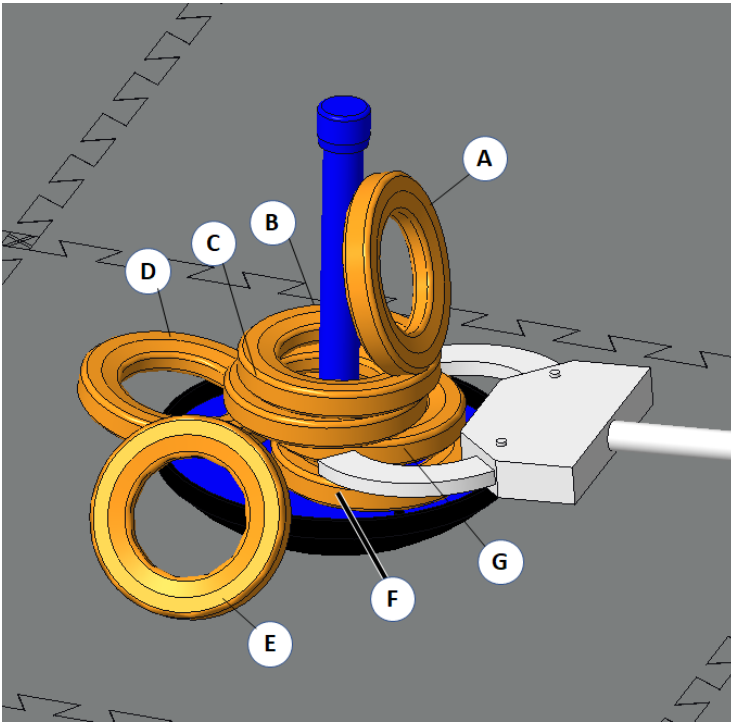
Appendix D – Starter Stack Randomization



D-1 Starter Stack Setup

Note: During setup, the *Rings* are centered on the tape squares

Appendix E – Wobble Goal Ring Scoring Examples



Ring	Points	
A	5	
B	5	
C	5	
D	5	
E	0	Not Completely Supported
F	5	
G	0	In contact with Robot

E-1 Wobble Goal Ring Scoring Examples

Appendix F – Navigation Images

Field Built With
Blue Tower Goal

Image 1
Front Wall (audience)



Image 2
Blue Drive Team Wall



Image 4
Back Wall
Blue Side Tower



Field Built With
Red Tower Goal

Image 1
Front Wall (audience)



Image 3
Red Drive Team Wall



Image 5
Back Wall
Red Side Tower



F-1 Navigation Image Locations