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2020-2021 *FIRST®* Tech Challenge

Game Manual Part 2 – Traditional Events

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Revision History			
Section	**Revision**	**Date**	**Description**
N/A	1	8/24/2020	Program Delivery Partner Limited Release
Section 4	1.1	8/31/2020	• Section 4.3 – Updated images to show correct alliance tape colors • Section 4.5.2 – Added reference to new rule <GS13> • Section 4.5.3 – Added reference to new rule <GS13> • Section 4.6.3 – Edited rule <GS12>; specific to illegal tower goal scoring • Section 4.6.3 – Added rule <GS13> - Illegal Power Shot scoring • Section 4.7 – Added end game point value for Power Shot Target • Section 4.8 – Edited <GS12> in rule summary table • Section 4.8 – Added rule <GS13> to rule summary table
Sponsors	1.1	9/12/2020	Updated Sponsor lockup
Section 4	1.2	9/12/2020	• Section 4 – Various – Changed Ultimate Goal℠ to ULTIMATE GOAL℠ • Section 4.5.2 – Added that Robots must be completely in the Launch Zone to score the Power Shot • Section 4.6.2 – Added orange box to rule <G7>

Contents

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 – Traditional Events is a resource for all *FIRST*® Tech Challenge *Teams* for information specific to the 2020-2021 season's game.

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 GOAL℠ presented by Qualcomm, the *FIRST®* Tech Challenge game for the 2020-2021 season. We recommend viewing the 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. The animation can be accessed on our website under "Videos and Promotional Materials": 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 - Traditional 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. 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 *Delivering Wobble Goals* to a randomly selected *Target Zone*, placing or *Launching Rings* into the *Tower Goal*, and *Launching Rings* to knock over *Power Shot Targets*.

The *Match* starts with a 30-second *Autonomous Period* in which *Robots* operate using only pre-programmed instructions and sensor inputs. During the *Autonomous Period*, *Alliances* earn 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*, *Alliances* earn 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, *Alliances* earn 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 Playing Field Illustrations

The following illustrations identify the *Game Elements* and give a general visual understanding of the game. *Teams* should refer to underlined andymark.com/FTC for the exact *Game Element* dimensions. The official *Playing Field* documents, including the official Field Setup Guide, are available at https://www.firstinspires.org/resource-library/ftc/game-and-season-info. Please note: *Playing Field Wall* heights are different depending on the manufacturer. *Wall* height measurements are in the official Field Setup Guide. Across the season, *Teams* may attend events that use *Playing Field Walls* from different manufacturers, please incorporate that into the design of your *Robot*.
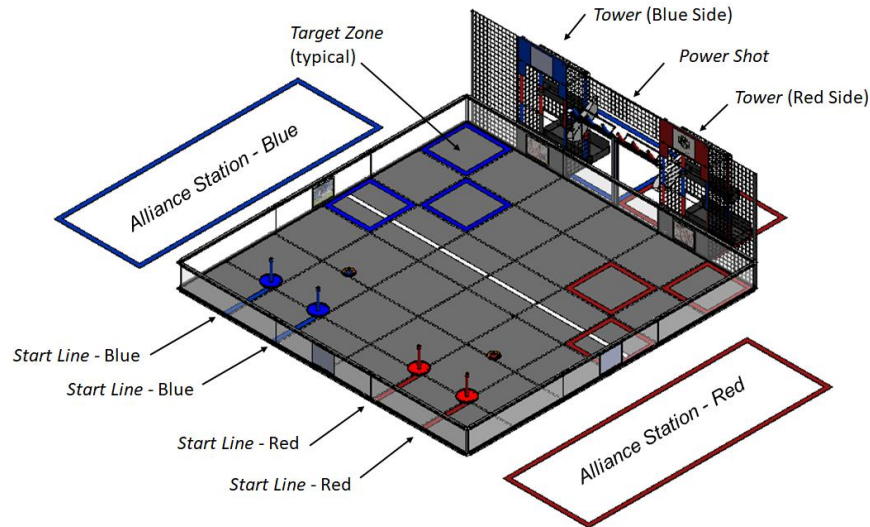

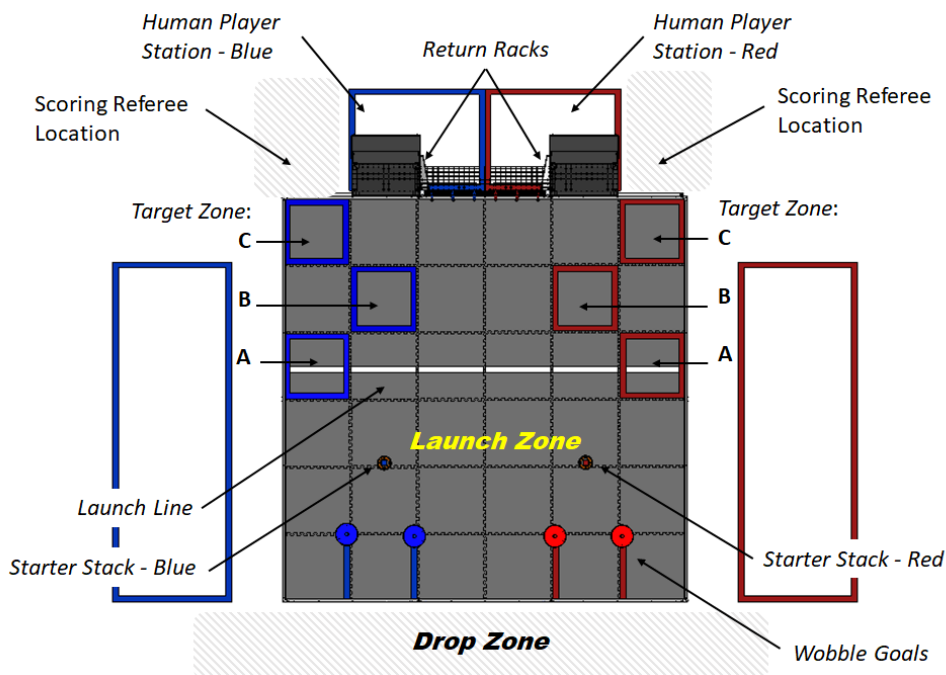**Figure 4.3-1 – Isometric view of the *Playing Field***

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

4.4 Game Definitions

The following definitions and terms are used for ULTIMATE GOAL℠ presented by Qualcomm:

Alliance – Each *FIRST* Tech Challenge *Match* consists of two, two-*Team Alliances*. These two *Teams* compete against an opposing *Alliance* (also made up of two *Teams*) to complete the game challenges and to earn the highest *Score*. For qualifying and championship tournaments with more than 20 *Teams*, the semi-final and final round *Alliances* consist of three *Teams* each. However, only two of those *Teams* compete during any one *Match*.

Alliance Neutral – Available to a *Robot* or *Human Player* from any *Alliance*.

Alliance Specific – Available only to a *Robot* or *Human Player* from a specific *Alliance* (i.e., Red or Blue *Alliance*).

Alliance Station – The designated "Red" or "Blue" *Alliance 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 Wall*). The boundary element (tape, wall, 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 *Robots* operate and react 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.

Block / Blocking – Preventing an opposing *Alliance Robot* from accessing an *Area* or *Game Element* for an extended period by obstructing ALL paths of travel to the object or *Area*. Active defense played by a *Robot* shadowing an opposing *Alliance Robot* that eliminates all paths of travel between the opposing *Alliance Robot* and an *Area* or *Alliance Specific Game Element* or all remaining *Alliance-Neutral Game Elements* is considered *Blocking*, even though at any frozen point in time there is an open path. See also *Trap / Trapping* (which may be considered the same except it is from a *Game Element* or *Area* of the *Playing Field*).

Coach – A student *Team* member or adult mentor designated as the *Drive Team* advisor during the *Match* and identified by wearing a "*Coach*" badge or identifying marker.

Competition Area – The *Area* where all the *Playing Fields, Alliance Stations,* scoring tables, on-deck queuing tables, event officials, and other tournament items relating to *Match* play are located. The *Team* Pit area and practice *Playing Fields* are not part of the *Competition Area*.

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*.

- *Herding* – 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*, *Playing Field Wall*, or *Robot* 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 or by the request of a referee. *Drive Teams* may not *Disable* a *Robot* without the permission of a Field Technical Advisor or referee. If a referee *Disables* a *Robot* during a *Match*, they may ask the *Team* to drive their *Robot* to a neutral position on the *Playing Field*, issue a stop command with the *Driver Station*, and place their *Driver Station* in a hands-off location on a tournament-provided structure or the *Alliance Station* floor.

Disqualified / Disqualification / Disqualify – A *Team* that is ineligible to compete in a *Match*. A *Team* that is *Disqualified* from a *Match* will not receive credit for the *Match* (that is, no Ranking and TieBreaker points).

Drive Team – Up to four representatives; two (2) *Drivers,* one (1) *Coach,* and one (1) *Human Player* from the same *Team*. Only one (1) *Human Player* represents an entire *Alliance* in a *Match*.

Driver – A pre-college student *Team* member responsible for operating and controlling the *Robot* and identified by wearing a tournament supplied "*Driver*" badge or identifying marker.

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

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 – Traditional Events.

Drop Zone – The *Alliance Neutral Area Outside* the *Playing Field Perimeter*, between the plane formed by the *front Playing Field Wall* and the audience, where *Robots Deliver 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*.

Game Element – Any item *Robots* or *Human Players* interact with to play the game. *Game Elements* for this year's game include: *Rings*, *Wobble Goals*, *Tower Goals*, *Power Shot Targets*, and *Return Racks*.

Human Player – A pre-college student *Team* member who supplies *Rings* to the *Playing Field,* resets *Power Shot Targets,* and is identified by wearing a tournament supplied "*Human Player*" badge or identifying marker.

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.

Interference - Interaction between opposing *Alliance Robots* that amplifies the difficulty of a *Scoring* activity. Actions that constitute *Interference* should not be considered illegal except as specified by a game rule.

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 blue *Alliance Wall* to the red *Alliance Wall* 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 Zon*e tape.

Launch Zone – The part of the *Playing Field* bounded by the Front Wall, Blue *Alliance* Wall, red *Alliance* Wall, and the *Launch Line*. The *Launch Line* is considered to be part of the *Launch Zone*.

Match – A head-to-head competition between two *Alliances*. 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.

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

Navigation Image - Five (5) unique images mounted on the *Playing Field Walls* that *Robots* can use to navigate around the *Playing Field*. One (1) image is placed below each *Tower Goal* and one (1) image is placed in the approximate center of each of the three remaining *Playing Field Walls*. 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.

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 that is identified by a referee. When a *Penalty* occurs, points will be deducted from the *Score* of the *Alliance* that incurred the *Penalty*. *Penalties* are further defined into *Minor Penalties* (ten (10) points) and *Major Penalties* (thirty (30) points). *Penalties* may also include and/or escalate to issuing of a *Yellow Card* or *Red Card* as a result of a continued occurrence of a rule violation and upon discretion of the Referee.

> **Yellow Cards and Red Cards** – In addition to rule violations explicitly listed in section 4.6, *Yellow Cards* and *Red Cards* are used in the *FIRST* Tech Challenge to manage *Team* and *Robot* behavior that does not align with the mission of *FIRST*. *Yellow* and *Red Cards* are not limited to just the *Competition Area*. *Teams* that display egregious behavior in the pit area, judging rooms, stands, or any other location of the tournament can be issued a *Yellow* or *Red Card* for egregious behavior.

> Illegal behaviors that are repeated (3 or more times), or egregious behaviors by a *Robot* or *Team* member at the tournament can result in a *Yellow* and/or *Red Card*. *Yellow Cards* are additive,

meaning that a second *Yellow Card* is automatically converted to a *Red Card*. A *Team* is issued a *Red Card* for any subsequent incident in which they receive an additional *Yellow Card*, for example, earning a second *Yellow Card* during a single *Match.*

Yellow and *Red Cards* may be issued on or off the competition field. For details please make sure to read the Tournament Rules outlined in section 4.2 of the [Game Manual Part 1](#) – Traditional Events.

Pin / Pinning – Preventing the movement in <u>all</u> directions of an opposing *Alliance Robot* while it is in contact with the *Playing Field Wall*, one or more *Game Elements*, or another *Robot*.

Playing Field – The part of the *Competition Area* that includes the 12 ft. x 12 ft. (3.66 m x 3.66 m) field and all the *Game Elements* described in the official field documents. From the audience viewpoint, the Red *Alliance Station* is on the right side of the *Playing Field*.

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 *Tiles* that make up the base of the *Playing Field.*

Playing Field Perimeter – The outside face of the *Playing Field Wall*.

Playing Field Wall – An approximate 12 inches (30.5 cm) tall, 12 ft. (3.66 m) long by 12 ft. (3.66 m) wide wall surrounding the *Playing Field Floor*. The height of the *Wall* will vary depending on which *Playing Field Wall* is being used at the event. *Robots* should be built to interact with all legal *Playing Field Walls*.

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 six (6) *Alliance Specific Targets*, three (3) red and three (3) blue. The *Targets* have two states:

- **Forward -** The *Targets are* oriented towards the field.
- **Back -** The *Targets* are oriented away from the field.

Pre-Load - A *Game Element* that a *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*.

Queuing Area – The location in the Competition *Area* where *Drive Teams*, *Robots,* and optional *Robot* carts are staged until directed by competition personnel to setup their *Robots* on a Competition *Playing Field*.

Return Rack – A *Game Element* used by the *Human Player* to introduce a *Ring* into the *Playing Field*. There is one (1) *Return Rack* for each *Alliance*.

Ring – An approximate 5-inch diameter torus-shaped, orange colored, *Alliance Neutral Scoring Element* that *Robots Launch* or place into a goal. A *Match* is played with a total of twenty (20) *Rings*.

Robot – Any mechanism that has passed *Robot* inspection and a *Drive Team* places on the *Playing Field* prior to the start of a *Match*. A detailed definition of *Robot* is in the *Robot* rules section in the Game Manual Part 1 – Traditional Events.

Scoring / Score – *Robots* earn points for their *Alliance* by interacting with *Scoring Elements* and *Parking* in specific *Areas* of the *Playing Field*. *Scoring Elements* still in contact with *Robots* of the corresponding *Alliance* have zero *Score* value, unless stated otherwise in Sections 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 a*chievement 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 *Robots* manipulate to earn points for their *Alliance*. The *Scoring Elements* for ULTIMATE GOAL℠ 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 *Alliance Specific* (red or blue) colored gaffer tape where *Robots* are 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. Z*ero (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 *Robots Deliver Wobble Goals*. There are three *Target Zone Goals* for each *Alliance*. Each *Zone* is indicated by red or blue gaffer tape around the inside perimeter of a *Tile*.

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, 36 of which make up the *Playing Field Floor*.

Tower Goal – A *Playing Field* element containing three vertically stacked *Alliance Specific* goals named the *Low, Mid,* and *High Goals*. ULTIMATE GOAL℠ is played with two (2) *Tower Goals*. *Alliance* goal ownership is shown in the table below:

Tower Closest to the Blue *Alliance Station*	Tower Closest to the Red *Alliance Station*
Low Goal – Blue *Alliance*	*Low Goal* – Red *Alliance*
Mid Goal – Red *Alliance*	*Mid Goal* – Blue *Alliance*
High Goal – Blue *Alliance*	*High Goal* – Red *Alliance*

Trap / Trapping – Preventing an opposing *Alliance Robot* from escaping a constrained *Area* of the *Playing Field* or from a *Game Element* for an extended period of time by obstructing all paths of travel from the object or *Area*. See also *Block / Blocking* (which may be considered the same except it is accessing a *Game Element* or *Area* of the *Playing Field*).

Wobble Goal – A moveable *Goal* for *Scoring Rings* and a location-based *Scoring Element*. There are two (2) Red *Alliance* and two (2) Blue *Alliance Wobble Goals*.

4.5 Gameplay

Prior to the start of the *Match*, *Drive Teams* perform 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*. When the *Match* is over and referees signal, *Drive Teams* collect their *Robots*, return *Possessed Game Elements* to the *Playing Field*, and exit the *Competition Area*.

4.5.1 Pre-Match

Field personnel set up the *Playing Field* as depicted in Figure 4.3-1. The four *Wobble Goals* are placed adjacent to their corresponding *Alliance Specific Start Lines* and a stack of four (4) *Rings* is placed on the *Playing Field Floor at* each *Alliance's Starter Stack Area*.

Prior to setting up on the *Playing Field*, the *Alliance* partner *Teams* decide which *Team* of their *Alliance* participating in the *Match* supplies the *Human Player*. Only one *Human Player* for an *Alliance* may come to the *Playing Field* from the *Queuing Area*.

Drive Teams set up their *Robots* on the *Playing Field* with the following required constraints:

1) **Starting Location** - *Drive Teams,* with the concurrence of their *Alliance* partner, select their *Robots'* starting locations.

   a) *Drive Teams* must place their *Robots,* in any orientation, *Completely Inside* the *Playing Field Perimeter.*

   b) The *Robot* must touch the front facing (i.e. closest to the audience) *Playing Field Wall.*

   c) A *Robot* must be *Parked In* their *Alliance Specific Start Line*. Only one (1) *Robot* per *Start Line.*

2) **Robot Contact** - A *Robot may not* contact another *Robot* or anything *Pre-Loaded* onto another *Robot*.

3) ***Wobble Goal*** -

   a) A *Robot* is required to *Pre-Load* exactly one (1) of their respective *Alliance Specific Wobble Goals*. *Drive Teams* may move the *Wobble Goals* from their initial *Field Set-up* position.

   b) A *Robot* may not touch an opposing *Alliance's Wobble Goal*.

4) ***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 *Alliance's Low Goal* for the *Human Player* to use during the *Driver-Controlled Period*. *Rings* cannot be loaded onto the *Wobble Goal*.

5) **Op Mode** – *Drive Teams* use 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.

Drive Teams may position themselves anywhere *In* their *Alliance Station*. When the *Robots* and *Drive Teams* are in position, the *Human Player* must also be *In* their *Human Player Station* and stay there for the remainder of the *Match*.

Once the referees give the set-up complete signal:

1) *Drive Teams* may no longer touch their *Robots* until the conclusion of the *Match*.

2) *Drive Teams* may not touch their *Driver Stations* or Controllers until the *Autonomous Period* has ended, except to initialize and/or start their *Autonomous* program using the *Driver Station* Android device screen. *Robots* that require *Autonomous* program initialization to satisfy the *Robot* starting size constraint must be initialized before referees give 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 respective *Alliance's Low Goal.*

4.5.2 Autonomous Period
The *Match* starts with a thirty-second *Autonomous Period* where *Robots* are operated via pre-programmed instructions only. *Teams* are 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 *Robots*. The only exception is to allow *Drive Teams* to start their *Robot* with "init" and/or "start" commands issued on the *Driver Station* Android device. *Teams* must use the built-in thirty-second timer.

Following a countdown by field personnel, the *Autonomous Period* begins. *Drive Teams* 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* and/or *Alliance* to a *Penalty* as specified in the game rules in section 4.6.2. *Drive Teams* are not required to start executing an *Op Mode* during the *Autonomous Period*.

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

*Autonomous p*oints 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 *Alliance Target Zone* (as identified by the size of the *Starter Stack)* for the corresponding *Alliance* earns fifteen (15) points.

2) **Robot Navigating** – Each *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 for the *Alliance* corresponding to the goal, regardless of which *Alliance Robot Scores* the *Ring*. Stuck *Rings* removed from *Inside* a *Tower Goal* by the *Human Player* or referee 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's* location 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* into the *High Goal* by a *Robot* 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 a *Launched Ring* earns points for the *Alliance* corresponding to the *Power Shot Target*. 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 for the corresponding *Alliance*.

b) *Power Shot Targets* can be *Scored* in any sequence.

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

d) *A Power Shot Target* knocked *Down* by an *Opposing Alliance Robot* by any means counts as *Scored*. For example, if a *Blue Alliance Robot* knocks *Down* a *Red Alliance Power Shot Target*, the *Red Power Shot Target* counts as *Scored* for the *Red Alliance*

> 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*, *Drive Teams* have five (5) seconds plus a "3-2-1-go" countdown to prepare their *Driver Stations* for the start of the *Driver-Controlled Period*. On the countdown word "go," the *Driver-Controlled Period* starts, and *Drive Teams* press their *Driver Station* start button to resume playing the *Match*.

During the *Driver-Controlled Period*, *Human Players* are expected to return *Rings* to the *Playing Field* via the *Return Racks* and reset *Scored Power Shot Targets* for their corresponding *Alliance* 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. Each *Ring* that enters *the Low, Mid, or High Goal* earns points for the *Alliance* corresponding to the goal regardless of which *Alliance Robot Scores* the *Ring*. *Robots* are allowed to *Score Rings* in any *Tower Goal*. Stuck *Rings* removed from *Inside* a *Tower Goal* by the *Human Player* or referee 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 *Alliance* 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 for the *Alliance* corresponding to the goal. The *Scoring Robot's* location can be anywhere *Inside* the *Playing Field*.

2) ***Mid Goal*** - Each *Ring Launched* into the *Mid Goal* by a *Robot* into the *Mid Goal* earns four (4) points. The *Scoring Robot* must be *Completely In* the *Launch Zone*.

3) **High Goal** - Each *Ring Launched* into the *High Goal* by a *Robot* 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** – A *Wobble Goal In* the *Start Line* for the corresponding *Alliance* at the *End of the Match* earns five (5) points for the *Alliance* corresponding to the *Wobble Goal*. To earn the points, t*he Wobble Goal must break the vertical plane of any side of the Start Line.*

   b) **Drop Zone** - A *Wobble Goal Supported* by the *Drop Zone* at the *End of the Match* earns twenty (20) points for the *Alliance* corresponding to the goal. 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 *Robots Deliver* 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 for the goal's *Alliance*. 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 a *Ring Launched* from a *Robot* located *Completely In* the Launch Zone is *Scored* for the *Alliance* corresponding to the *Power Shot Target.*

   a) Each *Scored Power Shot Target* earns fifteen (15) points for the corresponding *Alliance*.

   b) *Power Shot Targets* that start the *End Game* already *Back* are not eligible to be *Scored. Human Players* have a 10 second grace period following the start of *End Game* to reset the *Targets.*

   c) *Power Shot Targets* are allowed to be *Scored* in any sequence.

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

   e) *A Power Shot Target* knocked *Back* by an *Opposing Alliance Robot* by any means counts as *Scored.* For example, if a *Blue Alliance Robot* knocks *Back* a *Red Alliance Power Shot Target,* the *Red Power Shot Target* counts as *Scored* for the *Red Alliance.*

4.5.5 Post Match

After the *Match*, field personnel will finalize the *Score*. Referees will signal for the *Drive Teams* to enter the *Playing Field* and retrieve their *Robots. Drive Teams* 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 *Alliance'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.
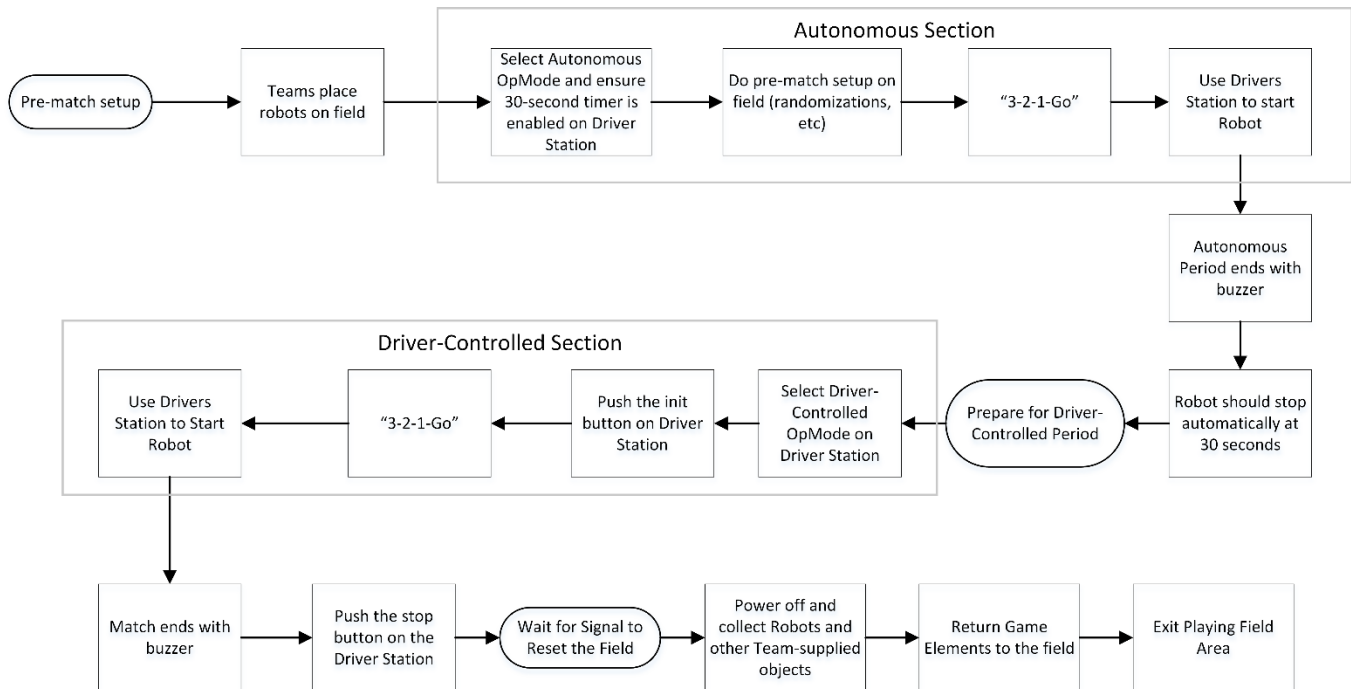
4.6 Rules of Gameplay
Gameplay is restricted by the Safety rules (<S#>), the General rules (<G#>), and the Game-Specific rules (<GS#>). Other rules to pay close attention to are the *Robot* rules, the inspection rules, and the tournament rules defined in the Game Manual Part 1 – Traditional Events. Violation of rules may lead to *Penalties*, *Yellow Cards* and/or *Red Cards*, a *Disabled Robot*, *Disqualification* of the offending *Team* and/or *Alliance* from either a *Match* or the tournament. 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.

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* or another *Robot*, by the determination of the referees, the offending *Robot* may be *Disabled,* and the *Team* may be issued a *Yellow Card*. Re-inspection of the *Robot* is required before it may play another *Match*. Damage that requires significant repair and/or delays subsequent *Match* play is likely to escalate to a *Red Card.*

<S2> *Robot* Extension *Outside* the *Playing Field Perimeter* – If any portion of the *Robot* contacts anything *Outside* the *Playing Field Perimeter,* the *Team* will be issued a *Yellow Card* and it may be *Disabled* immediately for the remainder of the *Match*, unless allowed by Game-Specific rule(s) listed in section 4.6.3. See the game definitions in section 4.4 for a complete description of the *Playing Field Perimeter*.

> The intent of this rule is not to *Penalize* an *Alliance* for *Inadvertent,* safe *Robot* extension *Outside* the *Playing Field Perimeter*. 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 – All members of the *Drive Team* are required to wear approved eye protection and shoes with closed-toes and a closed-back. If any member of the *Drive Team* is not wearing these safety items, the referee will issue a warning to the *Team* member(s) and if the situation is not remedied within thirty seconds, the offending member(s) of the *Drive Team* must leave the *Competition Area* for the remainder of the *Match* and may not be replaced by another *Team* member. Failure to comply with a request to leave the *Competition Area* violates rule <G30>. Repeated *Team* member violations during the tournament will escalate to a *Team* warning. Following the *Team* warning, subsequent violations by any member of the *Team* will result in a *Minor Penalty* for the *Alliance*.

4.6.2 General Game Rules

<G1> *Autonomous* to *Driver-Controlled Period* Transition – At the conclusion of the *Autonomous Period, Robots* will remain in a hands-off state. Field personnel will not enter the field and will not touch *Robots* 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.

<G3> Forcing an Opponent to Break a Rule – The actions of an *Alliance* or their *Robots* shall not cause an opposing *Alliance* or *Robot* to break a rule and thus incur *Penalties*. Any forced rule violations committed by the affected *Alliance* shall be excused, and no *Penalties* will be assigned.

<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* – *Robots* 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 - If a referee *Disables* a *Robot*, it will not be eligible to *Score* or earn points for the remainder of the *Match*. A *Disabled Robot* (whether referee induced or failure) does not earn *Penalties*

after becoming *Disabled*. Game-Specific rule(s) listed in section 4.6.3 take precedence over this general game rule.

<G7> *Playing Field* **Tolerances** – Tournament provided *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.

> *Playing Field* 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** – *Matches* are replayed at the discretion of the Head Referee only for a failure of a non-*Team* supplied *Game* or *Field Element,* or verified Wi-Fi interference that was likely to have impacted which *Alliance* won the *Match*.

Unexpected *Robot* behavior will not result in a *Match* replay. *Team*-induced failures, such as low battery conditions, processor sleep time-outs, *Robot* mechanical, electrical, software, or communication failures, etc. are NOT valid justifications for a replaying of a *Match*.

<G9> *Inadvertent* **and** *Inconsequential* - *Robot* actions that violate a rule may be ruled at the referee's discretion to be *Inconsequential* and *Inadvertent,* and will not be *Penalized*.

<G10> *Scoring Elements* **in Contact with** *Robots* – *Scoring Elements* in a *Scoring Area* that are in contact with or *Controlled* by a *Robot* on the corresponding *Alliance* 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* – Each *Drive Team* shall include up to two *Drivers,* one *Coach, and one Human Player* (however only one *Human Player* may represent an *Alliance*). Electronic communications (cell phone, two-way radio, Wi-Fi, Bluetooth, etc.) by *Drive Team* members after an *Alliance* has been called from the queue to the *Playing Field* for its *Match* are not allowed. The first instance of violating this rule will result in a warning, with any following instances during the tournament resulting in a *Minor Penalty*. Items that may be mistaken by a casual observer as being in violation should not be brought to the *Playing Field*. The *Driver Station* is exempt from this rule but must be used only for operating the *Robot*.

<G12> *Playing Field Access* - *Team* members cannot enter the *Playing Field* for any reason other than to place/retrieve their *Robots*. While placing or retrieving their *Robots*, *Teams* may not measure, test, adjust, or verify *Scoring* of *Game Elements*.

The consequences for violating this rule are:

   a) *Minor Penalty* for violation of this rule during *Match* setup or following the *End of the Match*.

   b) *Major Penalty* for violations of this rule that delay the start of the *Match*.

   c) Violations of this rule outside of normal *Match* play result in a *Yellow Card.*

> If a *Team* feels the *Playing Field* is not set up correctly, *Teams* should notify a Referee or Field Technical Advisor prior to the start of the *Match*.

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

a) During the Qualification *Matches*, the blue *Alliance Robots* are set up on the *Playing Field* first, unless the red *Alliance* waives their right to set up on the *Playing Field* second.

b) During *the* Elimination *Matches*, the 3rd and 4th seeded *Alliance Robots* are set up on the *Playing Field* first, unless the higher seeded *Alliance* waives their right to set up on the *Playing Field* second. *Alliance* color doesn't change the seeding of a *Team* during the Elimination *Matches*. If the 4th seed defeats the 1st seed in the Semi-Finals, they will still have to place their *Robot* on the field first in the finals because their seeding will be lower than the 2nd or 3rd seed.

c) During Elimination *Matches*, 3 *Team Alliances* may only place *Robots* that are intended to compete in that *Match*. Once two *Robots* are placed for the two *Teams* competing in a *Match*, the *Alliance* cannot swap in the 3rd *Alliance's Robot* for a *Robot* already placed.

d) *Teams* may implicitly waive their right to place their *Robots* on the *Playing Field* last by placing their *Robots* on the *Playing Field* before or with the opposing *Alliance*. There is no need to tell the referees; *Teams* waive their right by the act of placing their *Robots* on the *Playing Field*.

e) *Teams* that unnecessarily delay the beginning of a *Match* and/or field reset will incur a *Minor Penalty* for each offense. Significant delays may escalate to a *Major Penalty* at the discretion of the head referee.

> *Drive Teams* are expected to stage their *Robots* for a *Match*, and remove it 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:
>
> - Late arrival to the *Playing Field.*
> - *Robot* maintenance once on the *Playing Field.*

<G14> *Robot* **Starting Volume** – Before the start of a *Match*, each *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. In place of a delay of game *Penalty*, an offending *Robot* will be removed from the *Playing Field*. The *Team* remains eligible to earn *Ranking* and *TieBreaker Points* if a member of the *Drive Team* is in their *Alliance Station* during the *Match*.

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** – *Teams* may align their *Robots* 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 and Human Player Stations* – During a *Match*, the *Drivers*, *Coaches, and Human Players* 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) Opposing *Alliances' Drive Team* members on the same side of the *Field* cannot distract and/or *Interfere* with each other nor the off-field *Scoring Elements*. Violation of this rule will result in an immediate *Major Penalty* and a possible *Yellow Card*.

c) *Drive Teams* may be anywhere in their respective *Alliance* and *Human Player Stations*. *Human Players* 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*.

<G17> Post-*Match* Removal of *Robots* – *Robots* must be designed to permit easy removal of *Game Elements* from the *Robot* after the *Match*. *Robots* 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 a Referee.
> 2) Failing to remove *Driver Stations* in a timely manner.

<G18> Starting Gameplay Early – *Robots* that start playing the game (*Autonomous* or *Driver-Controlled Period)* prior to the start of a *Match Period* receive a *Minor Penalty*. Referees have the option of issuing a *Major Penalty* in place of the *Minor Penalty* if the early start results in a competitive advantage for the offending *Alliance*.

<G19> Late Start of the *Autonomous Period* – *Teams* participating in the *Autonomous Period* are 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. Referees have the option of issuing a *Major Penalty* in place of the *Minor Penalty* if the late start results in a competitive advantage for the offending *Alliance*.

<G20> Parked at End of the *Period* – *Robots* must *Park* at the *End of the Autonomous* and *Driver-Controlled Periods*. *Drive Teams* should make their best effort to stop gameplay immediately when the *End of the Period* game sound begins. *Robots* that are not *Parked* at the <u>conclusion</u> of the game sound receive a *Minor Penalty* and the actions of the *Robot* do not count towards their *Alliance's Score*. Referees have the option of issuing a *Major Penalty* in place of the *Minor Penalty* if the late stop results in a competitive advantage (other than *Scoring*) for the offending *Alliance*.

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*, *Drive Teams* may not directly or indirectly control or interact with *Robots* or *Driver Stations*. 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*, any *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 during the tournament resulting in a *Minor Penalty*. Contact that affects *Scoring* and/or gameplay will result in issuance of a *Yellow Card* at the discretion of the referees. 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*, *Robots* 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 during the tournament resulting in a *Major Penalty.* During the *Driver-Controlled Period*, *Drive Team Coaches* 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> *Robots* **Deliberately Detaching Parts** – *Robots* 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* if it does not *Block* an opposing *Alliance Robot, Alliance-*specific *Scoring Element* or *Scoring Area*. If a deliberately detached component or mechanism affects gameplay by any *Robot*, the offending *Robot* will receive a *Major Penalty* and will be issued a *Yellow Card. 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> *Robots* **Grasping** *Game Elements* – *Robots* may not grab, grasp and/or attach to any *Game Element*, *Robot,* 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 *Robots* or *Game Elements* are not in the spirit of the *FIRST* Tech Challenge and are not allowed unless permitted by Game-Specific rules. However, *FIRST* Tech Challenge games are highly interactive. *Robot*-to-*Robot* contact and defensive gameplay should be expected. 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 offending *Team* will receive a *Major Penalty* and a *Yellow Card.*

<G27> **Removing** *Game Elements* **from the** *Playing Field* – *Robots* 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*. *Teams* deliberately removing *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.

<G28> *Pinning, Trapping,* or *Blocking Robots* – A *Robot* may not cause an opposing *Alliance Robot* to become *Pinned, Trapped,* or *Blocked*. If a referee determines this rule is violated, the offending *Alliance* will receive a *Minor Penalty* for every five seconds that they are in violation. If a referee declares *a Pinning, Trapping,* or *Blocking* violation during the *Match,* the offending *Robot* must immediately move away at least 3 feet (0.9 m), approximately 1.5 floor *Tiles*, from the *Pinned, Trapped, or Blocked Robot.*

A *Robot* cannot incur this type of *Penalty* during the *Autonomous Period* unless it is determined by the *Referee* to be part of a deliberate strategy and will be penalized as described above. If the violation happens during the *Autonomous Period*, the first action done by the offending *Robot* during the *Driver-Controlled Period* must be to move away from the *Pinned, Trapped,* or *Blocked Robot* or a *Minor Penalty* will be assessed immediately and again for every five-seconds that they are in violation. Game-Specific rule(s) listed in section 4.6.3 that further define *Pinning, Trapping, or Blocking* take precedence over this general game rule.

> The intent of this rule is that *Drive Teams* begin to immediately move their *Robots* away and have a five second grace period to move the required distance. The grace period is not permission to intentionally *Block* for up to five seconds.

<G29> Illegal Usage of *Game Elements* - *Robots* 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. Continued violations of this rule will escalate to *Yellow Cards* quickly.

<G30> Egregious Behavior – Egregious *Robot* or *Team* member behavior at the *Playing Field*, as determined by the referees, will result in a *Major Penalty* and issuance of a *Yellow Card* and/or *Red Card*. Subsequent violations will result in *Team Disqualification* from the tournament. Egregious behavior includes, but is not limited to, repeated and/or flagrant violation of game rules, unsafe behavior or actions, and uncivil behavior towards *Drive Team,* competition personnel, or event attendees.

4.6.3 Game-Specific Rules
<GS1> *Robot* extension outside the *Playing Field Perimeter* – *Robots* may safely extend outside the *Playing Field Perimeter* for *Scoring Rings* in the *Low Tower Goal* (back wall) and during the *End Game* for *Scoring* a *Wobble Goal* in the *Drop Zone* (front wall*)*. All other extensions outside the *Playing Field Perimeter* 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 *Alliance's Return Rack,* and resetting *Power Shot Targets*.

<GS3> Grasping *Scoring Elements* – *Robots* 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 referee 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) *Human Players* may only introduce *Rings* into the *Playing Field* using their corresponding *Alliance's Return Rack*. *Drive Teams* may not bring tools or devices to the *Playing Field* for handling *Rings*. Accommodations and exceptions for *Human Players* with disabilities or extenuating circumstances will be made at the discretion of the event coordinator.

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 to prevent *Alliances* from gaining a strategic advantage. *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 Perimeter*.

e) The *Human Player* is allowed to reach into the *Tower Goal* to retrieve stuck *Rings* when all *Robots* are *at least one (1) Tile away from* the affected *Tower Goal*. A *Disabled Robot* in the vicinity does not prevent *Human Player* retrieval of a stuck *Ring*.

f) The *Human Player* may hold more than one *Ring* at a time.

g) The *Human Player* may use a tournament provided tool to remove *Rings* that are stuck in the *Return Rack.*

<GS5> *Drive Teams* Touching *Robots* or *Driver Stations* after *Starter Stack* Randomization – *Drive Teams* are not allowed to touch or interact with their *Robots* or *Driver Station* once field personnel have begun the randomization process. If this occurs, a *Minor Penalty* will be assessed, and the offending *Robot* is not eligible to earn the *Wobble Goal Delivery Score* in the *Autonomous Period*. This *Penalty* only affects the offending *Team*. The non-offending *Alliance* partner *Robot* remains eligible for the *Wobble Goal Delivery Scoring* achievement.

<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, defense) 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. Continued violation of this rule will escalate to *Yellow Cards* quickly.

    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. Strategies for *Controlling Rings* that deny all access by other *Robots* are not allowed. Violation of this *Rule* will escalate to a *Major Penalty* and potential *Yellow Card* on reoccurrence during the competition.

    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 accidently *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. Continued violation of this rule will escalate to *Yellow Cards* quickly.

<GS7> Launching of Game Elements –

1) **Rings** – *Robots* may *Launch Rings* during any *Match Period*. Any *Ring Launched* over a *Playing Field Wall* that is not the *Tower Goal Playing Field Wall* will receive a *Minor Penalty* per *Ring.*

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

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.

<GS8> Autonomous Interference - *Robots* may not *Interfere* with the opposing *Alliance's Scoring* attempts or with the opposing *Alliance's Starter Stack Area* during the *Autonomous Period.* A *Major Penalty* will be assessed for each occurrence.

<GS9> Wobble Goal Constraints -
A *Major Penalty* will be assessed for each of the following circumstances:

a) *Robots* may not *Interfere* with or *Control* an opposing *Alliance's Wobble Goal* that is *Completely In* any of its corresponding *Alliance's Target Zones.*

b) *Robots* are not allowed to *De-score* an opposing *Alliance's Wobble Goal* during the *End Game.*

c) *Robots* are not allowed to *Block* access to an opposing *Alliance's Wobble Goal* during the *End Game.*

d) *Robots* may not *Interfere* with an opposing *Alliance's* attempt to place a *Wobble Goal* in the *Drop Zone* when the opposing *Alliance's Robot* is within one (1) *Tile* of the *Front Wall* during the *End Game.*

A *Minor Penalty* will be assessed for each of the following circumstances:

e) *Robots* are not allowed to *De-score Rings* from an opposing *Alliance's Wobble Goal* during the *End Game.* A *Penalty* will be applied for each *Ring* that is *De-scored.*

f) *Robots* may not place *Rings* onto *Wobble Goals* except during the *End Game.* A *Penalty* will be assessed for each *Ring.* Strategies aimed at hoarding *Rings* prior to *End Game* will be addressed per Rule <G30>.

Inconsequential contact with an opposing *Alliance's Wobble Goal* will not be *Penalized.*

<GS10> Ring Interference - A *Robot* may not interfere with an opposing *Alliance's Launched Ring* that is at least 18 inches (45.7 cm) above the *Playing Field Floor* and was *Launched* with the intent of *Scoring.* A *Major Penalty* will be assessed for each occurrence. Continued violations will escalate to *Yellow Cards* quickly.

<GS11> Tower *Goal Interference* - A *Robot* may not prevent access to an opposing *Alliance's Tower Low Goal.* An immediate *Major Penalty* will be assessed for each occurrence. Continued violations will escalate to a *Yellow Card* quickly.

> The intent of this rule is to prevent goaltending in front of the *Low Goal*

<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.*

<G13> Illegal *Power Shot Scoring –* 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.) 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*
Wobble Goals Delivered (each) • *Target Zone* • *Start Line* • *Drop Zone*	15 - -	- - -	- 5 20	4.5.2.1 4.5.4.1	*End of Period*
Robot Navigating (each)	5	-	-	4.5.2.2	*End of Period*
Rings Scored In Tower Goal (each) • Low • Mid • High	3 6 12	2 4 6		4.5.2.3 4.5.3	*Scored Live*
Power Shot • *Target* moved from *Forward* to *Back* (each)	15	-	15	4.5.2.4 4.5.4.3	*Scored at Rest*
Wobble Goal Rings (each)	-	-	5	4.5.4.2	*End of Period*

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	Card Issued
Safety Rules						
<S1>	Unsafe *Robot* or Damage to the *Playing Field*.	*Disable* if unsafe operation is likely to persist. Optional *Yellow Card.* Significant damage and/or delays may escalate to *Red Card.*	D*			YC* RC*
<S2>	*C*ontact *Outside* the *Playing Field*.	Immediate *Yellow Card and* Optional *Disable* unless allowed by rule*.*	D*			YC
<S3>	*Drive Team* missing safety gear.	Warning and if not resolved within 30 seconds, the offending member(s) of the *Drive Team* must leave the *Competition Area* and may not be replaced.	W^T+	Per occurrence following *Team* Warning		
General Rules – Further definitions, no *Penalties* earned						
<G1>	*Autonomous* to *Driver-Controlled Period* transition					
<G2>	Certifying the *Score* at *End of Match*					
<G3>	Forcing an opponent to break a rule					
<G4>	*Scoring Elements* that are part of the *Robot*					
<G5>	*Scoring Elements* in two or more areas					
<G6>	*Disabled Robot* eligibility					
<G7>	*Playing Field* Tolerances					
<G8>	*Match* Replay					
<G9>	*Inadvertent* and *Inconsequential*					
<G10>	*Scoring Elements* in contact with *Robots.*	Points are not earned for any *Scoring Elements* in a *Scoring Area* in contact with *Robots* of the corresponding *Alliance.*				

Rule #	Rule	Consequence	Warning Disable	Minor Penalty	Major Penalty	Card Issued
General Rules – Pre-match *Penalties*						
<G11>	*Drive Team* using disallowed electronic communication	Warning followed by a *Minor Penalty.*	W^T	1x		
<G12>	Measure, test, or adjust *Game Elements. Playing Field* inspection to determine *Score*	*Minor Penalty* for pre-*Match* or post-*Match* violations. *Major Penalty* if delay start of *Match. Yellow Card* if outside of normal *Match* play.		1x	1x	YC
<G13>	*Pre-Match Robot* placement.	*Minor Penalty* if *Teams* delay the start of a *Match.*		1x	1x*	
<G14>	*Robot* starting volume.	*Robot* is removed from the *Playing Field.*				
<G15>	*Robot* setup alignment devices/*Match* Delay.	*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		
<G16>b	*Drive Teams* distracting and/or interfering with each other or the off-*Field Scoring Elements*.	Immediate *Major Penalty* and a possible *Yellow Card.*			1x	YC*
<G17>	Delay caused by the removal of *Robots* from the *Playing Field* and *Game Elements* from *Robots*.	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 for the offending *Alliance*.		1x	1x*	

Rule #	Rule	Consequence	Warning Disable	Minor Penalty	Major Penalty	Card Issued
<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 for the offending *Alliance.*		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 *Alliance's Score*. *Major Penalty* if the late stop results in a competitive advantage for the offending *Alliance.*		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*. Optional *Yellow Card* if contact affects *Scoring* and/or gameplay.	W^T	1x		YC*
<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>	*Robots* deliberately detaching parts.	*Minor Penalty. Major Penalty* and a *Yellow Card* if it affects gameplay.		1x	1x	YC
<G25>	*Robots* 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* and a *Yellow Card.*			1x	YC
<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*	*Card Issued*
<G28>	*Pinning, Trapping, or Blocking* for more than 5-seconds in the *Driver-Controlled Period.*	*Minor Penalty* for every five seconds the *Robot* violates this rule.		1x+		
<G29>	Illegal Use of *Game Elements* to ease or amplify *Scoring.*	*Major Penalty* will be assessed with any following instances resulting in a *Yellow Card.*			1x	YC
<G30>	Egregious behavior.	*Major Penalty* plus a *Yellow* and/or *Red Card.* Possible *Match Disqualification.* Subsequent violations result in *Team Disqualification* for the tournament.			1x	YC RC DQ
Game-Specific Rules – Further definitions, no *Penalties* earned						
<GS1>	*Robot* extension outside *Playing Field.*					
<GS2>	*Human Player Station* movement.					
<GS3>	*Grasping Scoring Elements.*					
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 *Robots* or *Driver Stations* after Randomization.	A *Minor Penalty* will be assessed, and the affected *Robot* is not eligible to earn the *Wobble Goal Delivery Score.*		1x		

Rule #	Rule	Consequence	Warning Disable	Minor Penalty	Major Penalty	Card Issued
<GS6>1	*Control/Possession* Limits for *Rings*.	a) Immediate *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. Escalates to a *Yellow Card* quickly. b) *Minor Penalty* for *Controlling* or *Possessing* a *Ring* before it has been *Supported* by the *Playing Field Floor*. Escalates to a *Major Penalty* and potential *Yellow Card* on reoccurrence during the competition.		1x+	1x	YC*
<GS6>2	*Control/Possession* Limits for *Wobble Goals.*	a) *Minor Penalty* per excess *Wobble Goal* plus a *Minor Penalty* for each excess *Wobble Goal* every five seconds. b) *Major Penalty* for each *Wobble Goal Scored* while in violation. Escalates to a *Yellow Card* quickly.		1x+	1x	YC*
<GS7>	*Launching Game Elements*	1) *Launching Ring* over front or side *Playing Field Wall.* 2) *Launching Wobble Goal.*		1x per *Ring*	1x plus no *Score* per *Wobble Goal* for that period	
<GS8>	*Autonomous Period Interference*	A *Major Penalty* will be assessed for each occurrence.			1x	
<GS9>	*Wobble Goal Constraints*	a) – d) A *Major Penalty* will be assessed for each occurrence. e) - f) A *Minor Penalty* will be assessed for each occurrence.		1x	1x	
<GS10>	*Ring Interference*	A *Major Penalty* for each interfered *Ring*, escalating to *Yellow Cards* quickly.			1x	YC

Rule #	Rule	Consequence	Warning Disable	Minor Penalty	Major Penalty	Card Issued
<GS11>	*Tower Goal Interference*	Immediate *Major Penalty*, escalating to a *Yellow Card* quickly.			1x	YC
<GS12>	Illegal *Tower Goal Scoring*	*Major Penalty* per *Ring.*			1x	
<GS13>	Illegal *Power Shot Scoring*	*Major Penalty* per *Power Shot Target*			1x	

Table Key	
W: Warning	W^T: Tournament Warning
D: *Robot Disabled*	1x: *Penalty* at single cost
YC: *Yellow Card* issued	1x+: *Penalty* at single cost every 5 seconds
RC: *Red Card* issued	2x: *Penalty* at double cost
DQ: *Disqualification*	* 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

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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.
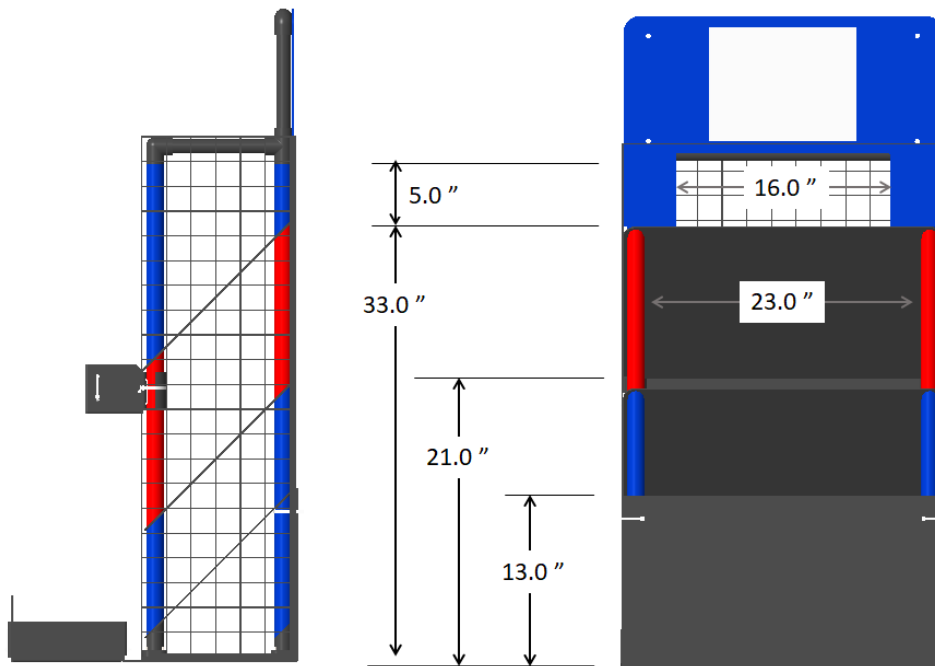
Feedback

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!
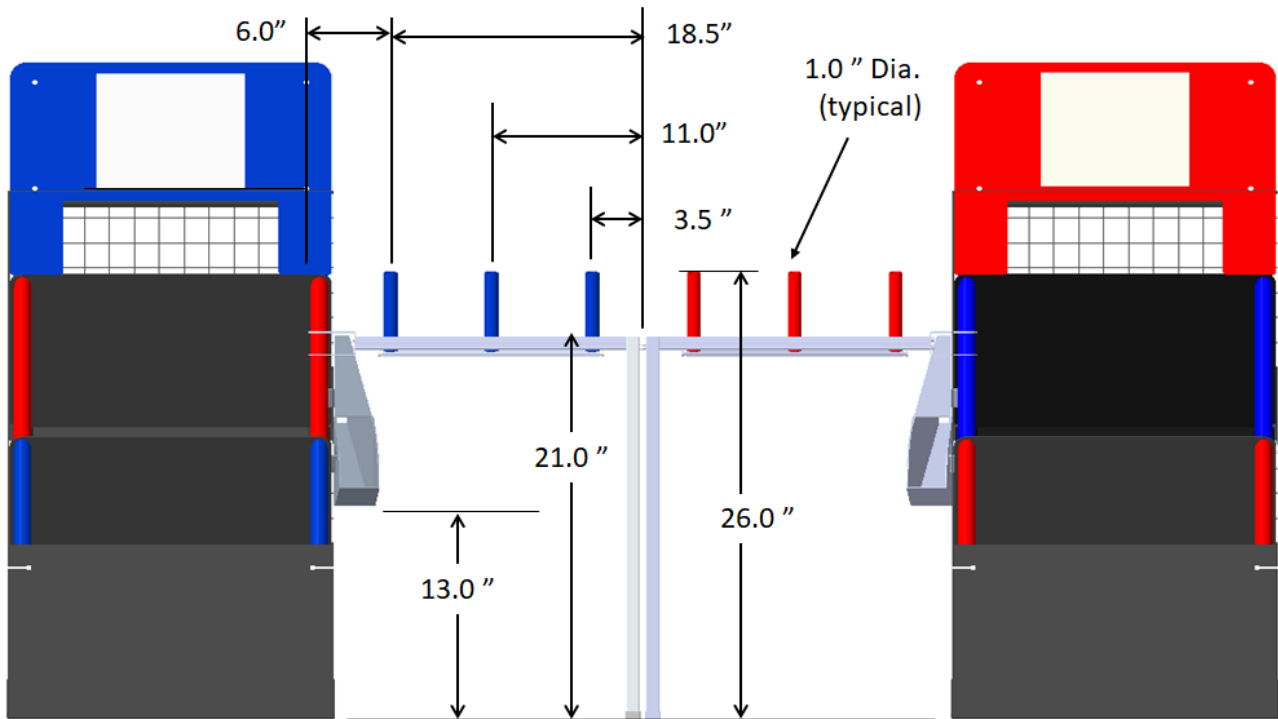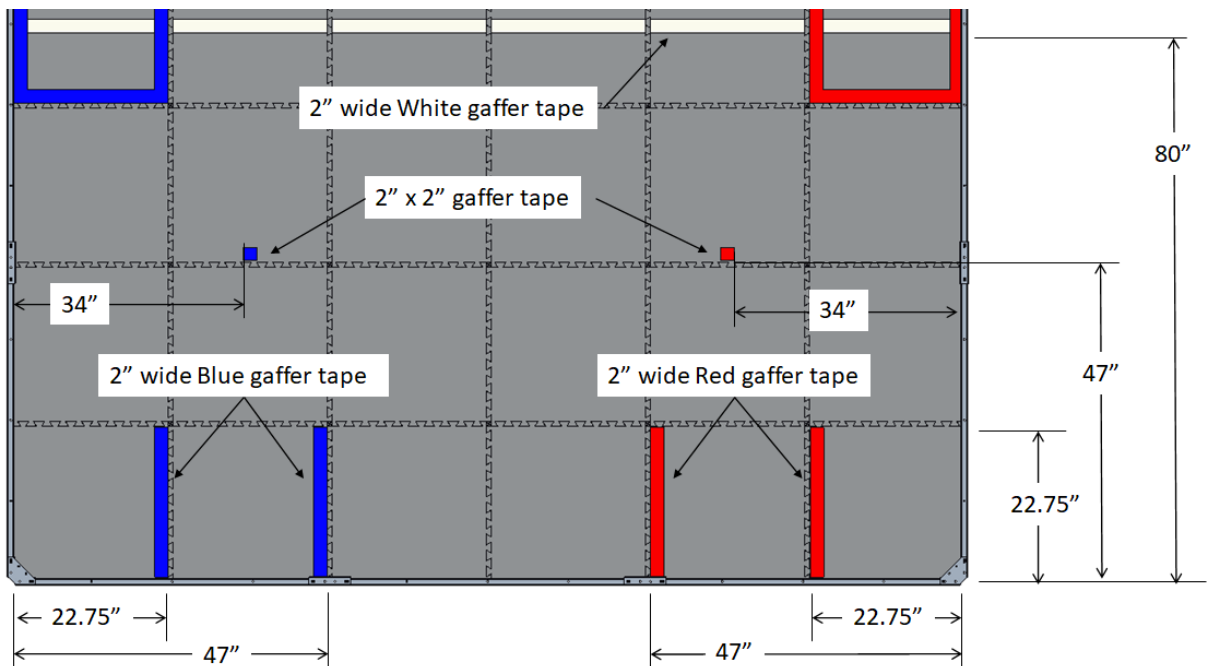
Appendix B – *Playing Field* Details
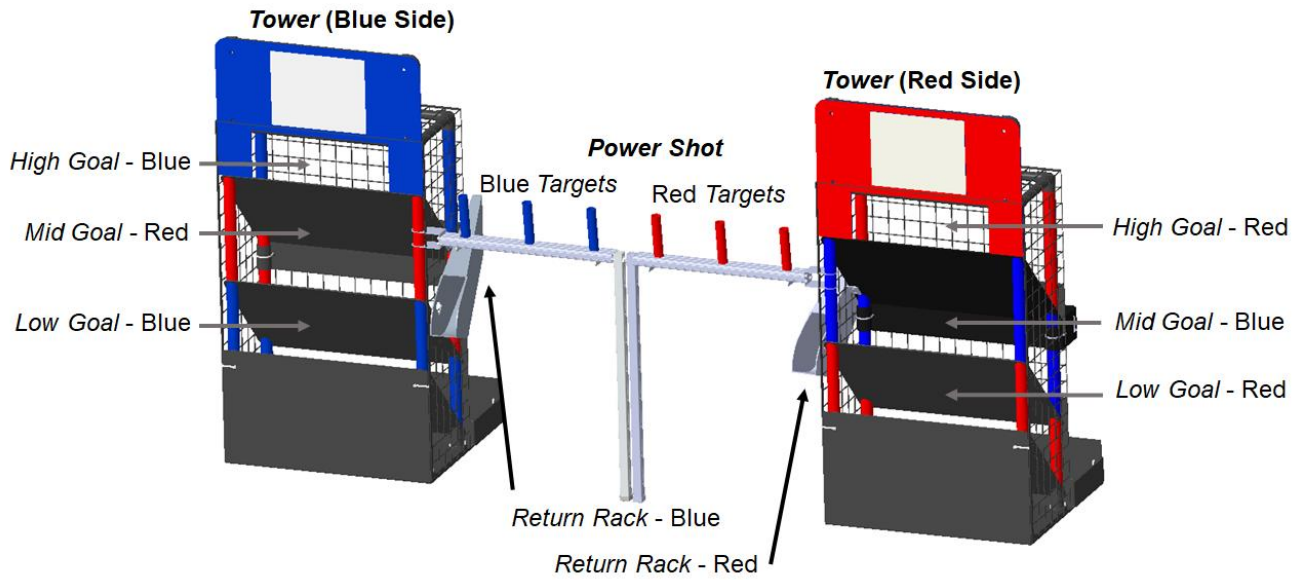
B-1 *Tower Goals*

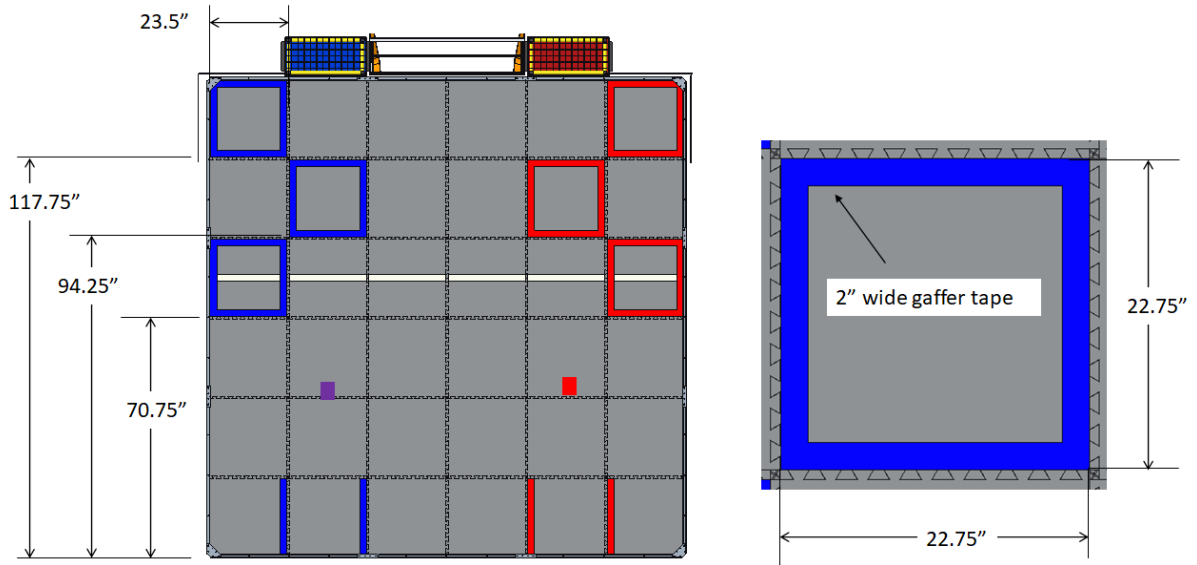**B-2 *Tower Goal* Dimensions**
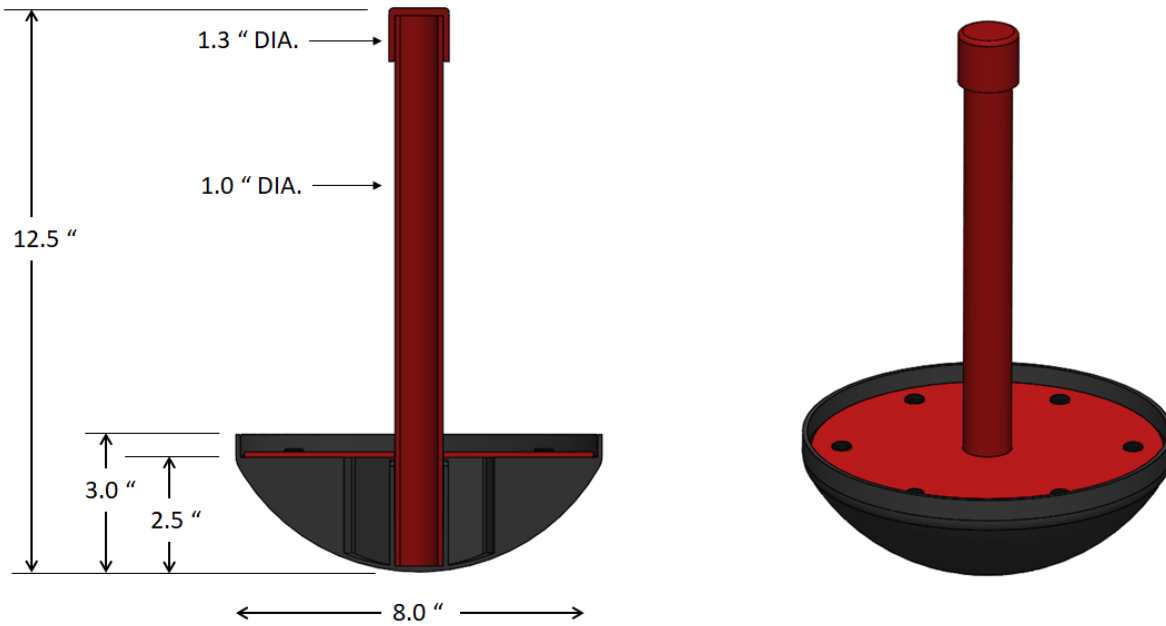
B-3 *Power Shot* Dimensions

B-4 *Playing Field* Tape Dimensions

Note: These dimensions are approximate. Refer to the Set-up Guide for exact placement. In general, the tape runs along the tabs of the *Tile* and the tape square is centered along one side of the *Tile*.
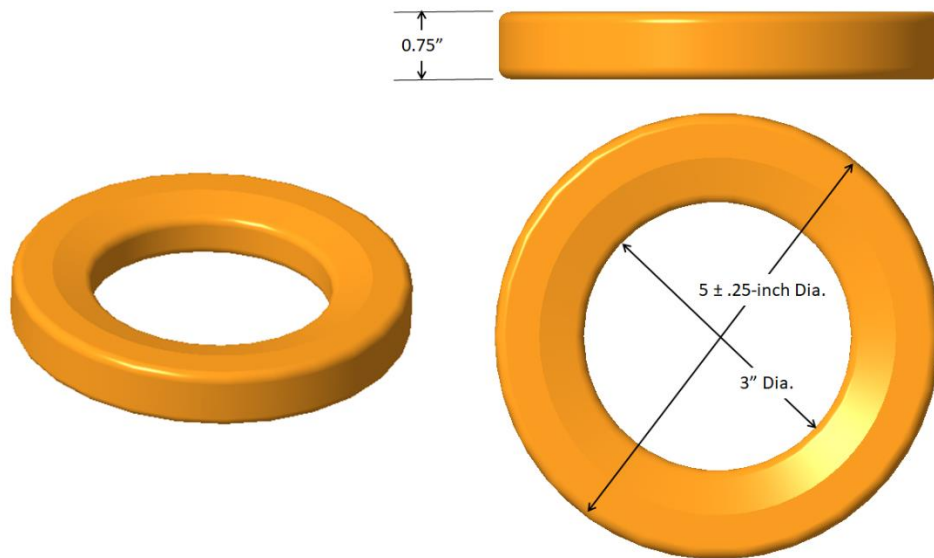
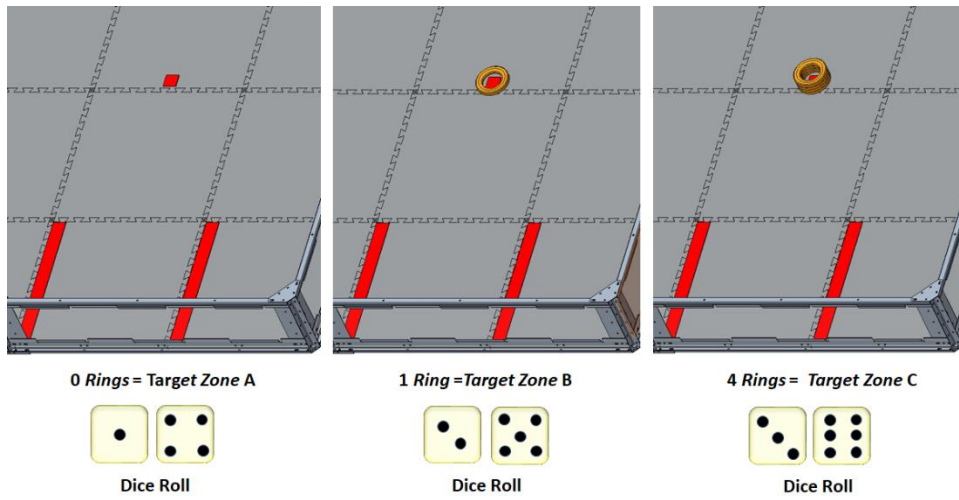**B-5 *Target Zone Goal* Dimensions**

Appendix C – *Scoring Elements*

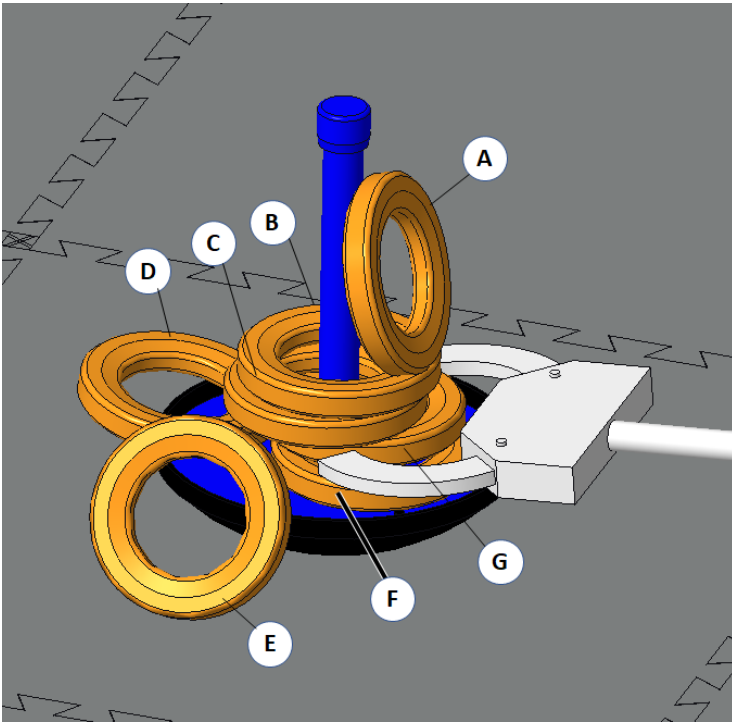**C-1 *Wobble Goal***

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*

Image 1
Front Wall (audience)

Image 2
Blue Alliance Wall

Image 3
Red Alliance Wall

Image 4
Back Wall
Blue Side Tower

Image 5
Back Wall
Red Side Tower

F-1 *Navigation Image* Locations