

WRO 2012

Regular Category

College

Game description, definitions, rules & scoring.

ROBOT VOLLEYED OVER

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Game Table in 3D

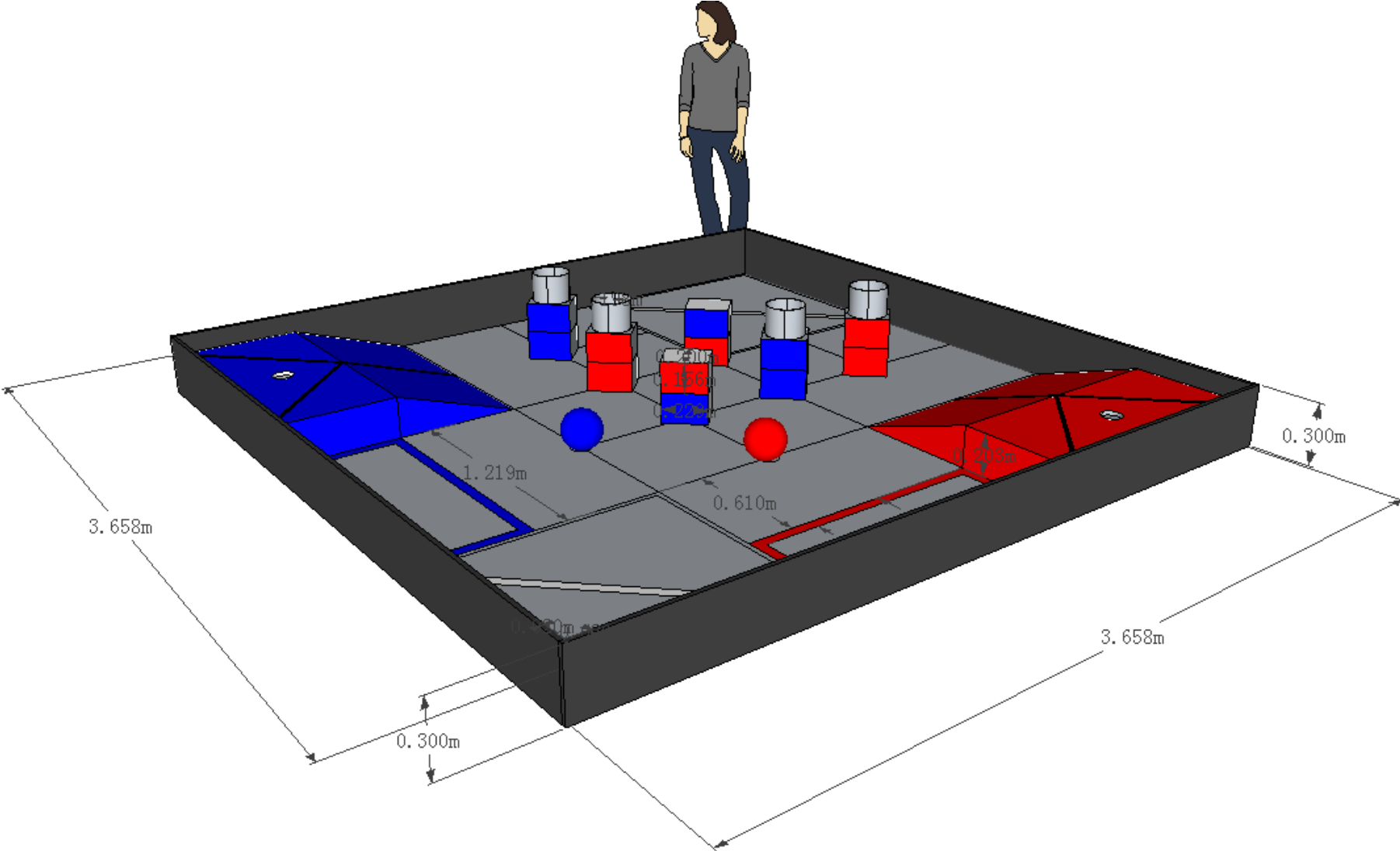


Table Specification I

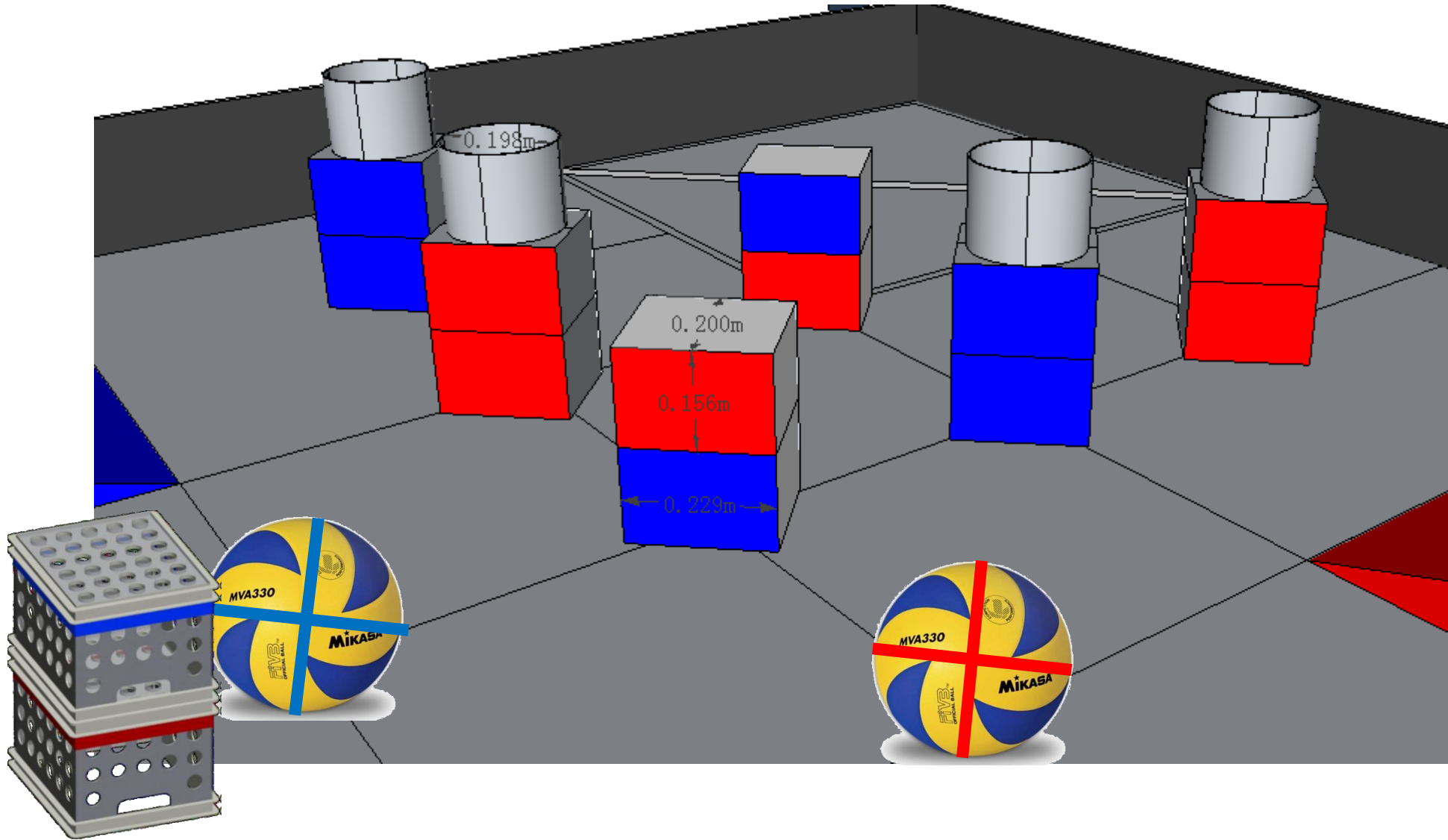


Table Specification II

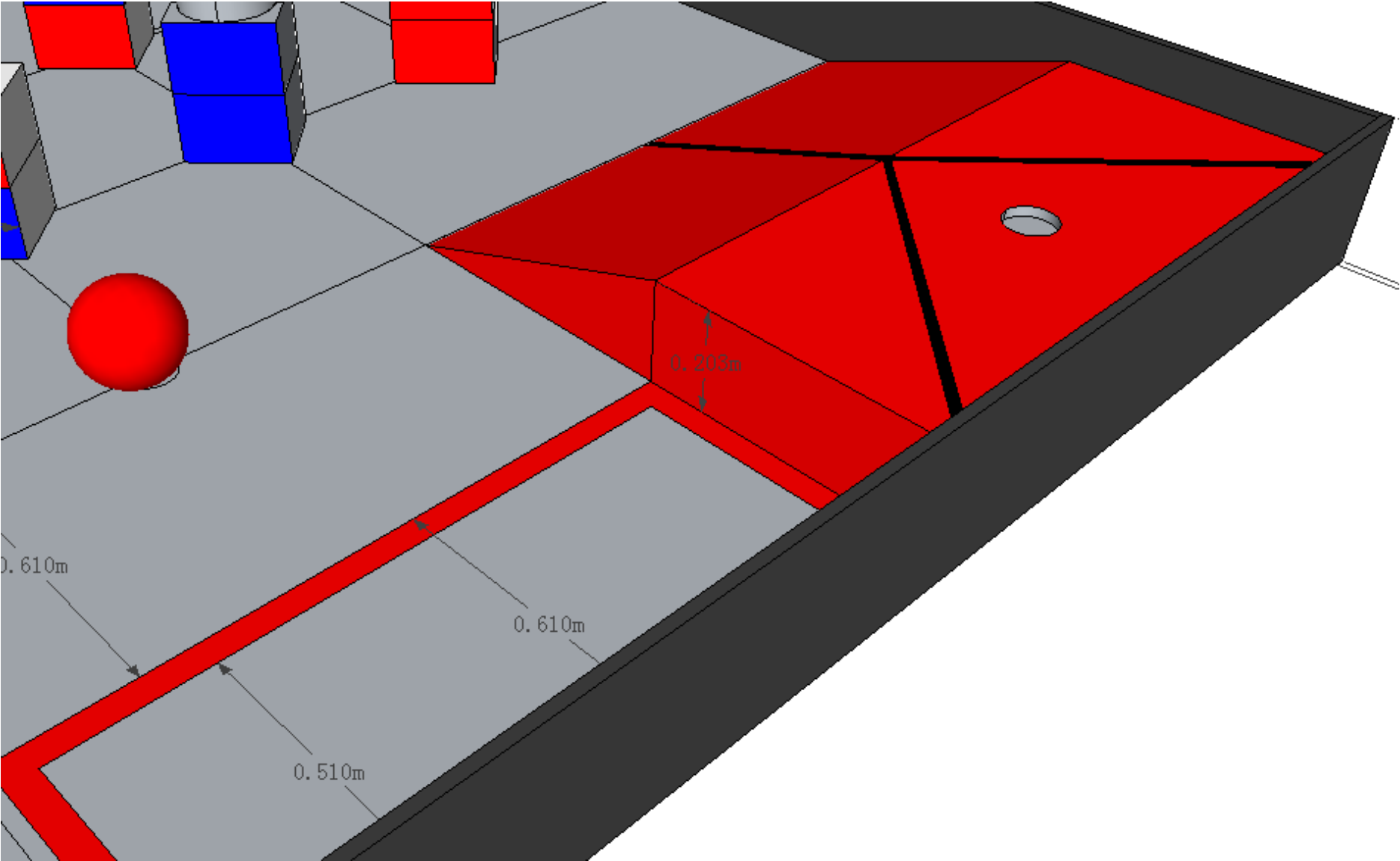


Table Specification III

1. The size of the game field is 3658mm x 3658mm(without side walls).
2. The floor of the game field is gray soft tiles, divided into 36 cells. The size of each cell is 609.6mm x 609.6mm.
3. The side walls are 30mm high and 20mm thick.
4. In the field there are two **Home Zones** (Platforms and Ramps), 12 **Ball Crates**, 4 **Ball Tubes**, 60 **Regular Tennis Balls** (6.7cm diameter) and two **Volleyballs**.
5. Two triangular shaped areas are **Parking Zones**, defined by 5cm white tape on the Playing Field surface.
6. Two coloured Low Goal is made up of an approximately 61cm*122cm taped area within the Playing Field.

Game Description

The name of this year's college regular category challenge is "Robot Volleyed Over".

This year's college level game challenges you to build a robot that is capable of Uprighting Ball Crates, Parking a Volleyball and/or itself in the Parking Zone in the Autonomous Period. Collecting more tennis balls in their respective area than opponent, Stacking Ball Crates as high as possible with at least one Tennis Ball inside in the Driver Controlled Period. Pushing the volleyball back to your Home Zone in the End Game Period (the last 30 seconds of the Driver Controlled Period) also worth points. Let's get started!

Matches are played on a Playing Field initially set up as illustrated in the figure above. Two Alliances - one "RED" and one "BLUE", compete in each Match. The object of the game is to attain a higher score than your opposing Alliance by placing 6.7cm diameter tennis balls into several Alliance-coloured scoring goals (**Ball Crates** and **Low Goals**) located on the Playing Field. The game is played in two distinct periods, **Autonomous** and **Driver-controlled**.

In the 30-second **Autonomous** Period, teams are rewarded for driving to specific places on the Playing Field as well as setting upright Team-coloured **Ball Crates** that will be used to collect balls during the rest of the game. Two **Volleyballs** on the Playing Field will earn points for the Alliance depending on their location at the conclusion of the **Autonomous** Period.

The two-minute **Driver-Controlled** Period follows the **Autonomous** Period. Teams earn points for their Alliance by scoring tennis ball in a **Low Goal**. Teams may also elevate stacks of Ball Crates to score more points. The final 30 seconds of the **Driver-Controlled** Period is called the **End Game**. Each Alliance is challenged to push their **Volleyball** onto their **Home Zone** to score additional points.

Game Definitions

Alliance – A pre-assigned grouping of two teams that work together for a given Match. Alliances are designated as either “RED” or “BLUE.”

Alliance Station – The designated region where the Drivers and Coach stand or move within during Matches.

Autonomous Period – A 30-second 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 game.

Ball - The Ball is a 6.7CM diameter single-coloured tennis ball.

Ball Crate - Scoring elements and containers for the game. There are six RED and six BLUE **Ball Crates** that measure 23cm*20cm*15.5cm. **Ball Crates** are in one of two states:

Inverted Crate - Starting position of the **Ball Crates** with the open-end down towards the floor.

Upright Crate - A legal scored position for a **Ball Crate** where at least one part of the bottom of the crate is in contact with the floor mat, platform, ramp, or with an element that is in contact with the floor mat, platform, or ramp.

Ball Tubes - A container that holds the balls at the start of the Match. There are four **Ball Tubes** located in top of **Ball Crate Stacks**. **Ball Tubes** are not scoring targets or objects, but they can be used to raise **Ball Crates** to different elevations.

Volleyball - The Volleyball is a regular Mikasa Volleyball with a maximum circumference of 65-67 cm and a weight of 260-280 g. The Volleyball may be of any colour. There are two, 2.54 cm wide strips of coloured tape (90 degrees apart) around the circumference of the Volleyball to signify Alliance colour.

Coach – A student designated as the team advisor during the Match and identified as the person wearing a “coach” badge or identifying marker.

Competition Area – The area where all the Playing Fields, **Alliance Stations**, Scoring tables, and other event officials and tables are located.

Disqualified / Disqualification - A team that is Disqualified from a Match will not receive credit for any points for the Match (i.e., no **Qualifying** and **Ranking Points**).

Drive Team – Up to three representatives (two **Drivers** and one **Coach**) from a legally registered entity with WRO and for the competition.

Driver – A college student team member responsible for operating and controlling the Robot and wearing a “**Driver**” badge or identifying marker.

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

End Game – The last 30 seconds of the Driver-Controlled Period at the end of the Match.

Field Control System (FCS) – The Field Control System is the computer program that will serve as the communications system between the Drivers and the Robot during each Match.

Home Zone – The area of the field that incorporates the Platform and the Ramp, including the side panel. There are two Home Zones on the field – one Red and one Blue. The Platform is approximately 20.3 cm high and measure 61cm x 122cm. The Ramp measures 61cm x 122cm and is attached to the Platform leading down onto the Playing Field. Each Platform and Ramp is painted the colour of the Alliance to which it belongs. In the centre of the Platform is the Home Zone Goal for scoring the Volleyball during the End Game.

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

Parked/ Completely Parked – An object (Robot or game element) is Parked if it is stationary and has broken the plane of the outside edge of the tape marking the Scoring Area or the boundary edge of the Home Zone. Being Completely Parked means that the entire scoring element or Robot must be within the Scoring Area defined by the outside edge of the tape marking the Scoring Area or the boundary edge of the Home Zone.

Parking Zones – The two triangular shaped areas located in the corners of the Playing Field. The Parking Zones are defined by 2.54cm white tape on the Playing Field surface. The Back Parking Zone is the corner area between the Alliance Stations. The Front Parking Zone is in the opposite corner of the field near the audience.

Penalty – A deduction to the Alliance's score assigned by a Referee for a rules violation.

Pin/ Pinning – Preventing the movement in all directions of an opposing Robot while in contact with the Playing Field boundary wall, one or more field elements, or another Robot.

Playing Field – The part of the Competition Area that includes the (3.65m x3.65m) field and all of the elements described in the official field drawings.

Protected Area - The area of the Playing Field that is outlined by the corresponding Team's colour tape. There are two Protected Areas on the Playing Field - one RED and one BLUE. Robots are not allowed to make contact with crates in the opposing Team's Protected Area. The Protected Area is also a Low Goal for scoring Balls. For the purposes of Stacking, the Home Zone is also considered part of the Protected Area.

Scoring Areas – There are 3 Scoring Areas where Balls or Bowling Balls may be scored – Low Goals, Upright Ball Crates and Home Zones. Balls will be counted for the corresponding Alliance color of the goal.

Low Goal - Each Team's Low Goal is located on the Playing Field surface immediately to the side of the Home Zone Platform of each team. The Low Goal is made up of an approximately 61cm*122cm taped area within the Playing Field defined by the outside edge of the tape and includes the space extending infinitely above the region.

Upright Ball Crates – Ball Crates start on the field in the Inverted orientation and they become Scoring Areas when they are uprighted during game play.

Home Zone - The area of the field that incorporates the Platform and the Ramp, including the side panel.

Home Zone Goal - A 10.16cm diameter circle cut out on the Home Zone Platform used for scoring the team's Volleyball.

Stacking/ Process of Being Stacked – A Ball Crate is in the process of being Stacked if it is in contact with a Robot of the corresponding Alliance colour, is completely off of the Playing Field and it breaks the projection of the vertical plane of a Ball Crate immediately below it.

Starting Location - The location where teams place their Robots before the start of the Match. The Robot may start in any orientation anywhere on top of the Platform, which is the Starting Location within the Home Zone for each Team.

Stacking Bonus – The bonus awarded to each Alliance based on the final location of the top-most portion of an Upright Crate that contains at least one scored Ball.

Rules & Regulations

<G1> At the beginning of a *Match*, each *Robot* must not exceed a volume of 18" (45.7cm) wide by 18" (45.7cm) long by 18" (45.7cm) tall. An offending *Robot* will be removed from the *Match* at the Head Referee's discretion.

a. Alignment devices that are not part of the *Robot* may NOT be used to assist with the positioning of the *Robot*.

<G2> Each *Drive Team* shall include up to two *Drivers* and one *Coach*.

<G3> During a *Match*, the *Drivers* and *Coach* must remain in their *Alliance Station*. The first instance of leaving the *Alliance Station* will result in a warning, with any following instances resulting in a *Penalty* or *Disqualification*.

<G4> *Drivers* and *Coaches* are prohibited from making contact with the *Playing Field* or any game or field object. The first instance of contact will result in a warning, with any following instances resulting in a *Penalty* and/or *Disqualification*.

<G5> During a *Match*, *Robots* must be remotely operated only by the *Drivers* and/or by software running in the on-board control system. The first instance of *Coach* interference (i.e. touching a Gamepad) will result in a warning, with any following instances resulting in a *Major Penalty* or *Disqualification*.

<G6> Scores will be calculated for all periods of a *Match* at the end of each period when all objects on the *Playing Field* have come to rest.

<G7> *Robots* may not deliberately detach parts during any *Match*, or leave mechanisms on the *Playing Field*. If a detached component or mechanism is attached to a *Scoring Area* and prevents additional scoring, the team will be *Disqualified*. Multiple infractions may result in *Disqualification* for the entire competition.

<G8> Strategies and mechanisms aimed solely at the destruction, damage, tipping over, or entanglement of *Robots* are not in the spirit of the *FIRST* Tech Challenge and are not allowed. However, *Bowled Over!* is a highly interactive contact game. Some tipping, entanglement, and damage may occur as a part of normal game play. If the tipping, entanglement, or damage is ruled to be deliberate, the offending team may be *Disqualified* for that *Match*. Repeated offenses could result in a team being *Disqualified* from the remainder of the competition.

<G9> A *Robot* cannot *Pin* another *Robot* for more than five seconds. If a referee determines this rule is violated, the offending *Alliance* will receive a *Penalty* and the offending *Robot* may be disabled for the *Match*. A *Robot* cannot incur a *Pinning Penalty* during *Autonomous Mode*. If a *Pinning* occurrence happens during *Autonomous Mode*, the first action done by the offending *Robot* during the *Driver-Controlled Period* must be to back away from the *Pinned Robot* or a *Penalty* will be assessed. If a *Referee declares a Pinning Warning* during the *Match*, the offending *Robot* must back away at least 3 feet (1.5 floor tiles) from the *Pinned Robot*.

<G10> 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 rule violations committed by the affected *Alliance* shall be excused, and no penalties will be assigned.

<G11> *Robots* must be designed to permit easy removal of scoring and field elements from any grasping,

containing, or holding mechanism without requiring that the *Robot* have power after the *Match*.

<G12> At the beginning of each *Match*, each *Alliance Robot* must be set up onto the *Playing Field* in the *Starting Location* ready to begin play. *Robots* may start anywhere in the *Alliance's Home Zone Platform*. *Drive Teams* are required to stand in the *Alliance Station* location specified by the *Match* schedule to assure that the Logitech Gamepads are assigned to the correct *Drive Team* and *Robot*.

- a. During the qualification *Matches*, the blue *Alliance Robots* must be set up on the *Playing Field* first.
- b. During the elimination *Matches*, the lower seeded (i.e. 3rd seed is lower than 2nd seed) *Alliance Robots* must be set up on the *Playing Field* first.
- c. *Alliances* may waive their right to place their *Robots* on the *Playing Field* after the opposing *Alliance* places their *Robots* as specified above.

<G13> *Matches* are replayed at the discretion of the Head Referee and Field Technical Advisor (FTA) only under the following circumstances:

- a. Failure of an on-field game element that was likely to have impacted which *Alliance* won the *Match*.
- b. Loss of control of a *Robot* due to a VERIFIABLE failure of the tournament-supplied *FCS* computer, *FCS* software, USB Hub, or Logitech Gamepad that was likely to have impacted which *Alliance* won the *Match*.
- c. Loss of control of all four *Robots* due to a failure of the field's wireless router that was likely to have impacted which *Alliance* won the *Match*.

Unexpected *Robot* behavior in itself will not result in a *Match* replay. Team induced failures, such as low battery conditions, processor sleep timeouts, *Robot* mechanical/electrical/software failures, *Robot* communication failures, etc. are **NOT** valid justifications for a rematch.

<G14> At the conclusion of the *Autonomous Period*, referees will record the score; then when needed, untangle *Robots*, place *Robots* on their drivetrain, make minor adjustments to *Robot* position, etc. so that the *Robots* can participate in the *Driver Controlled* portion of the *Match*.

<G15> Field and field element tolerances may vary by as much as +/- 1.0" (2.54cm). Teams must design their *Robots* accordingly.

<SG1> There are approximately 25 *Balls (Magnet plus Regular)* placed in each of the *Ball Tubes* before the beginning of the *Match*. The *Magnet Balls* will be placed in a random order in any of the *Ball Tubes*. *Teams* are not allowed to touch or reposition the *Bowling Balls, Balls, Ball Tubes, or Ball Crates* in any way prior to the start of a *Match*. Repeated violation of this rule may result in team *Disqualification*. There are no preloaded game objects in this year's game.

<SG2> Removing (de-scoring) *Balls* from the *Low Goal* is allowed. Deliberate de-scoring of *Balls* from the *Ball Crates* while in the Protected Area or *Off-field Goal* will result in *Major Penalty* (40 points) and a team *Disqualification*.

<SG3> *Balls* that leave the 12' x 12' area of the *Playing Field* will be placed back in play at the earliest safe opportunity by a designated game official at the approximate location where it exited unless it will score. *Drive Teams* are not allowed to return *Balls* onto the *Playing Field*. Violation of this rule will result in a *Penalty* (5 points) for the team per returned *Ball* and may result in a team *Disqualification*.

<SG4> *Robots* may not deliberately remove *Bowling Balls, Balls, or Ball Crates* from the *Playing Field*. *Teams* will be warned on a first occurrence. Repeated violations will result in a *Penalty* (5 points) per *Regular Ball* removed and a *Major Penalty* (40 points) per *Bowling Ball, Magnet Ball, or Ball Crate* removed with the possibility of a team *Disqualification*.

<SG5> *Robots* may only make contact with an opposing Alliance's *Ball Crate(s)* at one outside surface at a time and the crate must be in contact with the *Playing Field* floor or in contact with an element touching the *Playing Field* floor. Violations of this rule will result in a *Penalty* (5 points).

<SG6> Making contact with an opposing *Alliance's Ball Crate* or *Stack* while in its *Protected Area* and/or *Home Zone* is not allowed and will result in a major penalty (40 points). Making incidental contact with an opposing *Alliance's Ball Crate* or *Stack* where the contact doesn't change the score is allowed.

<SG7> Making contact with an opposing *Alliance's Robot* or carried *Crate* while the opposing *Alliance* is in the process of *Stacking* or carrying *Ball Crates* that are located in its *Protected Area* and/or *Home Zone* is not allowed and will result in a major penalty (40 points).

<SG8> *Stacking a Ball Crate* on top of an opposing *Alliance's Ball Crate* or *Stack* is not allowed and will result in a *Major Penalty* (40 points).

<SG9> Pushing an opposing *Alliance's Ball Crate* and/or *Bowling Ball* onto your *Home Zone* and/or *Protected Area* is not allowed at any time and will result in a *Major Penalty* (40 points).

<SG10> Making contact with an opposing *Alliance's Home Zone* during the *End Game* is not allowed and will result in a *Major Penalty* (40 points).

<SG11> A *Magnet Ball* may be scored in the *Alliance's own Off-field Goal* at any time of the *Match*. It will only be counted once at the end of the *Match*.

<SG12> Placing a *Ball* in the opposing *Alliance's Off-field Goal* is not allowed and will result in a *Major Penalty* (40 points) and a team *Disqualification*.

<**SG13**> Robots pushing their Alliance-colored Bowling Ball into a scoring position prior to the start of the End Game is not allowed and the Bowling ball will not count in the End Game bonus.

<**SG14**> Robots are not allowed to make contact with their opponent's *Bowling Ball* during the *End Game* and will result in a *Major Penalty* (40 points).

<**SG15**> Robots are not allowed to store, hold, control, contain, etc. more than fifteen (15) *Balls* at a time. Each *Ball* above the 15 *Ball* limit will receive a *Penalty* (5 points) and the *Robot* must pass a re-inspection prior to participating in another *Match*. *Balls* that are in contact with the *Playing Field* surface or are fully supported by a *Ball Crate* are excluded from this constraint. The ball-holding mechanism(s) of the *Robot* will be inspected before it will be allowed to play (i.e. if the ball holding capability of your *robot* can hold 16 or more balls, the *Robot* will not pass inspection).

Scoring

SCORING IN THE AUTONOMOUS PERIOD

The Following scores are recorded by the Referees at the end of the **Autonomous** Period:

1. Up righting a Ball Crate is worth **5** points per crate based on the Crate's team color. To be upright, any part of the bottom of the Ball Crate must be in contact with the Playing Field floor, platform, ramp, or with an element that is in contact with the floor mat, platform, or ramp.
2. Parking a Robot in the **Back Parking Zone** is worth **5** points. A portion of the Robot has to have broken the plane of the outside edge of the tape marking the Parking Zone.
3. Parking a Robot in the **Front Parking Zone** is worth **10** points. A portion of the Robot has to have broken the plane of the outside edge of the tape marking the Parking Zone.
4. Volleyball that is Parked in the **Front Parking Zone** is worth **10** points for the matching color team. For example, the Blue Volleyball scores for the Blue Team regardless of the robot placing the Volleyball in the Parking Zone.
5. A Volleyball that is Parked in the **Back Parking Zone** is worth **20** points for the matching color team. For Example, the Blue Volleyball scores for the Blue Team regardless of the robot placing the Volleyball in the Parking Zone.

SCORING IN THE DRIVER CONTROLLED PERIOD

The following scores are recorded by the Referees at the end of the Match.

1. A **Tennis Ball** that is parked in the **Low Goal** is worth **1** point for the corresponding Team. A portion of the Ball has to have broken the plane of the outside edge of the tape marking the Low Goal. A Ball will not count if it is in direct contact with a Robot of the corresponding Team.
2. A Tennis Ball that is scored in a Ball Crate is worth 2 points for the corresponding Alliance based on the color of the Ball Crate. To be scored the Ball must be supported by the Ball Gate and be within a space formed by the extension of the inside surface of the Ball Crate.
3. Stacking Bonus: Unscored Ball Crates receive zero Stacking Bonus points. A Ball Crate must contain at least one Ball in a scoring position for the Ball Crate to earn a Stacking Bonus. Stacking Bonus points are assigned to each Ball Crate based on the height, H of the highest point of that Ball Crate.
 - a. $0 < H \leq 26.67\text{cm}$ scores 0 points
 - b. $26.67\text{cm} < H \leq 41.9\text{cm}$ scores 10 points
 - c. $41.9\text{cm} < H \leq 57.2\text{cm}$ scores 20 points
 - d. $57.2\text{cm} < H \leq 72.4\text{cm}$ scores 30 points
 - e. $72.4\text{cm} < H \leq 87.6\text{cm}$ scores 40 points
 - f. $87.6\text{cm} < H \leq 102.9\text{cm}$ scores 50 points
 - g. $102.9\text{cm} < H \leq 118.1\text{cm}$ scores 60 points
 - h. An additional 10 points for every 15.24cm increment above 118.1cm
4. Robots may lift Ball Crates or Stacks of Ball Crates off of the floor or Home Zone to gain additional Stacking Bonus points.

5. Ball Crates Stacked on the Home Zone Platform automatically begin their Stacking Bonus calculations as if they were already at height on top of 1 crate (i.e. scored Ball Crates on the Platform start their Stacking Bonus at 10 points instead of 0 points).

SCORING IN THE END GAME PERIOD

The last 30 seconds is the **End Game**. During the End Game, the Robot may move their Alliance-coloured Volleyball onto the Platform of their Home Zone to receive additional scores. Teams are not allowed to make contact with their opponent's Volleyball during the End Game. Teams may not try to score their Volleyball onto their Home Zone until the start of the End Game. The End Game score is recorded by the Referees at the end of the Match as follows:

1. Parking your Team-colored Volleyball in your **Home Zone Goal** is worth **30** points. Contact with a Robot is allowed.
2. Parking your Team-colored Volleyball in your **Home Zone** outside of the Home Zone Goal and not touching the Playing Field foam mats is worth **20** points. The Volleyball may be in contact with the perimeter walls, and/or a Robot.

----- Please direct any questions you may have to john@kkinc.com.tw -----

----- Thank you -----