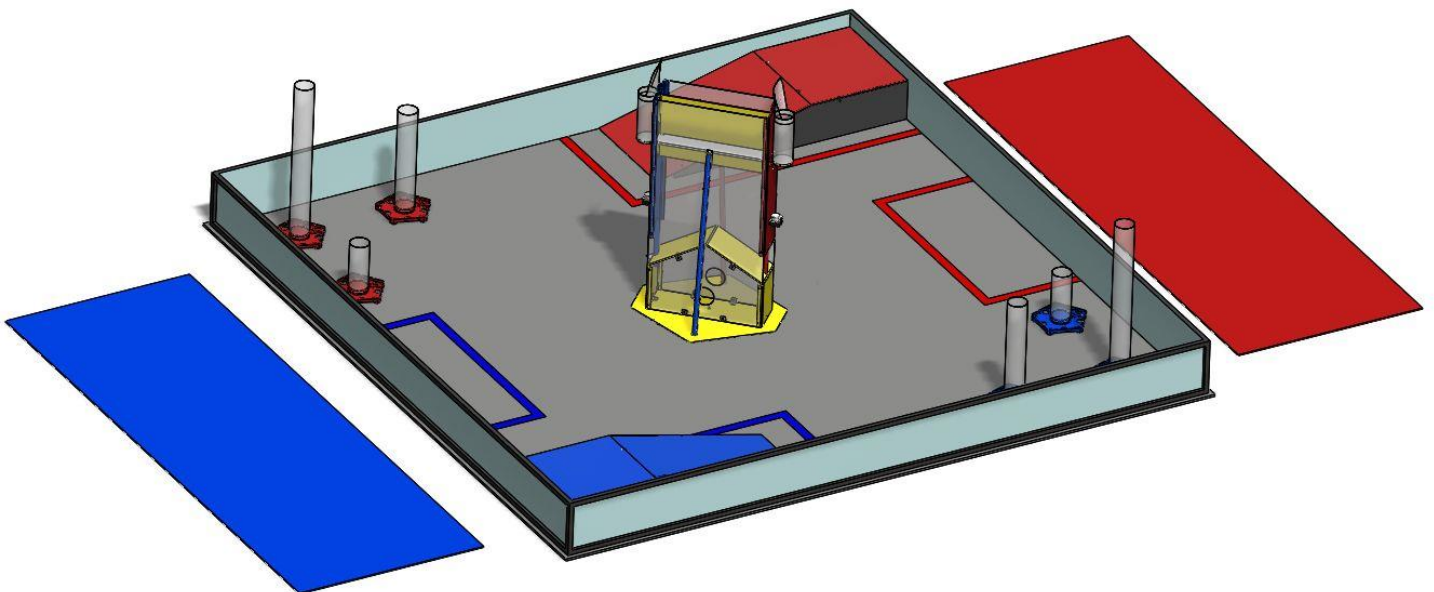




FIRST TECH CHALLENGE®

2014 – 2015 GAME MANUAL PART 2

CASCADE EFFECTSM GAME RULES



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IMPORTANT NOTICE:

TEAMS MUST COMPLY WITH ALL RULES AND REQUIREMENTS STATED IN THIS DOCUMENT AND IN PART 1 OF THE GAME MANUAL. ANY UPDATES TO THE GAME RULES ARE ISSUED ON THE Q&A SECTION OF THE GAME FORUM AT FTCFORUM.USFIRST.ORG. FORUM RULINGS TAKE PRECEDENCE OVER INFORMATION IN THE MANUALS FOR THIS SEASON.

Revision History		
Rev	Date	Description
0	September 4, 2014	Limited Release – Affiliate Partners
1	September 6, 2014	Kick-Off Release

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1.0 The Game

1.1 Overview

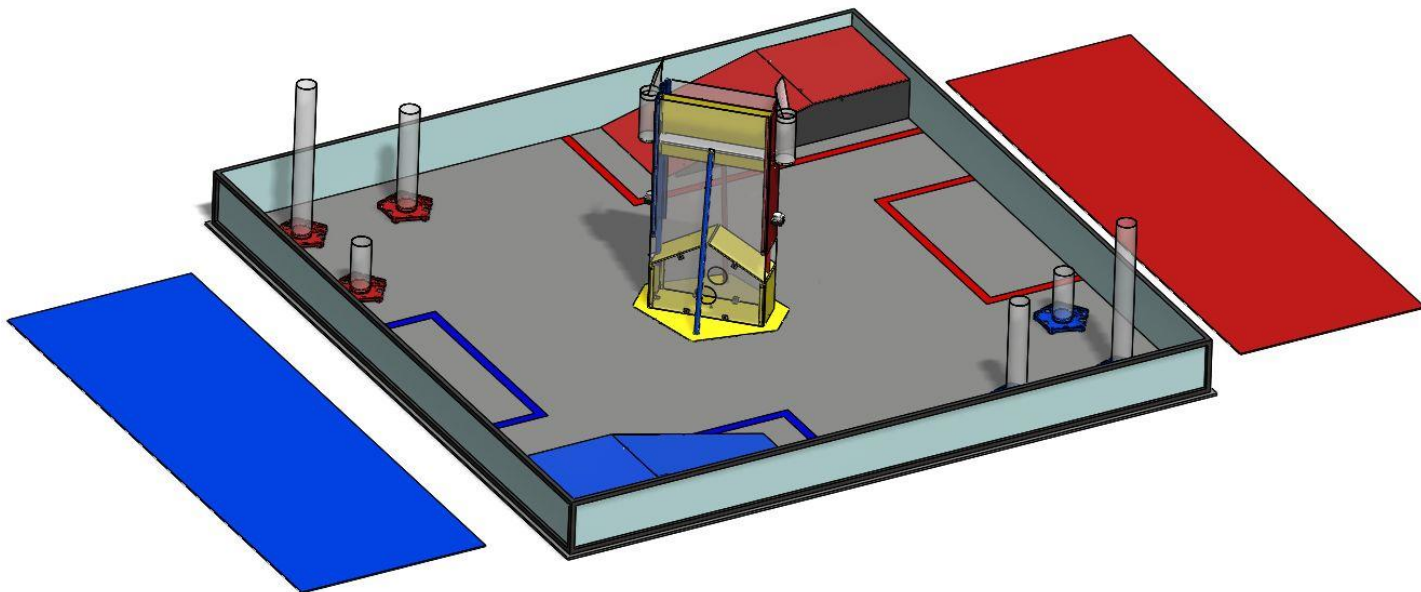
This section describes the *FIRST*[®] Tech Challenge game for the 2014-15 season called CASCADE EFFECTSM. It also lists the Game rules and Game definitions. Terms in italics are defined in this Manual specifically for this Game.

1.2 Game Description

Matches are played on a *Playing Field* initially set up as illustrated in the figure 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 placing plastic *Balls* – both large and small – into various *Goals* on a center structure (*Center Goal*) or into different sized *Rolling Goals*. The Game is played in two distinct periods: Autonomous and Driver-Controlled.

The *Match* starts with a 30-second *Autonomous Period* where *Robots* are operated via pre-programmed instructions only. Prior to the start of the *Autonomous Period*, the *Center Field Structure* will be rotated to one of three positions. Points will be awarded for *Robots* achieving certain tasks including placing Autonomous *Balls* in the *Rolling Goals* and/or *Center Goal*, *Robots* moving off the *Ramp/Platform*, *Releasing the Kickstand* (and releasing balls into the field of play), and moving their *Rolling Goals* into the *Alliance’s Parking Zone*.

The two-minute *Driver-Controlled Period* follows the *Autonomous Period*. *Robots* are tasked with collecting *Balls* and placing them in the *Rolling Goals*. *Balls Scored In* the *Rolling Goals* are worth points based on the length of the *Ball Tube* and the *Ball Height* (Points are scored at the end of the *Match*).



The last thirty (30) seconds of the *Driver-Controlled Period* is called the *End Game*. During the *End Game*, *Robots* may also *Score Balls* into the *Center Goal* as well as the *Rolling Goals*. Teams can also earn bonus points for every *Robot* and *Rolling Goal* that is not in contact with the floor when the *Match* ends and by moving their *Rolling Goals* and/or *Robots* into the *Alliance Parking Zone*.

1.3 Game Definitions

The following definitions and terms are used in the Rules sections below.

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 within which the *Drivers* and *Coach* stand or move during *Matches*.

Area – The space defined by the vertical projection of the Outside edge of a region’s boundary (e.g. gaffer’s tape, *Goal*, *Playing Field* perimeter wall, plywood, etc.) The boundary element (tape, wall, markings, etc.) is considered to be part of the *Area* for the purposes of determining *Completely In* or *Inside*.

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 time.

Ball – The *Scoring Element* for the game. *Balls* come in two sizes: *Large Balls* (quantity 40) and *Small Balls* (quantity 120). A *Ball* is *Scored* when it is *In* a *Goal’s Ball Tube*.

Ball Dispenser – The two locations on the *Center Field Structure* that hold the *Balls* prior to the start of the *Match*. Each *Ball Dispenser* has a *Ball* release mechanism that is held in place by an *Alliance-specific Kickstand*.

Ball Height – The measurement from the bottom of the *Ball Tube* to the top of the uppermost *Ball* in the *Ball Tube*, i.e. the height of the stack of *Balls* in the *Ball Tube*. This is used when calculating the *Score* for a *Goal*.

Ball Tube – The part of a *Goal* where *Balls* are placed to be *Scored*. It is transparent and each of an *Alliance’s Rolling Goals* has a different length *Ball Tube*.

Blocking Access – Preventing a *Robot* from getting to its *Alliance’s Ramp/Platform*, *Parking Zone*, or a *Goal*, e.g. by moving robot(s) and/or rolling goal(s) to obstruct all paths to the item.

Center Field Structure – The *Center Field Structure* is composed of the *Ball Dispensers*, *Kickstands*, *Center Goals*, and the plastic base and sides that support those elements.

Center Goal – Each *Alliance* has a color-coded *Center Goal*. Its highest point is 120 cm above the *Playing Field Floor*. The *Center Goal* is on the *Center Field Structure* and remains in place.

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

Control / Controlling – An object is considered to be *Controlled* by a *Robot* if the object is following the movement of the *Robot*. Examples are: pushing an object still on the *Playing Field* or holding or carrying a *Ball*. *Balls Controlled* by a *Robot* are considered to be part of the *Robot*. Driving through more than the maximum number of *Balls* is acceptable as long as they are not collected, guided, herded, etc.

Disable – If a Referee *Disables* a *Robot* during a *Match*, he/she will ask the Team to drive their *Robot* to a neutral position on the *Playing Field* and to place their Gamepad controllers on the floor in the *Alliance Station*.

Disqualified / Disqualification – A Team that is *Disqualified* from a *Match* has their *Robot Disabled* and will not receive credit for any points for the *Match* (i.e., no Qualifying or Ranking points).

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

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

Coach – A student or adult mentor designated as the Team advisor during the *Match* and identified as the person wearing a “*Coach*” badge or identifying marker.

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

End Game – The last thirty (30) seconds of the *Driver-Controlled Period*.

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

Field Elements – The following items are considered to be *Field Elements* for this year’s game: *Ramp/Platform*, *Center Field Structure*, and *Rolling Goals*. See also *Scoring Elements*.

Goal – An *Area* where *Robots* place *Balls* to earn points for their *Alliance*.

In(side) / Completely In(side) – An object that has crossed the vertical extension of a defined *Area*’s boundary is *Inside* the *Area*. An object that is entirely within the vertical extension of a defined *Area*’s boundary is *Completely Inside* the *Area*.

Inadvertent – An action is ruled to be *Inadvertent* when a Referee believes that the action was not a planned strategy.

Inconsequential – An action is ruled to be *Inconsequential* when a Referee believes that the action would not have an effect on scoring or gameplay.

Keep Out Zone – The *Area* around and including the *Ramp/Platform* delineated by the *Alliance*-specific colored tape.

The *Keep Out Zone* is protected from intrusion by the opposing *Alliance*’s *Robots* or *Rolling Goals* during the *End Game*.

Kickstand – The *Alliance*-colored PVC pipe that is used at the start of the *Match* to keep the *Ball* release mechanism closed and prevent the *Balls* from dropping before the start of a *Match*. *Releasing the Kickstand* is defined as deflecting the *Kickstand* sufficiently to disconnect it from the *Ball* release mechanism.

Match – A *Match* consists of an *Autonomous Period* followed by a *Driver-Controlled Period* for a total time of two minutes and thirty seconds (2:30).

Off the Floor – A *Robot* or *Goal* is said to be *Off the Floor* if it is not physically in contact with the *Playing Field Floor*. A *Robot* or *Goal* may be *Supported* by another *Robot* and/or a *Field Element* or *Scoring Element*.

On / Completely On – Physically in contact with and *Supported* by an object, surface, etc. An object that is entirely *Supported* by another object, surface, etc. is defined as *Completely On* the object, surface, etc.

Parking Zone – The *Area* of the *Playing Field* taped off in front of each *Alliance Station*. The *Parking Zone* can be used to place *Rolling Goals* or *Robots* for points.

Penalty – The consequence imposed for a rule or procedure violation that is identified by a Referee. When a *Penalty*

occurs, points will be awarded to the opposing *Alliance* that did not incur the *Penalty*. *Penalties* are further defined into *Minor Penalties* (10 points) and *Major Penalties* (50 points). Some *Penalty* values may be multiplied depending on the level of violation.

Pin / Pinning – Preventing the movement in ALL directions of an opposing *Robot* while it is 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 3.66m x 3.66m (12' x 12') Field and all of the *Field Elements* described in the official Game rules.

Playing Field Floor – The part of the *Playing Field* that is covered by tiles. This includes any tape or markings on the tiles.

Ramp/Platform – The assembly in the *Area* of the *Playing Field* located in the near corner to the right of each *Alliance Station*. It is where a *Robot* starts the *Match* and *Rolling Goals* and/or *Robots* are placed to *Score* points during the *End Game*. The *Platform* is the 61cm x 61cm (2' x 2') flat portion in the corner. The *Ramp* is the inclined plane leading up to the *Platform*. See *Field Drawings* for details.

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

Rolling Goal – There are three color-coded *Rolling Goals* per *Alliance*, each with a different length *Ball Tube*: 30 cm, 60 cm, and 90 cm. The *Rolling Goals* can be moved around the field or to the *Alliance's Ramp/Platform* or *Parking Zone* at any time.

Scoring – Teams earn points for their *Alliance* based on the locations of *Robots*, *Balls*, and *Rolling Goals* at the end of the *Autonomous Period* and at the end of a *Match*. Points are *Scored* as defined in the *Game Play* sections below and summarized in the following table:

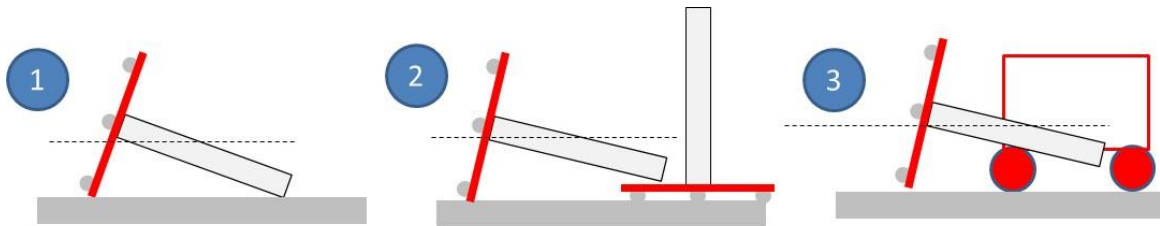
Game Period	Autonomous Period	Driver-Controlled Period	End Game
<i>When Scored</i>	<i>End of Period</i>	<i>Scored at End of Game</i>	
Driving from Platform On to Playing Field floor	20 points		
Releasing the Kickstand to distribute Balls	30 points		
Autonomous Ball In any Rolling Goal	30 points/Goal		
Autonomous Ball In Center Goal	60 points		
Moving Rolling Goal In Parking Zone	20 points/Goal		
Balls Scored In 30 cm (from floor) Rolling Goal		1 point per cm	
Balls Scored In 60 cm (from floor) Rolling Goal		2 points per cm	
Balls Scored In 90 cm (from floor) Rolling Goal		3 points per cm	
Robot / Rolling Goals In Parking Zone			10 points/item
Robot / Rolling Goals Completely Off the Floor			30 points/item
Balls Scored In (from floor) Center Goal			6 points/cm

Scoring Elements – The *Balls* and *Rolling Goals* are considered to be the *Scoring Elements* for this year's game.

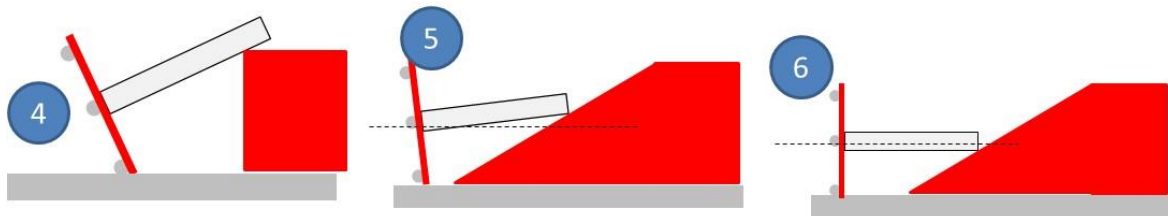
Support / Supported – To bear all or part of the weight.

Team - Pre-college aged students, mentors, and supporters affiliated with an entity registered with *FIRST* and the competition.

Tipped Over – A *Rolling Goal* is said to be *Tipped Over* if the top of its *Ball Tube* is resting on the *Playing Field Floor* or if the underside (wheels) of the *Rolling Goal* is greater than 90° with respect to the *Playing Field Floor*. A situation that is too close to 90° to determine without instruments should be ruled in favor of it NOT being *Tipped Over*. Pictorially:



Examples 1, 2, and 3 are considered to be Tipped Over



Examples 4, 5, and 6 are considered to NOT be Tipped Over.
#6 is based on benefit of the doubt

Trap / Trapping – Preventing an opposing *Alliance Robot* from accessing or escaping from a constrained *Area* of the *Playing Field* for an extended period of time.

1.4 Game Play

Matches are made up of several periods totaling 2 minutes 30 seconds (2:30). Prior to the start of the *Match*, *Drive Teams* have to perform some basic *Robot* setup steps listed in Section 1.4.1 below. The *Match* starts with a 30-second *Autonomous Period*, followed by a 2-minute *Driver-Controlled Period*. The last thirty (30) seconds of the *Driver-Controlled Period* is called the *End Game*. At the conclusion of the *Match*, the Referees will fill out the *Score* sheets and then signal the *Teams* to collect their *Robots* and leave the *Competition Area*.

1.4.1 Pre-Match

Teams may place their *Robots* in any orientation on the *Playing Field* with the following constraints:

1. *Robots* start the *Match* Completely On their *Alliance's Platform* or Completely In their *Alliance's Parking Zone* at the discretion of the *Alliance*.
2. The *Alliance's Platform* and *Parking Zone* may contain no more than one *Robot* each.
3. *Robots* may not extend beyond the outer edge of the *Playing Field* perimeter wall.
4. *Robots* starting in the *Parking Zone* must touch the *Playing Field* perimeter wall.

Each Team will receive an *Alliance*-colored *Robot* identification Flag from Field personnel. This Flag must be mounted on the *Robot* as defined in the *Robot* rule <RG08>.

Rolling Goals are placed in the corners of the *Field*, per the diagram on Page 1, on the far right in relation to each *Alliance Station*. Each *Rolling Goal* is centered in a tile, with the 90cm *Rolling Goal* in the corner, the 60cm *Rolling Goal* one tile toward the *Alliance's Ramp/Platform*, and the 30cm *Rolling Goal* one tile from the corner toward the opposing *Alliance Parking Zone*.

Small and *Large Balls* are distributed approximately evenly into the *Ball Dispensers* and the *Kickstands* are set to keep the *Balls* contained.

Each Team is given two (2) optional *Autonomous Balls* (one large and one small) that, if used, must be placed in contact with their *Robot* during the pre-*Match* setup by any member of the *Drive Team*. The *Autonomous Balls* may touch the *Playing Field* or *Ramp/Platform*, but may only be in contact with a single *Robot*. The *Alliance Flag* and *Autonomous Balls* may extend outside the *Robot* starting volume constraint. A *Robot* can touch a maximum of two *Autonomous Balls* while in the pre-*Match* starting position. *Autonomous Balls* are identical to the *Balls* in the *Ball Dispensers*. Teams are not required to accept/use the *Autonomous Balls*. Unused *Autonomous Balls* will be randomly placed in a *Ball Dispenser* by Field personnel.

After Teams place their *Robots* on the *Playing Field* and pre-load the *Autonomous Balls*, the Referees will rotate the *Center Goal* into 1 of 3 random positions with respect to the *Alliance Station*. A pair of IR beacons are located in the middle of the *Center Goal* pointing outward to help teams find the *Alliance-specific Center Goal*. Once the *Center Goal* is rotated, Teams may not touch or otherwise make adjustments to the *Robots* (per Rule <G18>).

1.4.2 Autonomous Period

The *Match* starts with a 30-second *Autonomous Period* where *Robots* are operated via pre-programmed instructions only, performing various tasks to earn points.

When the *Autonomous Period* ends, points are awarded as follows:

- 20 points for a *Robot* that started the *Match Completely On* the *Platform* and got *On* to any portion of the *Playing Field Floor*.
- 20 points for each *Rolling Goal* In its *Alliance's Parking Zone*.
- 30 points for *Releasing the Kickstand* (whether or not the *Balls* scatter onto the *Playing Field*).
- 30 points for each *Rolling Goal* In which at least one *Autonomous Ball* is *Scored*. (Note that this *Score* is per *Goal*, not per *Ball*.)
- 60 points if any *Autonomous Balls* are *Scored In* the *Center Goal*.

Note that the *Scores* for the *Kickstand* and *Goals* are based solely on the object's color, regardless of which *Alliance* accomplished the action.

1.4.3 Driver-Controlled Period

At the conclusion of the *Autonomous Period*, *Drivers* pick up their Gamepad controllers and a two-minute *Driver-Controlled Period* begins. *Robots* are tasked with collecting *Balls* and placing them *In* the *Rolling Goals*. *Balls* are legally able to be *Scored* once they have made contact with the *Playing Field Floor*. *Autonomous Balls* that were not *Scored* during the *Autonomous Period* may be *Scored* as regular *Balls* during the *Driver-Controlled Period*. *Balls*

Scored In the Rolling Goals are worth points based on the length of the *Ball Tube* and the *Ball Height* (at the end of the *Match*), as shown in the table below. The table also shows the maximum point value for each *Rolling Goal*.

Rolling Goal Height from floor	Points per cm of Ball Height	Maximum Points
30 cm	1 point per cm	27
60 cm	2 points per cm	114
90 cm	3 points per cm	261

1.4.4 End Game

The last thirty (30) seconds of the *Driver-Controlled Period* is called the *End Game*. During the *End Game*, *Robots* may *Score Balls* into the *Center Goal*. *Rolling Goals* and *Robots* can also park *Completely Off the Playing Field Floor* or *In the Parking Zone*. *Robots* may continue to *Score Balls In the Rolling Goals*.

When the *Match* ends, points are awarded as follows:

- 10 points for each *Robot In its Alliance's Parking Zone*.
- 10 points for each *Rolling Goal In its Alliance's Parking Zone*.
- 30 points for each *Robot Completely Off the Playing Field Floor*.
- 30 points for each *Rolling Goal Completely Off the Playing Field Floor*.
- 6 points for each cm of *Ball Height* for *Balls Scored In the Center Goal*.

Note: the *Rolling Goal* can only achieve one *Scoring* milestone (for example, *Off the Floor* and *In the Parking Zone*). It will be *Scored* for the highest value achieved.

1.4.5 Post Match

After the *Match* is over, the Referees will determine where *Robots* and *Rolling Goals* are located and the *Ball Height* for each *Goal*. After they are finished, the Head Referee will signal for the *Drive Teams* to enter the *Playing Field* and retrieve their *Robots*. The *Drive Teams* should return any *Unscored Balls* that are *Possessed* by the *Robot* to the Field and return the *Alliance-colored Robot* identification Flag to the Field Reset Crew. The Field Reset Crew will set up the *Playing Field* for the next *Match* at that time.

1.4.6 Penalty Scoring

Penalty points are added to the non-offending *Alliance's Score* at the end of the *Match*. *Minor Penalties* give the opposing (non-offending) *Alliance* 10 points per occurrence. *Major Penalties* give the opposing (non-offending) *Alliance* 50 points per occurrence.

1.5 Rules of Game Play

Game play 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 Part I of the Game Manual). Violation of these rules may lead to *Penalties* and/or *Disqualification* of the offending Team and/or *Alliance*.

1.5.1 Safety Rules

<S1> If at any time the *Robot* operation is deemed unsafe or has damaged the *Playing Field*, another *Robot*, *Field Elements*, surface, or perimeter walls, by the determination of the Referees, the offending *Robot* will be *Disabled* and the *Team* may be *Disqualified*. The *Robot* will require re-Inspection before it may compete again.

Note: Teams should pay close attention to other *Robot*-specific Safety rules outlined elsewhere in other sections of the Game Manual.

<S2> If any portion of the *Robot* goes Outside of the perimeter wall and makes contact with anything Outside of the *Playing Field* it will be *Disabled* for the remainder of the *Match*. Repeated offenses of this rule may lead to *Disqualification*.

<S3> If any member of the *Drive Team* is found not to be wearing Safety Glasses and/or Closed-toe Shoes, the Referee will issue a warning and if the situation isn't remedied within 30 seconds, the offending member 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 <G19>.

1.5.2 General Game Rules

<G1> Before the start of a *Match*, each *Robot* must not exceed a volume of 45.7cm (18") wide by 45.7cm (18") long by 45.7cm (18") tall. An offending *Robot* will be *Disabled*/turned off for the *Match* at the Head Referee's discretion and must remain on the *Playing Field* without any power for the length of the *Match*. Alignment devices are allowed only if they are constructed from legal components and they remain within the starting volume constraint of the *Robot* and remain attached to the *Robot* for the duration of the *Match*.

<G2> Each *Drive Team* shall include up to two *Drivers* and one *Coach*. Electronic communications (cell phone, two-way radio, Wi-Fi, etc.) by *Drive Team* members after an *Alliance* has been called 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 resulting in a *Minor Penalty* and/or *Disqualification*. Items that may be mistaken by a casual observer as being in violation should not be brought to the *Playing Field* violate this rule.

<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 *Minor Penalty* and/or *Disqualification*. Leaving the *Alliance Station* for safety reasons will not result in a warning or *Penalty*.

<G4> During a *Match*, the *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 *Minor Penalty* and/or *Disqualification*. Contact that affects *Scoring* and/or Game play will result in *Disqualification*.

<G5> During a *Match*, *Robots* must be remotely operated only by the *Drivers* using the Gamepads supplied by the Tournament Director and/or by Software running in the on-board Control System. The first instance of *Coach Interference* (e.g. touching a Gamepad) will result in a warning, with any following instances resulting in a *Major Penalty* and/or *Disqualification*.

<G6> Scores will be recorded at the end of the *Autonomous Period* and *Driver-Controlled 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 deliberately detached component or mechanism affects *Scoring*, a *Major Penalty* will be assessed, the *Robot* will be *Disabled*, and the *Team* will be *Disqualified*. Multiple infractions may result in *Disqualification* for the entire *Competition*.
- <G8> *Robots* may not grab, grasp, grapple, damage, or attach to any *Playing Field* Element or structure other than *Scoring Elements*, unless specifically allowed by Game-specific rule(s) listed in Section 1.5.3. Violations of this rule may result in a *Major Penalty* and/or *Disqualification*.
- <G9> Strategies and mechanisms aimed solely at the destruction, damage, tipping over, or entanglement of *Robots* and *Field Elements* are not in the spirit of the *FIRST* Tech Challenge and are not allowed. However, FTC Games are highly interactive and *Robot-to-Robot* contact and defensive Game play should be expected. Some robot tipping, entanglement, and damage may occur as a part of normal Game play. If the tipping, entanglement, or damage is ruled to be deliberate or chronic, the offending *Team* will receive a *Major Penalty* and may be *Disabled* and/or *Disqualified* for that *Match*. Repeated offenses could result in a *Team* being *Disqualified* from the remainder of the competition. See also <G19>.
- <G10> A *Robot* cannot *Pin* or *Trap* another *Robot* for more than five seconds. 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 and the offending *Robot* may be *Disabled* for the *Match*. In general, *Pinning* or *Trapping* will not be called during *Autonomous* mode. However, *Autonomous* strategies that appear to be intended to *Pin* or *Trap* an opposing *Alliance's Robot* may result in a *Minor Penalty*, or if chronic, *Disqualification*. If a *Pinning* or *Trapping* occurrence happens during the *Autonomous Period*, the first action done by the offending *Robot* during the *Driver-Controlled Period* must be to back away from the *Pinned* or *Trapped Robot* or a *Minor Penalty* will be assessed. If a Referee declares a *Pinning* or *Trapping* warning during the *Match*, the offending *Robot* must back away at least 0.9m (3 feet) or the approximate distance of 1.5 floor tiles from the *Pinned* or *Trapped Robot*.
- <G11> 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 *Penalties* will not be assessed. Strategies that appear to force an opposing *Alliance's Robot* to violate the rules are a violation of *Gracious Professionalism* and, if chronic, may result in the application of <G19>.
- <G12> *Robots* must be designed to permit easy removal of *Scoring Elements* and *Field Elements* from any grasping, containing, or holding mechanism after the *Match* without need of the *Field Control System*. *Robots* should also be able to be removed from the *Field* without need of the *Field Control System* or damaging the *Playing Field*. If this rule is violated, a *Minor Penalty* will be assessed and re-Inspection may be required before the *Team* is allowed to compete again. Repeated offenses may lead to *Team Disqualification*.
- <G13> At the beginning of a *Match*, each *Alliance Robot* must be set up on the *Playing Field* in accordance with section 1.4.1 *Pre-Match*. *Drive Teams* are required to stand *Completely In* the *Alliance Station* at the location (station one or station two) specified by the *Match* schedule to ensure that the Gamepads are assigned to the correct *Drive Team* and *Robot*.
- a. During the qualification *Matches*, the *Blue Alliance Robots* will set up on the *Playing Field* first unless *Red* waives their right to set up on the *Playing Field* second.

- b. During the elimination *Matches*, the lower seeded (e.g. 3rd seed is lower than 2nd seed) *Alliance Robots* will set up on the *Playing Field* first unless the higher seeded *Alliance* waives their right to set up on the *Playing Field* second.
- c. Teams that deliberately delay the start of the *Match* are not considered Gracious or Professional and will incur a *Minor Penalty* for each offense. Repeated offenses may lead to *Disqualification*.

<G14> *Matches* are replayed at the discretion of the Head Referee and only under the following circumstances:

- a. Failure of a *Field 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 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 time-outs, *Robot* mechanical/electrical/software failures, *Robot* communication failures, etc. are **NOT** valid justifications for a re-*Match*.

<G15> At the conclusion of the *Autonomous Period*, the Referees will, if needed, untangle *Robots*, place *Robots* on their drivetrains, make minor adjustments to *Robot* position, etc. so that the *Robots* can participate in the Driver-Controlled portion of the *Match*. The Referees will do this after finding out from the Team where the best place is to touch their *Robot*. Power to the *Robot* may also be reset under supervision of the Field Technical Advisor as long as the *Match* is not extraordinarily delayed. If the *Robot* cannot be controlled after attempts to get it working with the field, it will be *Disabled* for the remainder of the *Match*.

<G16> Field and *Field Element* tolerances may vary by as much as +/-2.5cm (1.0"). Teams must design their *Robots* accordingly.

<G17> *Robots* may not deliberately remove *Scoring or Field Elements* from the *Playing Field*. Field personnel will replace *Scoring or Field Elements* that incidentally fall Outside the *Playing Field* at the earliest convenient opportunity. Teams deliberately removing *Scoring or Field Elements* from the *Playing Field* will incur a *Minor Penalty* per occurrence. Continued violation of this rule may lead to *Disqualification*.

<G18> Teams are not allowed to touch their *Robots* once the Referee has moved all items into a *Match* starting location. If this occurs, a *Minor Penalty* will be assessed to the violating *Alliance* and the affected Team's *Robot* is not eligible to *Score* in the *Autonomous Period*.

<G19> Egregious *Robot* or Team member behavior at the *Playing Field*, as determined by the Referees, will result in a *Major Penalty* and possible *Disqualification*. Subsequent violations will result in Team *Disqualification*. Egregious behavior includes, but is not limited to, repeated and/or flagrant violation of Game rules, uncivil behavior towards *Drivers, Coaches*, competition personnel, or Event attendees, and repeated or flagrant unsafe behavior or actions.

1.5.3 Game-Specific Rules

<GS1> *Robots* may not *Control* more than five (5) *Balls* at any time. If a *Robot* is *Controlling* more than five (5) *Balls*, the *Alliance* will incur an immediate *Minor Penalty* for each *Ball* above the limit plus an additional *Minor Penalty* per

extra *Ball* for each 5-second interval that this situation continues. A *Double Minor Penalty* will be assessed for each *Ball Scored* while a *Robot Controls* more than five (5) *Balls*.

- <GS2> *Balls* must have been collected off of the *Playing Field Floor* to be eligible to be *Scored*. *Balls* that deliberately fall into *Possession* of a *Robot* without having been on the *Playing Field Floor* must be relinquished and then recollected before they can be *Scored*. Teams that violate this rule will be assessed a *Double Minor Penalty*.
- <GS3> *Balls* that are in contact with a *Robot* on the corresponding *Alliance* for the *Goal* at the end of the *Match* have zero *Score* value.
- <GS4> *Robots* may *Score Balls* into any of the opposing *Alliance's Goals* as long as no other rules are violated.
- <GS5> *Robots* may not *de-Score Balls* from any of the opponent *Alliance's Goals*. If *Balls* are *de-Scored*, the offending *Alliance* will incur a *Major Penalty* per incident plus a *Penalty* equal to the maximum *Ball Tube* points for that *Goal*. Please note that <GS14> may also apply.
- <GS6> During the *Autonomous Period*, *Robots* can only *Score* pre-loaded *Balls*. If any *Balls* other than the four *Autonomous Balls* are *Scored* by an *Alliance* during the *Autonomous Period*, their *Autonomous Period Ball Score* is zero. They can, however, still get a *Ramp/Platform* or *Kickstand Bonus*.
- <GS7> *Robots* may not begin *Scoring Balls* into the *Center Goal* during the *Driver-Controlled Period* before the *End Game* begins. If this occurs, the offending *Alliance* will not *Score* any *Center Goal End Game* points.
- <GS8> *Robots* may grab onto their own *Alliance's Rolling Goal* in any location except for the *Ball Tube*. Incidental contact with the *Ball Tube* during *Scoring* or pushing is allowed. *Robots* that grab their *Rolling Goals* by the *Ball Tube* will incur a *Minor Penalty* immediately and will incur additional *Minor Penalties* per five (5) second interval that this situation continues.
- <GS9> *Robots* may not grab, grasp, grapple, nor attach to the opposing *Alliance's Rolling Goals* at any time. *Robots* that violate this rule will be assessed a *Minor Penalty* unless the violation is continuous and/or repeated. If Teams perform continuous or repeated occurrences of this violation, they will be assessed a *Major Penalty* and may be *Disqualified* for the *Match*.
- <GS10> *Robots* may push any *Rolling Goals* (belonging to their *Alliance* or the opposing *Alliance*) as long as no other rules are violated.
- <GS11> *Robots* may not move the opposing *Alliance's Rolling Goal* FROM the opposing *Alliance's Parking Zone*. If this occurs, the offending *Alliance* will incur a *Major Penalty*.
- <GS12> *Robots* may not push any *Alliance's Rolling Goal In* to the opposing *Alliance's Parking Zone* or *Keep Out Zone*. *Robots* that violate this rule will be assessed a *Major Penalty* unless the violation is continuous and/or repeated. If Teams perform continuous or repeated occurrences of this violation, they may be *Disqualified* for the *Match*.
- <GS13> *Robots* may not push the opposing *Alliance's Rolling Goal* during the *End Game*. Contact that is determined by the Referees to be *inadvertent* and *Inconsequential* will not result in a *Penalty*. *Robots* that violate this rule will be assessed a *Minor Penalty* unless the violation is continuous and/or repeated. If Teams perform continuous or repeated occurrences of this violation, they will be assessed a *Major Penalty* and may be *Disqualified* for the *Match*.

<GS14> Robots may not tip over ANY Rolling Goal (deliberately or accidentally). If this occurs, the offending Alliance will incur a Major Penalty.

<GS15> Robots may not score Balls into a Rolling Goal that is Tipped Over. If this occurs a Minor Penalty will be assessed per Ball.

<GS16> During the End Game, an Alliance may not intrude In to the opposing Alliance's Keep Out Zone or otherwise Block Access to the opposing Alliance's Ramp/Platform. If this occurs, the offending Alliance will incur a Major Penalty. Intrusion In to the opposing Alliance's Keep Out Zone that is determined by the Referees to be Inadvertent and Inconsequential will not result in a Penalty.

<GS17> An Alliance may not Block Access to the opposing Alliance's Rolling Goals at any time. If this occurs, the offending Alliance will incur a Major Penalty.

<GS18> During the End Game, an Alliance may not Block Access to the opposing Alliance's Center Goal. If this occurs, the offending Alliance will incur a Major Penalty.

<GS19> During the End Game, an Alliance may not Block Access to the opposing Alliance's Parking Zone. If this occurs, the offending Alliance will incur a Major Penalty.

1.6 Penalty Summary

There are two types of Penalties in CASCADE EFFECTSM – Minor (10 points) and Major (50 points). The following table shows a summary of the possible rule violations and their consequences. Please refer to the rule above for complete details.

		Penalty Type				
Rule	Violation	Warning	Minor	Major	Disable	Disqualify
GENERAL GAME RULES						
<S1>	Unsafe Robot				X	DQ
<S2>	Robot goes outside of the Perimeter walls				X	DQ
<S3>	Drive Team not wearing Safety materials	w				
<G1>	Robot too big before start of match				X	
<G2>	Use of electronic communications after being called for a Match.	w	1x			DQ
<G3>	Drive Team Outside of Alliance Station.	w	1x			DQ
<G4>	Drive Team contacts Field or Game object.	w	1x			DQ
<G5>	Coach touches Gamepad controller after start of Match.	w		1x		DQ
<G7>	Robot deliberately detaches parts on Playing Field that prevent additional Scoring.			1x	X	DQ
<G8>	Robot attaches to Playing Field Element other than the excepted items.			1x		DQ
<G9>	Deliberate tipping, entanglement, or damage.			1x	X	DQ
<G10>	Pinning or Trapping.		1x			DQ
<G12>	Game Elements must be easily removed after Match		1x			DQ
<G13>	Team delays start of Match.		1x			DQ
<G17>	Deliberately removing Game Elements from the Playing Field.		1x			DQ
<G18>	Team touches Robots or Gamepads after Referee sets field ready to start Match		1x			
<G19>	Egregious Robot or Team member behavior.			1x		DQ
CASCADE EFFECT™ SPECIFIC GAME RULES						
<GS1>	Robots Possessing more than 5 Balls.		1x			
<GS2>	Balls not collected from Playing Field Floor before being Scored		2x			
<GS5>	Descoring Balls from the Center or Rolling Goals			1x +		
<GS6>	More than 2 Balls Scored during Autonomous Period.					
<GS7>	Scoring Balls in Center Goal during Driver Controlled period (not End Game)			V		
<GS8>	Grabbing onto their own Rolling Goal around the clear Ball Tube		1x			
<GS9>	Grabbing opposing Alliance's Rolling Goal		1x	1x		DQ
<GS11>	Moving opponents rolling goal from parking zone			1x		
<GS12>	Push Rolling Goals into opposing Alliances Parking Zone			1x		DQ
<GS13>	Push the opposing Alliance's Rolling Goal during End Game		1x	1x		DQ
<GS14>	Tip over any Rolling Goal			1x		
<GS15>	Scoring Balls in a Tipped Over Rolling Goal (penalty per Ball)		1x			
<GS16>	Blocking access to opposing Alliance's Ramp/Platform during End Game			1x		
<GS17>	Blocking access to opposing Alliance's Rolling Goal at any time			1x		
<GS18>	Blocking access to opposing Alliance's Center Goal during End Game			1x		
<GS19>	Blocking access to opposing Alliance's Parking Zone during End Game			1x		
Column Key						
w: warning			DQ: team disqualified from match			
1x: penalty at normal (single) cost			V: varies			
2x: penalty at double cost			X: robot disabled; team may be disqualified			