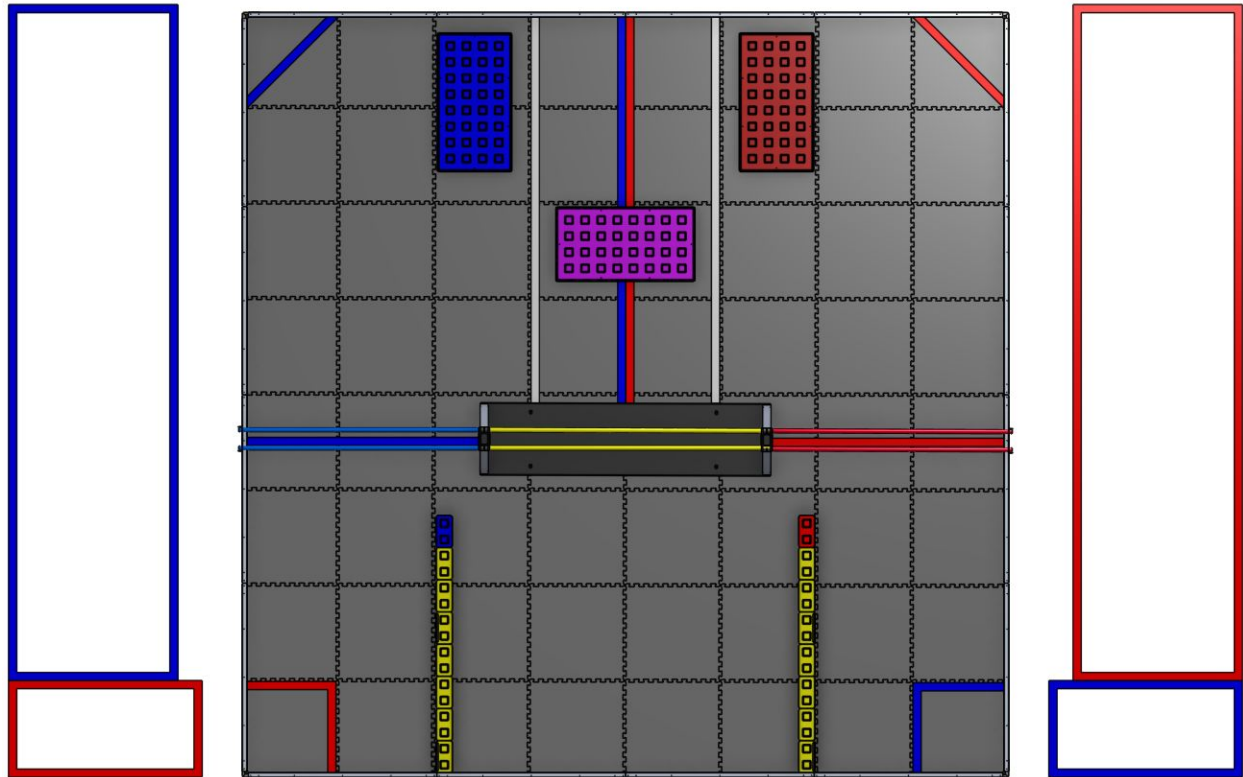


*CRI 2020 Rules*  
*For SKYSTONE<sup>SM</sup>*

The following rules are in addition or modification to the most recent version of the *FIRST* Tech Challenge 2020 Game, SKYSTONE<sup>SM</sup> presented by Qualcomm®, and its listed Game Manuals 1 and 2. Refer back to Game Manuals 1 and 2 for rules not explicitly listed here.

## Chicago Robotics Invitational 2020 Field Diagram



[Link to CAD Diagram \(OnShape\)](#)

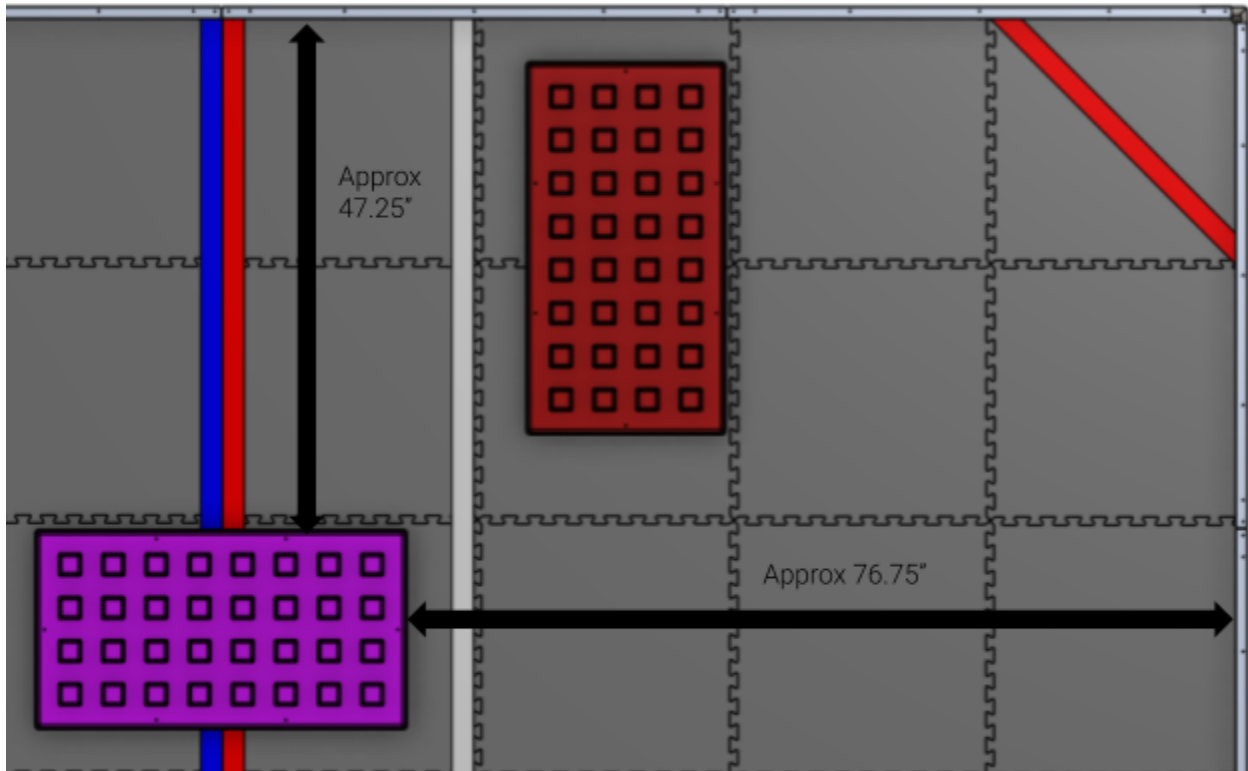
## Scoring Elements

### Alliance Specific Stones

*Alliance Specific Stones* are regular *Stones*, spray painted with their *Alliance's* color. The Spray Paint being used is Krylon Fusion Gloss Plastic paint. There will be one *Alliance Specific Stone* in each *Quarry* of that *Alliance's* color at the beginning of the *Match*. Eight *Alliance Specific Stones* of that *Alliance's* color will be in each *Alliance's Human Player Station*, in the *Stone Supply*. *Alliance Specific Stones* are considered *Stones* for all scoring purposes, including *Skyscrapers*, *Delivery* (and *Returning*), and *Placing*, similar to *Skystones*, in addition to specific scoring objectives for *Alliance Specific Stones* in this manual.

## Alliance Neutral Foundation

The *Alliance Neutral Foundation* is a regular *Foundation*, spray painted purple with Krylon Fusion Gloss Plastic paint. The *Alliance Neutral Foundation* will be positioned 47.25" (~2 tiles) from the back wall and ~76.75" (~3 ¼ tiles) from each of the side walls. The far edge of the *Alliance Neutral Foundation* is lined up on the edge of the tile tabs (on the inside of the seam) closer to the audience .



## Field Updates and Changes

### Field Borders

The *Field* is now 16'x16', instead of 12'x12'. This means that there are two more *Tiles* (and one field border panel) in each direction. There will be no *Navigation Targets* mounted on the *Field Perimeter Walls*.

### Depot / Building Site

The *Depot* and *Building Site* retain their original size and position in the four corners of the field.

## Quarry

The *Quarry* retains its position next to the front wall and the distance from each *Alliance* wall of ~47" (or lined up with the inside of the seam of *Field Tile* tabs). However, there are now eight *Stones* in each *Quarry*. There are still two *Skystones* in the *Quarry*, however these *Skystones* are now spaced with three *Stones* between them (as compared to two in 2019-2020 FTC SKYSTONE<sup>SM</sup>). There is also one *Alliance Specific Stone* of the same color as the *Alliance* that owns the *Quarry* that starts in one of the six positions which does not contain a *Skystone*. Randomization details can be found in the [Pre-Match](#) section.

## Skybridges

The *Neutral Skybridge* has been extended horizontally. The Bridge Support plate length remains the same - 18" - however, the width of the *Neutral Skybridge Bridge Support* plate has been extended to a total of 72" (three tiles). The center of the *Neutral Skybridge* remains centered between the Red and Blue *Alliance* walls; however, the front of the *Bridge Support* plate is 74" (three tiles + 2") from the front wall. The *Alliance* specific *Skybridges* remain centered on the *Skybridge Bridge Support* plate. The length of each *Alliance* specific *Skybridge* has been extended by ~1' (½ a tile) to be ~5' (2.5 tiles long).

The tape separating the *Building Zone* and the *Loading Zone* is now positioned ~81.5" from the front wall. This tape line is centered on the fourth *Tile* from the front wall. It extends from each *Alliance's* wall all the way to the *Bridge Support* plate. While this line is centered on this *Tile*, the *Skybridge* is not, due to zip tie points in the *Field* perimeter and places where the *Skybridge Support Plate* can be secured into the *Field Tiles*.

## Neutral Repositioning Line / Alliance Specific Build Zones

There are several new tape lines and *Areas* in the *Building Zone*. The *Neutral Repositioning Line* is made up of Red and Blue 2"-wide tape placed side by side with *Alliance* specific colors closest to that *Alliance's* wall, perfectly bisecting the *Building Site* between the *Alliance* walls. The Red and Blue tape that make up the *Neutral Repositioning Line* will be placed such that the line between the two pieces of tape defines the center of the field side-to-side from the *Bridge Support* plate to the back field perimeter wall. The edge of both pieces of tape should run down the center of the tile teeth seam.

*Alliance Specific Build Zones* -- the *Red Build Zone* and the *Blue Build Zone* are subsets of the *Build Zone*, as divided by the *Neutral Repositioning Line*.

## Neutral Lines / Neutral Zone

There are two *Neutral Lines* made with White 2"-wide tape which are each 7.5" (3 *Tiles*, lined up on the far edge of the tabs) from each of the *Alliance* walls. The *Neutral Lines* extend

from the back *Field Perimeter* wall to the edge of the *Skybridge Support* plate, parallel to the *Neutral Repositioning Line*.

The *Neutral Zone* is the area bounded by the back *Field Perimeter* wall, the outside of each of the *Neutral Lines* and the rear edge of the *Bridge Support* plate is considered the *Neutral Zone*. The *Neutral Zone* overlaps with both *Alliance Build Zones*.

## Game Additions Summary

### General Changes

*Matches* will be played with *Alliances* of 3 *Robots*, for a total of 6 *Robots* on the *Field* during each *Match*. *Drivers* and *Coaches* must stand within their *Driver Stations* and each *Drive Team* may pick where to stand within their *Alliance Station*. The *Driver Station* has been extended by ~4ft, such that it goes from the rear *Field Perimeter* wall. The *Human Player* station is unchanged at the front of the *Field*.

The *Driver-Controlled Period* is now 30 seconds longer for a total of 2 minutes and 30 seconds. *End Game* is still the last 30 Seconds of the *Driver-Controlled Period*. No other timing has changed.

### Pre-Match

The process of randomization has changed. There will no longer be any analogy of the die roll, whether it be within the scorekeeping software/tablets or on the displays. There will be four possible positions for the *Skystones* to be in -- the two *Skystones* will always be separated by a gap of three *Stones*. Out of the six possible positions in which there is not a randomized *Skystone*, one of those will be randomly chosen to be an *Alliance Specific Stone* of the same color as the *Alliance* that owns that *Quarry*. The randomly placed *Alliance Specific Stones* are in the same position for each *Alliance*, mirrored just like the randomly placed *Skystones*. All the possible Randomization options are listed in [Appendix A](#). Each of the potential *Skystone + Alliance Specific Stone* combinations has an equal chance of occurring.

Even though there are now six *Robots* on the field, the requirements for where *Robots* may start the *Match* have not changed. Each *Alliance* may still only have one *Human Player*.

### Autonomous Period

During the *Autonomous Period*, *Stone Delivery* bonuses are unchanged, with the addition that *Teams* may also receive a bonus of 15 points for delivering their *Alliance Specific Stone* during the *Autonomous Period*, regardless of the order it was *Delivered* in.

The *Alliance Neutral Foundation* can be *Repositioned* during the *Autonomous Period* by moving the *Neutral Foundation* such that it is *Completely In* an *Alliance Specific Build Zone* and *In*



the *Neutral Zone*. An *Alliance* may receive an additional *Foundation Repositioning* bonus for this action. (e.g., an *Alliance* that *Repositions* both the *Neutral Foundation* and their own *Foundation* would earn 20 points total for *Foundation Repositioning*.)

## Driver-Controlled Period

During the *Driver-Controlled* period, *Alliances* may place *Alliance Specific Stones* to battle for ownership of the *Neutral Foundation*.

Scoring in the *Neutral Foundation* occurs in the same way it does on an *Alliance Specific Foundation*, by placing *Stones* to build *Skyscrapers* and *Capstones* to cap the *Skyscrapers*. The total amount of points from *Placing* and building *Skyscrapers* on the *Neutral Foundation* is the *Neutral Points Buffer*. The total number of points in the *Neutral Points Buffer* is given to the *Alliance* that has more *Alliance Specific Stones* of their color *In* the *Neutral Foundation*. If both *Alliances* have the same number of *Alliance Specific Stones* *In* the *Neutral Foundation*, neither *Alliance* receives the *Neutral Points Buffer*.

In addition to receiving all the points for *Skyscrapers* and *Placement*, the *Alliance* which has more *Alliance Specific Stones* *In* the *Neutral Foundation* will receive a *Neutral Foundation Owner Bonus* depending on how many more *Stones* they have *In* the *Neutral Foundation* compared to the opposing *Alliance*. The total number of points the *Neutral Foundation* owning *Alliance* receives as the *Neutral Foundation Owner Bonus* is given by the following table:

Stones ahead of the Opposing <i>Alliance</i>	Points
0	0
1	2
2	4
3	6
4	8
5+	10

Table 1: *Neutral Foundation Ownership Bonus Points*

*Alliance Specific Stones* are worth two points when *Placed* on any *Foundation*, *Alliance Specific* or *Neutral* during the *Driver-Controlled Period*. *Placing Alliance Specific Stones* on any *Foundation* during *Autonomous* is not worth any extra *Placement* points. In addition, any *Alliance Specific Stones* that are placed on the opposite *Alliance's Foundation* are worth zero points for *Placements*, and are not considered *Interlocked* with the *Stones* or *Foundation* that they are supported by, even if they meet the definition of *Interlocked*.

## End Game

During *End Game*, either *Alliance* may *Cap* any *Skyscraper* on the *Neutral Foundation*. As many *Robots* and *Alliances* can *Cap* the same *Skyscraper* as physically possible. Each *Alliance* will receive the *Capping* points for their *Capstones* that are *In a Foundation* based on *Capstone* placement and level, whether the *Foundation* is *Alliance* specific or *Neutral*.

## Tournament Rules

There is significant demand for CRI this year, so the event coordinators may, at their discretion, make the event a dual-division event, or play the event with eight selected *Alliances*. A dual-division event will follow standard dual-division rules outlined in Game Manual Part 1. If eight selected alliances will be happening at CRI, a game manual update with further details will be given before the event.

During the *Elimination Matches*, if there are more than 24 *Teams* in each division at the tournament, *Alliances* of 4 *Teams* will be selected. Normal *Elimination Match* rules will be followed where each *Team* must play in at least one *Match* in each stage of the *Elimination Matches*. The draft will be performed in three rounds. The *Alliances Captains* will pick in numbered order 1-4, 4-1, then 1-4 for each of the three rounds. If there are less than 24 *Teams* in each division, 3 *Team Alliances* will be selected.

In the event that 3 *Team Alliances* are selected, the four highest seeded *Teams* that were not selected to join an *Alliance* will be designated as *Backup Robots*. In *Elimination Matches*, it may be necessary for an alliance to replace one of its members due to a faulty *Robot*.

*Robot* faults include but are not limited to:

1. mechanical damage,
2. electrical issues, or
3. software problems.

In this situation, the *Alliance Captain* has the option to bring in only the highest seeded *Team* from the pool of available *Teams* to join their *Alliance*. The *Team* whose *Robot* and *Drive Team* replaces another *Robot* and *Drive Team* on an *Alliance* during the *Elimination Matches* is called the *Backup Team*. The resulting *Alliance* is then composed of four *Teams*. The replaced *Team* remains a member of the *Alliance* for awards, but cannot return to play, even if their *Robot* is repaired. Each *Alliance* is allotted one *Backup Team* coupon during the *Elimination Matches*. If a second *Robot* from the *Alliance* becomes inoperable, then the *Alliance* must play the following matches with only two (or even one) *Robot*.

## Scoring Summary

<b>Scoring Achievement</b>	<b>Autonomous Points</b>	<b>Driver-Controlled Points</b>	<b>End Game Points</b>	<b>When Scored</b>
<i>Autonomous Stone Deliveries:</i> Initial Two - Skystone - Stone  Third and Higher  <i>Alliance Specific Stone</i>	10 2  2  15			As it occurs
<i>Repositioning</i>	10			End of <i>Period</i>
<i>Placing</i>	4	1		End of <i>Period</i>
<i>Navigating</i>	5			End of <i>Period</i>
<i>Driver-Controlled Stone Deliveries</i>		1		As it occurs
<i>Tallest Skyscraper Bonus</i>		2 per <i>Skyscraper Level</i>		End of <i>Match</i>
<i>Neutral Foundation Bonus</i> 1 Ahead 2 Ahead 3 Ahead 4 Ahead 5+ Ahead		2 4 6 8 10		End of <i>Match</i>
<i>Neutral Points Buffer</i>		All to owning Alliance		End of <i>Match</i>
<i>Alliance Specific Stone Placed on that Alliance's Alliance Specific Foundation</i>		2		End of <i>Match</i>
<i>Capping</i>			5	End of <i>Match</i>
<i>Capping Bonus</i>			1 per <i>Skyscraper Level</i>	End of <i>Match</i>
<i>Alliance Specific Foundation moved out of Building Site</i>			15	End of <i>Match</i>
<i>Parking</i>			5	End of <i>Match</i>

Table 2: Scoring Overview



## Rules and Penalties

### Robot Rules

*Robot* inspection will not take place, though all *Robot* rules outlined in GM1 and GM2 must be followed. If referees believe that a *Robot* does not comply with all building rules, an inspector will complete a full inspection of the *Robot* in question.

Control Hubs may be used at the tournament. As such, all the rules in the [Control Hub Pilot Addendum](#) are valid at this event, regardless of the region a *Team* is from or competing in. A word of caution: Event staff may not be fully trained and familiar with the Control Hub system, and as such they may have difficulty with troubleshooting issues.

### Game Specific Rules

All game specific rules, if they are not modified in this section, are assumed to be unmodified from the 2019-2020 FTC Skystone game.

**<GS1> Human Player Supplied Stones and Capstones** – The *Human Player* may deliver *Stones* or *Capstones* into their *Alliance's Depot* only during the *Driver-Controlled Period* with the following restrictions:

- a. Up to two *Scoring Elements* may be *Delivered* at a time. The maximum number of *Scoring Elements* (*Stones*, *Alliance Specific Stones*, and/or *Capstones*) in the *Depot* at once is two.
- b. A *Human Player* may not *Deliver Stones*, *Alliance Specific Stones*, and/or *Capstones* prior to the start of the *Driver-Controlled Period*.
- c. *Stones*, *Alliance Specific Stones*, and *Capstones* may only be hand-delivered to the *Alliance's Depot*. *Teams* may not bring tools or devices to the *Playing Field* for handling the *Stones*, *Alliance Specific Stones*, or *Capstones*. Accommodations and exceptions for a *Human Players* with disabilities or extenuating circumstances will be made at the discretion of the event coordinator.
- d. A *Human Player* cannot break the vertical plane of the *Perimeter Wall* when there is a *Robot* or the maximum number of *Scoring Elements* already *In the Depot*.
- e. A *Human Player* cannot hand-deliver a *Stone*, *Alliance Specific Stones*, or *Capstone* into the *Playing Field* when there is a *Robot* or the maximum number of *Scoring Elements* already *In the Depot*.
- f. Any *Stones* and/or *Alliance Specific Stones* that are hand-delivered by the *Human Player* from the *Stone Supply* during *Autonomous* are not eligible to receive points.
- g. *Stones*, *Alliance Specific Stones*, and/or *Capstones* must be *In the Depot* and *Completely On the Playing Field* floor prior to being *Controlled* by a *Robot*.

- h. Previously introduced *Scoring Elements* cannot be moved or adjusted when placing additional *Scoring Elements*. This includes *Scoring Elements* that were not placed in the *Depot* by the *Human Player*.

Note: A *Disabled Robot* In an *Alliance Depot* is not considered a safety hazard to the *Human Player*, therefore *Stones*, *Alliance Specific Stones*, and *Capstones* may continue to be placed. The rule <GS6> *Yellow Card* consequence applies to the *Disabled* opposing *Alliance Robot* In the *Depot*

Violations of <GS1> result in a *Minor Penalty* per occurrence.

**<GS2> Autonomous Period Interference** – During the *Autonomous Period*, *Robots* may not interfere with the opposing *Alliance's Scoring* attempts or contact/disrupt the *Stones* or *Skystones* in the opposing *Alliance's Quarry*. A *Major Penalty* will be assessed for each violation of this rule and any *Scoring* by the offending *Robot* that occurs using the opposing *Alliance's Game Elements* will not benefit the offending *Alliance*. This rule does not apply to attempts to *Score* with the *Neutral Foundation*, by *Repositioning*, *Placing*, or building *Skyscrapers*.

**<GS3> Control/Possession Limits of Stones/Capstones** – Once a *Match* begins; a *Robot* may *Control* or *Possess* a maximum of one (1) *Stone* (*Stone*, *Alliance Specific Stone*, OR *Skystone*) and/or one (1) *Capstone*.

- a. Plowing through any quantity of *Stones*, *Alliance Specific Stones*, *Skystone* or *Capstones* is allowed but herding or directing multiple *Stones*, *Alliance Specific Stones*, *Skystone* or *Capstones* 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 *Stone*, *Alliance Specific Stone*, *Skystone* or *Capstone* above the limit plus an additional *Minor Penalty* per *Stone*, *Alliance Specific Stone*, *Skystone* or *Capstone* for each 5-second interval that this situation continues.
  - i. A double *Major Penalty* will be assessed for each *Stone*, *Alliance Specific Stone*, or *Capstone* in excess of the limit that is *Placed* while a *Robot Controls* or *Possesses* more than the allowed quantity. Continued violation of this rule will escalate to *Yellow Cards* quickly.
  - ii. A *Minor Penalty* will be assessed for each *Stone*, *Alliance Specific Stone*, or *Capstone* in excess of the limit that is *Delivered* while a *Robot Controls* or *Possesses* more than the allowed quantity. Continued violation of this rule will escalate to *Yellow Cards* quickly.
- b. *Stones* and *Capstones* In any *Foundation* are exempt from the *Control/Possession Limit*.
- c. *Controlling* or *Possessing* an opposing *Alliance's Specific Stones* and/or *Capstone* is a *Major Penalty*, including *Control* or *Possession* while the opposing *Alliance's Specific Stones* and/or *Capstone* is in the *Neutral Foundation*.

**<GS5> Foundation Scoring Interference** – *Robots* may not be In their opposing *Alliance's Foundation* at any time. *Robots* may not interfere with an opposing *Alliance Robot* that is In their own *Foundation* or the *Neutral Foundation*. The first instance will result in an immediate *Major*

*Penalty* and an additional *Minor Penalty* assessed for every five seconds that the rule violation persists. Additional occurrences of violations of this rule will escalate to *Yellow Cards* quickly.

**<GS8> Controlling the Opposing Alliance's Foundation** – Robots may not *Control* the opposing *Alliance's Foundation* when the *Foundation* is *In* the opposing *Alliance's Building Site* or at any time during *End Game*. The first instance will result in an immediate *Major Penalty* and an additional *Minor Penalty* assessed for every five seconds that the rule violation persists. Additional occurrences of violations of this rule will escalate to *Yellow Cards* quickly. This does not apply to the *Neutral Foundation*.

**<GS9> De-scoring** – Robots may not remove or reposition *Stones/Capstones* from their opposing *Alliance's Foundation* when the *Foundation* is *In* the opposing *Alliance's Building Site* or at any time during *End Game*. Robots may not remove or reposition *Stones/Capstones* from the *Neutral Foundation* at any time during *End Game*. A double *Minor Penalty* will be assessed for each *Stone* that is de-scored. If a *Capstone* is de-scored, a *Major Penalty* will also be assessed.

**<GS10> Foundation Movement** – All *Foundations* must remain *Completely In* the *Building Zone*. A *Minor Penalty* will be assessed for every 5 seconds that the *Foundation* is not *Completely In* the *Building Zone*.

**<GS13> Neutral Foundation Movement** – The *Neutral Foundation* must be *In* the *Neutral Zone* at all times. A *Minor Penalty* is assessed to the offending *Alliance* for every five seconds the *Neutral Foundation* is not *In* the *Neutral Zone*.

**<GS14> Foundation Control Limits** – Robots may only control one *Foundation* at a time. A *Minor Penalty* will be assessed for each *Foundation* under control of one robot in excess of this limit, with an additional *Minor Penalty* per excess *Foundation* for each 5-second interval that this situation continues. GS8 still applies.

**<GS15> Neutral Foundation Control** – During the *Autonomous Period*, Robots may not *Control* the *Neutral Foundation* if it is not *In* that *Alliance's Build Zone*. Violation of this rule is a *Major Penalty*.

## Appendix A: Randomization Options

Skystone Positions	Alliance Specific Stone Position
	8
	7
	6
	4
	3
	2
	8
	7
	5
	4
	3
	1
	8
	6
	5
	4
	2
	1
	7
	6
	5
	3
	2
	1

Table 3: All 24 possible Randomization Options