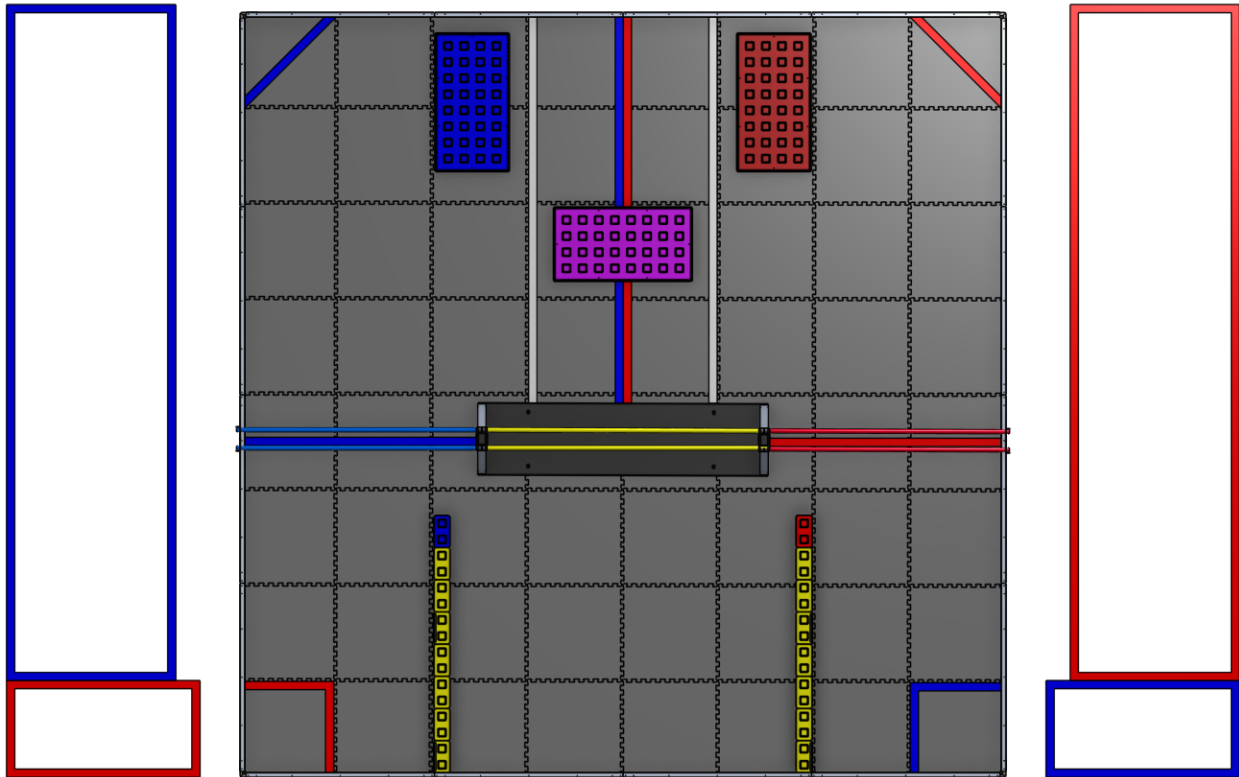


CRI 2020 Rules
For SKYSTONESM

The following rules are in addition or modification to the most recent version of the *FIRST* Tech Challenge 2020 Game, SKYSTONESM 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 \(OnShape\)](#)

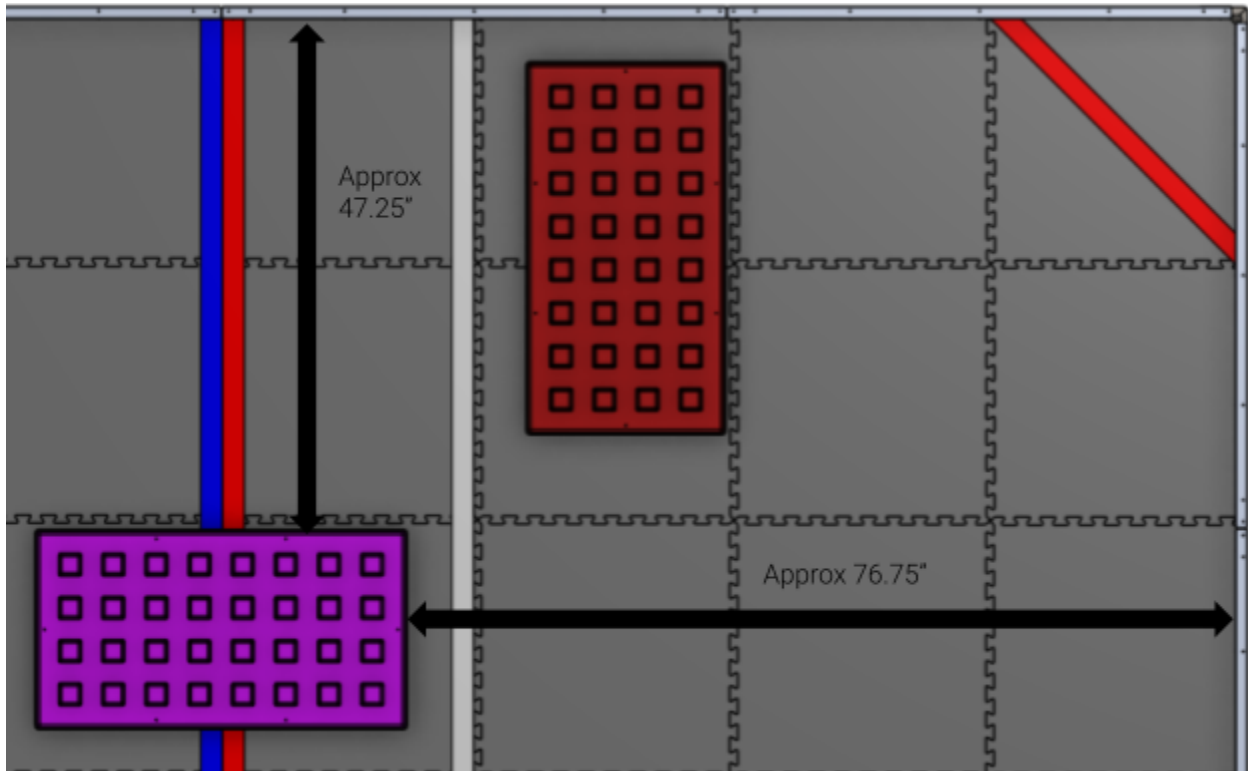
Scoring Elements

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 SKYSTONESM). 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

Scoring Achievement	Autonomous Points	Driver-Controlled Points	End Game Points	When Scored
<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

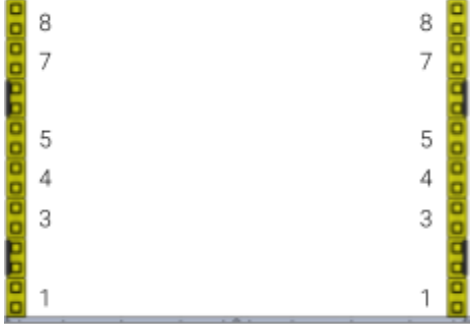

Skystone Positions	Alliance Specific Stone Position
	<p>8</p> <p>7</p> <p>6</p> <p>4</p> <p>3</p> <p>2</p>
	<p>8</p> <p>7</p> <p>5</p> <p>4</p> <p>3</p> <p>1</p>
	<p>8</p> <p>6</p> <p>5</p> <p>4</p> <p>2</p> <p>1</p>
	<p>7</p> <p>6</p> <p>5</p> <p>3</p> <p>2</p> <p>1</p>

Table 3: All 24 possible Randomization Options