# Team Update 22

## General Notes

- We have no idea how many more *Team Updates* there will be… but we're 99.9% sure they'll all relate to the 2017 *FIRST* Festival of Champions.

## Section 10.13 Festival of Champions Additions & Exceptions

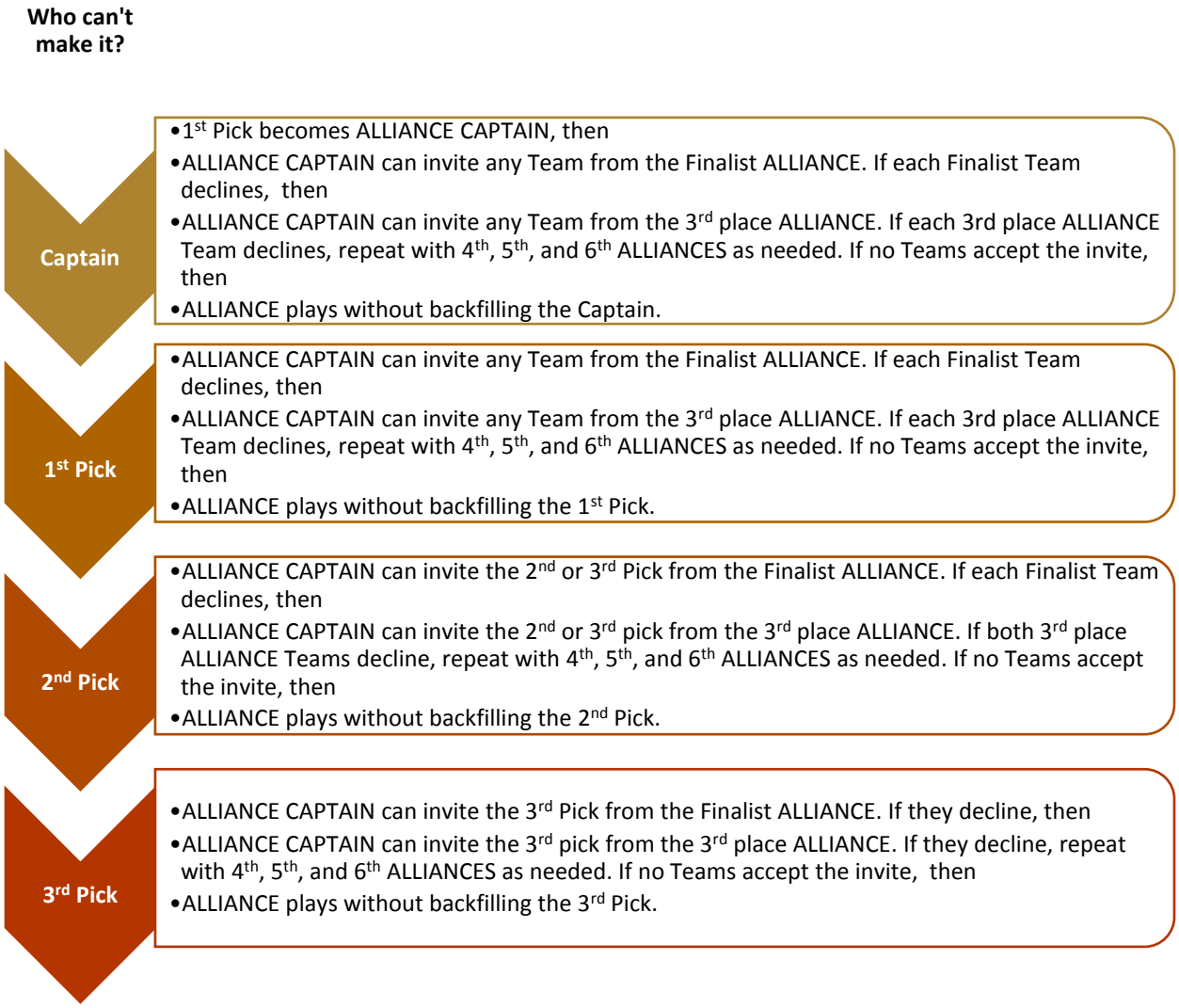
At the 2017 Festival of Champions, ALLIANCES representing FIRST Championship Houston and FIRST Championship St. Louis will meet in competition.

The ALLIANCE first winning three (3) MATCHES will be declared the winner of the event. If the MATCH score of each ALLIANCE is equal in any given MATCH, the MATCH is replayed.

ALLIANCES for the 2017 Festival of Champions will consist of the winning ALLIANCE at FIRST Championship Houston and the winning ALLIANCE at FIRST Championship St. Louis (all four (4) TEAMS from each).

Should a team from a winning alliance at a FIRST Championship location not be able to attend the 2017 Festival of Champions, the ALLIANCE CAPTAIN of that ALLIANCE may invite a team per Figure 10-5.

*Figure 10-5: Festival of Champions Backfill Process*




All relevant rules under Section 10.11.1, four-ROBOT ALLIANCES, will continue to be followed at the 2017 Festival of Champions.

As a practical matter, we will not be able to inspect for every modification TEAMS may have made to their ROBOTS after their participation on Einstein. However, the intent of these rules is to help make sure the ROBOTS that participate in the Festival of Champions are reasonably similar to the ROBOTS that participated in Einstein, with allowances for improvements in software. As with many FIRST Robotics Competition rules, we are relying on our TEAMS' Gracious Professionalism in making the Festival of Champions a fun and fair competition.

All rules in Section 9 apply, except there is no 'bagging' requirement for the ROBOTS used in competition at the Festival of Champions. Additionally, the following rules apply:

**T25.** TEAMS must compete in each MATCH with the same ROBOT they competed with at FIRST Championship, as configured for their ALLIANCE'S final MATCH. In other words, TEAMS may

not add mechanical or sensor functionality to their ROBOTS for or during the Festival of Champions, including, but not limited to:

- **A.** New functionality
- **B.** Redesigned/enhanced mechanisms
- **C.** New sensors

T25 does not prohibit changes to or additions of software, the OPERATOR CONSOLE, or non-functional decorations. It also does not restrict any activities including off-season event participation, outreach, demonstrations, or practice.

> TEAMS may make any necessary repairs to their ROBOTS. This includes the repair or replacement of damaged or non-functioning parts.
>
> Teams may modify their ROBOT in any way they wish for non-Festival of Champions activities, but any changes not compliant with this section must be undone prior to participation in the Festival.
>
> TEAMS may collaborate on the allowed activities above with any other TEAMS or resources they choose.

**T26.** ROBOTS used at the Festival of Champions must remain compliant with all ROBOT rules except R17.

> Teams participating in the Festival of Champions that have any questions on these rules should email frcteamadvocate@firstinspires.org If you are unsure whether or not an action you are considering with your Einstein ROBOT is legal, please ask.

# Team Update 21

## General Notes

- **Last One:** *Team Update 21* is the last scheduled Team Update for the 2017 season.
- **No changes:** There will be no changes to the pressure threshold or the number of prepopulated GEARS for the *FIRST* Championship.
- **Q&A:** The official Q&A will close to new questions at noon (Eastern time) this Thursday, April 13, 2017.
- **Event Rules:** The Rules & Expectations for *FIRST* Robotics Competition Events page has been updated with the following updates.
  - **E14-1** Teams may only practice with their robot in their pits or in designated practice areas that are open to all teams at events. Teams may not set up their own practice equipment outside their pits. When practicing in their pit space, safety must remain the top priority for teams. If Event Management determines an in-pit practice setup is unsafe, or interferes with activity in adjacent pits or pit aisles, the team will be required to discontinue the activity.
  - **E14-2** Teams may not expand their pit activities to empty pit spaces.
  - **E14-3** Teams may not swap pit spaces with other teams without Event Management approval.

## Section 3.6 STEAM TANK

Three windows in the STEAM TANK contain Philips Color Kinetics LED Light Strips used to indicate the amount of steam pressure generated by the BOILER and transmitted to the AIRSHIP. Each window displays the same information. ~~Each row of two (2) LEDs changes, from off to on in white, then from on in white to on in the ALLIANCE color, for each ten (10) kPa of pressure generated.~~ For every five (5) kPa of pressure generated, a row of LEDs illuminates in the ALLIANCE'S color. For example, if ~~an ALLIANCE generates ten (10) kPa of pressure, the bottom row is white. If~~ the Red ALLIANCE has generated forty (40) ~~20 (twenty)~~ kPa, the bottom eight (8) rows of LEDs are red. If the Blue ALLIANCE generates ten (10) ~~thirty (30)~~ kPa, the bottom two (2) rows are ~~row is~~ blue ~~and the second row is white~~.

## Section 10.11.3 *FIRST* Championship Playoffs

~~In the case where Championship Scores of two or more alliances are equal, the tie is broken using the criteria in Table 10-6.~~

*Table 0-1: Einstein Tournament Ranking Criteria*

| Order Sort | Criteria |
|---|---|
| 1st | Championship Score |
| 2nd | Cumulative sum of MATCH points |
| 3rd | Cumulative sum of ROTOR and pressure bonuses |
| 4th | Cumulative sum of AUTO points |
| 5th | Cumulative ROTOR engagement score (AUTO and TELEOP) |
| 6th | Cumulative TOUCHPAD score |
| 7th | • If tie affects which ALLIANCES advance to Playoffs, a tiebreaker MATCH is played between the affected ALLIANCES.<br>• If tie is between ALLIANCES advancing to Playoffs, FMS randomly seeds tied ALLIANCES to determine ALLIANCE color. |

## Section 10.11.4 *FIRST* Championship TIMEOUTS

*Einstein timeouts are being removed because there will be at least six minutes of downtime (often more) between any two sets of Einstein matches.*

There are no TIMEOUTS for teams in the Einstein tournament.

~~For the Einstein Tournament, each ALLIANCE will be issued one TIMEOUT coupon for use as described in Section 10.9 TIMEOUTS and BACKUP TEAMS.~~

**T17.** ~~If an Einstein ALLIANCE wishes to call a TIMEOUT, the ALLIANCE CAPTAIN must submit their TIMEOUT coupon to the Head REFEREE (or their designee) within two (2) minutes of the ARENA reset signal from the previous MATCH. If there is no preceding MATCH, the TIMEOUT coupon must be submitted no later than two (2) minutes before the scheduled MATCH time. The TIMEOUT will begin two (2) minutes after the ARENA reset signal (i.e. at the end of the TEAM TIMEOUT Coupon Window depicted in Figure 10-4.~~ Deleted.

## Section 11 Glossary

| Term | Definition |
|---|---|
| PORT | a 13 in. (~33 cm) wide by 19½ in. (~50 cm) hole next to each LIFT cut in each of the three walls facing the ALLIANCE WALL |

# Team Update 20

There are no changes this week!

# Team Update 19

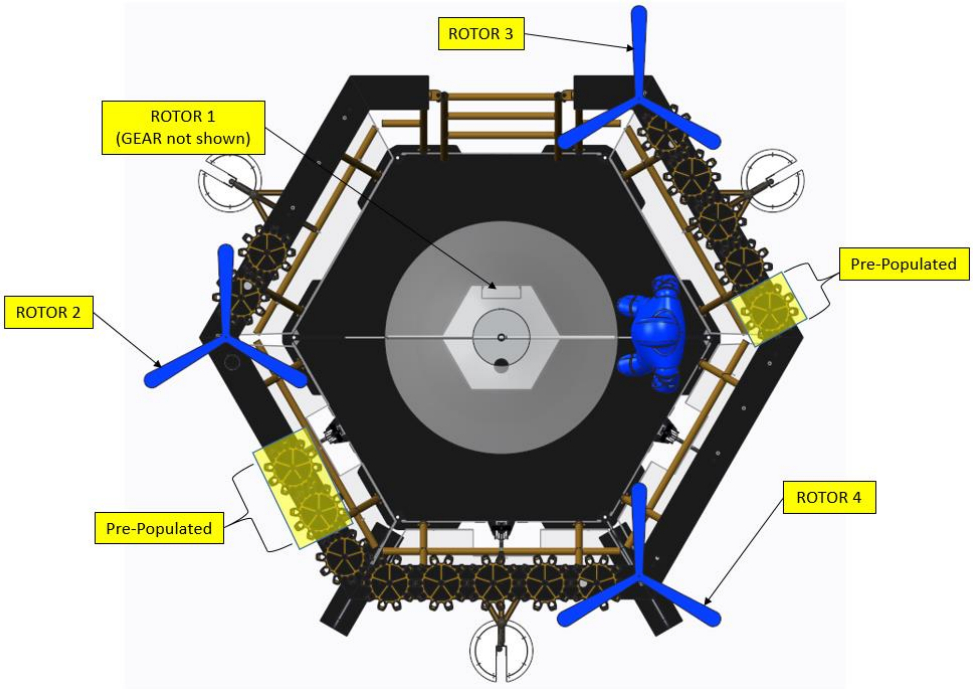
## General Notes

- Neither the number of pre-populated GEARS nor the threshold pressure will be changed for District Championships.
- *GE-17448 3/8 Flexible Steel Conduit* has been added to the Field Components drawing package.

## Section 3.4.2 GEAR Sets

*Figure 3-11 has been edited to move the pre-populated GEARS from the left side of the set to the right side of the set (in reference to the PILOT'S perspective).*

*Figure 3-11: GEAR placement*




## Section 3.11.4 BOILER

*FIRST* instructs FTAs to test BOILER counting by dumping forty (40) FUEL into each High and Low Efficiency GOAL and noting the count logged by the FMS three times before MATCHES begin each day. The BOILER is operating as expected if the counts in each batch are 40 +/-1.

## Section 5 Safety Rules

**S04.** **Wait for the green lights.** ~~Non-PILOT members of~~ DRIVE TEAMS may only enter the FIELD if the LED strings are green, unless explicitly instructed by a REFEREE or an FTA, and PILOTS may only exit the AIRSHIP if the LED strings are green, unless explicitly instructed by a REFEREE or an FTA.

## Section 7.3 ROBOT to ROBOT Interaction

**G14.** **Don't climb on each other.** Unless attempting to right a fallen (i.e. tipped over) ALLIANCE partner, ROBOTS may neither fully nor partially support the weight of other ROBOTS on the same ALLIANCE strategically or repeatedly.

## Section 10.8 MATCH Replays

Over the course of the Tournament, ARENA FAULTS may occur. An ARENA FAULT is an error in ARENA operation that includes, but is not limited to:

**A.** broken FIELD elements due to

**i.** normal, expected game play or

**ii.** ROBOT abuse of FIELD elements that affects the outcome of the MATCH for their opponents.

A broken FIELD element caused by ROBOT abuse that affects the outcome of the MATCH for their ALLIANCE is not an ARENA FAULT.

For example, a ROBOT that slams into their own LIFT (which has been constructed and assembled per the manual) so hard that the peg breaks, is not considered an ARENA FAULT.

# Team Update 18

## General Notes

- **Drawing Package:** *GE-17047 Lift Assembly, Rev A* has been added to the Field Components drawing package and includes a modification to the peg (spring) on the carriage assemblies used for GEAR handling on the AIRSHIP. This alternate peg assembly has increased peg stiffness and durability and tested well at an event over the weekend. While it does not eliminate the possibility of peg damage during play, it does appear to reduce it. This is now the primary design, and will likely be installed at all Week 4 events, however former versions may still be used if Rev A is not available.

## Section 5 Safety Rules

**S04.** **Wait for the green lights.** Non-PILOT members of DRIVE TEAMS may only enter the FIELD if the LED strings are green, unless explicitly instructed by a REFEREE or an FTA, and PILOTS may only exit the AIRSHIP if the LED strings are green, unless explicitly instructed by a REFEREE or an FTA.

**S12.** **Climb facing the ladder, but don't operate it.** PILOTS may only enter and exit the AIRSHIP under the following criteria:

**A.** a member of the FIELD STAFF has released the ladder,

**B.** one rung at a time (though bottom rung may be skipped), and

**C.** facing your AIRSHIP.

Note that PILOTS exiting the AIRSHIP if the LED strings are purple is a violation of S04.

# Section 7.7 Human Action Rules

**H12.** **You can't bring/use anything you want.** The only equipment that may be brought to the ARENA and used by DRIVE TEAMS during a MATCH is listed below. Regardless if equipment fits criteria below, it may not be employed in a way that breaks any other rules, introduces a safety hazard (e.g. a step stool or large signaling device in the confined space of the AIRSHIP are safety concerns), blocks visibility for FIELD STAFF or audience members, or jams or interferes with the remote sensing capabilities of another Team, including vision systems, acoustic range finders, sonars, infrared proximity detectors, etc. (e.g. including imagery that, to a reasonably astute observer, mimics the Vision Guides).

**A.** the OPERATOR CONSOLE,

**B.** BANNERS and devices, if needed, to assist placement in the BANNER Holder,

**C.** non-powered signaling devices,

**D.** reasonable decorative items,

**E.** special clothing and/or equipment required due to a disability

**F.** devices used solely for the purpose of planning or tracking strategy or devices used solely to record gameplay, provided they meet all of the following conditions:

- **i.** do not connect or attach to the OPERATOR CONSOLE
- **ii.** do not connect or attach to the FIELD or ARENA
- **iii.** do not connect or attach to another ALLIANCE member
- **iv.** do not communicate with anything or anyone outside of the ARENA.
- **v.** do not include any form of enabled wireless electronic communication (e.g. radios, walkie-talkies, cell phones, Bluetooth communications, Wi-Fi, etc.)
- **vi.** do not in any way affect the outcome of a MATCH, other than by allowing PLAYERS to plan or track strategy for the purposes of communication of that strategy to other ALLIANCE members.

**G.** non-powered Personal Protective Equipment (examples include, but aren't limited to, gloves, eye protection, and hearing protection)

Violation: MATCH will not start until situation remedied. If discovered or used inappropriately during a MATCH, TECH FOUL.

# Team Update 17

## General Notes

- **Drawing Update.** Please note, there are three types of points that will be used on LIFTS at 2017 events, *GE-17064 Peg, Point (black ABS), GE-17064 Peg, Point, Rev A (white HDPE)*, and *GE-17064 Peg, Point, Rev B (clear Polycarbonate)*

## Section 3.5 LIFTS

It is constructed from ⅞-in. (nominal) diameter extension spring (McMaster P/N: 9664K68 or Century Spring P/N: E-41).

## Section 3.7 DAVIT

These fingers are 1¼ in. (~3 cm) apart and have a hole for a wire locking retaining pin (McMaster P/N: 98416A009 or similar).

## Section 7.5 GAME PIECE Interaction

**G15**

> GAME PIECES are expected to undergo a reasonable amount of wear and tear as they are handled by ROBOTS, such as scratching or marking. Gouging, tearing off pieces, or routinely marking GAME PIECES are violations of this rule. Humans causing GAME PIECE wear and tear, e.g. flattening FUEL, are subject to a CARD per Section 10.7 YELLOW and RED CARDS.
>
> A ROBOT that has only unseated the TOUCHPAD dome has not damaged the FIELD.
>
> GEARS placed in a BOILER will damage the BOILER internal elements and such an action is considered an egregious violation of G15.

## Section 8.8 Control, Command & Signals System

*We have received reports of issues connecting to devices plugged into the "802.3af" port (further from the power connector) on OM5P-AC radios, which are often resolved by power cycling the radio. We are looking in to the issue but currently have no estimated timetable for a fix. We have relaxed R63, as shown below, to allow teams to connect the roboRIO through a switch to the 18-24V POE port. The OM5P-AN radio should not be affected by this issue.*

**R63** The roboRIO Ethernet port must be connected to the Wireless Bridge port labeled "18-24V POE," closest to the power connector (either directly, via a switch, or via a CAT5 Ethernet pigtail).

> Note: Placing a switch between the roboRIO and radio may impede the ability for FIELD STAFF to troubleshoot roboRIO connection issues on the FIELD. Teams may be asked to try directly connecting from the radio to roboRIO as part of troubleshooting efforts.

**I04**, part E

To interface with the field a ROPE must have a retaining feature (e.g. a knot) greater than 1 in. (~25.4 mm) in diameter to interface with the DAVITS (RF).

The DAVIT's retaining pins are not designed to hold the weight of a ROBOT and therefore attachment to them would not be considered engaging "securely with the FIELD" per I04-D.

# Team Update 16

## General Notes

- **Drawing Update.** Please note, there are two types of points that will be used on LIFTS at 2017 events, *GE-17064 Peg, Point* (black ABS) and *GE-17064 Peg, Point,* Rev A (white HDPE).
- **NI Update.** An optional update to the NI FRC Update Suite (17.2.0) has been posted. This update contains modifications to the Dashboard and LabVIEW code to improve the reliability of the Dashboard connecting to USB camera streams for teams using LabVIEW. Teams that still see issues at their event should try restarting Robot Code from the Driver Station and talk with their CSA.
- **Connectivity Reminders:**
  - To connect to the Field Management System at events, your Driver Station must have an Ethernet port (per R98).
  - Rookie teams should make sure to bring the USB-to-Ethernet adapter provided in the Yellow Tote of your Kickoff Kit.
- **Event Rules.** The edit below was made to the Rules & Expectations for *FIRST* Robotics Competition Events page because it duplicates E32-2.

  ~~**E31.** No more than five members of each team (one must be an adult mentor) are permitted.~~

## 5 Safety Rules

**S07.** **Keep your limbs safe ~~hands "inside" the vehicle~~ at all times.** During the MATCH, the PILOT may neither

**A.** contact ROTORS,

**B.** contact DAVITS,

**C.** reach outside any port (except for incidental and brief excursions outside the port and above the deck, required to manipulate the carriage assembly), nor

**D.** contact any part of a deployed (i.e. any part of the ROPE is below the deck of the AIRSHIP) ROPE.

Reaching outside a port to retrieve a GEAR is a violation of S07-C, as retrieving a GEAR is not manipulating the carriage assembly.

Reaching outside a port to untangle a pull handle or pull cord is not a violation of S07-C, as those elements are part of the carriage assembly.

Violation: YELLOW CARD

## 10.7 YELLOW and RED CARDS

*Table 10-4: YELLOW and RED CARD application*

| Time YELLOW or RED CARD earned: | MATCH to which CARD is applied: |
|---|---|
| prior to the start of Qualification MATCHES | Team's first Qualification MATCH |
| during the Qualification MATCHES | Team's current (or just-completed) MATCH. In the case where the Team participated as a SURROGATE in the current (or just completed) MATCH, the card is applied to the Team's previous MATCH (i.e. the Team's second Qualification MATCH.) |
| between the end of Qualification MATCHES and the start of Playoff MATCHES | ALLIANCE'S first Playoff MATCH |
| during the Playoff MATCHES | ALLIANCE'S current (or just-completed) MATCH. |

## 10.12.3.7 *FIRST*® Championship Eligibility for District Teams

*Table 10-11: District slot allocations for FIRST Championship*

| | | | Chairman's Award | | | Dean's List Award | | | Engineering Inspiration Award | | | Rookie All Star Award | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *FIRST* Championship Slots | *FIRST* Championship Normalized Slots | Max Ratio | Min Ratio | District Selection | Max Ratio | Min Ratio | District Selection | Min | Max | District Selection | Min | Max | District Selection |
| | | | 18 | 9 | | 9 | 6 | | | | | | | |
| ***FIRST* Championship St. Louis** | | | | | | | | | | | | | | |
| *FIRST* Chesapeake | 23 | | 1 | 3 | 2 | 3 | 4 | 4 | 1 | 2 | 2 | 1 | 2 | 1 |
| *FIRST* in Michigan | 82 | | 5 | 9 | 5 | 9 | 14 | 14 | 1 | 2 | 1 | 1 | 2 | 2 |
| Indiana *FIRST* | 10 | | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 1 |
| Mid-Atlantic Robotics | 22 | | 1 | 2 | 2 | 2 | 4 | 4 | 1 | 2 | 2 | 1 | 2 | 1 |
| New England | 37 | | 2 | 4 | 4 | 4 | 6 | ~~5~~6 | 1 | 2 | 2 | 1 | 2 | 2 |
| Ontario | 29 | | 2 | 3 | 3 | 3 | 5 | 5 | 1 | 2 | 1 | 1 | 2 | 1 |
| ***FIRST* Championship Houston** | | | | | | | | | | | | | | |
| *FIRST* Israel | 16 | 13 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 |
| *FIRST* North Carolina | 15 | 12 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 |
| Pacific Northwest | 39 | 32 | 2 | 4 | 3 | 4 | 5 | 5 | 1 | 2 | 2 | 1 | 2 | 2 |
| Peachtree | 18 | 15 | 1 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 2 | 1 | 2 | 1 |

# Team Update 15

## General Notes

- **Team Update Schedule.** For the remainder of the 2017 *FIRST* Robotics Competition season, Team Updates will only be posted on Tuesdays (i.e. no more Friday Team Updates).
- **Crib Sheet.** G20-1, added below, has also been added to the *FIRST* STEAMWORKS Crib Sheet.

## Section 3.4.2 GEAR Sets

Some AXLES are prepopulated with GEARS and indicated in Table 3-1. Prepopulated GEARS are marked with ALLIANCE color gaff tape.

## Section 5 Safety Rules

**S12.** **Climb facing the ladder, but don't operate it.** PILOTS may only enter and exit the AIRSHIP under the following criteria:

**A.** a member of the FIELD STAFF has released the ladder,

**B.** one rung at a time (though bottom rung may be skipped), and

**C.** facing your AIRSHIP.

## Section 6 Conduct Rules

**C08.** **Don't expect to gain by doing others harm.** Strategies aimed solely at forcing the opposing ALLIANCE to violate a rule are not in the spirit of *FIRST* Robotics Competition and not allowed. Rule violations forced in this manner will not result in an assignment of a penalty to the targeted ALLIANCE.

Violation: FOUL. If egregious or repeated, YELLOW CARD.

> C08 does not apply for strategies consistent with standard gameplay, e.g. contacting an opponent while in your RETRIEVAL ZONE to retrieve GAME PIECES.
>
> C08 requires an intentional act with limited or no opportunity for the TEAM being acted on to avoid the penalty, e.g. placing a GEAR on/in an opponent who's already controlling a GEAR ~~pinning an opponent in your KEY~~ such that they cannot help but violate G27~~G17~~.

## Section 7.4 FIELD Interaction

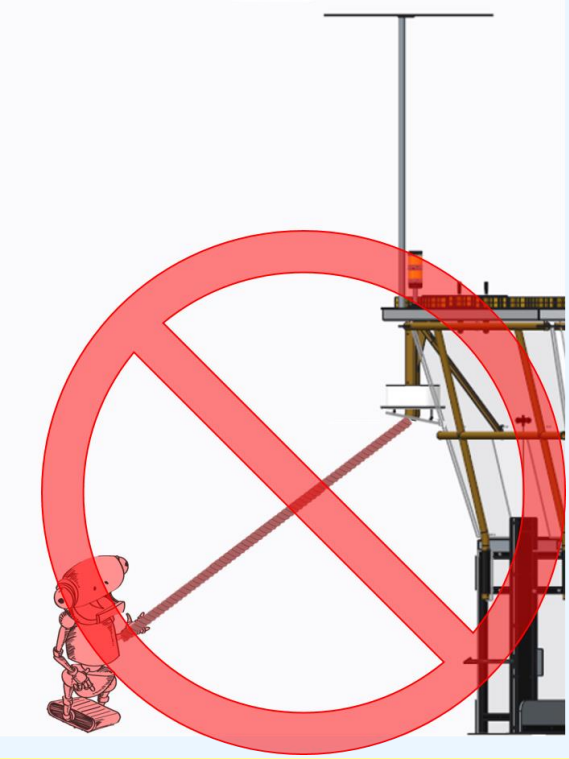
**G20-1.** **ROBOTS gotta climb.** A ROBOT may only signal they're "Ready for Takeoff" by climbing a ROPE.

Violation: RED CARD

> 'Climbing a ROPE' means ascending using a ROPE.

A ROBOT may supplement the climbing action by using an extension that reaches out to trigger a TOUCHPAD (assuming, of course, ROBOT size restrictions are still met), but climbing must be part of the triggering action.

*Figure 7-3: Use of FIELD geometry to signal a ROBOT is "Ready for Takeoff" without climbing the ROPE is an example of a violation of G20-1.*



## 7.5 GAME PIECE Interaction

**G26.** **If you're going to deliver GEARS, you have to use a LIFT.** Any GEAR transferred from a ROBOT to a PILOT during the MATCH must be done so via a LIFT.

Violation: TECH FOUL and a YELLOW CARD.

## Section 10.12.3.7 *FIRST* Championship Eligibility for District Teams

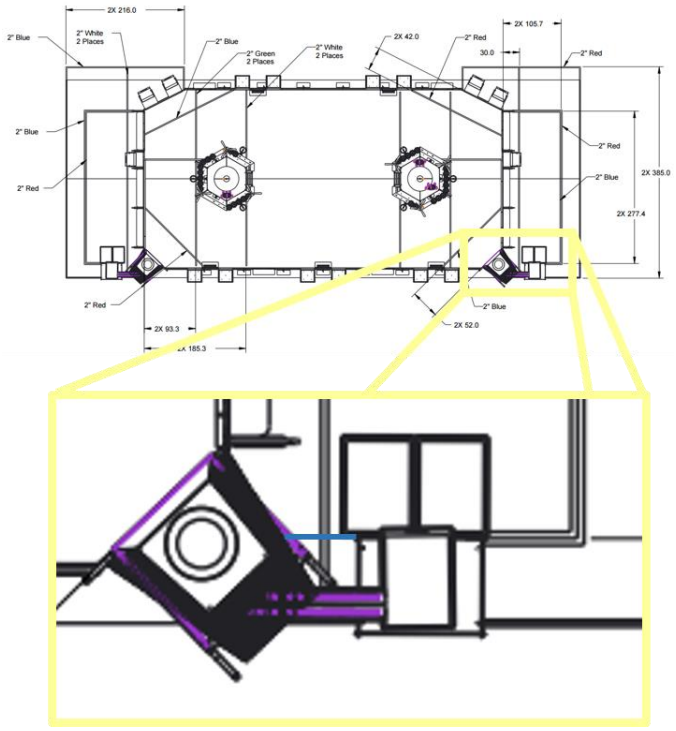
*Table 10-11: District slot allocations for FIRST Championship*

| | *FIRST* Championship Slots | *FIRST* Championship Normalized Slots | ~~Dean's List~~ Chairman's Award | | | ~~Chairman's~~ Dean's List Award | | | ~~Rookie All Star~~ Engineering Inspiration Award | | | ~~Engineering Inspiration~~ Rookie All Star Award | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Max Ratio | Min Ratio | District Selection | Max Ratio | Min Ratio | District Selection | Min | Max | District Selection | Min | Max | District Selection |
| | | | 18 | 9 | | 9 | 6 | | | | | | | |
| ***FIRST* Championship St. Louis** | | | | | | | | | | | | | | |
| *FIRST* Chesapeake | 23 | | 1 | 3 | 2 | 3 | 4 | 4 | 1 | 2 | 2 | 1 | 2 | 1 |
| *FIRST* in Michigan | 82 | | 5 | 9 | 5 | 9 | 14 | 14 | 1 | 2 | 1 | 1 | 2 | 2 |
| Indiana *FIRST* | 10 | | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 1 |
| Mid-Atlantic Robotics | 22 | | 1 | 2 | 2 | 2 | 4 | 4 | 1 | 2 | 2 | 1 | 2 | 1 |
| New England | 37 | | 2 | 4 | 4 | 4 | 6 | 5 | 1 | 2 | 2 | 1 | 2 | 2 |
| Ontario | 29 | | 2 | 3 | 3 | 3 | 5 | 5 | 1 | 2 | 1 | 1 | 2 | 1 |
| ***FIRST* Championship Houston** | | | | | | | | | | | | | | |
| *FIRST* Israel | 16 | 13 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 |
| *FIRST* North Carolina | 15 | 12 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 |
| Pacific Northwest | 39 | 32 | 2 | 4 | 3 | 4 | 5 | 5 | 1 | 2 | 2 | 1 | 2 | 2 |
| Peachtree | 18 | 15 | 1 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 2 | 1 | 2 | 1 |

# Team Update 14

## General Notes

- **Drawings:** FE-00040 in the Field Assembly drawing package has been updated to extend the ALLIANCE STATION tape border to the BOILER (blue example shown below).



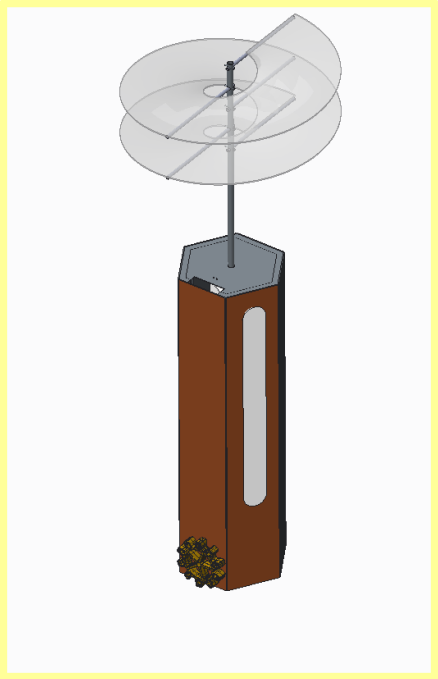

- **Q&A:** The answer to Q597 has been revised to be consistent with the edit to *Section 8.1* detailed below. Our apologies for any confusion!
- **Crib Sheet.** G11, edited in this Team Update, has been updated in the *FIRST* STEAMWORKS Crib Sheet.

| Section | # | Headline | Verbal Warning | FOUL | TECH FOUL | DISABLED | YELLOW CARD | RED CARD | Other |
|---|---|---|---|---|---|---|---|---|---|
| **7. Game** (Robot to Robot) | G11 | **There's a 5-count on pins.** | | √ + every 5s[1] | √ + every 5s[2] | | | if extended/ egregious | 1) If pinning ROBOT is not in the opponent's KEY<br>2) If pinning ROBOT is in the opponent's KEY |

## Section 3.4.2 GEAR Sets

*Figure 3-12 has be updated to change the Reserve GEAR from the base of the STEAM TANK opposite its slot to the base of the STEAM TANK on the same side as its slot.*

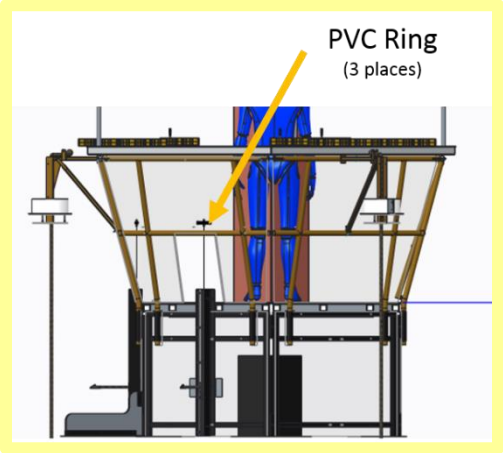
*Figure 3-12: Reserve GEAR location*



## Section 3.5 LIFTS

LIFTS are used to transfer GEARS from the ROBOTS to the PILOTS. One (1) LIFT is mounted to each of the three (3) sides of the deck that face the PLAYER STATIONS. Each LIFT consists of a peg, steel guide frame, carriage assembly, and cable. The cable is pulled by the PILOT to raise the carriage to a PORT where the GEAR can be safely accessed. Each carriage has a peg designed to hold the GEAR during the transition. The peg is 1 ft. 1 in. (~33 cm) from the FIELD carpet when the carriage is all the way down, protrudes 10½ in. (~27 cm) from the carriage and is 1⅜ in. (~3 cm) wide. It is constructed from ⅞-in. (nominal) diameter extension spring (McMaster P/N: 9664K68). A PVC ring, centered on and mounted to the lower rung of the AIRSHIP rail as show in Figure 3-15, loosely holds the pull cord and prevents the LIFT handle from falling out the PORT.

*Figure 3-15: LIFT handle ring location*




## Section 3.7 DAVIT

These fingers are 1¼ in. (~3 cm) apart and have a hole for a wire locking retaining pin (McMaster P/N: 98416A009 or similar). The ROPE passes through the fingers with the top knot on the AIRSHIP side of the fingers.

## Section 4.2 MATCH Setup

Each MATCH begins with GAME PIECES, elements used to score points, staged as shown in Figure 4-1. Staging details are as follows:

- FUEL
    - **A.** Ten (10) available for each TEAM to preload in their ROBOT (any not preloaded are staged in the bin referenced in the next bullet, B)
    - **B.** Twenty (20) in each LOADING LANE (in a bin staged between the LOADING STATION and the STARTING LINE)
    - **C.** One hundred (100) plus or minus four (4) in each HOPPER (i.e. fifty (50) plus or minus two (2) in each HOPPER container)
- GEARS
    - **D.** One (1) available to each team to preload in their ROBOT (any not preloaded are staged with GEARS in E)
    - **E.** Eighteen (18) in each LOADING LANE (staged on the carpet between the LOADING STATION and the STARTING LINE)
    - **F.** One (1) in each AIRSHIP (as described in Section 3.4.2)

## Note from Frank Merrick, FRC Director, about G11 and G17 edits:

Many folks probably know that we had our Week Zero event last Saturday here in New Hampshire. What you may not know is that we use these Week Zero events to train our Head Referees. During their discussions, our Head Refs noted a problem with G11 and G17. G11 says pinning longer than 5 seconds is against the rules, while G17 says being in your opponent's KEY longer than 5 seconds is against the rules. But it may not be uncommon for both of these things to be happening at the same time, in the same place, involving the same two robots. It would even be possible for the same robot to be violating both rules, but with different start times for each 5 second count.

This is not something the Refs could realistically keep track of fairly and is likely to be confusing to Teams. So, you will see in the changes below, we essentially eliminated the possibility that Refs would need to keep track of both penalties at the same time and place with the same two robots. However, while we wanted to eliminate the possibility that both penalties could be called in this situation, we did not want to eliminate the additional consequence to an alliance should one of their robots pin an opponent longer than 5 seconds while simultaneously being in that opponent's KEY. So, we bumped the penalty for pinning in an opponent's KEY to a TECH FOUL. We recognize this penalty increase is significant, compared to two FOULS, but it does get the message across that this is to be avoided, while at the same time allowing our Refs to do their jobs fairly.

## Section 7.3 ROBOT to ROBOT Interaction

**G11.** **There's a 5-count on pins.** ROBOTS may not pin an opponent's ROBOT for more than five (5) seconds. A ROBOT will be considered pinned until the ROBOTS have separated by at least six (6) feet. The pinning ROBOT(s) must then wait for at least three (3) seconds before attempting to pin the same ROBOT again. Pinning is transitive through other objects. If the pinned ROBOT chases the pinning ROBOT upon retreat, the pinning ROBOT will not be penalized, and the pin will be considered complete.

Violation: If pinning ROBOT is not in the opponent's KEY, FOUL, plus an additional FOUL for~~. For~~ every five (5) seconds in which the situation is not corrected~~, FOUL~~. If pinning ROBOT is in the opponent's KEY, TECH FOUL, plus an additional TECH FOUL for every five (5) seconds in which the situation is not corrected. In either scenario, if ~~If~~ extended and egregious, RED CARD.

> There is no *FIRST*® Robotics Competition specific definition of pin, so a general definition applies; "to prevent or stop something from moving." As a result, contact is not required for pinning to occur. For example, a ROBOT parked right behind an opponent that is between dividers could be considered pinning because the dividers and the parked ROBOT prevent the opponent from moving.
>
> Generally, pins that exceed fifteen (15) seconds are considered extended and egregious, regardless of a pinning ROBOT's mobility, however circumstances vary and the assessment is open to REFEREE discretion.

## Section 7.4 FIELD Interaction

**G17.** **Opponent's KEY: a no parking zone.** A ROBOT may not be in their opponent's KEY for more than five (5) seconds (if the ROBOT is breaking the plane of the line with BUMPERS, it is considered in the KEY).

A ROBOT that is being pinned is exempt from G17. Once the pin is over, the G17 5-second count begins.

Violation: FOUL. For every five (5) seconds in which the situation is not corrected, FOUL.

> In a scenario where a ROBOT is pinning (per G11) and in the opponent's KEY, REFEREES are instructed to disregard G17 so they can focus on the pinning.

## Section 7.6 AUTO Period Rules

**A05.** **PILOTS: don't take the "free" GEAR yet.** During AUTO, PILOTS may not remove the reserve GEAR from the starting position ~~slot~~ in which it begins the MATCH.

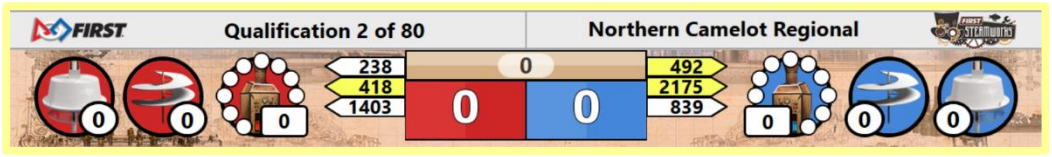
Violation: TECH FOUL.

## Section 8.1 Overview

Many rules in this section reference Commercial-Off-The-Shelf (COTS) items. A COTS item must be a standard (i.e. not custom order) part commonly available from a VENDOR for all Teams for purchase. To be a COTS item, the COMPONENT or MECHANISM must be in an unaltered, unmodified state (with the exception of installation or modification of any software). Items that are no longer commercially available but are functionally equivalent to the original condition as delivered from the VENDOR are considered COTS and may be used.

## Section 10.7 YELLOW and RED CARDS

*Figure 0-1: Audience Screen Graphic Showing YELLOW and RED CARD Indicators*



# Team Update 13

## General Notes

- **Crib Sheet.** G01-1, added in this Team Update, has been included. A discrepancy between the *FIRST* STEAMWORKS Crib Sheet and the 2017 FRC Game & Season Manual has been corrected in the crib sheet.

| Section | # | Headline | Verbal Warning | FOUL | TECH FOUL | DISABLED | YELLOW CARD | RED CARD | Other |
|---|---|---|---|---|---|---|---|---|---|
| **7. Game** (GAME PIECE) | G01-1 | **Know your ROPE setup.** | | | | | | | If quick fix, MATCH won't start until requirements are met. If not quick fix, default FIELD ROPE installed. |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **7. Game** (GAME PIECE) | G27 | **One-GEAR limit.** | | √ | If strategic | ~~if strategic~~ | if strategic | | |

## Section 3.8 ROPE

Each default ROPE is knotted at the top, such that there's at least 7 ft. 2 in. (~218 cm) below the knot (see Figure 3-19), fused at the bottom, suspended from a notch at the end of each DAVIT, and ~~coiled and~~ stowed using the ROPE retention strap and loop pad (as described in GE-17025) on the outside of the AIRSHIP.

## Section 7.1 Before the MATCH

**G01-1** **Know your ROPE setup.** If a Team is using their own ROPE, it must be stowed using the ROPE retention strap and/or loop pad such that it is not deployed.

Violation: If fix is a quick remedy, the MATCH won't start until all requirements are met. If it is not a quick remedy the FIELD STAFF will install a default ROPE.

## Section 7.7 Human Action Rules

**H12.** **You can't bring/use anything you want.** The only equipment that may be brought to the ARENA and used by DRIVE TEAMS during a MATCH is listed below. Regardless if equipment fits criteria below, it may not be employed in a way that breaks any other rules, introduces a safety hazard (e.g. a step stool or large signaling device in the confined space of the AIRSHIP are safety concerns), blocks visibility for FIELD STAFF or audience members, or jams or interferes with the remote sensing capabilities of another Team, including vision systems, acoustic range finders, sonars, infrared proximity detectors, etc. (e.g. including imagery that, to a reasonably astute observer, mimics the Vision Guides).

A. the OPERATOR CONSOLE,

B. BANNERS and devices, if needed, to assist placement in the BANNER Holder,

C. non-powered signaling devices,

D. reasonable decorative items,

E. special clothing and/or equipment required due to a disability

F. devices used solely for the purpose of planning or tracking strategy provided they meet all of the following conditions:

   i. do not connect or attach to the OPERATOR CONSOLE

   ii. do not connect or attach to the FIELD or ARENA

   iii. do not connect or attach to another ALLIANCE member

   iv. do not communicate with anything or anyone outside of the ARENA.

   v. do not include any form of enabled wireless electronic communication (e.g. radios, walkie-talkies, cell phones, Bluetooth communications, Wi-Fi, etc.)

   vi. do not in any way affect the outcome of a MATCH, other than by allowing PLAYERS to plan or track strategy for the purposes of communication of that strategy to other ALLIANCE members.

G. non-powered Personal Protective Equipment (examples include, but aren't limited to, gloves, eye protection, and hearing protection)

Violation: MATCH will not start until situation remedied. If discovered or used inappropriately during a MATCH, TECH FOUL.

## Section 10.4.3 Qualification Ranking

Ranking Points (RP) are units credited to a Team based on their ALLIANCE'S performance in Qualification MATCHES. Ranking Points are awarded to each eligible Team at the completion of each Qualification MATCH:

A. Each Team on the winning ALLIANCE receives two (2) Ranking Points.

B. Each Team on the losing ALLIANCE receives zero (0) Ranking Points.

C. In the event of a tied score, all Teams receive one (1) Ranking Point.

D. Each Team on an ALLIANCE that achieves at least 40kPa receives one (1) Ranking Point.

E. Each Team on an ALLIANCE that engages all four (4) ROTORS by the end of the MATCH receives one (1) Ranking Point.

Exceptions to A-E are as follows:

F. A SURROGATE receives zero (0) Ranking Points.

G. A DISQUALIFIED Team, as determined by the Head REFEREE, receives zero (0) Ranking Points in a Qualification MATCH or causes their ALLIANCE to receive zero (0) MATCH points in a Playoff MATCH.

H. A "no-show" Team is either DISQUALIFIED from or issued a RED CARD for that MATCH (see C07). A Team is declared a no-show if no member of the DRIVE TEAM is in the ALLIANCE STATION, AIRSHIP, or LOADING LANE at the start of the MATCH.

# Team Update 12

## General Notes

- **Robot Lockup Form.** The following edit was made to the Robot Lockup Form:
  **3.** Stop build day is 04:59 UTC on Wednesday, February 22, 2017 which is 11:59 PM Eastern on Tuesday February 21, 2017.
- **FRC Driver Station Software.** A mandatory update for the FRC Driver Station has been released (NI FRC Update Suite 2017.1.0, DS version 17.0.1) and can be downloaded from here. This update fixes bugs in DS<->FMS connectivity for both the regular FMS and FMS Offseason.
- **C++\Java Eclipse**. An optional update for the C++\Java Eclipse plugins has been released (2017.3.1). This update has fixes to SmartDashboard (especially regarding Sendable Chooser), CameraServer, and I2C/SPI communications. A full changelog can be found here. Update instructions can be found here.
- **2017 FRC Inspection Checklist.** The following edit was made to the 2017 FRC Inspection Checklist:
  Driver Station – ~~17.0a11~~ 17.0.1 <R96>

## Section 4.6 Logistics

Once the MATCH is over, if the Head REFEREE determines that the FIELD is safe for FIELD Staff but not safe for everyone (e.g. the FIELD is littered with FUEL that may cause a tripping hazard for a DRIVE TEAM carrying a ROBOT), they will turn the LED strings purple. Once the FIELD is ready for regular traffic, the Head REFEREE will change the LED strings to green and DRIVE TEAMS may retrieve their ROBOT in accordance with S04.

## Section 7.3 ROBOT to ROBOT Interaction

**G14.** **Don't climb on each other.** Unless attempting to right a fallen (i.e. tipped over) ALLIANCE partner, ROBOTS may neither fully nor partially support the weight of other ROBOTS strategically or repeatedly.

## Section 8.7 Power Distribution

**R44.** The one (1) ROBOT battery, a single pair of Anderson Power Products (or APP) 2-pole SB type connectors, the one (1) main 120-amp (120A) surface mount circuit breaker (Cooper Bussmann P/N: CB185-120 or CB185F-120), and the one (1) CTR Electronics Power Distribution Panel (PDP, P/N: am-2856, 217-4244, 14-806880) shall be connected with 6 AWG (7 SWG or 16 mm2) wire or larger, with no additional devices or modifications, as shown in Figure 8-8.

**R57.** All circuits shall be wired with appropriately sized insulated wire:

*Table 8-4: Wire sizes*

| Application | Minimum Wire Size |
|---|---|
| 31 – 40A protected circuit | 12 AWG (13 SWG or 4 $mm^2$) |
| 21 – 30A protected circuit | 14 AWG (16 SWG or 2.5 $mm^2$) |
| 6 – 20A protected circuit<br>Between the PDP dedicated terminals and the VRM or PCM | 18 AWG (19 SWG or 1 $mm^2$) |

| | |
|---|---|
| Compressor outputs from the PCM | |
| Between the PDP and the roboRIO<br>≤5A protected circuit | 22 AWG<br>(22 SWG or 0.5 $mm^2$) |
| VRM 2A circuits | 24 AWG<br>(24 SWG or .25$mm^2$) |
| roboRIO PWM port outputs | 26 AWG<br>(27 SWG or 0.14 $mm^2$) |
| SIGNAL LEVEL circuits (i.e. circuits which draw ≤1A continuous and have a source incapable of delivering >1A, including but not limited to roboRIO non-PWM outputs, CAN signals, PCM Solenoid outputs, VRM 500mA outputs and Arduino outputs) | 28 AWG<br>(29 SWG or .08 $mm^2$) |

Wires that are recommended by the device manufacturer or originally attached to legal devices are considered part of the device and by default legal. Such wires are exempt from R57.

## Section 8.10 OPERATOR CONSOLE

**R96.** The Driver Station software provided on the National Instruments website is the only application permitted to specify and communicate the operating mode (i.e. Autonomous/Teleop) and operating state (Enable/Disable) to the ROBOT. The DRIVER Station software must be revision ~~17.0a11~~ 17.0.1 or newer.

# Team Update II (it's one louder)

## General Notes

- The following edits were made to the 2017 FRC Inspection Checklist.

  **Starting Configuration** - No parts may extend beyond the vertical projection of the ~~BUMPER ZONE~~ FRAME PERIMETER. <R02>

  **Custom Circuits, Sensors and Additional Electronics** – cannot directly control speed controllers, Spike relays, actuators or servos and may not produce voltage in excess of 24 volts. <R35, R49 & R60>
- An update to the FRC Radio Configuration Utility (17.3) is now available. This update contains updated firmware for both the OM5P-AN (2016) and OM5P-AC radios to fix the following issues:
  - OM5P-AC US version now set to proper country code (previously could only use Band 1 5GHz channels)
  - OM5P-AN LED now works properly in Bridge mode
  - Patches potential security vulnerability in event configuration

  All teams should update radio firmware using this utility before attending an event.
- The Robot Lockup Form has been published on the *FIRST* STEAMWORKS Game & Season Materials site.
- The following edits were made to the "Report Incidents" section of the Rules & Expectations for *FIRST* Robotics Competition Events page.

## Report Medical Incidents

*FIRST* strives to create an environment in which team members can grow, learn, and have fun with minimal risk of injury. *FIRST* requires that physical injuries and medical problems, however slight, be documented and reported to the party conducting the event or his or her designee and to *FIRST* Headquarters within 48 hours of the occurrence. Should an incident or illness occur at an event, we ask that you do the following:

- Report it to the EMT or nurse.
- Have an adult mentor complete a Medical Incident ~~report~~ Report ~~with the~~ at Pit Administration ~~area~~. Pit Administration staff will be available to help complete the form. Once the form is completed, it should be turned in to Pit Administration, who will take the process from there.

## Report Non-Medical Incidents

*FIRST* maintains a culture where concerns about ~~the~~ safety, ~~and~~ comfort, and fairness ~~of team members~~ can be raised and addressed. If anyone states that they feel threatened or uncomfortable because of verbal abuse, inappropriate contact, or other negative behaviors that are not in the spirit or event rules of *FIRST*, we ask that you complete a Non-Medical Incident Report to formally document the event.

This form may ~~also~~ be used to report witnessed violations of any rules in this section, such as the rules against seat saving or throwing objects from seating areas. The fastest and easiest way to resolve such issues is often to have a friendly conversation with the individual or individuals engaging in the behavior. It's very possible they are not aware of the rule being violated.

However, if you are not comfortable doing so, or have attempted that approach and it has not worked, please report it on the Non-Medical Incident Report form.

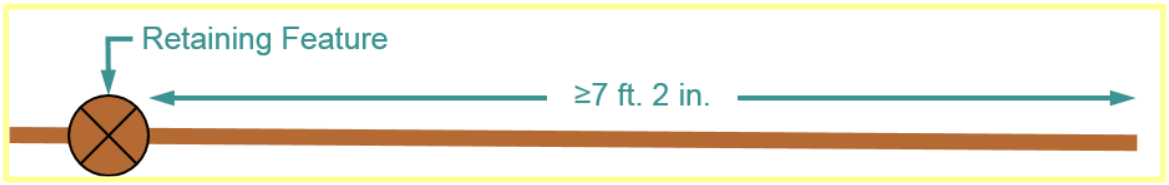
*FIRST* takes all disclosures and indications of risk seriously, and will work to resolve the issue quickly, while honoring every individual's right to privacy.

Non-Medical Incident Forms are kept at the Pit Administration area and may be completed anonymously. Pit Administration staff will be available to help complete the form. Once the form is completed, it should be turned in to Pit Administration, who will take the process from there.

## Section 3.8 ROPE

Each default ROPE is knotted at the top such that there's at least 7 ft. 2 in. (~218 cm) below the knot (see Figure 3-19), fused at the bottom, suspended from a notch at the end of each DAVIT, and coiled and stowed on the outside of the AIRSHIP.

*Figure 3-19: FIELD ROPE Anatomy*




## Section 8 The ROBOT

**R02.** In the STARTING CONFIGURATION (the physical configuration in which a ROBOT starts a MATCH), no part of the ROBOT shall extend outside the vertical projection of the FRAME PERIMETER, with the exception of its BUMPERS and minor protrusions such as bolt heads, fastener ends, rivets, etc.

If a ROBOT is designed as intended and each side is pushed up against a vertical wall (in STARTING CONFIGURATION and with BUMPERS removed), only the FRAME PERIMETER (or minor protrusions) will be in contact with the wall.

The allowance for minor protrusions in R02 is intended to allow protrusions that are both minor in extension from the FRAME PERIMETER and cross sectional area.

# Team Update 10

## General Notes

- The *2017 Inspection Checklist* has been posted on the *FIRST* STEAMWORKS Game & Season Materials page.
- *GE-17306 Alliance Plastic, GE-17307 Return Loading Station, GE-17356 Field Top Rail, and GE-17358 Alliance Station Frame* have been added to the Field Components drawing package.

## Section 3.11.2 Overflow LOADING STATION

The Overflow LOADING STATION shelf is 2 ft. ~~1 in.~~ (~~64~~ 61 cm) wide, 3 ft. (~91 cm) long, and mounted at a 72 deg. angle. The top of the shelf is 3 ft. 7⅜ in. (~110 cm) from the carpet.

## Section 7.3 ROBOT to ROBOT Interaction

**G11. There's a 5-count on pins.** ROBOTS may not pin an opponent's ROBOT for more than five (5) seconds. A ROBOT will be considered pinned until the ROBOTS have separated by at least six (6) feet. The pinning ROBOT(s) must then wait for at least three (3) seconds before attempting to pin the same ROBOT again. Pinning is ~~transitory~~ transitive through other objects. If the pinned ROBOT chases the pinning ROBOT upon retreat, the pinning ROBOT will not be penalized, and the pin will be considered complete.

## Section 8.6 Motors & Actuators

**R35.** Each power regulating device may control electrical loads per Table 8-2. Unless otherwise noted, each power regulating device shall control one and only one electrical load.

*Table 8-2: Power regulating device allotments*

| Electrical Load | Motor Controller | Relay Module | Pneumatics Controller |
|---|---|---|---|
| CIM<br>AndyMark 9015<br>WCP RS775 Pro<br>VEX BAG/MiniCIM<br>Banebots | Yes | No | No |
| Automotive Window/Door/Windshield Wiper/Seat/Throttle Motors<br>AndyMark PG Snow-Blower Motor<br>NeverRest | Yes (up to 2 per controller) | Yes | No |
| Compressor | No | Yes | Yes |
| Pneumatic Solenoid Valves | No | Yes* | Yes (1 per channel) |
| Electric Solenoids | No | Yes* | Yes (1 per channel |
| CUSTOM CIRCUITS[a] | Yes | Yes* | Yes (1 per channel) |

* Multiple low-load, pneumatic solenoid valves, electric solenoids or CUSTOM CIRCUITS may be connected to a single relay module. This would allow one (1) relay module to drive multiple pneumatic actions or multiple CUSTOM CIRCUITS. No other electrical load can be connected to a relay module used in this manner.

[a] A Custom circuit is any electrical component of the robot other than motors, pneumatic solenoids, roboRIO, PDP, PCM, VRM, RSL, 120A breaker, motor controllers, relay modules (per R34-B), wireless bridge, or batteries.

## Section 8.7 Power Distribution

**R60.** CUSTOM CIRCUITS shall not directly alter the power pathways between the ROBOT battery, PDP, motor controllers, relays (per R34-B), motors and actuators (per R32), pneumatic solenoid valves, or other elements of the ROBOT control system (items explicitly mentioned in R71). Custom high impedance voltage monitoring or low impedance current monitoring circuitry connected to the ROBOT'S electrical system is acceptable, if the effect on the ROBOT outputs is inconsequential.

## Section 8.8 Control, Command & Signal Systems

**R71.** The Driver Station software, roboRIO, Power Distribution Panel, Pneumatics Control Modules, Voltage Regulator Modules, RSL, 120A breaker, motor controllers, relay modules (per R34-B), Wireless Bridge, and batteries shall not be tampered with, modified, or adjusted in any way (tampering includes drilling, cutting, machining, rewiring, disassembling, etc.), with the following exceptions:

**R73.** Every relay module (per R34-B), servo controller, and PWM motor controller shall be connected to a corresponding port (relays to Relay ports, servo controllers and PWM controllers to PWM ports) on the roboRIO (either directly or through a WCP Spartan Sensor Board) or via a legal MXP connection (per R74). They shall not be controlled by signals from any other source.

## Section 10.12.3 District Events

~~Teams are ranked in decreasing order,~~ If there is a tie in the season point total between teams, those ties are broken using the following sorting criteria:

*Table 10-8: District Team sort criteria*

| Order Sort | Criteria |
|---|---|
| 1st | Total Playoff Round Performance Points |
| 2nd | Best Playoff Round Finish at a single event |
| 3rd | Total ALLIANCE Selection Results Points |
| 4th | Highest Qualification Round Seed or Draft Order Acceptance (i.e. Highest ALLIANCE Selection points at a single event) |
| 5th | Total Qualification Round Performance Points |
| 6th | Highest Individual MATCH Score, regardless of whether that score occurred in a Qualification or Playoff MATCH |
| 7th | Second Highest Individual MATCH Score, regardless of whether that score occurred in a Qualification or Playoff MATCH |
| 8th | Third Highest Individual MATCH Score, regardless of whether that score occurred in a Qualification or Playoff MATCH |
| 9th | Random Selection |

## 10.12.3.6 District Championship Eligibility

*Table 10-10: 2017 District Championship Capacities*

| District Championship | 2017 Team Capacity |
|---|---|
| Chesapeake District Championship | 58 |
| Indiana State Championship | 32 |
| Israel | 45 |
| Michigan State Championship | ~~TBD~~160 |
| Mid-Atlantic Robotics District Championship | 60 |
| New England District Championship | 64 |
| *FIRST* North Carolina State Championship | 32 |
| *FIRST* Ontario Provincial Championship | 60 |
| Pacific Northwest District Championship | 64 |
| Peachtree District State Championship | 45 |

# Team Update 09

## General Notes

- *GE-17096, Crank Handle* has been added to the Field Components drawing package.

## Section 5 Safety Rules

**S01. Safety glasses: required.** All event attendees must wear ANSI-approved, UL Listed, CE EN166 rated, AS/NZS, or CSA rated non-shaded safety glasses while in the ARENA. Lightly tinted lenses are permitted provided eyes are clearly visible to others, but reflective lenses are prohibited.

*This edit will also be made in the 2017 Safety Manual.*

## Section 9 Eligibility & Inspection

**I04 D.** consist entirely of (except for dye or ~~an~~ adhesive applied by the VENDOR as part of the normal manufacturing process for a COTS item and no longer tacky, e.g. a “binder coat”) flexible, non-metallic fibers sewn, twisted, tied, woven, knitted, crocheted, intertwined, or braided together except for the last 4 in. (~10 cm) of any cut end (E) which may be whipped (with material that is flexible and non-metallic) or fused only to prevent fraying.

# Team Update 08

## General Notes

- A material note in *GE-17081, Upper Arm* has been corrected to reflect that the piece is made from 1 in. tubing.

## Section 9 Eligibility & Inspection

**I04**, **G**. if frayed, knotted or looped, the total diameter does not exceed 10 in. (~25 cm) (D)

## Section 10.4.2 MATCH Assignment

*See the FRC blog post for background and added explanation regarding this particular edit. Thank you to Tom and Cathy Saxton at Idle Loop Software Design for updating the algorithm!*

FMS assigns each Team two (2) ALLIANCE partners for each Qualification MATCH using a predefined algorithm, and teams may not switch Qualification MATCH assignments. The algorithm employs the following criteria, listed in order of priority:

1. Maximize time between each MATCH played for all Teams

2. Minimize the number of times a Team plays opposite any Team

3. Minimize the number of times a Team is allied with any Team

4. Minimize the use of SURROGATES (Teams randomly assigned by the FMS to play an extra Qualification MATCH)

5. Provide even distribution of MATCHES played on Blue and Red ALLIANCE

6. Balance assigned PLAYER STATION proximity to a BOILER.

## 10.12.3.3 Awards

This attribute measures Team performance with respect to ~~judged~~ Team awards judged at the event.

The points earned for Team awards in this system are not intended to capture the full value of the award to the Team winning the award, or to represent the full value of the award to *FIRST*. In many ways, the Team's experience in being selected for awards, especially the Chairman's Award, the Engineering Inspiration Award, and the Rookie All Star Award, is beyond measure, and could not be fully captured in its entirety by any points-based system. Points are being assigned to awards in this system only to help Teams recognize that *FIRST*® continues to be "More than Robots®," with the emphasis on our cultural awards, and to assist in elevating award-winning Teams above non-award winning Teams in the ranking system.

Teams only get points for ~~judged~~ Team awards judged at the event. If an award is not judged, e.g. Rookie Highest Seed, ~~or~~ is not for a Team, e.g. the Dean's List Award, or is not judged at the event, e.g. Safety Animation Award, sponsored by UL, no points are earned.

# Team Update 07

## General Notes

- *GE-17025, Airship Assembly* in the 2017 Field Components drawing package has been updated to include information about the ROPE retention strap attached to the AIRSHIP.

## Section 3.4.2 GEAR Sets

Once a ROTOR is started, it remains turning for the duration of the MATCH. ROTORS only start ~~if GEARS are installed~~ in ~~ROTOR~~ order: 1, 2, 3, and then 4. The order of GEAR placement within a ~~ROTOR~~ GEAR set is not important. To start ROTOR 1, the PILOT places the GEAR in the GEAR slot at the top of the STEAM TANK, opposite the stack light for ROTOR 1.

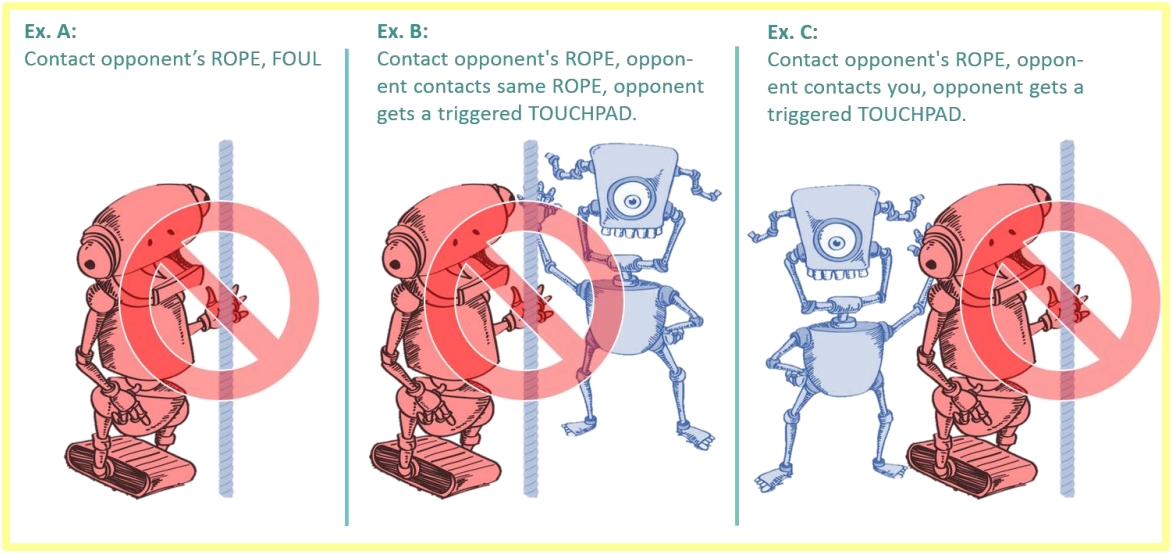
## Section 3.9 TOUCHPAD

While a force less than 75 lbs (~34 kg) applied to the TOUCHPAD plate once it's fully pressed is not likely to damage the TOUCHPAD, be aware that any damage, even if a result of less than 75 lbs of ~~pressure~~ force, is a violation of G15.

## Section 7.4 FIELD Interaction

**G20.** **Let 'em climb: don't touch their ROPES.** During the final thirty (30) seconds of a MATCH, ROBOTS may not contact an opposing ALLIANCE'S ROPE.

*Figure 7-3: Don't touch opponents' ROPES in the final thirty (30) seconds of the MATCH.*




Violation: FOUL. If an opposing ROBOT contacts the offending ROBOT or the ROPE, the opposing ROBOT is considered to have triggered an un-triggered TOUCHPAD at the end of the MATCH.

# Team Update 06

## General Notes

- **Q&A:** There are a high number of duplicate questions being asked in the Q&A. A duplicate question is one we believe has already been asked and has the same answer (regardless of whether the answer's already published or still pending). A deluge of duplicate questions clogs the Q&A resulting in delayed answers and consumes resources we could otherwise be dedicating to new questions. So, from this point forward, duplicate questions will be deleted. If your question has been deemed a duplicate and deleted, use the 'search' function to find your answer. If you still can't find your answer, ask again, and consider referencing a question that has already been answered with a 'In the answer to Question X, you said Y, but I am looking for clarification on situation Z' which will help the Q&A staff understand why what you're asking is a new inquiry.
- **Q82:** The answer to Q82 has been updated to reflect the change to *Section 3.4.2 GEAR Sets* described below.
- **Field Tour Video:** Alliance Station depicts the dual light strings in the STEAMPIPE mounted back-to-back and vertically. The actual FIELDS will ship with a single strand facing up. A note will be added to the video's description.
- **Drawing Update:** *GE-17047, Carriage Assembly* has been updated in the Field Components drawing package to include previously omitted items 11 and 12 (collar and associated hardware) and update notes as needed.

## Section 3.2 FIELD

There are two versions of GUARDRAILS and PLAYER STATIONS (i.e. the FIELD perimeter) used for competitions. One design has been used at *FIRST* Robotics Competition events for several years and is depicted in the 2017 Basic Field Drawings and *FIRST* provided CAD models. The other is designed and sold by AndyMark. While the designs are slightly different, the critical dimensions, performance, and expected user experience between the two is the same. All Regional and Championship assemblies will use the traditional *FIRST* design (except for Shenzhen Regional and all *FIRST* Championship practice fields). Teams may contact their local District leadership for details on which assembly is used by their District. Detailed drawings for the AndyMark design are posted on the AndyMark website. All illustrations in this document depict the traditional FIELD design.

## Section 3.4 AIRSHIP

The AIRSHIP is a structure that features an elevated hexagonal deck, slanted walls, rails with AXLES to mount GEARS, four (4) ROTORS, three (3) LIFTS, a STEAM TANK, and three (3) ROPES attached to DAVITS. There is one AIRSHIP at the edge of each LAUNCHPAD. The AIRSHIP is positioned such that the three (3) LIFTS face the ALLIANCE WALL. The maximum capacity of the AIRSHIP is two (2) people.

## Section 3.4.2 GEAR Sets

When a GEAR set for ROTORS 2, 3, or 4 is complete, a CRANK, a handle located with the first GEAR in the set, can be turned which engages the corresponding ROTOR. It takes three (3) full rotations to engage the ROTOR. If a GEAR set corresponding to the next sequential unengaged ROTOR remains idle for more than ten (10) seconds, the rotation count resets to zero (0).

## Section 3.9 TOUCHPAD

The force required to activate the TOUCHPAD (i.e. push the TOUCHPAD plate up by approximately ½ in. (~1.3 cm), causing activation of one or more of its microswitches) is no more than 1 lb. (~½ kg).

The force required to move the TOUCHPAD throughout its full range of travel (i.e. cause the TOUCHPAD plate to travel the full 1½ in. (~4 cm)) is no more than 2 lbs. (~1 kg).

While a force less than 75 lbs (~34 kg) applied to the TOUCHPAD plate once it's fully pressed is not likely to damage the TOUCHPAD, be aware that any damage, even if a result of less than 75 lbs of pressure, is a violation of G15.

## Section 7.4 FIELD Interaction

**G15. Be careful about what you grab on to.** DRIVE TEAMS, ROBOTS, and OPERATOR CONSOLES are prohibited from the following actions with regards to interaction with ARENA elements.

Items A and B exclude DRIVE TEAM interaction with FIELD elements in their areas.

Item C excludes use of the PLAYER STATION hook-and-loop tape, plugging in to the provided power outlet, and plugging the provided Ethernet cable in to the OPERATOR CONSOLE.

Items A-E exclude GAME PIECES.

Items A-G exclude ROPES installed on an ALLIANCE'S AIRSHIP.

Items A-H exclude a ROBOT'S interaction with a Team supplied ROPE that doesn't litter the FIELD.

- **A.** Grabbing
- **B.** Grasping
- **C.** Attaching to (including the use of hook-and-loop tape against the FIELD carpet)
- **D.** Grappling
- **E.** Hanging
- **F.** Deforming
- **G.** Becoming entangled
- **H.** Damaging

Violation: If prior to MATCH, and situation can be corrected quickly, it must be remedied before the MATCH will start. If during a MATCH, FOUL. If during a MATCH and extended or repeated, YELLOW CARD. If offense is via a ROBOT and the Head REFEREE determines that further damage is likely to occur, offending ROBOT will be DISABLED. Corrective action (such as eliminating sharp edges, removing the damaging MECHANISM, and/or re-Inspection) may be required before the ROBOT will be allowed to compete in subsequent MATCHES.

GAME PIECES are expected to undergo a reasonable amount of wear and tear as they are handled by ROBOTS, such as scratching or marking. Gouging, tearing off pieces, or routinely marking GAME PIECES are violations of this rule. Humans causing GAME PIECE wear and tear, e.g. flattening FUEL, are subject to a CARD per Section 10.7 YELLOW and RED CARDS.

A ROBOT that has only unseated the TOUCHPAD dome has not damaged the FIELD.

## Section 8.3 ROBOT Safety & Damage Prevention

**R06.** Protrusions from the ROBOT and exposed surfaces on the ROBOT shall not pose hazards to the ARENA elements (including the GAME PIECES and excluding a Team supplied ROPE) or people.

## Section 9 Inspection & Eligibility

**I04. D.** consist entirely of flexible, non-metallic fibers sewn, twisted, tied, woven, knitted, crocheted, intertwined, or braided together except for the last 4 in. (~10 cm) of any cut end (E) which may be whipped (with material that is flexible and non-metallic) or fused only to prevent fraying.

# Team Update 05

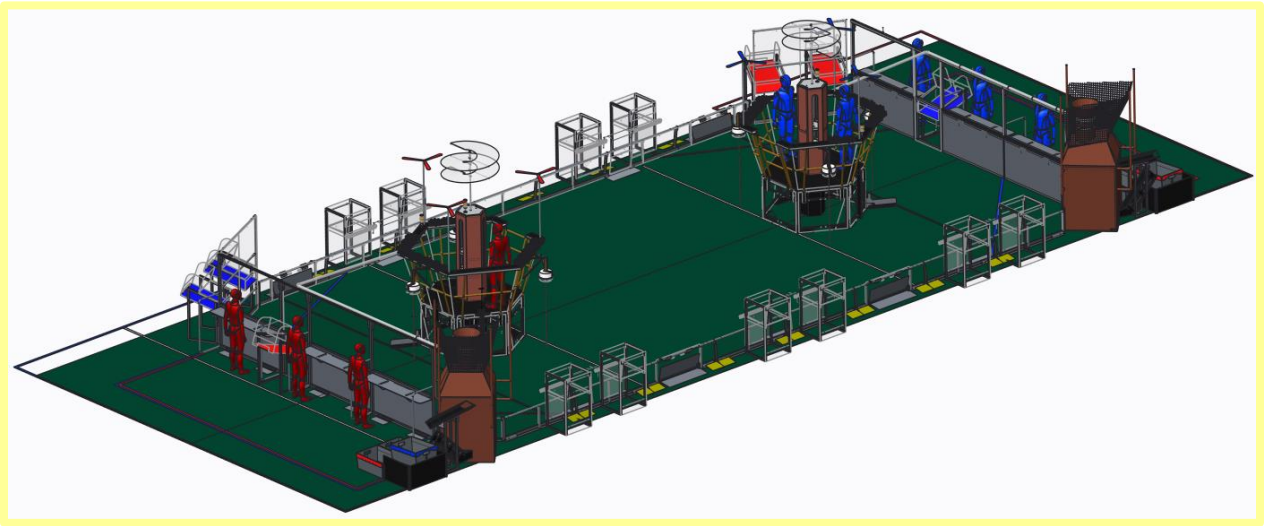
## General Notes

- **Game Animation:** The 2017 *FIRST* STEAMWORKS game animation shows the Blue AIRSHIP Rails and ROTORS 2-4 reversed from how they appear, and actually are, in the 2017 Game & Season Manual, Figure 3-1 (i.e. ROTOR 3 is immediately to a PILOT'S left as they enter the AIRSHIP vs on their right as shown in the animation). A note will be added to the description of the video.
- **C++/Java WPILib Update:** An optional update for C++\Java WPILib has been released (2017.2.1). This update contains a number of minor fixes\updates including fixing a race condition when setting camera settings via robot code while a dashboard was open. A full changelog can be found here.
- **Team Drawings:** Errors in the Team Versions drawing package have been corrected as follows:
  - *TE-17001, Rope Climb*, Sheet 3
    Item 2: TE-17001-02
    Material: 2x4
    QTY :~~2~~ 4
  - *TE-17005, Hopper Container*, Sheet 5
    Item 2: TE-17005-02
    .75 Plywood Sheet
    QTY:~~2~~ 3
  - *TE-17007, HP - Loading Station*, Sheet 4
    ITEM: TE-17007-001
    ~~.50"~~ .75" Plywood Sheet
    QTY: ~~1~~ 2

## Section 2 FIRST STEAMWORKS Overview

*Figure 2-1*, a still from the 2017 *FIRST* STEAMWORKS game animation, has been replaced with an export from the official CAD model of the *FIRST* STEAMWORKS playing area per the first bullet in General Notes above.

*Figure 2-1: FIRST STEAMWORKS playing area*



## Section 8.5 BUMPER Rules

**R31.** BUMPERS must be supported by the structure/frame of the ROBOT (see Figure 8-7). To be considered supported, a minimum of ½ in. (~12.7 mm) at each end of ~~the~~ each BUMPER wood segment must be backed by the FRAME PERMIETER. "Ends" exclude hard BUMPER parts which extend past the FRAME PERIMETER permitted by R29, part B. Additionally, any gap between the backing material and the frame:

- **A.** must not be greater than ¼ in. (~6 mm) deep, or
- **B.** not more than 8 in. (~20 cm) wide

## Section 9

**I04**

**D.** consist entirely of (except for an adhesive applied by the VENDOR as part of the normal manufacturing process for a COTS item and no longer tacky, e.g. a "binder coat") flexible, non-metallic fibers sewn, twisted, tied, woven, or braided together except for the last 4 in. (~10 cm) of any cut end (E) which may be whipped (with material that is flexible and non-metallic) or fused only to prevent fraying.

**E.** be configured such that it engages securely with the FIELD~~.~~ with a Retaining Feature (RF) that does not extend more than 2 in. (~5 cm) below the DAVIT fingers.

# Team Update 04

## General Notes

- The *Early Pit Setup* section of the Rules and Expectations for *FIRST* Robotics Competition Page has been updated to include the following additions:

  **E32-1.** Only five team members (one of which must be an adult) may be in the pit area, and this must be for the purposes of pit set up only.

  **E32-2.** Once pit set-up is complete, or the early Pit Set-up time the evening before pits open to all has ended, team members must immediately leave the pit area

  If an event has designated Early Pit Setup times both the evening before and the morning before pits open to all, a team may use both periods to set up its pits, but, per E32-2, must leave once pit set up is complete. Teams can be expected to be asked to leave by event personnel if it is noted that their pit set up is complete and they have not yet left the pit area.

## Section 3

- GE-17560 has been added to the Field Components drawing package.

## Section 3.9 TOUCHPAD

Figure 3-20 shows the two extreme states of the TOUCHPAD plate. The image on the left shows the TOUCHPAD unactuated and the figure on the right shows one example of an actuated TOUCHPAD (with the plate pressed all the way up). The DAVIT'S steel channel does not move with the TOUCHPAD plate.

*Figure 3-20 Unactuated TOUCHPAD (left) and fully displaced TOUCHPAD plate (right)*

## Section 8 ROBOT Rules

**R35.** Each power regulating device may control electrical loads per Table 8-2Table . Unless otherwise noted, each power regulating device shall control one and only one electrical load.

*Table 8-2: Power regulating device allotments*

| Electrical Load | Motor Controller | Relay Module | Pneumatics Controller |
|---|---|---|---|
| CIM<br>AndyMark 9015<br>WCP RS775 Pro<br>VEX BAG/MiniCIM<br>Banebots | Yes | No | No |
| Automotive Window/Door/Windshield Wiper/Seat/Throttle Motors<br>AndyMark PG Snow-Blower Motor<br>NeverRest | Yes (up to 2 per controller) | Yes | No |
| Compressor | No | Yes | Yes |
| Pneumatic Solenoid Valves | No | Yes* | Yes (1 per channel) |
| Electric Solenoids | No | Yes* | Yes (1 per channel |
| CUSTOM CIRCUITS[a] | Yes | Yes* | Yes (1 per channel) |

* Multiple low-load, pneumatic solenoid valves, electric solenoids or CUSTOM CIRCUITS may be connected to a single relay module. This would allow one (1) relay module to drive multiple pneumatic actions or multiple CUSTOM CIRCUITS. No other electrical load can be connected to a relay module used in this manner.

[a] A CUSTOM CIRCUIT is any electrical COMPONENT of the ROBOT other than motors, pneumatic solenoids, roboRIO, PDP, PCM, VRM, RSL, 120A breaker, motor controllers, relay modules, wireless bridge, or batteries.

**R44.** The one (1) ROBOT battery, a single pair of Anderson Power Products (or APP) 2-pole SB type connectors, the one (1) main 120-amp (120A) circuit breaker (Cooper Bussman P/N: CB185-120), and the one (1) CTR Electronics Power Distribution Panel (PDP, P/N: am-2856, 217-4244, 14-806880) shall be connected with 6 AWG (7 SWG or 16 $mm^2$) wire or larger, with no additional devices or modifications, as shown in Figure 8-8.

**R82-C**

| |
|---|
| Norgren 16-004-011, 16-004-003 or McMaster-Carr 48435K714 recommended. |

## Section 10.4.3 Qualification Ranking (*and ultimately Section 11 Glossary*)

The total number of Ranking Points earned by a Team throughout their Qualification MATCHES divided by the number of MATCHES they've been scheduled to play (minus any SURROGATE MATCH), then truncated to two (2) decimal places, is their Ranking Score (RS).

## Section 10.5.3 Playoff MATCH Bracket

ALLIANCE Leads are assigned to PLAYER STATION 2, the first picks are assigned to the PLAYER STATIONS ~~1~~ closer to the BOILER, and second picks are assigned to the PLAYER STATIONS ~~3~~ closer

to the opponent's LOADING STATION. If a BACKUP TEAM is in play, they will be assigned to the PLAYER STATION that was assigned to the DRIVE TEAM they're replacing.

For Quarterfinal MATCHES, the higher seeded ALLIANCE is assigned to the Red ALLIANCE. Beyond the Quarterfinal MATCHES, the ALLIANCE on the top of each MATCH in Figure 10-2 are assigned to the Red ALLIANCE, regardless of whether they are the higher seeded ALLIANCE in that particular MATCH.

## Section 10.12.3.7 *FIRST* Championship Eligibility for District Teams

Districts determine the number of Dean's List, Chairman's, Rookie All Star, and Engineering Inspiration Awards to present at their Championship, within a range established by *FIRST* and shown in Table 10-11.

*Table 10-11: District slot allocations for FIRST Championship*

| ~~District~~ | *FIRST* Championship ~~Houston~~ Slots | *FIRST* Championship ~~St. Louis~~ Normalized Slots | Chairman's Award | | | Dean's List Award | | | Engineering Inspiration Award | | | Rookie All-Star Award | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Max Ratio 18 | Min Ratio 9 | District Selection | Max Ratio 9 | Min Ratio 6 | District Selection | Max | Min | District Selection | Max | Min | District Selection |
| ***FIRST* Championship St. Louis** | | | | | | | | | | | | | | |
| *FIRST* Chesapeake | 23 | ~~23~~ | 1 | 3 | 2 | 3 | 4 | 4 | 1 | 2 | 2 | 1 | 2 | 1 |
| *FIRST* in Michigan | 82 | ~~82~~ | 5 | 9 | 5 | 9 | 14 | 14 | 1 | 2 | 1 | 1 | 2 | 2 |
| Indiana *FIRST* | 10 | ~~10~~ | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 1 |
| Mid-Atlantic Robotics | 22 | ~~22~~ | 1 | 2 | 2 | 2 | 4 | 4 | 1 | 2 | 2 | 1 | 2 | 1 |
| New England | 37 | ~~37~~ | 2 | 4 | 4 | 4 | 6 | 5 | 1 | 2 | 2 | 1 | 2 | 2 |
| Ontario | 29 | ~~29~~ | 2 | 3 | 3 | 3 | 5 | 5 | 1 | 2 | 1 | 1 | 2 | 1 |
| ***FIRST* Championship Houston** | | | | | | | | | | | | | | |
| *FIRST* Israel | 16 | 13 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 |
| *FIRST* North Carolina | 15 | 12 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 1 |
| Pacific Northwest | 39 | 32 | 2 | 4 | 3 | 4 | 5 | 5 | 1 | 2 | 2 | 1 | 2 | 2 |
| Peachtree | 18 | 15 | 1 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 2 | 1 | 2 | 1 |

All Districts, regardless of Championship Slot allocation, may award one (1) or two (2) Engineering Inspiration and Rookie All-Star Awards.

Chairman's Award and Dean's List Award maximums and minimums are determined by ratios applied to a given District's Championship Slot allocations. However, Districts assigned to Houston have relatively larger Championship slot allocations for a given team count compared to Districts assigned to St Louis, and we did not want these larger allocations to skew award allocations. So, for the purposes of award allocations only, Championship slots for Houston Districts were 'normalized', as shown in the table, reducing the slots allocated to what they would have been if both Championship geographies had the same total number of *FIRST* Robotics Competition teams. This 'normalized' slot allocation was then used to determine award minimums and maximums. As noted, these normalized slot values are used only for award allocations. The Houston-assigned Districts still retain the full Championship Slots Allocated (the larger number) shown in the table.

# Team Update 03

## General Notes

- **Q&A**
  - We ask all teams to search Q&A content before submitting a question. We're seeing a high volume of questions that have already been asked, and some even answered. The result is a bloated Q&A system with a lot of redundant content. Our hope is that teams will recognize an existing question that asks the same thing they'd like to ask, follow it (by clicking the "star" icon), and not submit a duplicate question.
  - The answer to Q11 has been edited to acknowledge that there may be circumstances where the Overflow LOADING STATION is used to feed GEARS on to the FIELD and thus better match the response given to Q49.
- **Field Tour Video Correction**
  - The Boiler: Thanks to Q126, a discrepancy has been identified regarding the height of the High Efficiency GOAL cited in the video vs. that cited in the official manual and drawings. The opening is 8 ft. 1 in. from the carpet and set back from the face of the BOILER by 1 ft. 5½ in., as documented in the manual and the drawings.

## Section 3 The ARENA

- **Drawing Updates:**
  - *GE-17362, HDPESlide* has been added to the Field Components drawing package.
  - Detail about which side of the chute plastic is up has been added to *TE-17007, HP – Loading Station* in the Team Versions drawing package.

## Section 5 Safety Rules

**S07. Keep your hands "inside" the vehicle at all times.** During the MATCH, the PILOT may neither

**A.** contact ROTORS,

**B.** contact DAVITS, ~~nor~~

**C.** reach outside any PORT, nor

**D.** contact any part of a deployed (i.e. any part of the ROPE is below the deck of the AIRSHIP) ROPE.

Violation: YELLOW CARD

## Section 8.1 Overview (*of ROBOT Rules*)

The rules listed below explicitly address legal parts and materials and how those parts and materials may be used on a 2017 ROBOT. There are many reasons for the structure of the rules, including safety, reliability, parity, creation of a reasonable design challenge, adherence to professional standards, impact on the competition, and compatibility with the Kit of Parts (KOP), which is the collection of items listed on any Kickoff Kit Checklists, distributed via *FIRST*® Choice, or paid for completely, except shipping, with ~~obtained via~~ a Product Donation Voucher (PDV).

## Section 9 Inspection & Eligibility

**I04.**

**D.** consist entirely of flexible, non-metallic fibers sewn, twisted, tied, woven, or braided together except for the last 4 in. (~10 cm) of any cut end (E) which may be whipped (with material that is flexible and non-metallic) or fused only to prevent fraying.

**I.** be flexible such that it's not capable of being pushed to activate the TOUCHPAD.

*Also, the blue box below I04-D has been moved to be below I04-I.*

> Flexible means that if the ROPE is held at any point, it should not extend more than 12 in. above the point where it is held. ROPES are meant to be pulled, not pushed.

## Section 11 Glossary

| Term | Definition |
|---|---|
| RS | Ranking Score, the total number of Ranking Points earned by a Team throughout their Qualification MATCHES divided by the number of MATCHES they've been scheduled to play (minus any surrogate MATCH) |

# Team Update 02

## General Notes

- A Rule & Penalty Crib Sheet has been posted to the "Game and Season Manual" section of the 2017 Game and Season Materials site. This spreadsheet is intended to be a modifiable, filterable resource for quick reference of rules and violations. While it will be updated as Team Updates are published, any discrepancy between it and the 2017 Game and Season Manual is unintended, and the content of the manual takes precedent.

## Section 4.3 Scoring

*Table 4-1:* FIRST *STEAMWORKS rewards*

| Action | Criteria | MATCH Points | | Ranking Points |
|---|---|---|---|---|
| | | AUTO | TELEOP | |
| AUTO mobility | For each ROBOT that breaks the BASE LINE vertical plane with their BUMPER by T=0 | 5 | | |
| Pressure accumulation | For every three (3) FUEL counted in the Low Efficiency GOAL by T=0 | 1 | - | - |
| | For every one (1) FUEL counted in the High Efficiency GOAL by T=0 | + 1 kPa | | |
| | For every nine (9) FUEL counted in the Low Efficiency GOAL by T=0 | - | 1 | |
| | For every three (3) FUEL counted in the High Efficiency GOAL by T=0 | | + 1 kPa | |
| | If ALLIANCE meets or exceeds a threshold pressure of 40 kPa | | 20 (Playoffs only) | 1 (Quals only) |

## Section 7.1 Before the MATCH

**G01-F.** ~~in possession of~~ supporting not more than 10 FUEL and 1 GEAR (as described in Section 4.2 MATCH Setup).

## Section 7.7 Human Action Rules

**H15. Seriously, GEARS stay installed.** A pre-populated GEAR may not be removed from its AXLE.

## Section 9 Inspection & Eligibility

**I04. ROPES have to be inspected.** A Team must submit any ROPE they intend to use in a MATCH for Inspection. A ROPE must meet the following criteria (see Figure 9-2 for letter references):

**A.** have a maximum width (W) of 1 in. (nominal) (e.g. exclusive of any knot widths)

**B.** be designed/configured to be at least 5 ft. 3 in. (~160 cm) long ~~(measured end to end)~~ measured from the side of the ROPE'S retaining feature (per I04-E) that abuts the DAVIT fingers (L), to the farthest point on the ROPE from this feature.

**C.** be designed/configured to not exceed a length of 8 ft. (~244 cm) ~~(measured end to end)~~ measured from the side of the ROPE'S retaining feature (per I04-E) that abuts the DAVIT fingers (L), to the farthest point on the ROPE from this feature.

**D.** consist entirely of flexible, non-metallic fibers twisted, tied, woven, or braided together except for the last 4 in. (~10 cm) of ~~each~~ any cut end (E) which may be whipped~~,~~ (with material that is flexible and non-metallic) or fused~~, covered in heat shrink or tape, or dipped in a coating material~~ only to prevent fraying.

> Flexible means that if the ROPE is held at any point, it should not extend more than 12 in. (~30 cm) above the point where it is held. ROPES are meant to be pulled, not pushed.

*Figure 9-1 has been edited to remove the section of ROPE with tape on the end to be in compliance with edits to I04-D made in this Team Update.*

*Figure 9-1 ROPE examples*

**E.** be configured such that it engages securely with the FIELD.

> To interface with the field a ROPE must have a retaining feature (e.g. a knot) greater than 1 in. (~25.4 mm) in diameter to interface with the DAVITS (RF).

**F.** if knotted, the top knot must be at least 29 in. (~74 cm) below the retaining knot/feature (K)

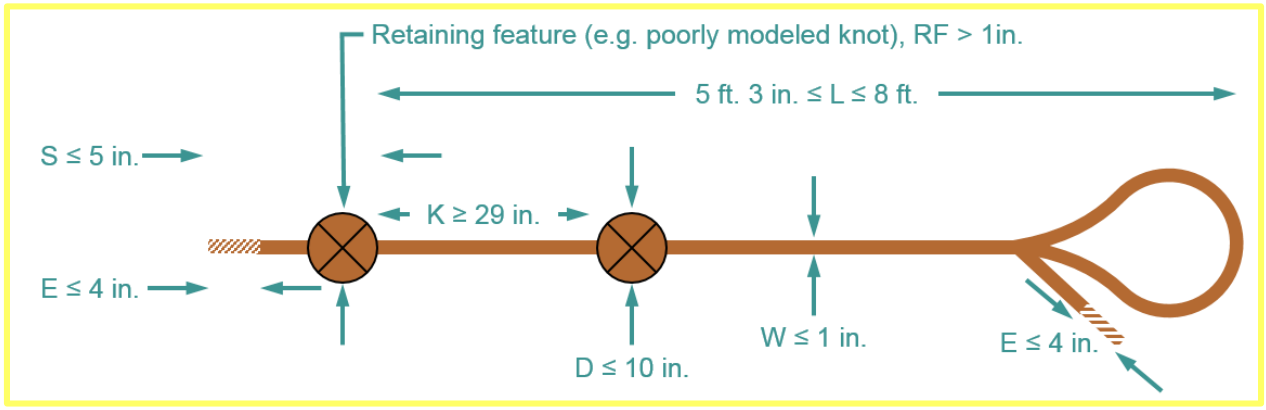
**G.** if knotted or looped, the total diameter does not exceed 10 in. (~25 cm) (D)

> If the ROPE has a loose loop such that, uncompressed it's 12 in. (~30 cm) in diameter, but it can be easily compressed by hand to less than 10 in., that ROPE has met the requirement of part I04-G.

**H.** be designed/configured to not exceed a length of 5 in. (~12 cm) measured from the side of the ROPE'S retaining feature (per I04-E) that abuts the DAVIT fingers, to the closest end on the ROPE from this feature (S)**.**

> The intent of I04 is to allow Teams the convenience of bringing their own ROPE for reliability and predictability purposes, as well as accommodate some modifications to ease the challenge associated with accessing the TOUCHPAD (e.g. tying knots).
>
> The modifications allowed are limited, however. For example, consider the limitation of the purpose of whipping or fusing to prevent fraying in I04-D and that *FIRST* Robotics Community members are innovative and may discover a way to fuse the end of the ROPE in a way that can be leveraged for competitive advantage. This "superfusion" extends the fusing's purpose beyond only preventing fraying.
>
> We acknowledge that this could result in temptation to implement the superfusion method anyway and hope an Inspector doesn't notice, or that you will be able to convince them the superfusion method really is "only to prevent fraying." Please don't do this. It will likely lead to a bad experience both for you and the volunteer who really does want you to participate in the event, but with a 100% legal ROBOT.

*Figure 9-2 ROPE anatomy*



# Team Update 01

Team updates notify the *FIRST* Robotics Competition community of content changes to any official season documentation (e.g. the game and season manual, award deadlines, drawing changes, etc.) or important season news. Team Updates will not highlight typo fixes.

## General Notes

- **Q&A:** Questions about the game and season rules can be asked, starting Wednesday, January 11, at noon Eastern time using the official Q&A system (see blog and *2017 Game and Season Manual's Section 1.8* for more information).
- **Drawing Omissions:** This year, certain field equipment drawings are excluded because we don't believe they are relevant to a robot's interaction with the field, and they may provide a solution to an element of the game challenge.
- **Manchester, NH Kickoff Field Images:** Images of the Kickoff field, courtesy of Brad Miller at WPI, are posted in a "2017 *FIRST* STEAMWORKS Field Pictures" album on the *FIRST* Robotics Competition Facebook page. Please note, some Boiler elements (netting supports, boiler internals) shown in these images aren't exactly the same as the competition versions, and we don't believe they're relevant for robot design.
- **Field Tour Video Corrections:**
  - "Alliance Station" Field Tour Video: The arrow pointing to the depth of the ALLIANCE STATION incorrectly stops at the STARTING LINE. It should go all the way to the ALLIANCE WALL. A note has been added to the video's description.
  - Assorted Field Tour Videos, particularly "The Lifts": The BASE LINE is shown as being directly next to the AIRSHIP when it's actually out at the edge of the Barriers. A note has been added to applicable videos' descriptions.
- **Radio Configuration Tool:** The Radio Configuration Utility has been updated to version 17.2 to fix issues with configuring radios without using a robot name and with a fallback potentially used in firmware loading (NPF error, even with just one adapter enabled).
- **Driver Station Image:** The Driver Station Image originally posted for the Acer ES1 PC (2016 Rookie computer) was corrupt. The image has been updated with a working copy and is posted on the FRC Driver Station Images - 2017 Season site.
- **Bumpers Included:** Seriously, R3 says bumpers are included in overall robot size this season. For real.

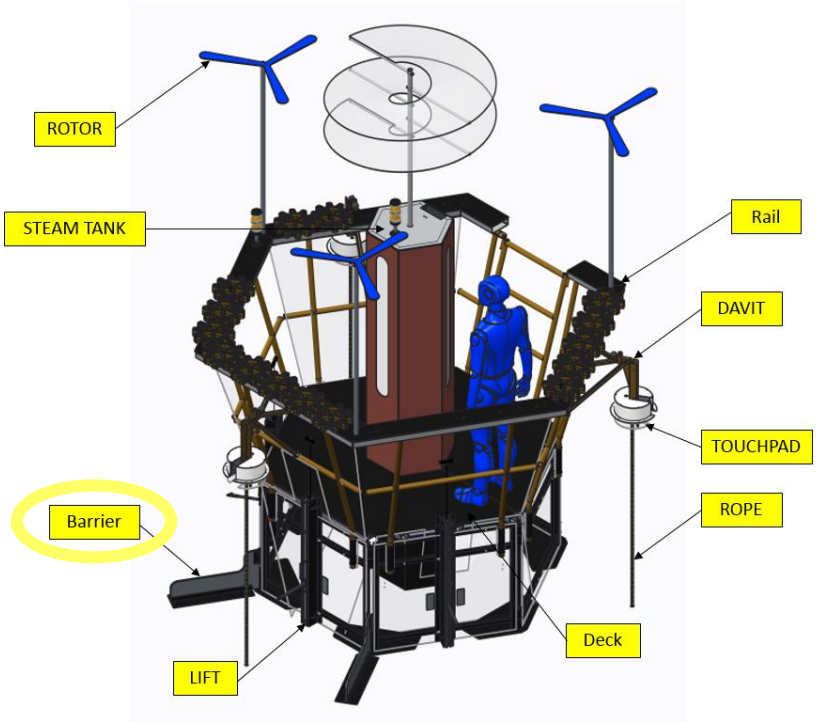
## Section 3.1 Zones & Markings

- BASE LINE: a green line that spans the width of the FIELD and is ~~9 ft. 4 in. (~284 cm)~~ 7 ft. 9¼ in. (~237 cm) from the ALLIANCE WALL diamond plate.

## Section 3.4 AIRSHIP

Figure 3-7: “Divider” label has been changed to “Barrier” to match text in Section 3.5 LIFTS.

*Figure 3-7: AIRSHIP elements*



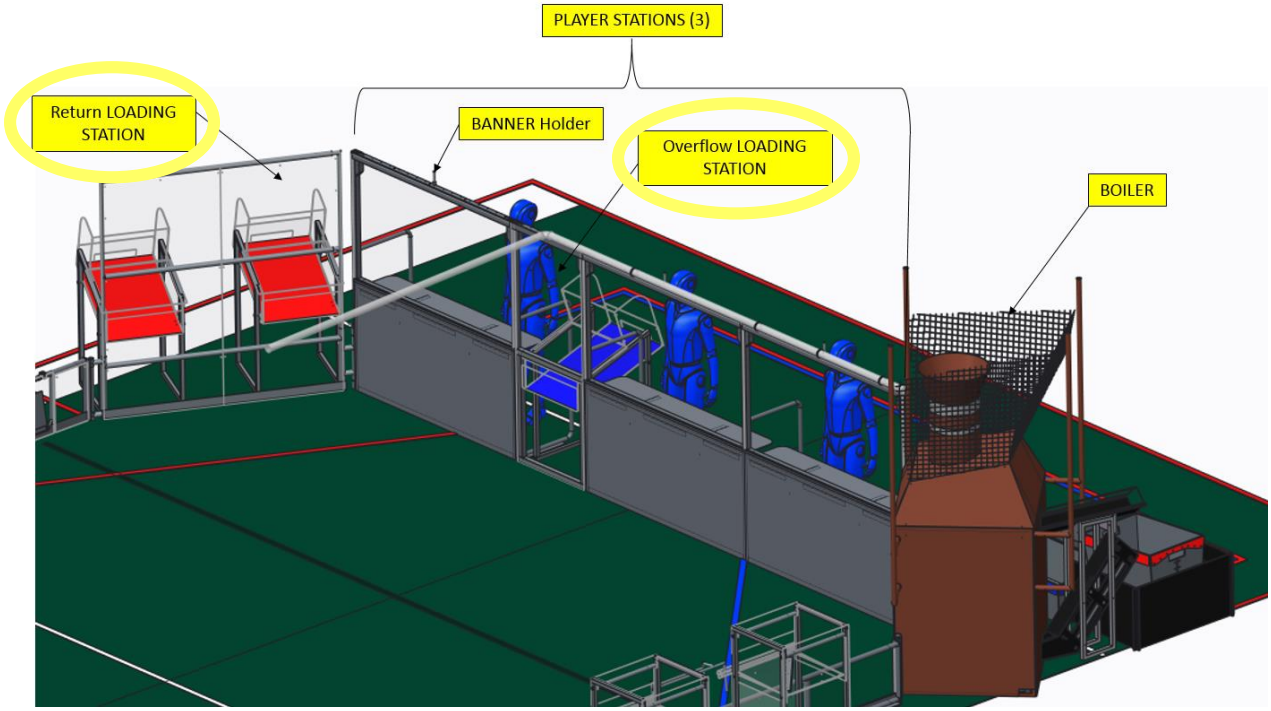

## Section 3.4.2 GEAR Sets

When a GEAR set for ROTORS 2, 3, or 4 is complete, a CRANK, a handle located with the first GEAR in the set, can be turned which engages the corresponding ROTOR. It takes three (3) full rotations to engage the ROTOR.

## Section 3.11 ALLIANCE WALL

Figure 3-24: The labels for the OVERFLOW and RETURN LOADING STATIONS have been corrected.

*Figure 3-24: ALLIANCE WALL COMPONENTS*




## Section 3.11.4 BOILER

- **Note regarding Low GOAL geometry:** Some attendees of the Kickoff in Manchester, NH have noted that there may be a possibility that FUEL entered into the Low Efficiency GOAL opening could become stuck between the outside of the FUEL processor and the inside wall of the BOILER and as a result, not processed during the MATCH. We would like to reassure teams that that the processor design seen at the Manchester Kickoff wasn't final and that, while the BOILER drawings are omitted drawings (described above in the "Drawing Omissions" bullet above), teams can expect that any FUEL that passes through the GOAL openings will be processed inside the BOILER (MATCH time permitting).
- The capacity of the Low Efficiency GOAL is seventy (70) FUEL. The capacity of the High Efficiency GOAL is one-hundred and fifty (150) FUEL. FUEL that exceeds GOAL capacities will fall back on to the FIELD.

## Section 4.3 Scoring

*Table 4-1: FIRST STEAMWORKS rewards*

| Action | Criteria | MATCH Points | | Ranking Points |
|---|---|---|---|---|
| | | AUTO | TELEOP | |
| ROTOR engagement | For each ROTOR turning by period's T=0, that's not previously been scored | 60 | 40 | - |
| | If all four (4) ROTORS turning by T=0 | | 100 (Playoffs only) | 1 (Quals only) |

## Section 7.7 Human

**H15.** A pre-populated GEAR may not be removed from its AXLE.

Violation: RED CARD.

## Section 8.4 Budget Constraints & Fabrication

**R21.**

> Example 1: A team creates 10 lbs (~4 kg.) of FABRICATED ITEMS after Stop Build Day. During their first ROBOT Access Period before their first event, they install these items on the ROBOT and bag them with the ROBOT. The team may bring up to 20 lbs. (~~4~~ 9 kg.) of FABRICATED ITEMS (which may be items removed from the ROBOT before bagging at the end of the ROBOT Access Period) with them to the event.

## Section 11 Glossary

| Term | Definition |
|---|---|
| STEAMACRIT | one who complains about non-working gears being used while coating a Nerf gun with paint and calling it a raygun. (courtesy "TimeTinker" on The Steampunk Forum at Brass Goggles) |