



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 configurationAll 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.

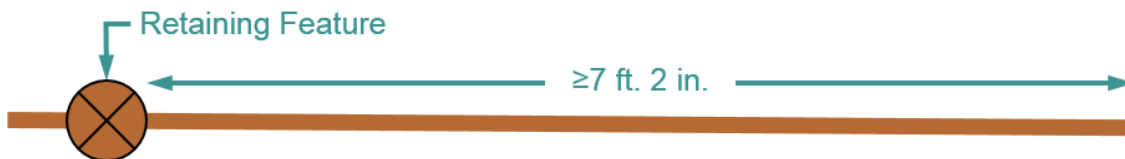
FIRST takes all disclosures and indications of risk seriously, and will work to resolve the issue quickly, while honoring every individual's right to privacy.

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. 4 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. 7 7/8 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 AndyMark 9015 WCP RS775 Pro VEX BAG/MiniCIM Banebots	Yes	No	No
Automotive Window/Door/Windshield Wiper/Seat/Throttle Motors AndyMark PG Snow-Blower Motor 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
1 st	Total Playoff Round Performance Points
2 nd	Best Playoff Round Finish at a single event
3 rd	Total ALLIANCE Selection Results Points
4 th	Highest Qualification Round Seed or Draft Order Acceptance (i.e. Highest ALLIANCE Selection points at a single event)
5 th	Total Qualification Round Performance Points
6 th	Highest Individual MATCH Score, regardless of whether that score occurred in a Qualification or Playoff MATCH
7 th	Second Highest Individual MATCH Score, regardless of whether that score occurred in a Qualification or Playoff MATCH
8 th	Third Highest Individual MATCH Score, regardless of whether that score occurred in a Qualification or Playoff MATCH
9 th	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

104, 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.

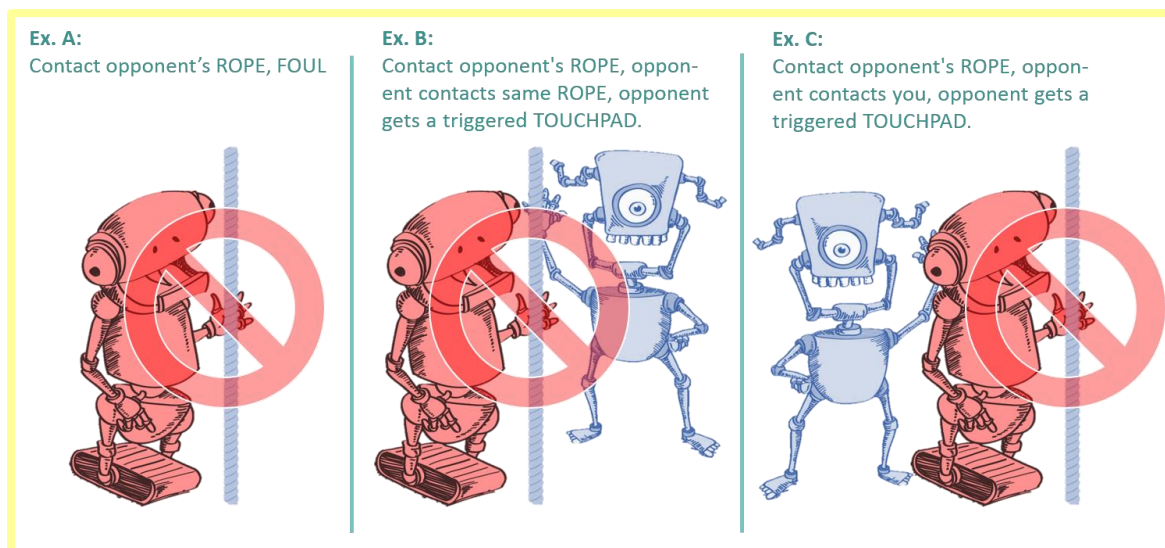
Section 3.9 TOUCHPAD

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

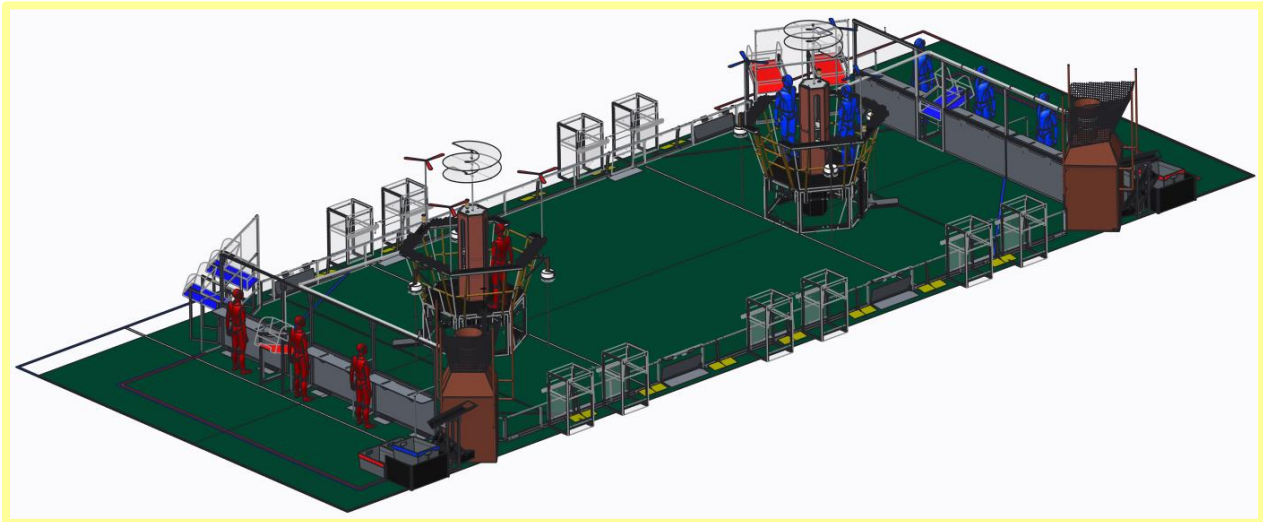
- **Game Animation:** The [2017 FIRST STEAMWORKS game animation](#) shows the Blue AIRSHIP Rails and ROTORS 2-4 reversed from how they appear, and actually are, in the [2017 Game & Season Manual](#), Figure 3-1 (i.e. ROTOR 3 is immediately to a PILOT'S left as they enter the AIRSHIP vs on their right 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: 4 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 $\frac{1}{2}$ in. (~12.7 mm) at each end of the each BUMPER wood segment must be backed by the FRAME PERIMETER. "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 $\frac{1}{4}$ in. (~6 mm) deep, or
- B. not more than 8 in. (~20 cm) wide

Section 9

104

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.

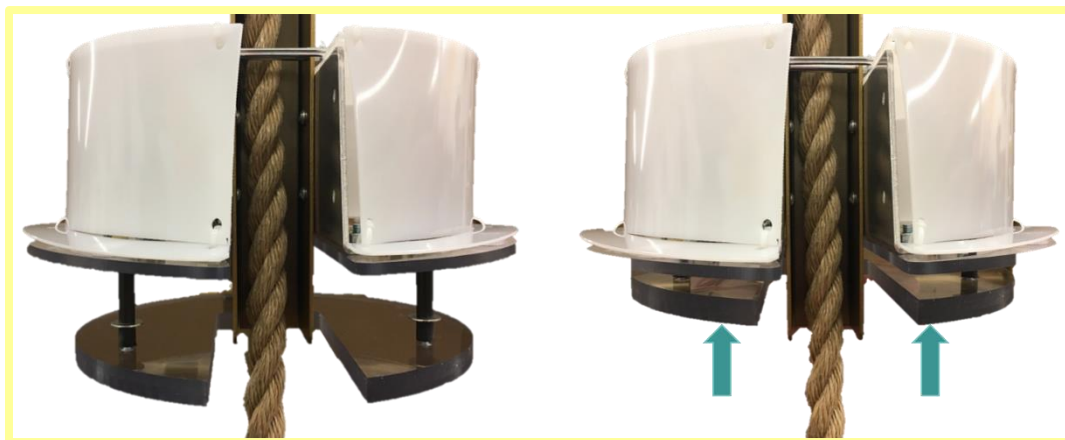
Section 3

- 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 AndyMark 9015 WCP RS775 Pro VEX BAG/MiniCIM Banebots	Yes	No	No
Automotive Window/Door/Windshield Wiper/Seat/Throttle Motors AndyMark PG Snow-Blower Motor 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 mm²) 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 4 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	<i>FIRST</i> Championship St. Louis <i>FIRST</i> Championship Houston Slots		Chairman's Award			Dean's List Award			Engineering Inspiration Award			Rookie All-Star Award		
			District Selection			District Selection			District Selection			District Selection		
			Max Ratio	Min Ratio		Max Ratio	Min Ratio		Max	Min		Max	Min	
			18	9		9	6							
<i>FIRST</i> Championship St. Louis														
<i>FIRST</i> Chesapeake	23	23	1	3	2	3	4	4	1	2	2	1	2	1
<i>FIRST</i> in Michigan	82	82	5	9	5	9	14	14	1	2	1	1	2	2
Indiana <i>FIRST</i>	10	40	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
<i>FIRST</i> Championship Houston														
<i>FIRST</i> Israel	16	13	1	1	1	2	2	2	1	2	2	1	2	1
<i>FIRST</i> 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		
	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		-
Pressure accumulation	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	
		-	20	1
	If ALLIANCE meets or exceeds a threshold pressure of 40 kPa		(Playoffs only)	(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):

- 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.



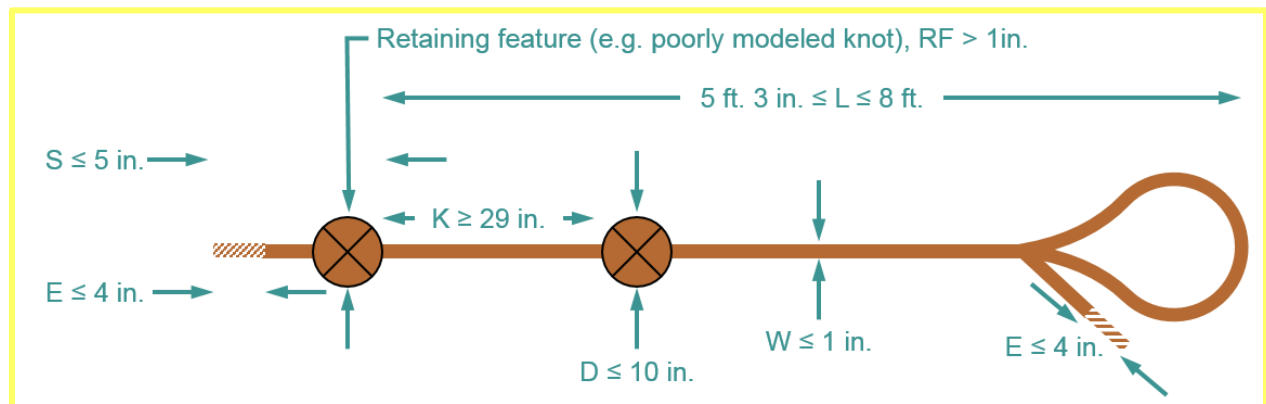
- H. be designed/configured to not exceed a length of 5 in. (~12 cm) measured from the side of the ROPE'S retaining feature (per I04-E) that abuts the DAVIT fingers, to the closest end on the ROPE from this feature (S).

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.

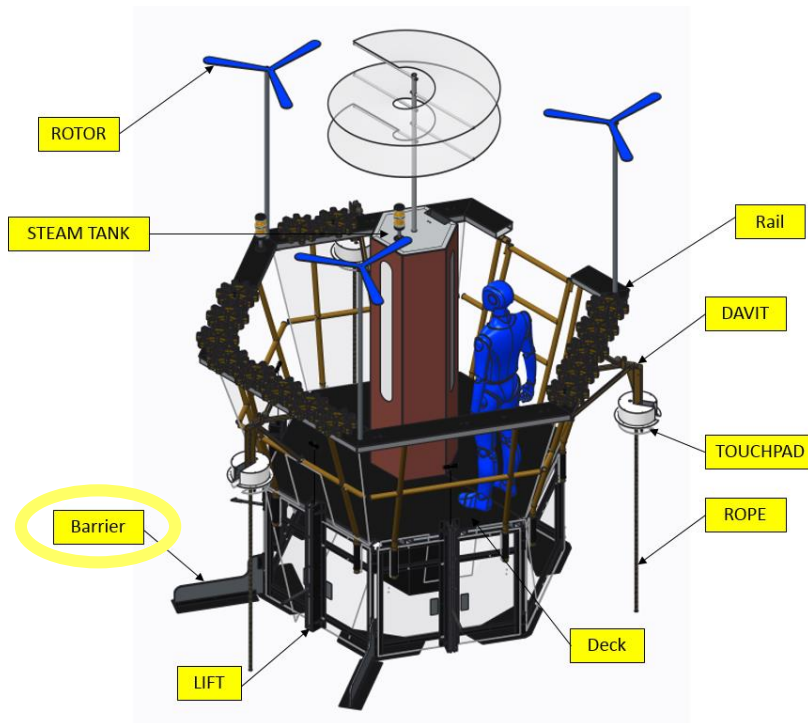
Section 3.1 Zones & Markings

- **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

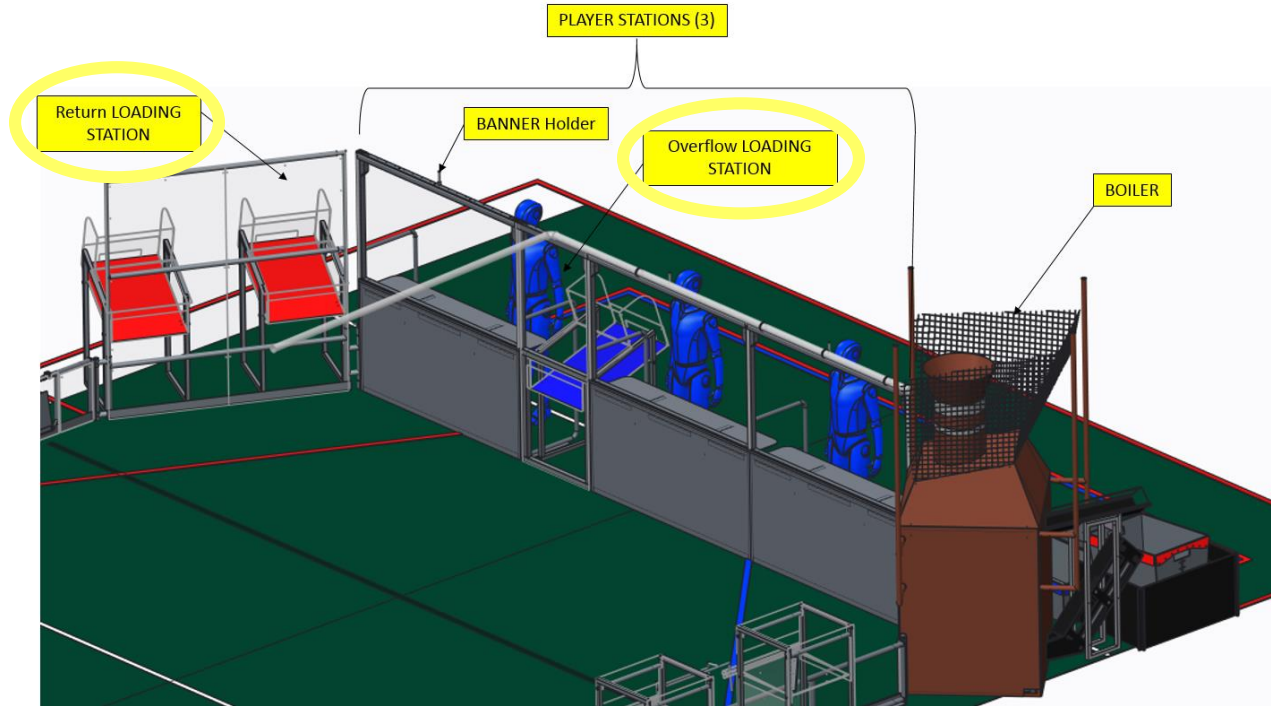
When a GEAR set for ROTORS 2, 3, or 4 is complete, a CRANK, a handle located with the first GEAR in the set, can be turned which engages the corresponding ROTOR. It takes three (3) full rotations to engage the ROTOR.



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	-
			100	1
	If all four (4) ROTORS turning by T=0		(Playoffs only)	(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)