2023-2024 *FIRST*® Tech Challenge

Referee and Head Referee Manual

Sponsor Thank You

Thank you to our generous sponsor for your continued support of the *FIRST®* Tech Challenge!

Volunteer Thank You

Thank you for taking the time to volunteer for a *FIRST®* Tech Challenge event. *FIRST®* and *FIRST®* Tech Challenge rely heavily on volunteers to ensure events run smoothly and are a fun experience for teams and their families, which could not happen without people like you. With over 6,500 teams competing yearly, your dedication and commitment are essential to the success of each event and the *FIRST* Tech Challenge program. Thank you for your time and effort in supporting the mission of *FIRST*!

Revision History		
Revision	**Date**	**Description**
1	10/18/2023	Initial Release
1.1	12/5/2023	• Corrected language in Penalties section • Updates scenario 2 in <G28 rule description • <GS05> - corrected sequence of penalties
1.2	2/7/2024	• Updated Key Volunteer Role Minimum Age Requirement section

Contents

Introduction

What is FIRST® Tech Challenge?

FIRST® Tech Challenge is a student-centered program that focuses on giving students a unique and stimulating experience. Each year, teams engage in a new game where they design, build, test, and program autonomous and driver operated robots that must perform a series of tasks. Participants and alumni of *FIRST* programs gain access to education and career discovery opportunities, connections to exclusive scholarships and employers, and a place in the *FIRST* community for life. To learn more about *FIRST*® Tech Challenge and other *FIRST*® Programs, visit www.firstinspires.org.

Gracious Professionalism®

FIRST® uses this term to describe our programs' intent.

Gracious Professionalism® is a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.

Watch Dr. Woodie Flowers explain *Gracious Professionalism* in this short video.

FIRST Privacy Policy

FIRST takes the privacy of our community seriously. As a nonprofit and a mission-driven youth-serving organization, we are compelled to understand who we are serving, how our programs are performing, and make improvements so that we can achieve our goals of making *FIRST* accessible to any youth who wants to be part of the fun, exciting and life-changing experience. Thus, we need to collect certain personal data from participants and volunteers to ensure we are meeting our goals and responsibilities as a youth-serving nonprofit organization.

As a volunteer, you may be asked to handle the personal data, or personally identifiable information (PII), of coaches, team members, and even other volunteers. It is critical that you understand and follow the *FIRST* Privacy Policy and complete any data protection and privacy training required by your role. If you have any questions regarding data protection and privacy, please reach out to the *FIRST* Data Governance Team at privacy@firstinspires.org.

Volunteer General Information

Our *FIRST* Volunteer Handbook is a comprehensive guide to the different ways people can volunteer with *FIRST*. It includes expectations, descriptions of training, policies, and more.

Learn more about the roles of volunteers on our Volunteer Resources page, "Volunteer Role Descriptions

Volunteer Training and Certification

Volunteers must create an account on www.firstinspires.org and apply to the role. Upon application, training can be accessed from within the dashboard. Please follow these instructions to access training through the dashboard.

If you have applied for a role but do not see the link to training in your dashboard, or you have other training related questions please email FTCTrainingSupport@firstinspires.org.

Volunteer Minimum Age Requirement
The minimum age requirement of a *FIRST* volunteer is **13 years old**.

A minor must have a parent or guardian give written permission to volunteer. In addition, the *FIRST* Consent and Release Forms will need to be signed by a parent or guardian in the Volunteer Registration system for any volunteer under age 18.

Key Volunteer Role Minimum Age Requirement
Volunteers MUST be at least **18** years old before they can serve in the following key volunteer roles:

- Referee
- *FIRST* Technical Advisor
- Lead Scorekeeper

Volunteers MUST be at least **21** years old before they can serve in the following Key Volunteer roles:

- Judge
- Field Supervisor
- Lead Robot Inspector
- Lead Field Inspector
- Head Referee

Volunteer MUST be at least 23 years old before they can serve in the following Key Volunteer role:

- Judge Advisor

Local program delivery partners can make case by case exceptions to these guidelines by contacting *FIRST* for approval.

Please visit our Volunteer Role Descriptions document for a list of all roles and prerequisites for each role.

Bring a Friend!
Volunteers are a huge part of the *FIRST* Tech Challenge Program and continuing to inspire students to seek out careers in science, technology, engineering, and math (STEM). *FIRST* Tech Challenge needs your help in recruiting new volunteers to keep our programs thriving for future generations! If you have a friend or co-worker you think would be interested in volunteering at an event, there are just a few easy steps to help get them involved!

1. Check out our full list of volunteer opportunities online!
2. Have them apply for the Event in the Volunteer Registration System. Volunteers must be screened before volunteering.
3. Have them contact Firsttechchallenge@firstinspires.org with any questions they may have.

If they are concerned about jumping in head first, no worries! Job shadowing at a *FIRST* Tech Challenge Event is a great way to get a taste of what a full day's worth of competition looks like. New volunteers can discover ways they can fit their personal skills into a volunteer position!

Helping Teams Succeed

A volunteer's role is about helping a team succeed so they can compete. Teams spend countless hours, weeks and sometimes months working and reworking their robot design and strategies. After all this effort, some teams will still need a friendly volunteer to help create a positive event experience for the students.

Understanding Differences

Each student is special and unique, with different strengths, challenges, social skills, and learning abilities.

Some differences may be misinterpreted. Please be mindful that your first perception may be off. A few differences that you may encounter include students with limited social skills, who have difficulty expressing thoughts verbally, who shout out blunt or inappropriate comments, or may distance themselves physically from the team. Some of these challenges may be neurological in nature. Differences between a student who is not able to do something as compared to a refusal to do something can show up in a way that is not familiar to you.

You may also notice cultural differences. Remember that some cultures expect eye contact, while others may find eye contact to be disrespectful. Always be positive, flexible, and patient.

As a referee or head referee, you will need to adjust your communication style in these instances. Many students with high abilities may take longer to process and answer questions; many may get left behind compared with a student who reacts more quickly.

Autism Awareness

As a *FIRST* Tech Challenge referee/head referee, you should be aware that youth on the autism spectrum often take part in *FIRST* programs. Autism spectrum disorders relate to communication, social interaction, and restrictive or repetitive behaviors and interests.

People with autism may have difficulty understanding language gestures or social cues; difficulty engaging in back-and-forth conversations or interactions; intense interest in unusual topics or objects, an intense concentration on favorite activities; good rote learning and long-term memory skills, a desire to adhere to the rules; ability to understand and retain concrete concepts and patterns, often with strong interest or ability in math and technology; difficulty managing transitions, changes in routine, stress, and frustration. On the more severe end of the spectrum, people with autism may have limited to no speech or limited to no eye contact.

As a referee/head referee, be prepared to include students with many types of special needs, including those who are on the autism spectrum. You may find you need to use direct concrete phrases and break down questions or instructions into fewer steps. Give the student extra time to respond and be aware that students who have autism sometimes have outbursts or unexplained behavior, which could be directed at judges or even teammates.

Understanding Bias

We strongly encourage our referee and head referee volunteers to complete the Strategies fort Inspiring Success for All modules on Thinkscape to develop a better understanding of invisible biases. While these resources are designed for coaches and mentors, the concepts can be applied to all volunteer roles.

Job Description

Introduction
Refereeing is one of the most challenging and rewarding *FIRST* volunteer opportunities. Not to mention that it comes with the fringe benefit of having the best seats in the house! This manual contains information that is vital to your success as a referee. Please make sure to take the time to get familiar with the current season's game as well as the role of referee as soon as possible. The full Game Manuals Part 1 and 2 are available on the *FIRST* Tech Challenge game website.

FIRST Tech Challenge tournaments squeeze a lot of activity into one day. One of the keys to running a smooth and successful event is for teams and volunteers to show up prepared. Teams spend countless hours preparing for competition day and we ask our volunteers to also prepare for tournament day.

- **Physical/Technical Requirements:**
  - Technical – Medium
  - Physical – High
    - Referees spend most of the tournament on their feet.
  - Administrative – Medium
  - Communication – High
- **Time Commitment:**
  - Training – Approximately 3 – 4 hours
  - Event Day – Approximately 8 hours
- **Proper Attire:**
  - Wear comfortable close-toed and closed-back shoes. Most of the day will be spent standing/walking in the competition fields.
  - ANSI Z87.1 certified safety glasses are required in the competition area.

Head Referee and Referee Minimum Age Requirement
The minimum age allowed for volunteers filling a role as a head referee or referee is 21. Students who have been a part of a team must be at least 3 years removed from the team before they can serve as a head referee or referee at an Official *FIRST* Tech Challenge tournament.

Overview of Responsibilities

Refereeing at *FIRST* competitions is different from a traditional sporting event in that the referees at *FIRST* events help the competitors to avoid breaking the rules of the game. We like to remind team members if they are getting close to an infraction and warn them rather than watching passively. Continued violations of the game rules outlined in this manual and the game manuals should fall into fair and consistent enforcement. Penalties will be applied for these violations and could lead to disqualification of a team. A referee must understand what constitutes a penalty and allow a team the opportunity to remedy the situation.

Experience and skills needed
- Ability to "take charge" and be assertive but friendly and tactful.
- Thorough knowledge of the competition, game, and rules of play.
- Strong assessment skills.
- Outgoing personality; high energy.
- Strong communication and diplomacy skills.
- Ability to collaborate with others, work as a member of a team.
- Attention to detail.
- Ability to move about the field.

- Ability to stand for long periods of time.

Referee Role Descriptions

Referees have two main role distinctions; observing matches to call penalties and tracking the status of the match score. Four referees will be assigned to each field. There will be two referees responsible for tracking and calling penalties as they occur during the match. The other two referees track the score for either the red or the blue alliance. After completion of the match, the referees will work together to finalize the score and account for any penalties assessed during the match.

Penalties

Observes matches, identifies rule violations, and "calls" them. Referees help the competitors to avoid breaking the rules of the game. Referees participate in deliberations regarding contested calls, working directly through the head referee.

Scoring

Scoring referees monitor the status of the game and scoring elements during match play. There will be one referee assigned to the blue alliance side of the field, and the other to the red alliance side of the field. Some tournaments will track the status of the field on paper, using score sheets. Other tournaments may use live scoring, and the referee will use an app installed on either a phone or tablet to track the status of the field.

Personal Demeanor

As a referee, it is important to recognize the very public nature of your volunteer role as well as the close level of interaction with the students. Your actions are seen and heard by many participants and spectators at your tournament. The manner that you display in your actions frequently carries more weight with the students than what you say in your interactions with them.

As you are carrying out your responsibilities, keep in mind a few key thoughts:

- I am participating as a volunteer to help inspire students.
- I have many opportunities to serve as a mentor/teacher to those students during the event.
- My job is not to punish teams that commit rule violations. My job is to keep gameplay fair and equitable.
- I inspire better when it is obvious that I am having fun with the people around me while doing my job.

Keeping these thoughts in mind and focusing on having fun with the students will make for a great experience for all involved!

Referee Best Practice

It is the intent of *FIRST* Tech Challenge and the game design committee to create rules to foster fair gameplay and encourage a level playing field. Overall, you and the entire referee crew are here as mentors to the students. Your wish should be to see every team success. Although your job is to enforce the rules, you should do so in a nurturing, non-authoritarian fashion.

If a referee finds themselves on the fence about a decision and unsure which way to make a call, they should consult with the rules and use the most appropriate rule to help guide their decision. If a referee is unsure of a team in fact violating a rule and has difficulty making a determination, they should not penalize the team. If a quick determination cannot be made about a rule violation, it is best not to penalize a team.

Referees should feel empowered to apply the rule that best fits the situation, even if the situation falls into a gray area. If a situation arises where multiple rules can be applied, the referee should use the rule that most closely fits the scenario.

Social Media Considerations
Referees and Head Referees need to be aware of their interactions with teams/coaches/mentors while active on social media. Care should be taken to remember that outside of an event, your role as a referee/head referee has ended. You should refer all questions to sources for official answers like team Q&A forum.

You should avoid offering opinions on gameplay strategies, interpretations of rules, or critiques of videos of matches. Conversations that take place at events with teams, students or other key volunteers should not be shared or discussed.

If asked questions via social media sources, you should direct teams/students/mentors/coaches to the official resources, the FIRST Tech Challenge Q&A - https://ftc-qa.firstinspires.org/.

Special Considerations for Remote Events

For remote events, there is no defined role for a referee. The normal referee responsibilities have been designated as belonging to field personnel.

The best service you can provide to the teams in your region that are participating in remote events is to help train them in understanding the rules from a referee's perspective.

Making sure that they understand the rules and their application to gameplay situations will allow the teams to maximize their successes while maintaining a high degree of fairness.

Consider working with your region's program delivery partner and identifying ways to help teach, train and educate the students!

As you work with the teams to deepen their understanding, keep in mind that the rules for remote events are a subset of the rules for traditional events. Make sure to read the appropriate game manual version when you are working with remote event teams.

FIRST Mentor Network
The FIRST Mentor Network is a great way to connect those who want to mentor teams with the teams looking for mentors. This tool can be used by referees looking to support teams within their community, or even outside their own communities, to help teams understand game rules and to be more successful competing remotely.

Note that referees will NOT call remote events, this is up to the team and their field personnel as noted in the Game Manual Part 2 – Remote Events.

Pre-Event Day Responsibilities

Prior to the Event
It is important prior to the event that the referee reviews the Game Manual Part 1 and 2, watch the game animation video for a general understanding of the game, and watch the pre-recorded referee training videos. Referees are required to pass a certification test to fill this role at an event.

The training will walk through the referee's responsibilities throughout the event and discuss the game rules in greater detail. The scheduled Q&A calls will provide an opportunity to ask questions, and even provide feedback to other referees. The referee must be confident and comfortable with the game rules to be able to reliably make calls during the hectic pace of a *FIRST* Tech Challenge event. Learning ahead of time will go a long way towards keeping the event running smoothly and on time.

In addition to the training resources, there are monthly referee/head referee conference calls that can be used to ask questions and discuss situations from events. It is highly recommended to join as many of these calls as possible. If you are not able to join a call, you can listen to/watch a recording. Recordings of past calls are available through the training system.

Required Reading
All referees must read and be familiar with the entire Game Manual Part 1 and 2. Specifically, it is critical to read and completely comprehend the following portions:

Game Manual Part 1 – Traditional Events, Section 4 – The Competition
Pay attention to the tournament definitions and the tournament rules.

Game Manual Part 1 – Traditional Events, Section 7 – The Robot
Ideally, this section of the game manual is managed primarily by the inspection process. Referees must be familiar with and aware of the general rules for robot construction. Referees can, as appropriate, require a robot to go back for inspection if there is a concern about a violation of the robot construction rules.

Game Manual Part 2 – Traditional Events
It is key to familiarize yourself with the game overview, game definitions, and game rules. Referees must understand the set of rules that can trigger penalties for an alliance. Penalties come in several weights, minor penalties, major penalties, disablement, and yellow or red cards.

A table summarizing rules and their associated penalties can be found in Game Manual Part 2, Section 4.8. The table is a summary; the body of the game manual will always supersede the summary.

It is also essential for referees to be up to date with the state of the game rulings that have taken place. Game rulings can be found in the [*FIRST* Tech Challenge Game Forum](). They are updated throughout the season. They should be read and understood immediately prior to the tournament. Updates stop for the week on Thursdays at approximately 12:00PM Eastern time during tournament season. The *FIRST* Tech Challenge Game Forum is also converted to PDF, EPUB, and MOBI formats every Thursday afternoon.

Event Day Responsibilities

Before Matches Begin
The referee should arrive early to the event. Their first step should be to check in with the head referee. The head referee will hold a meeting the morning of the event with the referees to talk about the flow of the day. This is a good opportunity for the referee to know which field they will be working on (if there are multiple fields) and which referees they are working with. The head referee should work with the referees to come up with a communication plan to make sure penalties and scores are recorded correctly. It is important that they communicate well during the matches to ensure the matches run smoothly and on time.

The head referee will ask the referees about any conflict of interest they have with a team. Conflicts of interest can cause teams to feel the process isn't fair, and we strive to avoid any perception of unfairness at *FIRST* Tech Challenge events. For more information about conflict of interest, please visit Appendix H.

Match Play

Queuing and Entering the Field Prior to the Match
- Check for badges – the two drivers, coach, and the human player must have a badge. Coaches will have a dot or other designation on their badge. At some events, badges are not provided. If this is the case, ask the tournament director or the program delivery partner about methods to identify coaches and drivers.

- Remind the coach not to touch the controls during the match.

- Check for safety glasses; be sure that everyone has them on.

- Remind the drive team to remain in the alliance station or human player station as is appropriate.

- Ensure that the field has been reset properly.

During the Autonomous Period
Teams may not touch the controllers after robots are placed and until the autonomous period is complete.

Watch the drivers in the alliance station to be sure they do not touch the controls or any part of the playing field during the autonomous period. Keep watch for any potential penalties during the autonomous period and warn teams as appropriate if they are violating a rule.

Referee
- Note any penalties incurred during this period of the match.

Scoring Referee
- Keep track of the status of the field by noting either via score sheet or the live scoring software the status of scoring elements and other scoring tasks completed successfully by a team during a match.

Transition from Autonomous to Driver Controlled Period
Once the autonomous portion of the match ends, the scoring system will tell the teams to pick up their driver station. As a visual cue, the scoring system will display to teams that they must pick up their driver station. Teams will only have 5 seconds to pick up their driver station, so they should make sure to pay close attention! After the 5 seconds, there will be a 3-2-1 countdown (both visual and audio through the scoring system) and the driver-controlled period of the match will begin right away. In total teams will have 8 seconds from the end of the autonomous period to pick up their controllers before the driver-controlled period of the match begins.

During the Driver-Controlled Period
- Watch that coaches do not touch the controls in any way during the match.
- Watch for team members touching their robot, game element, scoring elements, or any part of the playing field.
- Watch for robot pinning, trapping, or blocking.
- Watch for rule violations or intentional damage to the field or other robots.
- Communicate any penalties incurred to the scoring referee.

After the Match, the Referees Shall
- Consult with the scoring referee to ensure the status of the field has been recorded correctly, and that all penalties have been recorded properly.
- Signal to teams that they can remove their robots from the playing field.
- The head referee will communicate with the teams as necessary.

Head Referee Question Box

The head referee question box is a place where teams can ask questions of the head referee after a match. Per Rule <C02>b:

> *All questions about a match or scores must be brought forward to the referees by using the referee question box located in the competition area. Only one **student** from an alliance is permitted to enter the question box and must do so within the time period of three (3) matches following the disputed match.*

Referees should refer questions from teams to the head referee. Head referees must be diligent to ensure they are addressing questions from teams in a timely manner, but not so that it affects the match schedule. Only students are allowed to ask questions in the question box; if a coach or parent approaches the question box, graciously remind them that it is the responsibility of the student to be present to ask a question.

Recording Scores and Penalties

There should be 4 referees for each field, two per alliance. Two referees on an alliance split the scoring, one tracks the scoring achievements, while the other tracks penalties.

Referee Paper Scoresheets

Paper scoresheets can be used for those events that do not set up the live scoring system which uses tablets to track the status of each match. The paper scoresheets can be printed directly from the website. Instructions on how to fill out the scoresheets are in Appendix F of this document.

Link to paper scoresheets: https://www.firstinspires.org/node/5146

Live Scoring

Referees will, in most cases, use tablets to track the status of the match using the live scoring system. The scoring system and tablets are set up by the scorekeeper for the referees to use. Detailed guides on how to use the system can be found on our website.

Link to scoring system and scoring system guides: https://www.firstinspires.org/node/5146

Score Changes

Referees are human, and at times there could be a score that was either entered incorrectly or missed and must be added to the final score. In these instances, the referee should have a discussion with the head referee.

If the score change will affect the outcome of a match (e.g., the change means that the blue alliance wins the match, versus the red alliance that originally won the match), the head referee should discuss the change with each of the teams prior to the scores being updated in the scoring system and the new rankings posted. It is recommended to gather the captains of all teams from both alliances before sharing the change with the teams. Make sure to allow time for the team captains to ask clarifying questions.

This need to pre-share the match outcome score changes is even more critical during the elimination portion of an event. Make sure to communicate with the emcees and/or announcers for the event prior to the beginning of the elimination matches to help them understand the timing of possible team challenges to help avoid premature announcement of match outcomes – and potentially incorrect identification of alliances advancing during the playoffs.

Taking the time to manage the announcing of match outcomes during elimination matches will help avoid considerable upset from the teams involved.

Game Overview
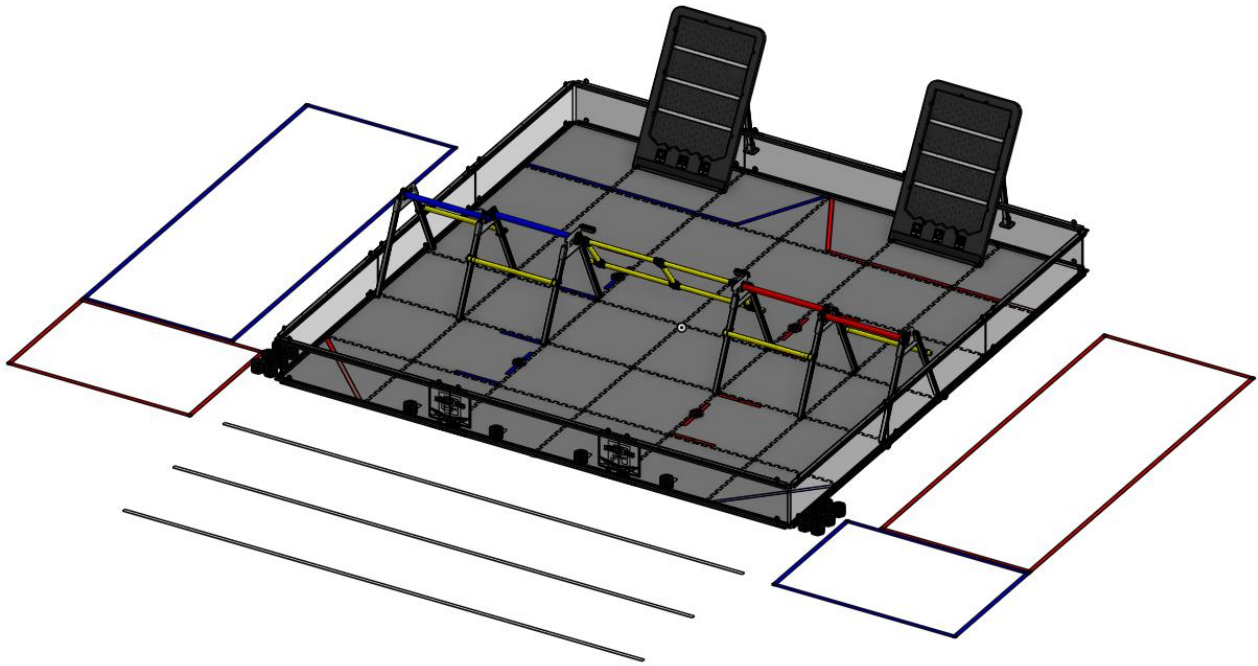
Welcome to CENTERSTAGE^{SM} presented by RTX. *Matches* are played on a *Playing Field* initially set up as illustrated above. Two *Alliances* – one "red" and one "blue", made up of two *Teams* each – compete in each *Match*. The object of the game is to earn as many points as possible by performing the achievements outlined below.

The *Match* starts with a 30-second *Autonomous Period* in which *Robots* operate using only pre-programmed instructions and sensor inputs. The following *Robot* actions earn points during the *Autonomous Period:*

1. *Navigating* to their *Alliance Backstage.*

2. Placing *Pixels On* their *Alliance Backdrop* or *In* their *Alliance Backstage.*

3. Identifying the *Randomization Object* on the randomly selected *Spike Mark. Alliances* can earn points by:

    a. *Placing* a purple *Pixel On* the randomly selected *Spike Mark.*

    b. *Placing* a yellow *Pixel On* their *Alliance Backdrop* in the location corresponding to the randomly selected *Spike Mark.*

    Additional points are earned for these tasks when a *Team* uses their *Team Prop* in place of the tournament provided white *Pixel.*

The two-minute *Driver-Controlled Period* follows the *Autonomous Period*. *Robots* earn points by:

1. Placing *Pixels On* their *Alliance Backdrop* or *In* their *Alliance Backstage.*

2. Creating *Mosaics.*

3. *Scoring Pixels* that cross the *Set Line* on their *Alliance Backdrop.*

The final 30 seconds of the *Driver-Controlled Period* is called the *End Game*. In addition to the previously listed *Driver-Controlled Period Scoring* activities, *Alliances* earn points by:

1. *Suspending Robots* from their *Alliance Rigging.*

2. *Parking Robots In* their *Alliance Backstage.*

3. *Parking* their *Launched Drones In Landing Zone* 1, 2, or 3.

Penalties

There are several rule infractions that can result in a team being assessed for a penalty. A summary of the penalties that can be incurred are listed in the official Game Manual Part 2 – Traditional Events https://www.firstinspires.org/resource-library/ftc/game-and-season-info. There are two types of penalties, minor and major. Minor penalties add 10 points to the non-offending alliance's score per occurrence. Major penalties add 30 points to the non-offending alliance's score per occurrence. In addition, there are a few offenses that carry double minor penalty points. Penalties are designed to allow teams to continue to play, despite having committed a significant infraction of the rules.

When a penalty is called, the referee making the call should signal the penalty by waving the appropriate flag (either red or blue), pointing at the offending robot, and verbally indicating the rule violation that has resulted in the penalty. This communication is needed to help ensure that teams are aware that their actions are drawing penalties.

It is important to keep track of the penalties given to each team/alliance during the match, as they may become part of discussions between the teams and the head referee post-match. The referee should communicate these penalties to the scoring referee to track during the match.

Yellow/Red Cards
In addition to rule violations explicitly listed in the Game Manual Part 2 – Traditional Events, yellow cards and red cards are used in the *FIRST* Tech Challenge to manage team and robot behavior that does not align with the mission of *FIRST*.

Egregious or repeated (3 or more) robot or team member behavior at the tournament can result in a yellow and/or red card. Yellow cards are additive, meaning that a second yellow card is automatically converted to a red card. A team is issued a red card for any subsequent incident in which they receive an additional yellow card, for example, earning a second yellow card during a single match.

Yellow and Red Cards at the Competition Field

The head referee may assign a yellow card as a warning, or a red card for disqualification in a match. A yellow card or red card is signaled by the head referee standing in front of the team's alliance station and holding a yellow card and/or red card in the air.

To issue the second yellow card, the head referee will stand in front of the team's alliance station and hold a yellow card and red card. The head referee will signal the second yellow card after the match has ended.

A team that has received either a yellow card or a red card carries a yellow card into the following matches, except as noted below. A red card results in match disqualification. Multiple red cards may lead to tournament disqualification. Once a team receives a yellow card or red card, the team number is presented with a yellow background on the audience screen at the beginning of all following matches. This is a reminder to the team, referees, and audience that the team carries a yellow card.

Yellow cards do not carry over from the qualification matches to the elimination matches. During the elimination matches, yellow and red cards count against the entire alliance, not to a specific team. If a team receives a yellow card or red card, it results in the entire alliance receiving the yellow card or red card for

that match. If two different teams on the same alliance are issued yellow cards, the entire alliance is issued a red card. A red card results in zero (0) points for that match, and the alliance loses the match. If both alliances receive red cards, the alliance which committed the action earning the red card first chronologically loses the match.

Yellow and Red Cards off the Competition Field

Teams can incur yellow and red cards for their actions off the competition field. Egregious behavior off the competition field should be reported to the tournament director. The tournament director will first consult with the coach of the team about the behavior of the team or its members, explain the ways in which the behavior is considered egregious, and give a warning to discontinue this behavior. If the behavior persists, the tournament director will work with *FIRST* headquarters to assess whether or not the behavior exhibited by the team is considered egregious and if a yellow and/or red card should be issued. If it is determined that the team should receive a yellow and/or red card, the tournament director will report to the head referee. The yellow and/or red card will be recorded into the scoring software based on the next match played by the team during qualification matches. If a team is competing in elimination matches receives a yellow or red card between the qualification matches and elimination matches, the card will be applied to the first elimination match. If a team receives a yellow or red card during the elimination matches for off field behavior, the yellow or red card applies to the current or just completed elimination match.

Obtaining Yellow and Red Cards
Every head referee should carry with them a yellow card and a red card throughout the event. This will act as a visual aid not only to the teams but to the audience when the alliance or team has received a yellow or red card. Yellow and red cards can be purchased such as the following:

http://soccer.epicsports.com/prod/3133/champion-soccer-ref-red-yellow-cards-pack-of-2.html?cid=11425

Yellow and red cards can also be simply cut out of construction paper. If needed an app can be downloaded to serve as the visual aid, however the head referee must clearly display the screen to the team as well as to the audience. Although the yellow cards will be displayed on a screen to the audience, this is only displayed after the completion of the match, only after the scorekeeper has entered the information to be displayed.

Issuing & Tracking Cards
If you observe a rule violation that merits a team receiving a yellow or red card, you should notify your head referee of the infraction, explain your observations to allow your head referee to be able display the appropriate card to the team(s) involved and to be able to discuss the situation with the team(s) as needed.

Yellow and red cards will be tracked within the scoring system and by the head referee.

Repeated Rule Violations
There are several rules in the Game Manual Part 2 – Traditional Events that make reference to repeated actions leading to more significant penalties being applied. An action that is repeated 3 or more times should be considered for additional penalties. These should be acknowledged with verbal warnings given to the offending teams at each of the 1st and 2nd offenses.

If a referee sees a team's ungracious behavior or receives information about team behavior, the referee should note relevant details and pass that information to the head referee.

At times the head referee or referees may need to confer with the judge advisor to report or discuss reports of ungracious behavior from a team. The tournament director or program delivery partner should be alerted to any reports of ungracious behavior in order to investigate the report and talk to the team mentor. Regardless of the outcome, all reports of ungracious behavior must remain confidential and must not be discussed with anyone other than the head referee, judge advisor, tournament director/program delivery partner.

Safety Rule Interpretation

<S01> Unsafe Robot and Playing Field Damage
Safety is everyone's job at a *FIRST* event, including safety on the playing field. If a robot is unable to be controlled in a manner that does not risk potential injury to students or field personnel or if it has caused damage to the playing field, it should be disabled for the remainder of the match.

In extreme or more dangerous cases, a yellow card may be appropriate.

If the damage is significant enough to require match delaying repair, it may be appropriate to escalate to a red card.

The goal is to protect the people around the playing field and the ability to continue the event.

<S02> Robot Extension Outside the Playing Field Perimeter
Robots that extend outside the playing field perimeter are potentially unsafe. Contact with anything outside the perimeter should result in a yellow card and if there is danger in allowing the robot to continue operation, it should be disabled.

Inadvertent, safe extension outside the field perimeter should not be penalized.

<S03> Safety Gear
All members of each drive team are required to be appropriately attired at the playing field (and in the pits). closed-toed/closed-back shoes as well as required by <C17> should be worn at the playing field.

If a student arrives at the playing field without appropriate safety gear, they should be reminded of the rules and given the opportunity to remedy the situation. If they are unable to remedy (including being replaced by a teammate) within a reasonable timeframe (30 seconds or when the match is prepared to start), the student must leave the competition area and may not return while the match proceeds.

<S04> Competition Area Safety
Teams must comply with venue specific safety rules for the competition area. Initial violations result in a verbal warning, and any subsequent violations result in a yellow card.

This rule is a result of the addition of raised platforms at the FIRST Tech Challenge World Championships and the need to have teams abide by safe procedures for entering and exiting the platforms.

Venue specific rules should have been communicated to the teams by the tournament director and/or the program delivery partner prior to the event. Review any such rules during the morning drivers' meeting and make sure all teams understand the importance of the venue safety rules.

General Game Rule Interpretation

<G01> Autonomous to Driver-Controlled Period Transition
At the conclusion of the autonomous period, robots will remain in a hands-off state. Field personnel will not enter the field and will not touch robots on the field from the autonomous to driver-controlled transition.

If the scoring system software is not being used to manage the match timings, a consistent method of notifying teams that they need to prepare for the driver-controlled period should be utilized. The wording and timing should be consistent across all matches within an event.

<G02> Score Certification at the End of the Match

Effort should be made to conclude the final assessment of the scoring as quickly as is reasonable. Some discussion amongst the referee crew to make sure that penalties are being appropriately recorded is possible. Active communication throughout the match between referees and scoring referees will help with minimizing the time required to finalize match scores.

<G03> Forcing an Opponent to Break a Rule

Referees should keep an eye out for instances where a robot is forced into a penalty by an opposing robot. This may be accidental or intentional. If intentional, the offending team should be warned of potential escalation to a <G30> Egregious Behavior violation.

Scenario:

A blue robot is parked by one of the red alliance's protected scoring areas. A red robot pushes the blue robot, causing the blue robot to enter the red protected scoring area, which could potentially be a rule violation. No penalty will be assessed on the blue robot providing the blue robot moves out of blocking position as soon as possible.

<G04> Robot Manipulation of Scoring Elements - Game elements that are controlled by a robot are considered a part of that robot except when determining the location of the robot. This applies to interactions between robots, game elements, or field elements.

<G05> Robot or Scoring Elements In Two or More Scoring Areas

Game elements that straddle multiple scoring areas should be scored as if they were in the higher valued scoring area, unless there are game specific rules that provide exceptions.

<G06> Scoring Elements in Contact with Robots

In general, game elements that are in contact with a robot of the same alliance do not score for that alliance.

<G07> Disabled Robot Eligibility

A robot that is disabled by the referees due to rule violations is deemed ineligible to score for the remainder of the match. Before the team puts down their controllers, the robot should be moved into a neutral, non-scoring position. The ineligibility includes any actions by their alliance partner that would cause the disabled robot to be moved into a scoring position. Game-specific rule(s) listed in section 4.5.3 take precedence over this general game rule. Exceptions are listed in <GS01>.

Robots that are disabled due to failure of the robot or its subsystems are still eligible to score. Work with the FTA at the playing field to help with determinations of robot status.

<G08> Playing Field Tolerances

The dimensions of the playing field are specified as +/- 1.0 inches. While we try to be more accurate when we set up and manage our fields, teams should be prepared to play in an environment with variances.

<G09> Match Replay

This rule dictates the conditions that the head referee and the field technical advisor will use to determine the possibility of a match replay. The key here is that a discussion between the field technical advisor and the head referee will be the determination of possible replay. Verifiable faults (such as failure of a non-team supplied game element or verified Wi-Fi interference) are required. Head referee decisions are final. Note that the justification for match replay requires situations that are deemed "likely to have impacted which alliance won the match" in order to justify match replay.

<G10> Inadvertent and Inconsequential

Rule violations that are determined by referee's discretion to be BOTH inadvertent AND inconsequential may be waived and not penalized.

<G11> Illegal Match Communication

Rule <G11> prohibits teams from bringing electronic communication devices to the alliance station. This includes, but is not limited to; cell phones, walkie-talkies, Bluetooth headsets, tablets with internet connections, etc. Any device that would be reasonably assumed to be a communication device should not be brought to the alliance station. This of course does not apply to the driver station (for example, the cellphone that is a part of the driver station).

<G12> Playing Field Access
This rule specifies that team members cannot enter the playing field for any reason other than to place/retrieve their robots. Teams may not measure, test, or adjust field or game elements. Inspection of the playing field elements by team members to determine scoring is not allowed.

The consequences for violating this rule are:

a) Minor penalty for violations during match setup or following the end of the match.

b) Major penalty for violations that delay the start of the match.

c) Violations of this rule outside of normal match play will result in a yellow card (i.e., accessing the field during a lunch break or while the field is idle between matches)

Referees should expect that teams may ask about the proper placement of field and game elements. Effort (in conjunction with the FTA and/or field manager) should be made to fix any team identified setup issues.

Contact with game elements that is incidental and inconsequential should be ignored.

<G13> Pre-Match Robot Placement
This rule specifies the order that the robot should be placed onto the field. During qualification matches, blue alliance robots should be placed first. If the blue alliance arrives to the match late, and the red alliance has already placed their robots, the red alliance will be given the opportunity to reposition their robots. During elimination matches, the lower seeded robots should be placed first (i.e., 3rd place seed places before 2nd place seed). During any match, an alliance may waive its right to place last (i.e., they are not required to wait until the opposing alliance has placed but are merely given the right to place last if they choose). During elimination matches, 3 team alliances may only place robots that are intended to compete in that match. Once two robots are placed for the two teams competing in a match, the alliance cannot swap in the 3rd alliance's robot for a robot already placed.

Note that in 3 team alliance matches, each alliance is required to notify the referees which two robots are participating in each match 2 minutes prior to the start of the match (see Game Manual Part 1, section 4.10).

Make sure to watch for teams that may be 'gaming' this rule, looking to take advantage and possibly delay match start. Remind them of the goals of *Gracious Professionalism*®.

Per the orange box in <G13>, teams that are late enough that the entire field is waiting for them before being able to start the Match should be penalized (<G13>.e).

<G14> Robot Starting Volume
Robots are required to start in a legal configuration. Robots that are unable to establish and maintain an appropriate starting configuration should be removed from the playing field. The robot and the drive team must remain at the field for the duration of the match if they are removed from the field.

<G15> Robot Setup Alignment
Robots are allowed to use alignment devices. The alignment devices must be made from legal parts/materials and must be a permanently attached part of the robot. The alignment devices are allowed to extend outside the

robot starting size but must be fully retracted prior to Match start. Using body parts, team members standing inside/outside the field perimeter, are examples of dis-allowed alignment devices.

<G16> Alliance and Human Player Stations

Drive teams must remain in their alliance station or human player station during a match. Once a match begins, drive teams may stand, sit, or kneel within the alliance or human player station for the remainder of the match. Rule <G16> prohibits a player from leaving the alliance or human player stations during a match, except in the case of safety. This includes leaning and/or reaching into the field from the alliance station. Leaning/reaching out of the alliance station that does not result in a competitive advantage should not be penalized. Teams that reach/lean into the field should be warned to keep inside their alliance station. Repeated violation should result in penalties being assessed.

Similar arguments apply to team members stepping out of the alliance station. Some latitude can be allowed for minor crossings of the alliance station perimeter, coupled with gentle reminders. Repeated or more blatant violations should be assessed with penalties.

When game specific rules allow for the Human Player reaching into the field, the Human Player should reach only with the minimum amount of exposure needed to perform the Human Player tasks. For example, a Human Player leaning their head into the playing field should not be a normal part of Human Player action and should be penalized according to <G16> or by Human Player constraints listed in the Game Specific rules section.

<G17> Post-Match Removal of Robots

Robots need to be designed to allow quick removal of game elements from the robot. The goal of the rule is to efficiently get robots off the field at the end of a match and the field prepped and ready for the next match.

<G18>, <G19>, <G20>, <G21> Starting Gameplay Early, Starting Gameplay Late, Robot Actions at End of Period, Robot Control During Autonomous

Robots that start or end gameplay either late or early will receive a minor penalty. A major penalty may be assessed instead, if the referees determine competitive advantage was gained. Scoring that occurs as a result of late gameplay by robots will not be counted as scored.

Note that a <G19> violation does not automatically include a <G21> violation. <G21> violations are intended to cover only actions after the robot has been started for the autonomous period.

<G20> requires robots to park at the end of both the autonomous and driver-controlled periods. Allowances should be made for human response times. Examples of competitive advantages other than scoring that could come from late game play at the end of the autonomous period include moving to an advantageous defensive/offensive position and deploying/retracting a mechanism (and potentially many others).

<G20> also addresses scoring actions that occur after the end of a period. If the action was started prior to the end of the period, it should count as scored. For example, a drone launched before the end of end game should be scored after it comes to rest.

Scoring actions that take place in the pause between the autonomous and driver-controlled period should not count for either period.

<G22> Drive Team Contact with the Playing Field or Robots

Members of a drive team should not make contact with the playing field, any robot, or game elements, including those that leave the field of play. Teams should not be penalized for unintentional and incidental contact with game elements that leave the field into the driver stations. Teams should leave the game elements alone and allow designated field personnel to return the game elements to the field when it is safe to do so. Defensive actions should be considered unintentional.

<G23> Drive Team Coach Driver Station Control
The member of the drive team that is designated as the coach is not allowed to control the robot. Coaches are allowed to hold the driver station Android device, including interacting with it to select op modes, start/stop/initialize/reset the robot (as appropriate for the current period of the match)

<G24> Robots Deliberately Detaching Parts
Robots that deliberately detach parts during a match should be issued a minor penalty. Additionally, if the detached part affects gameplay of any robot, the penalty should escalate to a major penalty and a yellow card. Parts of robots that are attached only with a tether will count as detached for the purposes of <G24> penalties.

Tethered components that move independent of the main robot are considered a detached component and are illegal.

<G25> Robots Grasping Game Elements
In general, this rule prohibits team robots from grabbing onto game or field elements. The game specific rules will provide exceptions where necessary for a given year's game.

<G26> Destruction, Damage, Tipping, etc.
Entanglement occurs when parts of two or more robots are locked together. Not all occurrences of entanglement require a penalty. It is up to the referee to determine if a robot has an arm or other device that greatly increases the chance of entanglement. A referee may also assign a penalty for a strategy resulting in entanglement, such as intentionally spearing a robot with an arm.

> **Teams/alliances that play very aggressively should be warned about the possible penalties associated with <S1> and <G26> (i.e., intentional damage and/or strategies aimed at damage).**

Scenario 1:
> Two robots collide and their wheels interlock, preventing either from moving freely. No penalty should be awarded since wheeled robots are of a conventional design and neither have a design that increases the chance of entanglement.

Scenario 2:
> Blue 1 has wires running loosely from an arm to the robot body. Red 2 drives by and is caught on blue 1's wires. Blue 1 should receive a penalty for entanglement since the wires clearly extend beyond the main part of the robot and were not properly tied down to prevent catching on a robot or field element.

The intent of this rule is to prevent one robot from tipping over and disabling an opponent. This rule is similar to the entanglement rule in that it is very situation and robot dependent. *FIRST* Tech Challenge games are highly interactive, and robots are expected to push and otherwise make physical contact with each other. Robots should be designed with that in mind. The fact that a robot is top heavy and easily falls over when bumped by another robot should be considered before a penalty is awarded. A robot with a feature that enhances the ability to tip over other robots, regardless of the feature's intended purpose (such as a ramped plow to herd game elements) should be warned that contact with other robots using this plow can be interpreted as tipping. Teams should be warned not to take advantage of a situation when an opposing robot is off balance.

Scenario 1:
> Red 2 is driving up the edge of a field element and is off balance. Blue1 drives up and begins to push red 2, causing red 2 to tip over. Blue 1 should be penalized for tipping.

Scenario 2:
> Red 1 and blue 2 are pushing each other with their arms. Blue 2 is off balance so red 1 backs off. Blue 2 cannot recover and falls. This action should not be a tipping penalty.

Scenario 3:
>   Blue 2 has a ramp in front that is used to scoop up scoring elements. When blue 2 is pushing red 2, the ramp goes under the wheel of red 2, tipping red 2 over. Blue 2 should be penalized for tipping.

\<G27\> Removing Game Elements from the Playing Field
Team should not intentionally remove game elements from the field. They should expect to be penalized for each game element placed out of bounds. Actions that repeatedly and routinely cause game elements to leave the field will be determined to be intentional.

Game elements that leave the field of play should be returned to the field at the earliest possible SAFE opportunity, at approximately the position where they left the game field. Due to the proximity of the driver station to the field edge, it may be difficult to return game elements that leave the field in front of the driver station in a timely way. It is important to make sure not to interfere with any of the members of the drive team while returning game elements to the field. Game elements returned to the field should be placed in non-scoring locations.

It is possible that some game elements that leave the field of play may not make it back into play for the remainder of the match, particularly for those that leave the field near the alliance station.

All game elements that leave the field during the autonomous period should be returned to the field of play during the pause between the autonomous period and the driver-controlled period, while the robots are all inactive, if possible.

\<G28\> Pinning, Trapping, or Blocking Robots
Pinning is a rule that generates a great number of complaints/comments from teams. The intent of this rule is to stop one robot from preventing the motion of an opposing robot. Many times, this is confused with blocking. Blocking, or preventing a robot from moving in a specific direction is legal but holding a robot against a field element or another robot and preventing it from moving in any direction is illegal. The pinning rule is applied differently in the autonomous mode and the driver-controlled mode. Trapping applies in cases where a robot can move, but it prevented from being able to leave or access an area of the field.

The 5 second count is not permission to violate the rule for just under 5 seconds. Teams are expected to back their robots away from Pinning/Trapping/Blocking situations as soon as the initial count begins. The 5 second count is a grace period to allow the back out to take place.

Autonomous Mode
In general, pinning, trapping or blocking in autonomous mode is quite rare. The difficulty with calling this penalty is that since the robots are not being driven, the referee cannot ask the offending robot to back up. The referee must determine whether the pinning, trapping, or blocking is intentional or accidental. Unless the offending team has specifically targeted their opponent and has demonstrated in past matches a strategy aimed at pinning a robot, the referee is usually better off issuing a warning. If pinning, trapping, or blocking does occur, the referee must notify the team with the pinning, trapping, or blocking robot that as soon as the driver-controlled mode starts, their robot must back up 36in (91.44cm) immediately (approximately 1.5 full field tiles). There will be no 5 second count.

Driver-Controlled Mode
For pinning to occur, the pinned robot must not be able to move in any possible direction. Blocking a robot from traveling in its preferred direction is not pinning. Open field contact between robots is not pinning. If pinning does occur, the referee must notify the offending team and begin counting. The count should be visible, pointing fingers is recommended, and the count should be loud enough for the teams to hear. Referees should start the count at 2, since by the time the count is started at least one second has gone by. The pinning robot must back off a minimum of 36in (91.44cm) (approx. 1.5 full field tiles). If the offending robot does not back up, the referee should assign a penalty. Repeated pinning for less than 5 seconds is allowed, provided the

offending robot backs up a minimum of 36in (91.44cm) each time. If the robot continues to violate the rules, the referee should disable the robot, but only after making the team move the robot away from the pinned robot.

A key phrase in the definition of pinning is "preventing the movement in all directions of an opposing robot". If the robot is not attempting to move, there is no pinning. A robot must be actively attempting to move for it to be considered pinned. Contact with a robot parked against a field border or field element in a way that would prevent a robot from moving is not enough to be considered pinning. The pinned robot must be attempting to move away from the object that it is being pinned against.

Scenario 1:
Red 1 is 3" from the wall. Blue 2 is preventing red 1 from moving toward a scoring area. The red team is calling for a pinning penalty, but since red 1 has room to turn and move parallel to the wall, the referee should not begin the count. It is not pinning/trapping if the robot can move in another direction.

Scenario 2:
A referee starts a pinning count on red 1 for pinning blue 2. Red 1 backs up 12in (30.48cm) and then drives back to blue 2. The referee continues counting (12in (30.48cm) is not sufficient to end the pin), and at 5 seconds assigns penalty to red 1 and warns them to back off at least 36in (91.44cm). If red 1 continues to pin the blue robot, the referee should call a minor penalty for every 5 seconds red 1 continues to pin blue 2, while asking the red alliance to move at least 36in (91.44cm) away.

<G29> Illegal Usage of Game Elements
Deliberate use of game elements to aid or amplify the difficulty of robot gameplay should be penalized.

Some examples include; stacking game elements in front of the opposing alliance's scoring areas, using game elements to block/lock a dynamic field element, placing game elements into opposing alliance robots in an effort to hinder robot motion.

As an example, in this season's game, intentional placement of Team Props into the opposing alliance's Wing would constitute illegal game element usage.

<G30> Egregious Behavior
Teams should expect to behave appropriately in all situations at the playing field. This includes respectful interactions with all field personnel, as well as with all competitors in the match. This same respect extends to the game rules and to general safety around the playing field.

For rule violations to escalate to egregious behavior, there needs to have been a discussion between the head referee and the team about the escalating consequences. One of the goals of the conversation is to help the team avoid the violation. See the discussion of tracking rule violations in the head referee portion of this manual.

In most cases, as determined by the referees, the offending team behavior will result in a *Major Penalty* and issuance of a *Yellow Card* and/or *Red Card*. Subsequent violations may result in Team disqualification from the competition.

Continued and repeated violations will be brought to *FIRST* Headquarters' attention. *FIRST* Headquarters will work with event staff to determine if further escalations are necessary, which can include removal from award consideration and removal from the event.

In the case of dealing with a persistent, confrontational coach, mentor or parent (i.e., an adult), it is a good practice to de-escalate, get the tournament director involved with contacting FIRST Headquarters and focus on the teams and remaining matches for the event.

All discussions regarding possible <G30> violations must involve the head referee. Escalations that require involvement with *FIRST* Headquarters will involve the head referee along with the tournament director or program delivery partner.

Game Specific Rule Interpretation

<GS01> General Rule Exceptions
Rule <GS01> provides a list of all the exceptions to the general game rules for CENTERSTAGE.

There are seven general game rule exceptions this season: one each for <G06>, <G25>, <G27>, <G28>, and three for <G07>.

The <G06> exception allows robots to be in contact with (not possess) a pixel that has been scored in the backstage area. The alliance still earns points for the pixel they are in contact with. This is intended to take care of the case of robots driving over or parking on scored pixels in the backstage area.

The <G25> exception allows robots to grasp the rigging to suspend during end game.

The <G27> exception allows robots to launch their drone as part of end game scoring.

The <G28> exception prevents an opposing alliance robot from using the height restricted portions of travel under/through the Truss to aid in blocking/trapping a robot during endgame. I.e., if the only path to a rigging is via a crossing underneath the yellow, height restricted bars, blocking access counting and consequences should apply.

There are three <G07> exceptions. Each allows penalties to be applied to a disabled robots in an opposing alliances critical spaces, including the wing, the backdrop, and the stage door. **<GS02>** *Drive Teams* **Touching** *Robots* **or** *Driver Stations* **after Randomization**

Once the white pixel on the spike marks has been randomized, teams should not touch their robots or their driver station. A minor penalty and a loss of the randomization tasks for the offending team's robot should be assessed. An exception can be made, if and only if, the FTA at the field works with the team and their robot to fix any pre-match issues. In this case, redoing the randomization is acceptable. We do NOT want to normalize re-randomization as a part of match flow. Teams should expect to be "hands off" once they have indicated to field personnel that they are ready. It is good practice to have a very explicit "are you ready" dialog as part of the pre-match preparation. Work with your field personnel to clearly identify who manages the dialog and stick to a single method and rhythm to the process.

<GS03> Autonomous Interference
Robots that interfere with scoring attempts of the opposing alliance during the autonomous period should be assessed a major penalty per occurrence.

Note the explicit identification of the columns of playing field tiles that are associated with each alliance for the autonomous period. This should help teams understand more completely where interactions are likely to lead to penalties.

<GS03>c. covers interfering with the white pixel stacks on the opposing alliance half of the field. Although simply knocking over a stack doesn't incur a penalty in itself, the offending alliance may be penalized if the knocked over stack clearly impedes the other alliances attempts to score during the autonomous period of the match. For example, blue robot knocks over the stacks on the red alliance half of the field during autonomous.

The red robot is clearly hindered from picking up pixels in the stack as part of their autonomous program. This would incur a major penalty to the blue alliance.

<GS04> Descoring
Descoring of pixels from an opposing alliance backdrop may be difficult to track. When multiple pixels are descored, a best effort should be made to tally the displaced pixels as quickly as possible.

<GS04>b. states descoring or moving pixels that were part of a mosaic or set line bonus incur an additional minor penalty. There are a few examples of this scenario listed in the game manual part 2 to help assist the referees in making this call:

Examples:

1. A *Robot* descores a *Pixel* from the opposing *Alliance's Backdrop.* The opposing *Alliance's Mosaic* or *Set Line* points are unaffected. The offending *Robot* that descored the *Pixel* receives one *Minor Penalty*.
2. A *Robot* descores a *Pixel* from the opposing *Alliance's Backdrop*. The opposing *Alliance's Mosaic* score is affected by the descore. The offending *Robot* that descored the *Pixel* receives two *Minor Penalties.*
3. A *Robot* repositions a *Pixel* on the opposing *Alliance's Backdrop*. This causes the affected *Alliance* to lose points for an already achieved *Set Line* bonus. The offending *Robot* receives one *Minor Penalty*.

<GS05> Robot Control/Possession Limits for Scoring Elements
A robot is allowed to control/possess up to two pixels and one drone. Control or possession of more than the allowed limit results in an immediate minor penalty for each scoring element above the limit. Scoring while in violation of <GS05> results in a minor penalty for each element scored.

A robot may not possess a drone provided by another team (see <GS11>), regardless of it belonging to their alliance partner or to the opposing alliance robots.

<GS06> Truss Constraints
<GS06> provides limits on how robots interact with the Trusses and their components. Only the Riggings may be Grasped – and only their own alliance's Riggings.

<GS07> Stage Door Constraints
Robots are not allowed to interfere with the normal operation of the stage door.
There are two transit constraints included in <GS07> that will require care in communication and enforcement. The first prohibits disrupting the transit of an opposing alliance robot through the stage door, The second provides a transit priority to robots passing through the stage door going from the audience/wing side of the field to the back/backstage side of the field.

Frequent conversations with teams as they run into these two constraints should help them understand and avoid the penalties associated with <GS07>

<GS08> Backdrop and Backstage Constraints
Most of <GS08> is self-explanatory. Note that <GS08>b is similar to <G28>, but carries an immediate Major Penalty once identified, rather than requiring a 5-second count. <GS08>.c adds an exception that continues penalties for disabled robot for <GS08> violations.

<GS09> Wing Constraints
The wing is a critical gameplay choke point for each alliance as the wing is the area that the human player is allowed to introduce scoring elements into the playing field. As such, the wing has a series of protections.

Of note is the <GS09>.b that prohibits robots from being In the opposing alliance wing.

Robots that attempt to abuse the wing protections by leaving long extensions In their wing should not be afforded the <GS09> protections and should be warned about blocking access and/or entanglement violations.

<GS10> Pixel Constraints
Robots are not allowed to propel pixels. <GS12>e also prohibits human players from propelling pixels.

<GS11> Drone Constraints
This year's team supplied scoring element is a drone – a paper airplane. Below are some notable parts of the rule:
- <GS11>.b prohibits robots from possessing a drone from another team (from either alliance). Possession due to inadvertent capture (I.e., the drone lands within the robot) should be excused and not penalized.
- <GS11>.d allows drones to be launched by suspended robots. The drone still needs to meet GS11.e limits.
- <GS11>.e requires the drone to pass over a rigging or the top pole of the stage door. This means that the drone has to pass over the vertical extension, bounded by the field perimeter (where the riggings end).
- <GS11>.f prohibits alteration of a drone after inspection in any way that would make it no longer pass inspection – drones that have been modified in violation of GS11.f cannot count as scored.
- <GS11>.g covers a variety of drone interference situations. Note that GS11.g.iv awards zone 1 achievements to drones that hit field personnel that are in the landing zone – stay out of the landing zone during gameplay!
- <GS11>h. covers drone parking. Drones must leave the playing field completely in order to score. This means that all parts of the drone must be in a landing zone. Any part of the drone propped on the perimeter, or still within the playing field, do not score.

<GS12> Human Player Constraints
<GS12> lists the conditions that the Human Player must follow to place pixels in the wing legally. Most of the constraints are intended to help manage human player safety and provide guidance to the human players as to how they may interact with the gameplay taking place on the playing field.

The remainder of the constraints limit the number and timing of introduced scoring elements into the wing.

Note that the human player is not allowed to handle any of the items in pixel storage until after the match begins, this includes no re-arranging of the pixel stacks. Once the match has begun, the human player is free to arrange the items in the pixel storage as they see fit. There is no limit to the number of pixels they can hold at a time, but only two at a time may be placed into the wing.

<GS13> Truss/Stage Door Safety
Drive team members (and field personnel) may never jump/step over any part of the truss or stage door structures. If a student does step over the truss, there should be a gentle conversation about field safety in addition to the formal warning.

It is important as volunteers at the playing field that we all model the correct safety procedures around the truss and associated parts. NEVER step over the truss!

Scoring Considerations

Due to the layout of the scoring screens on the score tablets, it will be important for the scoring referees to stay in the rear corners of the field. The alliance stations have been sized to leave a place for the scoring referees to stand and work.

In the case that gross scoring errors are identified before finalizing the match, the simplest method to fix the scores will be to work with the scorekeeper. The scorekeeper screens provide a quicker means for doing large-scale edits.

Many referees may prefer utilizing a stylus for doing the score marking. Encouraging all referees to have their own stylus is one way to ensure that they have access to a stylus at their events.

Robot Rules

There are guidelines and specifications teams must follow when constructing their robot (refer to the Game Manual Part 1 – Traditional Events for the full list of specifications). Although all robots must pass an inspection prior to competing, the referee has the discretion to send a robot back to inspection if the referee believes the robot violates the stated rules. There are a few of the robot construction rules that are of particular importance to referees.

<RG02> Robot Size
This rule limits the physical size of a robot in its starting configuration to be able to fit within an 18-inch (45.72cm) cube. This includes all attachments, extensions, etc. If there is any doubt about the size of a robot, the head referee should be notified, the inspectors summoned, and a possible re-inspection of the robot may be required.

<RG04> Team Number
This rule requires all robots to clearly display their team number. There are requirements for size and contrast of the numbers, as well as their positioning. The primary requirement is for the referee to be able to clearly identify the robot at all times (both by number and by alliance).

<RG05> Alliance Marker
This rule requires all robots to clearly display their alliance marker that identifies to the referee's which alliance the robot is on. There are size and shape requirements for the alliance marker that are outlined in the Game Manual Part 1 – Traditional Events, rule <RG05> The alliance marker should be within 3" of the team number and on the same sides of the robot as the team numbers. This normally should be managed during robot inspection.

<RG07> Propelling Game Scoring Elements
This rule limits the energy that *FIRST* Tech Challenge robots can impart onto any projectiles that they launch. It is an operational definition, and its intent is completely about safety for the alliances, the field personnel, and the audience that may be seated near the field. If at any time the referee and inspector disagree on a ruling, the final decision on whether to allow a robot to compete is up to the head referee.

If there is a determination of excessive velocity, based on observation during gameplay, the robot in question should be sent back to inspection for a formal assessment of the velocity of its shots.

Competition Rules

There are a few competition rules in the game manual that have an impact on the role of the referee. This section is important to understand since it lays out the flow of the competition, including the descriptions of the different types of matches.

<C02> Referee Authority
Rule <C02> from the Game Manual Part 1 – Traditional Events introduces that referee rulings are final. Additionally, it sets a process and a time limit for the possible questioning of disputed rulings. Most tournaments will have a designated area where a student-member of the drive team waits for the opportunity to discuss a ruling with a head referee.

When a question is brought forward it should be directed to the head referee only, and in the designated referee question box located in the competition. All questions and discussions with the team are addressed by the head referee only.

If a non-student team member attempts to bring forward a question, politely remind them that all questions and discussion occur only with student team members. Ask them to leave the immediate area of the discussion and continue the discussion with student members.

At no point should you ever allow teams to show you pictures or videos of matches. Rule <C02>a. expressly prohibits review of recordings or pictures. Teams are encouraged to bring supporting documentation such as a specific game rule from the Game Manual Part 2, or a forum post when asking questions about a call.

Be aware that teams often may not agree with the decisions of the referees. They may attempt to engage in repeated attempts to reopen the discussion about the decision. Remind them that the head referees' decisions are final and that repeated discussions will not change the outcome. If they persist, gently remind them about the ideals behind *Gracious Professionalism*®. It would also be good at this point to highlight the team's behavior to the judge advisor.

<C06> Competition Area Access
Teams are issued badges as part of the check-in process for the tournament. All members of the drive team must wear the provided badges. If they are not readily visible, encourage the members to place the badges more visibly (i.e., above the waist). Badges may NOT be swapped during a match (i.e., the coach at the start of the match remains the coach for the entire match).

Note that with the addition of human players, there are now 3 distinct types of badges, driver, coach and human player.

<C12> Wireless Communication
No team, team member, or event attendee is allowed to set up their own Wi-Fi 802.11a/b/g/n/ac (2.4GHz or 5GHz) wireless communication in the venue. Non-allowed wireless communications include, but are not limited to:

 a. Cellular Hotspots (e.g., cell phones, tablets, MiFi).

 b. Ad-hoc networks.

 c. Nintendo DS peer-to-peer.

 d. Bluetooth communication with robots in the *competition area*.

No team, team member, or event attendee shall interfere with a team's Wi-Fi Direct® communication with their own robot.

The penalty for violating rule <C12> is disqualification of the entire team from the event and their removal from the venue property. Teams may not appeal the penalty and no refunds will be given for registration fees, pre-paid meals, etc. *FIRST* may conduct a post-event review and determine if any additional penalties are to be imposed upon the offending team.

<C15> Safety Glasses

Safety is everyone's responsibility. All drive team members MUST wear safety glasses (or shatterproof prescription glasses with side shields).

<C29> Elimination Matches

<C29> contains several important pieces of information related to the playoff portion of tournaments. <C29> includes the guidelines for determining the sizes of the alliances during elimination matches. It also includes the requirements for three-team alliances to notify the referees with an identification of which two teams will be participating in an upcoming match. This requirement also includes the process for selection of teams if the alliance fails to abide by the requirements.

Head Referee Manual Supplement

Please make sure to read the entire referee manual. The duplicate head referee manual information has been removed and the following section is meant to serve as a head referee supplement with information that applies only to the head referee role.

Head Referee Role Responsibilities

Refereeing at *FIRST* competitions is different from a traditional sporting event in that the referees help the competitors to avoid breaking the rules of the game. We like to remind team members if they are getting close to an infraction and warn them rather than watching passively. Continued violations of the game rules outlined in this manual should fall into fair and consistent enforcement. Penalties will be applied for these violations and could lead to disqualification of a competitor. It is important for a head referee to understand what constitutes a penalty, and to allow a competitor the opportunity to remedy the situation. It is the responsibility of the head referee to have a complete understanding of the rules and penalties of the game and be able to convey and communicate these rules and penalties clearly and effectively.

Experience and skills needed
- Ability to "take charge" and be assertive, but friendly and tactful.
- Thorough knowledge of the competition, game, and rules of play.
- Outgoing personality; high energy.
- Strong communication and diplomacy skills.
- Ability to collaborate with others, work as a member of a team.
- Attention to detail.
- Ability to move around the field.
- Ability to stand for long periods of time.
- Strong assessment skills.

The referees work under the direction of the head referee and may be required to participate in deliberations regarding referee calls contested by teams. Head referees play a critical role in ensuring smooth flow of match play and maintaining the pace of the event.

Personal Demeanor
As a head referee, it is important to recognize the very public nature of your volunteer role as well as the close level of interaction with the students. Your actions are seen and heard by many participants and spectators at your tournament. The manner that you display in your actions frequently carries more weight with the students than what you say in your interactions with them.

As you are carrying out your responsibilities, keep in mind a few key thoughts:

- I am participating as a volunteer to help inspire students.
- I have many opportunities to serve as a mentor/teacher to those students during the event.
- My job is not to punish teams that commit rule violations. My job is to keep gameplay fair and equitable.
- I inspire better when it is obvious I am having fun with the people around me while doing my job.

Keeping these thoughts in mind and focusing on having fun with the students will make for a great experience for all involved!

Volunteer Training and Certification

If you have applied for a role but have not received access to the training, please email
FTCTrainingSupport@firstinspires.org.

FIRST Tech Challenge requires head referees to be trained before volunteering in the role. Training, including review of the current year's manual, supplemental manual review (for example, Game Manual Part 1), training video, and the Head Referee certification test will take approximately three hours.

Pre-Tournament Responsibilities

Prior to the Event

It is important prior to the event that the head referee reviews the Game Manual Part 1 and 2 (Traditional Events), and watches the pre-recorded head referee training video. Head referees are required to pass a certification test to fill this role at an event.

The training will walk through the head referee's responsibilities throughout the event and discuss the game rules in greater detail. The scheduled monthly key role discussion calls will provide an opportunity to ask questions, and even provide feedback to other head referees. The head referee must be confident and comfortable with the game rules to be able to reliably make calls during the fast pace of a *FIRST* Tech Challenge event. Learning ahead of time will go a long way towards keeping the event running smoothly and on time.

Required Reading

All head referees must read and be familiar with the entire game manual. The head referee should read all of the resources outlined above in the referee portion of this manual.

Head Referee - Additional Roles and Responsibilities

In addition to the responsibilities of a referee, the head referee also has additional roles and responsibilities. These include: serving as a knowledge reference and training resource for the referee crew, communication with the teams, helping manage tournament schedule, and serving as a role model for *Gracious Professionalism*®.

Knowledge and Training Resource for Referees

The head referee serves as a role model and a knowledgeable resource for the referee crew and the tournament staff. The entire referee crew looks to the head referee to be a reference for all rulings on the field and for the interactions with the teams and coaches.

Take the time to study the Game Manual Part 1 and 2, and online Q&A forum. Understanding the intent of the rules is critical to be able to explain as needed to the referees.

Depending upon the program delivery partner or tournament director, the head referee may be asked to help with the training for the referee crew at the event.

Tournament Flow Management

The head referee plays a critical role in keeping the match schedule flowing smoothly and on time. Effective management of the field reset, pre-match robot setup, and the scoring of the matches will keep the day running smoothly. Keeping an eye out for bottlenecks and any possible inefficiency during the day and working with your tournament director or field manager will also help.

Keep in mind that part of your role as a head referee is to be a collaborative partner in managing the field and the match schedule. You should strive to work with the other key volunteers around the field and in the competition area in running a smooth event.

The FTA/head referee match workflow described below is an example of the types of collaborations we should be supporting.

There are times, particularly at smaller events, that you might be called on to take on more than one event responsibility. It should always be a goal to train others around you, sharing knowledge and skills and helping to build a larger, more involved volunteer pool.

FTA and Head Referee Match Workflow
The key volunteer that owns the playing field is responsible for everything that occurs on the playing field. Specifying which key volunteer is in charge of the playing field and how field ownership transitions between these volunteers improves workflow efficiency. The recommended playing field ownership timeline is as follows:

1) The head referee owns the playing field starting when the field technical advisor (FTA) signals to the head referee that the drive teams and their robots are ready to start the match and ending when the referee crew signals to drive teams that they may remove their robots from the playing field. For example, the head referee owns the playing field during the following activities:

 a) Randomization of the playing field elements.

 b) Autonomous period.

 c) Transition between the autonomous and driver-controlled periods.

 d) Driver-controlled period.

 e) Post-match score certification.

 f) Signaling drive teams to remove their robots from the playing field.

2) The FTA owns the playing field at all other times. For example, the FTA owns the playing field during the following activities:

 a) Playing field reset.

 b) Robot setup on the playing field by the drive teams.

Prior to the start of qualification matches, the FTA should meet with the head referee to confirm how they will work together across the match workflow timeline. The head referee should be familiar with the field ownership concept because it is described in the referee manual.

Referee Roles
The referees report directly to the head referee. Referees have two main role distinctions; observing matches to call penalties and tracking the status of the match score. It is necessary for the head referee to understand the different referee role distinctions to act as a resource for these volunteers. Four referees will be assigned to each field. There will be two referees responsible for tracking and calling penalties as they occur during the match. The other two referees track the score for either the red or the blue alliance. After completion of the match, the referees will work together to finalize the score and account for any penalties assessed during the match.

Penalties
Observes team matches, identifies rule violations, and "calls" them. Referees help the competitors to avoid breaking the rules of the game. Referees participate in deliberations regarding contested calls, working directly through the head referee.

Scoring
Referees monitor the status of the game and scoring elements during match play. There will be one referee assigned to the blue alliance side of the field, and the other to the red alliance side of the field. They may track the status of the field on paper, using score sheets. Some tournaments may live scoring, and the referee will use an app installed on either a phone or tablet to track the status of the field.

Referee Meeting
The head referee should plan to arrive at the event early to meet with the referee crew. The referees work very closely when assessing penalties and finalizing the score of each match. Having introductions in the morning as well as reviewing their assignments will make for a great start to the day. This is an opportunity to come up with a communication plan with all the referees. It's also an opportunity to discuss how the referees will rotate after every fifth match has been played.

The head referee will ask the referees about any conflict of interest they have with a team. Conflicts of interest can cause teams to feel the process isn't fair, and we strive to avoid any perception of unfairness at *FIRST* Tech Challenge events. For more information about conflict of interest, please visit Appendix H.

Talking points at the referee meeting can include:

- Remind the referees why they are there, to make this a memorable event for the students.
- Review each referee's assignment for the day.
- Giving a high-level overview of the game (if there are new referees)
- Go over important rule updates from the Official Q&A Forum
- Common rule violations to watch for

Drivers Meeting
One of the head referee's responsibilities is leading the driver's meeting that takes place the morning of the tournament, prior to the start of any matches.

The driver's meeting should emphasize key rules and interpretations and reiterate any recent changes or clarifications to the rules as published in the online Q&A forum. It should serve to clarify any misunderstandings the teams may have about game or robot rules or of the scoring for the game.

The meeting is an opportunity to make sure that all the teams understand the match flow such as when and where they should queue, the order the robots should be placed onto the field, the sequence of the match, and the cue for the reset of the field and the removal of their robots. The field manager may handle this part of the meeting. Also, the field technical advisor may wish to communicate with teams during this meeting.

During the drivers' meeting the head referee should describe the process for teams to ask questions. Make sure to emphasize the timing for questions. It is also critical at the driver's meeting to point out the location of the question box where the team member should wait to ask his or her question.

Make sure to allow time for questions from the teams. Depending on the size of the tournament and the noise level where the driver's meeting takes place, you will possibly need to repeat questions so that all attending the meeting can hear the questions as well as the answers. See Appendix D for drivers meeting talking points.

Managing Disputes Within an Alliance

There are occasions where there may be a dispute within an alliance. In particular, the alliance may not agree on which robot will be placed in which starting position, which team will stand in which position, or which team will provide the human player for the match.

When no agreement can be reached, the team designated as #1 shall have the right of decision during qualification matches and the alliance captain shall have right of decision during elimination matches.

Answering Team Questions

One of the key responsibilities for a head referee is to address questions from teams and to provide fair, consistent, rule-based answers to their concerns.

It is important to make sure to patiently listen to the questions from the students. Make sure to consider their points and to hear them out completely. They are often very passionate about their concerns and that passion typically becomes more heated if they are not allowed to clearly and completely express their concerns.

> **Teams are encouraged to support their question by bringing either the Game Manual or the Q&A forum printout when asking a question or disputing a call.**

Do not allow a team to bring more than one person to the question box. If they do come with multiple members, politely remind them of the "one student limit" and wait to begin the discussion until they comply. Similarly, if an adult mentor or coach comes to the question box, politely remind them of the "students only" rule and ask them to send a student team member to ask any questions or to raise any concerns.

At the end of the discussion, it is a good idea to reinforce any positive behaviors displayed by the students. Thanking them for having a calm, intelligent discussion and wishing them good luck with the remainder of the tournament will help with keeping a positive environment around the playing field.

Don't be afraid to correct errors. The referee crew are human. If, in consulting with your crew, you determine that the team has a valid concern, appropriate corrections should be made.

Remember that while working with the students in the question box, the goal is to have a reasoned discussion, not an argument. The question box is not a courtroom. The discussion is not a trial.

Model for Gracious Professionalism®

As head referee, you serve in a very visible role in a tournament. You are frequently front and center and in the thick of the activity. As such, your actions are very noticeable. You should make sure to keep a professional demeanor in working with the entire referee crew as well as all the field personnel around the playing field. A light-hearted, friendly personal style around the field should help to keep the interactions with everyone, including the teams, friendly and cordial.

> **At times, there will be photographers and video crews at the playing field are who will seem to be, or will be, in the way. Please be tolerant, but make sure they do not interfere with the match or obstruct the audience view.**

Yellow and Red Cards

Issuing Cards
The act of displaying a yellow or red card to a team needs to be timely and non-confrontational.

If a yellow or red card is to be issued as a result of rule violations in a match, the process below should be followed:

- The referee that observed the infraction should have an immediate discussion with the head referee.
- The head referee should, while inside the playing field, walk calmly toward the affected team and hold in the air the appropriate colored card. Care should be taken to verify the correct team before showing the card.
- If the team is receiving a red card as a result of a 2nd yellow card, the yellow card should be displayed first, immediately followed by the team being shown the red card.
- The head referee should encourage the team to send a representative to the question box after the match to discuss the rule violation.
- The referee crew should finalize the scoring for the match and allow the field to be immediately reset.

Tracking Repeated Rule Violations
Yellow card escalations for repeated rule violations should involve discussion between the head referee and the team. This implies that repeated violations cannot escalate within a match, but only across matches. In the case of flagrant rule violations, yellow card escalations within a match may still be appropriate.

A verbal warning to the team about an impending escalation should be made after the 2nd violation. I.e., something to the effect of "Hey team 1234, I wanted to let you know that we have observed violations of rule <Gxxx> in two matches. Violations in any of the remaining matches will result in a yellow card".

In all cases, we want to keep in mind the mentoring aspect of being a referee or head referee and help the team(s) understand the violations and potentially avoid them for future game play.

Tracking Cards
It is important to keep track of the yellow and red cards that have been issued during the tournament. The scorekeeping software will provide a means to review the cards, but the head referee should keep notes for each team that receives cards during the tournament.

Cards During Elimination Matches
All teams enter the elimination matches with a clean slate; that is, any record of prior cards (from qualification matches) is cleared for all teams.

Cards received by teams during the elimination matches apply to the entire alliance. Any two yellow cards earned during an elimination match results in the alliance receiving a red card for the match.

Red cards during the elimination matches are a disqualification for the entire alliance and cause the alliance to lose the match.

Cards Away from the Playing Field
The process for management of yellow/red cards for behavior away from the playing field is described in Game Manual Part 1 – Traditional Events, section 3.5.

Note that the process for determining cards away from the playing field involves the tournament director and *FIRST* headquarters. The head referee is not directly involved in the initial phases. In all cases, the goal is to mentor the team members and correct their behavior. Be prepared for being the final link in the chain of events in the case that the behavior persists.

During qualification matches, any cards earned away from the field apply to the next match played. If earned prior to the start of elimination matches, the card should apply to the initial elimination match. During elimination matches, the card should be applied to the current or just completed elimination match.

Alliance Selection Meeting

During the short meeting for captains that takes place as part of the alliance selection, you should emphasize a few key differences between the qualification matches and the elimination matches.

Clearly explain the consequences of a team disqualification during the playoff matches (if a team is disqualified, the alliance in turn is disqualified which equates to the loss of the match).

Referee Conferences

Occasionally, during scoring or in answering a team's questions, it is useful to hold an impromptu conference with the referees. This also encourages consistent application of the rules throughout the course of the day. Gather the crew and discuss the situation as needed. Make sure to allow the entire crew the opportunity to speak if they wish.

Sometimes a brief conference is a valuable tool for defusing dispute. As you listen to a team's questions it may be useful to step away, confer with your crew, and then provide the answer; even if the conference doesn't impact the decision, you would have made anyway. Taking the time to discuss the question with the crew helps the team feel that their concerns were heard, understood, and valued, even if the final decision doesn't go the way they are arguing for. Make sure that the short conference happens away from earshot of the teams that are asking (also away from others that may eavesdrop). Also keep in mind that the matches must keep moving forward; this meeting should be short in order to keep the match schedule moving on time.

Appendix A – Resources

Game Forum Q&A
https://ftc-qa.firstinspires.org/

Anyone may view questions and answers within the *FIRST*® Tech Challenge game Q&A forum without a password. To submit a new question, you must have a unique Q&A system user name and password for your team.

Volunteer Forum
Volunteers can request access to role specific volunteer forums by emailing FTCTrainingSupport@firstinspires.org. You will receive access to the forum thread specific to your role.

FIRST Tech Challenge Game Manuals
Part 1 and 2 - https://www.firstinspires.org/resource-library/ftc/game-and-season-info

FIRST Headquarters Pre-Event Support
Phone: 603-666-3906
Mon – Fri
8:30am – 5:00pm
Email: Firsttechchallenge@firstinspires.org

FIRST Tech Challenge Event On-Call Support
The on call event support number is available for event personnel only. Please **do not** call these numbers if you are a team looking for a ruling, a decision, or assistance. We trust that you will not misuse this resource.

Day of event robot control system and scoring system support: 603-206-2450
All other day of event support: 603-206-2412

FIRST Websites
FIRST homepage – www.firstinspires.org

FIRST Tech Challenge Page – For everything *FIRST* Tech Challenge.

FIRST Tech Challenge Volunteer Resources – To access public volunteer manuals.

FIRST Tech Challenge Event Schedule – Find *FIRST* Tech Challenge events in your area.

FIRST Tech Challenge Social Media
FIRST Tech Challenge Twitter Feed - If you are on Twitter, follow the *FIRST* Tech Challenge Twitter feed for news updates.

FIRST Tech Challenge Facebook page - If you are on Facebook, follow the *FIRST* Tech Challenge page for news updates.

FIRST Tech Challenge YouTube Channel – Contains training videos, game animations, news clips, and more.

FIRST Tech Challenge Blog – Weekly articles for the *FIRST* Tech Challenge community, including outstanding volunteer recognition!

FIRST Tech Challenge Team Email Blasts – contain the most recent *FIRST* Tech Challenge news for teams.

Feedback
We strive to create support materials that are the best they can be. If you have feedback about this manual, please email firsttechchallenge@firstinspires.org. Thank you!

Appendix B: Referee Tip Sheet

A good referee will:

- Warn a team if they are getting close to being penalized.
- Make the necessary calls, even if something happens unintentionally.
- Be fair and consistent to all teams.
- Be friendly and encouraging – make sure this is a fun and positive experience for all teams.
- Be sure of a call and stick to it, referee decisions are final.
- Direct all match questions to the head referee. Do not discuss or argue rulings with team members (or others affiliated with the team such as coaches, parents, siblings, etc.).
- Attend the practice rounds in the morning to get an idea of the intensity of the gameplay. During practice matches the rules are not enforced, but this is an opportunity to instruct the drivers and pre-empt violations during the competitions.
- Not view any video replays or photographs of a match to make the call.
- Set an example by adhering to and enforcing *FIRST* safety rules.

Primary referee focal points are:

- Field perimeters
- Driver's and coach's actions
- Robot actions and interactions
- Scoring

Appendix C: Drivers Meeting Talking Points

Safety:
• **Safety rules come first, always and with no exception.**

Setup:
• Must be in 18" cube configuration before match start <RG02> & <G14>
• Alliance Markers <RG04>
• Make sure that drive team badges are visible! (<C06>)

Autonomous to Driver-Controlled Period Transition (<G01>):
• Automatic transition from autonomous to driver-controlled period – teams should stay alert to pick up driver stations before driver-controlled period begins.

Pinning/Trapping/Blocking (<G28>):
• Watch for referee counting (be smart!)
• Must back off by at least 36" to stop pinning count.
• If pinning during autonomous, must back off immediately at start of driver control, otherwise an immediate penalty is assessed.
• Strategic pinning during autonomous = penalty
• Note the exceptions for blocking access in the end game (<GS06>.f height restricted paths don't count)

Forced Penalties (<G03>):
• If a robot is forced to break a rule by the opposing alliance, it is not counted as a penalty.
• When no longer forced, the affected robot must immediately remove itself from penalty condition (example of contact w/ opposing alliance scoring zone during end game)

"Rough Play" (<G26>) – Destruction/Damage/Tipping:
• Interactive game – some contact is expected.
• Intentional damage = possible yellow card – includes intentional field damage

Play Smart, Be careful
• <GS02> – No contact with the driver station, robot, or any game elements once randomization takes place.
• <GS03> – Be careful about interfering with opposing alliance scoring attempts during autonomous.
• <GS05> – No more than 2 pixels at a time. Be careful if knocking over stacks of pixels (could be launching)
• <GS06> - can only grasp riggings of truss. Watch out for obstruction.
• <GS07> - Stage door – no grasping - no preventing movement – priority to robots moving to back of field.
• <GS08> - Dangerous to be in opposing alliance backstage.
• <GS09> - Don't block access or be in the opposing alliance's wing.
• <GS12> - Human player penalties have been significant in prior years. Make sure your human player understands all the constraints! Make sure they listen to the referees during matches!

Robot rules always apply:
• Changes may need re-inspection! (<I03>a.)
• Referees can request re-inspection at any time (<I01>b.)

Challenges/Questions after matches (<C02>)

Minimum of 5 minutes between matches (<C08>)
• No photos/videos (<C02>a.)
• Questions must be asked within 3 matches during qualification matches.
• Challenges can ONLY be made in designated spot – question box (describe where, remind teams they should bring rule or forum post to back up their question)
• ONLY 1 student team member per team in the question box
• ONLY with <u>head</u> referee
• Be gracious.
• **Head referee ruling is FINAL!**

Appendix D: Alliance Captains Meeting Talking Points

All the talking points from the driver's meeting still hold. Here are additional talking points that teams competing in the elimination and final matches should be aware of.

Match Setup:

- Elimination matches – Lower seeded alliance robots are set up on the playing field first, unless the higher seeded alliance waives their right to set up on the playing field second.
- 3 team alliances only – Once two robots are placed, a third cannot be swapped out for either of the two robots already placed and ready for the match.

Elimination Matches (<C29>):

There are no team requested timeouts. An alliance has eight minutes (8:00) from the initial announcement or display of the match results for their robots to be set up on the playing field and ready for the start of their next match. A match may begin early if both alliances are ready to begin a match ahead of time.

Team Questions (<C02>b)

- Questions must be asked before the match that involves either alliance during elimination matches

Yellow & Red Cards (<C03>)

- Apply to entire alliance
- Yellow card for 1 robot = yellow card for every robot in alliance
- Red card for 1 robot = disqualified robot = disqualified alliance = loss of match

Appendix E – Scoresheets

Red Alliance

Match: _____   Field: _____

Pre-Match

	White Pixel	Team Prop
Robot 1	☐	☐
Robot 2	☐	☐

Autonomous Period

Backstage Pixels _____

Robot	Purple Pixel		Yellow Pixel		Navigation	
	No	Spike Mark	No	Backdrop	No	Yes
Robot 1	☐	☐	☐	☐	☐	☐
Robot 2	☐	☐	☐	☐	☐	☐

Backdrop Pixels _____

Driver-Controlled Period

Backstage Pixels _____
Backdrop Pixels _____
Mosaics _____   Max Set Line _____

End Game Period

	None	Backstage	Rigging
Robot 1	☐	☐	☐
Robot 2	☐	☐	☐

Drone Zones	None	1	2	3
	☐	☐	☐	☐

Penalties

# Minor	# Major
☐	☐

Team #	No Robot	No Show	Yellow Card	Red Card
_____	☐	☐	☐	☐
_____	☐	☐	☐	☐

Blue Alliance

Match: _____   Field: _____

Pre-Match

	White Pixel	Team Prop
Robot 1	☐	☐
Robot 2	☐	☐

Autonomous Period

Backstage Pixels _____

Robot	Purple Pixel		Yellow Pixel		Navigation	
	No	Spike Mark	No	Backdrop	No	Yes
Robot 1	☐	☐	☐	☐	☐	☐
Robot 2	☐	☐	☐	☐	☐	☐

Backdrop Pixels _____

Driver-Controlled Period

Backstage Pixels _____
Backdrop Pixels _____
Mosaics _____   Max Set Line _____

End Game Period

	None	Backstage	Rigging
Robot 1	☐	☐	☐
Robot 2	☐	☐	☐

Drone Zones	None	1	2	3
	☐	☐	☐	☐

Penalties

# Minor	# Major
☐	☐

Team #	No Robot	No Show	Yellow Card	Red Card
_____	☐	☐	☐	☐
_____	☐	☐	☐	☐

Appendix F – Paper Scoresheet Instructions

Step by Step Instructions

1. Fill out the match number.
2. Indicate which field the match is taking place (if there are multiple fields being played).

FIRST TECH CHALLENGE

Red Alliance

Match: _____ Field: _____

CENTERSTAGE

3. Pre-match Setup

Pre-Match		
	White Pixel	**Team Prop**
Robot 1	☐	☐
Robot 2	☐	☐

a) For each robot on the alliance, note whether or not each team has opted to use the default white pixel or the team supplied team prop.

4. Autonomous Period

Autonomous Period					
Backstage Pixels			**Backdrop Pixels**		
Robot	**Purple Pixel**		**Yellow Pixel**		**Navigation**
	No	**Spike Mark**	**No**	**Backdrop**	**No**	**Yes**
Robot 1	☐	☐	☐	☐	☐	☐
Robot 2	☐	☐	☐	☐	☐	☐

b) Check the box for each robot on the alliance that indicates whether they placed the purple pixel on the randomized spike mark. If not, check no.
c) Check the box for each robot on the alliance that indicates whether they placed the yellow pixel on the randomized backdrop location. If not, check no.
d) Check the box for each robot that navigated and parked in the backstage area. If not, check no.

5. Driver-controlled Period

Driver-Controlled Period

| Backstage Pixels | _____ | e) | Backdrop Pixels | _____ |
| Mosaics | _____ | f) | Max Set Line | _____ |

e) Record the number of pixels scored
    i.   In the backstage
    ii.   On the backdrop
f) Record the number of:
    i.   Mosaics scored
    ii.   Highest set line crossed with pixels (max 3

6. End Game

End Game Period

		None	Backstage	Rigging
Robot 1	g)	☐	☐	☐
Robot 2		☐	☐	☐

		None	1	2	3
Drone Zones	h)	☐	☐	☐	☐
		☐	☐	☐	☐

g) Check the box that indicates the location of each alliance robot during end game. If they are not parked in the backstage, or suspended from the rigging, check none. Check the box that indicates where each alliance's drone is parked. If they did not launch a drone, or the drone did not park in any of the landing zones, check none.

Appendix H: Conflict of Interest

Conflict of Interest

"Conflict of Interest – a conflict between the private interests and the official responsibilities of a person in a position of trust.

All referees will be asked to disclose any potential Conflicts of Interest, and to complete the Conflict of Interest and Disclosure form. Some scenarios of conflict of interests:

- A coach/mentor is volunteering as a referee.
- A parent/relative of a team member is volunteering as a referee.
- An alumni (student or adult) of a team competing at the event is volunteering as a referee.
- A sponsor of a team that is competing at the event is volunteering as a referee.

Having a Conflict of Interest, or even the perception of a Conflict of Interest can affect a team's experience, even if decisions that were made throughout the day were not biased in any way. The perception of potential favoritism is enough to discourage a team, coach, or mentor, and take away from their overall experience at an event. Knowing what Conflict of Interest is, and how to avoid being in a position that could be a conflict will ensure all teams feel they have been evaluated fairly.

A volunteer who does not disclose their conflict of interest can compromise the integrity of *FIRST* Tech Challenge events. In some cases, this could cause teams affiliated with the volunteer with a conflict to be removed from consideration for awards.

Conflict of Interest, in some cases, can be very easy to see. In other cases, it may be less obvious, and it may be difficult to decide what constitutes a true Conflict of Interest. In some cases, the bias may be apparent, while other times a Conflict of Interest may be perceived by a team or a coach. It is best to keep the following in mind when volunteering:

- Be open and forthcoming about conflicts you may have with a team competing at the event.
- If there is a known Conflict of Interest, avoid making decisions about a team that would change the outcome of a match.
- Remove yourself from any situation that could be perceived as a Conflict of Interest.

Below is one example of a Conflict of Interest. Keep in mind this is an example, and there are many forms of Conflict of Interest, and ways to handle it.

Parent/Relative/Alumni of a Team

If a parent or a relative of a team member is volunteering at an event, this volunteer must abstain from making any decisions that could affect the results of the tournament. Whether volunteering as a judge or as field personnel (referee, field technical assistant, etc.) it is important to have that volunteer remove themselves from making any decisions related to that team. For example:

- If the volunteer is a judge, they must recuse themselves from any conversations about that team during deliberations.
- If the volunteer is a referee, they should not be involved in any decisions around penalties, match replays, etc.

Keep in mind that there are many ways Conflict of Interest can be present, from parents to sponsors. Make sure to remove any apparent Conflicts of Interest, but also keep in mind any perceptions of conflicts.