Inspection Guide

Overview

Thank you for your willingness to help make the VEX Robotics Competition a success. This document will serve as a guide to assist you during your time as a VRC Inspector.

Inspecting is both a challenging and rewarding role. Inspectors get a firsthand look at many amazing and innovative robots, while having an opportunity to interact with the young minds behind these creations. This guide contains information that is vital to the success of an Inspector. Please take the time to become familiar with both the current VEX Robotics Competition challenge and the role of an Inspector as soon as possible.

Contents

This document pertains to the inspection at events using VEXnet.

Inspector Position Summary

Inspectors are responsible for determining if robots are constructed within the rules outlined in the Game Manual in "Section 4 – The Robot." All teams must pass inspection before competing. This makes the role of Inspector vital to the entire competition.

Key roles of an Inspector:

- Follows the inspection checklist, and verifies that robots are in compliance with all robot rules
- Ensures that robots are safe and pose no danger to any person or other robots
- Works with teams having difficulties and helps these teams pass inspection
- Works with the Referees to ensure that teams stay rule compliant throughout the duration of the tournament
- Perform re-inspections of teams who have modified their robots

Documents & Resources

Inspectors should familiarize themselves with the following documents:

- Inspectors Guide *(This Document)*
- Game Manual *(Section 4 – The Robot)*
- Software Inspection for Cortex
- Robot Inspection Checklist *(V5 Brain)*
- Robot Inspection Checklist *(Cortex)*
- PTC Verification Testing Guide

Key skills of an effective Inspector:

- Effective decision maker
- Confident and projects authority
- Thorough knowledge of the VRC robot rules, and the VEX EDR product line
- Basic knowledge of robot construction
- Strong communication, diplomacy skills
- Ability to collaborate with others, work as a member of a team
- Attention to detail

Inspector responsibilities:

- Review and learn all the rules in the Game Manual, specifically "Section 4 – The Robot." All Game Manual documents can be found at: http://www.roboticseducation.org/vex-robotics-competitionvrc/game-day-running-an-event/
- Review "Section 4 – Robot Inspection Guidelines"
- Review the VEX product line, so you will be familiar with which parts are legal for competition use. The entire product line can be found at: http://www.vexrobotics.com/vexedr/products/view-all
- Review the official **VEX Robotics Competition Q&A** at RobotEvents.com

In addition to the normal Inspectors, each event will have one lead Inspector. The lead Inspector is responsible for organizing and overseeing the other Inspectors. The lead Inspector is the final authority for all robot and inspection related rulings.

Key roles of the lead Inspector (In addition to the role of a regular Inspector):

- Training all Inspectors, and ensuring that Referees are fully versed in the robot rules and that VRC inspection process
- Making sure that all Inspection Materials are present at the event
- Setting up the Inspection Station
- Makes the final decision on all controversial or complicated inspection decisions
- Works with the head Referee on all Referee issued re-inspections
- Once inspections are complete, watches all matches to ensure teams are still robot rule compliant

Inspector Staffing

It is recommended that each event have a ratio of one Inspector for every 6-8 teams. The more Inspectors, the smoother the inspection process will be. Since the bulk of the inspection process takes place in the morning before qualification matches, it is not uncommon to have Inspectors do double duty as Referees or other volunteer roles. If this is the case at your event, make sure that at least one Inspector as well as the lead Inspector are available to inspect throughout the entire tournament.

Inspection Station & Materials

Each tournament should have a table set aside in the pit area for an Inspection Station. This is where most inspections will take place. During the morning of the event, there should be at least one Inspector at the Inspection Station who is ready to answer any questions that teams may have.

The following materials should be present in the Inspection Station:

- Team Lists
- Game Manual and Appendices
- A file folder to store partial and completed Inspection Checklists
- Projector or large TV connected to the laptop for teams to view team inspection status
- Inspection sizing tool or box
- Stickers or other items (such as zip ties) to place on robots as proof of passing inspection
- Pens
- Inspection Checklists
- Copies of the Inspector's Guide
- A laptop connected to TM to input which teams have and have not passed inspection
- A competition switch to perform software checks
- #32 & #64 Rubber bands for Inspectors to use as a comparison tool for reference
- Clipboards
- Sticky-Notes
- A dial caliper to measure polymer thickness

Inspector Task List

At larger events, it may be difficult to conduct all inspections on the morning of the tournament. If possible, it is recommended that the event be open the night before the tournament, so that local teams can drop in and have their robots inspected early. These early Inspections also serve as great training opportunity for new Inspectors. Remember that robots inspected the night before an event must remain in the venue or they must be re-inspected.

Morning of the Event, Before Teams Arrive:

- Participate in training with Lead Inspector
- Setup the Inspection Station
- Gather all Inspection Materials

Regular Inspection Process:

- Seek teams out for inspection. Often teams will approach the Inspection Station when ready for inspection, but to keep the process moving it is recommended that some Inspectors actively approach teams in their pits, especially if the inspection station is not busy.
- Follow the Inspection Checklist and inspect each robot. If a team only partially passes inspection, file their checklist at the Inspection Station, so it can be completed later.
- In case of any disputed rulings with teams, seek out the lead Inspector for clarification and a final ruling.

- Once a team has passed inspection, sign the Inspection Checklist, mark them off on a master list, and give them their inspection sticker (if being used at your event).

After the Main Inspection Process:

- By the start of tournament matches, all teams should have passed inspection. If not, a few Inspectors should work directly with the remaining teams to help them pass inspection
- Throughout the rest of the tournament Inspectors should be stationed at the Inspection Station, awaiting any team who requires a re-inspection, or if they are serving another volunteer role, be sure to let the head Referee know how to get in touch with the Inspectors if the need arises.
- The Head Referee should be able to reach the Lead Inspector for questions that go beyond the knowledge of the Head Referee.

Inspection tips

The inspection process should not be a stressful time for teams. It is the job of the Inspectors to work with the teams to ensure that their inspection goes as smoothly as possible. Help the teams wherever you can, and work with them.

Other tips include:

- Know the VEX product line fully. For the most part, VRC legal parts are restricted to the VEX product line. Being well versed in what is or is not a VEX part makes inspections go much faster. Remember it is a team's responsibility to provide documentation of legacy VEX products.
- Be fair and consistent to all teams.
- Be friendly and positive
- If you are unsure of a rule, ask for help or look it up!
- It is the goal that all teams pass inspection, but if a team has violated a rule, they must fix the problem before you can pass them. It is essential that all teams are rule compliant.
- When inspecting teams, a great place to start is to ask them to describe their robot to you. This gives the teams a chance to show-off their robot, and will you a chance to inspect all subsystems of the robot.
- Once inspection has started, do NOT give teams back their inspection checklist. Partial and completed checklists should be kept at the inspection station and teams should be told to come back to the station to complete the process.
- Use Referees as Inspectors when possible. This will be useful at the field when questions come up about inspection issues.

Discussion Points

The following section takes a closer look at some of the more complex robot rules and inspection issues. Before reading this section, it is crucial that you have become 100% familiar and comfortable with the rules in Section 4 of the Game Manual. All definitions and rules mentioned in this section are quoted directly from Section 4.

Robot Rule:

<R3> The following types of mechanisms and components are NOT allowed:

- Those that could potentially damage playing field components.
- Those that could potentially damage other competing robots.
- Those that pose an unnecessary risk of entanglement.

Comments:

- This is a rule that is up to the discretion of the Inspector. If you find a team whose robot presents the risk of damage or entanglement, work with them to find a solution.
- Robots which dangle long chains of cables, zip ties or any other non-rigid items behind them are in violation of **<R3c>**

Robot Rule:

<R4> "During inspections, robots will be measured in one of two ways

- Robots will be placed into a "sizing box" … To pass inspection, a robot must fit within the box without touching the box walls or ceiling."
- Robots will be sized using a VRC Sizing Tool. Robots will be placed on a flat surface and must not touch the measurement slide as it is passed over the surface. There are two types of sizing tools that may be used:
  - **1.** https://www.vexrobotics.com/276-2086.html
  - **2.** https://www.vexrobotics.com/276-5942.html

Comments:

In the past robots were allowed to touch the walls or ceiling of the sizing box as long as they did not exert any force on them. This proved to be difficult for Inspectors to Judge. Now you will just need to verify that the robot is NOT touching any of the walls or ceiling of the box. If there is any doubt as to whether they are touching or not, rule in favor of the team.

Robot Rule:

<R5> "Robots may be built ONLY from Official Robot Components from the VEX Robotics Design System unless otherwise specifically noted within these rules." AND **<R7b>** "Any parts which are identical to legal VEX parts. For the purposes of this rule, products which are identical in all ways except for color are permissible.

Note: It is up to Inspectors to determine whether a component is "identical" to an official VEX component."

Comments:

- It is the responsibility of the team to prove that any non-VEX parts are identical to VEX parts.
- Examples of identical parts include
  - #32 or #64 Elastics purchased locally
- Examples of non-identical parts include
  - Latex tubing made of a different durometer Latex than that used in official VEX Latex Tubing
  - 7.2V battery packs manufactured by a different vendor
  - Any metal that is not made by VEX

Robot Rule:

> **<R7>** "Robots are allowed the following 'non-VEX' components:"

Comments:

- Plastics used must appear to have been cut from a single 12"x24" sheet up to 0.070" thick (multiple sheets can be used, but in the end, the sum of all the parts cannot exceed a single 12x24 sheet).
- Most teams will use polycarbonate, the manual has a full list of allowable materials
  - Rubber, Teflon and Acrylic are NEVER allowed
  - Polycarbonate cannot be chemically treated or moulded. It may be heated to ease bending.
- The use of any #4, #6, #8, M2, M2.5, M3 or M4 screw up to 2" long is allowed.
- Tape may be used for securing ends of PWM cables, labelling wires, sealing pneumatics and securing VEXnet keys. Specific details are in **<R7f>**

Robot Rule:

> **<R8g>** "Decorations that visually mimic field elements or could otherwise interfere with an opponent's Vision Sensor are considered functional and are not permitted. This includes lights, such as the VEX Flashlight. The Head Inspector and Head Referee will make the final decision on whether a given decoration or mechanism violates this rule."
>
> **<R12>** Robots may use either:
>
> **Option 1**: A VEX ARM® Cortex®-based Microcontroller, up to ten (10) 2-Wire Motors or VEX Servos (in any combination up to ten) and a legal VRC pneumatic system per <R19>.
>
> **Option 2**: A VEX ARM® Cortex®-based Microcontroller, up to twelve (12) 2-Wire Motors or VEX Servos (in any combination up to twelve) and no pneumatic components, excluding pneumatic tubing.
>
> **Option 3**: A V5 Robot Brain, up to six (6) V5 Smart Motors, and a legal VRC pneumatic system per **<R19>**.
>
> **Option 4**: A V5 Robot Brain, up to eight (8) V5 Smart Motors, and no pneumatic components, excluding pneumatic tubing.

Comments:

- Only one (1) motor may be attached to Motor Port 1 and one (1) motor to Motor Port 10 on Cortex controllers.
- When using a Y-cable, the Y-cable must be plugged into Motor Port 2-9, and then "Y" into two Motor Controller 29 modules. They may never use a single Motor Controller 29 module then "Y" into two motors. (This is for Cortex only)**<R14>** "The only allowable source(s) of electrical power are as follows:
    a. If using a VEX ARM® Cortex®-based Microcontroller, robots may use (1) VEX 7.2V Robot Battery Pack of any type, and one (1) 9V backup battery.
        i. Robots utilizing the VEX Power Expander may use a second VEX 7.2V Robot Battery of any type. Robots are permitted to use a maximum of one (1) VEX Power Expander.
        ii. To ensure reliable wireless communication, it is required that all teams connect a charged 9V backup battery to their VEXnet system using the VEXnet Backup Battery Holder (276-2243).
        iii. The only legal means for charging a VEX 7.2V Battery Pack is via one of the following VEX Battery Chargers: Smart Charger (276-1445); Smart Charger v2 (276-2519); 276- 2221 (discontinued), 276-2235 (discontinued). All other chargers are strictly prohibited.
        iv. VEXnet Joysticks must only be powered by AAA batteries.
        v. Some events may provide field power for VEXnet Joysticks. If this is provided for all teams at the event, this is a legal source of power for VEXnet Joysticks.
    b. If using a V5 Robot Brain, robots may use (1) V5 Robot Battery (276-4811).
        i. There are no legal power expanders for the V5 Robot Battery.
        ii. V5 Robot Batteries may only be charged by the V5 Robot Battery Charger (276-4812).
        iii. V5 Wireless Controllers may only be powered by their internal rechargeable battery."

Robot Rule:

> **<R19>** "Teams may only use a maximum of two (2) legal VEX pneumatic air reservoirs on a Robot."

Comments:

This is a change from previous years where teams were allowed any number of reservoirs. Teams may not use tubing to store extra air; look for excessive use of tubing for this purpose, which is not allowed. Do not allow teams to use additional (more than the maximum of 2) air reservoirs as ballast.

Robot Rule:

> **<R20a>** "Every robot should have their VEX Team ID# Plates displayed on a minimum of 2-opposing sides.

Comments:

- Be sure to ask them to show when they are on both the red and blue alliance as they will need to switch, or add plates, which might bring them outside of the allowable 18x18x18 inch cube. They must still fit even when adding the extra plates.
- When placing a colored plate on top of another colored plate, be sure that only one color can be seen. We don't want the blue plate to be seen when the robot is driving toward the audience, then red when driving away from the audience

Software Inspection

The Software Inspection is to ensure that teams are using the correct firmware and software competition templates so that the robots will be disabled, perform autonomous, and driver control functions at the correct times on the field.

Please see the Software Inspection for Cortex document to help you through this process. That document is found using this link: http://www.roboticseducation.org/documents/2013/06/software-inspection-cortex.pdf