

TEAM NUMBER: _____

INSPECTOR: _____

INITIALS (after passing): _____

DATE (after passing): _____ / _____ / _____

REINSPECTION (initial) _____

FINAL INSPECTION (initial) _____

Initial Inspection

- _____ **Weight** - Robot Weight (must be ≤ 125 lbs (~56kg) excluding bumpers and battery). <R5> _____ pounds
 _____ Bumper Weight (must be ≤ 15 pounds (~6kg)). <R30> Red Bumper _____ Blue Bumper _____ pounds
- _____ **Starting Configuration** – Parts may not extend beyond the vertical projection of the FRAME PERIMETER. <R2>
- _____ **Starting Volume** – FRAME PERIMETER Not greater than 120in. (~304 cm) and may not be taller than 4ft. (~121 cm) <R3>
- _____ **FRAME PERIMETER** – Frame must be non-articulated. <R1>
- _____ **Playing Configuration** – Robot may not extend beyond the FRAME PERIMETER by more than 30" (~76 cm). <R4>
- _____ **Standard Bumpers** - must follow all specifications in Sec. 10.5, BUMPER Rules.
- Bumpers must provide protection for at least 6" (~16cm) on both sides of **all** outside corners. (Wood within ¼" of corner) <R24>
 - Hard bumper parts defined by bumper backing, may not extend >1" (~25mm) beyond robot frame. < R31-B >
 - No bumper segment may be unsupported by robot frame for a length greater than 8" (~20cm). Gaps must be less than or equal to ¼" (~6mm) <R33 >
 - Bumpers must be supported by at least ½" (~13mm) of Robot Frame at each end (< ¼" (~6mm) gap OK) <R33 >
 - Corners must be filled with pool noodle such that no "hard parts" are exposed. <R32 & Fig 10-7>
 - Must use ¾" (~19mm) thick x 5" (+/- ½") (~127 mm \pm 12.7 mm) tall plywood or solid robust wood backing with no extraneous holes that may affect structural integrity. (clearance pockets and/or access holes are acceptable). <R31-A>
 - Must use a pair of vertically-stacked 2.5" pool noodles. Pool noodles may be any shape cross section, solid or hollow, but both must be identical in shape and density. <R31-C>
 - Must use a durable fabric cover for the noodles secured as in Fig 10-6 cross section. <R31.D.>
 - Must be able to display red or blue to match alliance color. < R28.>
 - Team number displayed with Arabic numerals, min. font 4" (~11cm) tall x ½" (~13mm) stroke, in white or outlined in white with a minimum 1/16in. (~2mm) outline and be easily read when walking around the perimeter of the robot. No logos may be used for numerals. First Logos similar to 2019 KOP are OK. < R29 & R28>
 - Must be securely mounted when attached and be easily removable for inspection. <R31,G & R27>
 - When on flat floor, bumpers must reside entirely between the floor and 7-1/2" (~19cm) above floor (evaluated when sitting flat on floor) and may not be articulated. <R25 & R26>

Mechanical

- _____ **BOM Cost** – Team must present worksheet with total cost \leq \$5500, and no single component > \$500. <R12 thru R14>
- _____ **No Sharp Edges or Protrusions that are a hazard for participants, robots, arena, or field.** <R7 & R8>
- _____ **No Prohibited Materials** – e.g. sound, lasers (other than class 1), flammable gases, or untreated hazardous materials <R9>
- _____ **No Unsafe Energy Storage Devices** - carefully consider safety of stored energy or pneumatic systems <R9>
- _____ **No Risk of Damage to Other Robots** - e.g. damaging, entangling, upending or adhering <G19, G20 & R9 >
- _____ **No Risk of Damage to Field** – e.g. metal cleats on traction devices or sharp points on frame. <G15 & R7>
- _____ **Decorations** - Cannot interfere with other robots' electronics or sensors, be in spirit of "Gracious Professionalism". <R9>
- _____ **End Game** – Game Objects can be removed from robot and robot from field without power. <R10 >

Electrical

- _____ **Components** – **None** may be modified, except for motor mounting and output shaft, motor wires may be trimmed, window motor locking pins may be removed, and certain devices may be repaired with parts identical to the originals. PDP fuses may be replaced with identical fuses only. Servos may be modified per manufacturer's instructions. <R35, R73>
- _____ **Battery** - A single 12 volt, 17-18 AH robot battery (or listed equivalent), securely fastened inside robot. <R39, R43, R44>
- _____ **Other Batteries** – Integral to COTS computing device or camera or COTS USB < 100Wh (20,000mAh at 5V) and 2.5Amp max output per port used for COTS computing device and accessories only. <R40>
- _____ **Visibility** –The single PDP and PDP breakers must be easily visible for inspection. <R51 >
- _____ **Main Breaker Accessibility** – the single 120A main breaker must be readily accessible with labeling preferred. <R50>
- _____ **Allowable PD Breakers** - Only VB3-A, MX5-A or MX5-L Series, Snap-Action breakers may be inserted in the PD <R57>
- _____ **Robot Radio** – A single OpenMesh OM5P-AN or OM5P-AC radio must be powered via a VRM +12 volt, 2 amp output. The VRM must connect to the dedicated +12 volt output on the PDP. Radio LEDs are easily visible. <R54,R55,R65>
- _____ **CAN BUS** – The RoboRio and PDP must be connected via CAN wiring even if no other CAN devices are used. <R79>
- _____ **RoboRio Power** – Only the RoboRio must be connected to dedicated power terminals on PDP. <R53>
- _____ **Wire Size Minimum and Breaker Size** - obey the wiring size conventions.
- _____ All wire from battery to main breaker to PDP must have min 6 AWG (7 SWG or 16mm²) wire <R47 & Fig.10-9>
 - _____ 40 amp breakers must have min 12 AWG (13 SWG or 4 mm²) wire <R60>
 - _____ 30 amp breakers must have min 14 AWG (16 SWG or 2.5 mm²) wire <R60>
 - _____ 20 amp breakers must have min #18 AWG (18 SWG or 1 mm²) wire <R60>

- ___ **Wire Colors** – All power wire must be color coded - red, white, brown, yellow, or black w/stripe for +24, +12, +5 VDC supply (positive) wires and black or blue for common (negative) for supply return wires <R62>
- ___ **Copper Wire Only** – All wire used on robot must be copper wire, stranded preferred. (Signal wire excluded) <R60>
- ___ **1 Wire per WAGO** - Only 1 wire may be inserted in each WAGO terminal, splices and/or terminal blocks, may be used to distribute power to multiple branch circuits but all wires in the splice are subject to the Wire Size rules <R56>
- ___ **Motors** –Only motors listed per table 10-1<R34>
- ___ **Actuators** – Electrical solenoid actuators, max. 1 in. stroke and no greater than 10 watts@12V continuous duty, <R34>
- ___ **Motor/Actuator Power** –Each motor controller may have one motor connected to the load terminals with exceptions in Table 10-2, (R37), and single specified motors may be connected to Spike or Automation Direct Relay (however multiple pneumatic valves may be driven by a single Spike). CIMs and specified other motors must be fed by speed controllers only. Two PWM controllers can be connected by a PWM “Y” cable. <R36, R37 & Table 10-2>
- ___ **Motor/Actuator Control** – Motors/actuators must be controlled by legal motor controllers and driven directly by PWM signals from RoboRio or through legal MXP board or by CAN bus.<R77-R80>
- ___ **Custom Circuits, Sensors and Additional Electronics** - cannot directly control speed controllers, relays, actuators or servos. Custom Circuits may not produce voltage exceeding 24V.<R52 & R63>
- ___ **Pneumatic Control Module (PCM)** - PCM modules must be connected to RoboRio via CAN bus<R78>
- ___ **Spike Fuse** – Spike must have 20 amp fuse installed. When used for compressor control only, the Spike fuse may be replaced with 20 amp, snap action, breaker (recommended). <R73.D>
- ___ **Isolated Frame** – Frame must be electrically isolated from battery, RoboRio must be insulated from frame. (>3k Ohm between either PD battery post and chassis) <R49>

Pneumatic System using one on-board compressor (n/a for robots that do not use pneumatics)

- ___ **No Modifications** - pneumatic parts may not be modified except actuator mounting pins may be removed. <R83>
- ___ **Compressor** - Only one KOP, or equivalent compressor (max 1.1 CFM flow rate) may be used (on robot only). <R86>
- ___ **Compressor Power** - must use a PCM or Relay module <R37 & Table 10-2>
- ___ **Compressor Control** – A Pressure Switch must be wired directly to the PCM or RoboRio to control compressor. <R92>
- ___ **Vent Plug Valve** – must include an easily-accessible manual vent plug valve to release all system pressure.< R93>
- ___ **tubing** – Equiv. to KOP with a maximum OD of ¼” (~6 mm) with screen printed rating or documentation. <R84.D>
- ___ **Gauges** - must be present at both the high pressure side and low pressure regulator outlet(s) and be readily visible. <R85, R90>
- ___ **Pressure Rating** - all pneumatic components at working pressure, must be rated for at least 70 psi (~483 kPa) working pressure. <R82> All components at stored pressure must be rated for at least 125 psi (~862 kPa). <R82>
- ___ **Valve Control** - pneumatic solenoid valves must have a max 1/8” NPT, BSPP, or BSPT port diameter, be controlled by either a PCM or Relay Module and valve outputs may not be plumbed together.< Table 10-2, R84.C, & R94>

Power On Check (Driver Station must be tethered to the Robot)

- ___ **Unauthorized Wireless Communication** – no wireless communication to/from ROBOT or OPERATOR CONSOLE without prior FIRST written permission. No radios allowed on the OPERATOR CONSOLE or in the pit<R70, R99 >
- ___ **Confirm Pneumatics Operation** – With no pressure in system, compressor should start when robot is enabled.
 - ___ Compressor should stop automatically at ~120 psi under RoboRio control. <R87>
 - ___ Check that Main Pressure <= 120 psi <R87> and Working Pressure <= 60 psi <R87 & R88>
 - ___ **Compressor Relief Valve** – set to 125 psi, attached to (or through legal fittings) compressor outlet port.<R91>
 - ___ **Relieving Pressure Regulator** – Set to <= 60 psi, providing all working pressure. <R88>
- ___ **Robot Signal Light(s)** - The Robot Signal Light (two max.) from the KOP must be visible from 3’ in front of the robot, and be plugged into the RSL port on RoboRio. Confirm that the RSL flashes in sync with RoboRio. <R72>.
- ___ **Verify Team Number on DS** – team has programmed the OpenMesh Wireless Bridge at kiosk for this event. < R68>
- ___ **Software Versions** – The RoboRio image (FRC_robRIO_2019_v14 or later) and DS (19.0 or later) must be loaded <R64 & R95>
- ___ **Hatch Panel** - measured with a stationary ROBOT relative to the ground and from the ROBOT’S FRAME PERIMETER to where the HATCH PANEL first contacts the ground. HATCH PANEL cannot travel more than 3 feet. <R6>
- ___ **Power Off** – Disable robot and open Main Breaker to remove power from the robot, confirm all LEDs are off, actuate pneumatic vent plug valve and confirm that all pressure is vented to atmosphere and all gauges read 0 psi pressure.
- ___ **Driver Console is less than 60” x 14” x 6’6” above floor (approx).** May have hook and loop hook side attached to secure to Driver’s Station shelf. <R98>

Team Compliance Statement

We, the Team Mentor and Team Captain, attest by our signing below, that our team’s robot was built after the 2019 Kickoff on January 5, 2019 and in accordance with all of the 2019 FRC rules, including all Fabrication Schedule rules. We have conducted our own inspection and determined that our robot satisfies all of the 2019 FRC rules for robot design.

Team Captain: _____

Team Mentor: _____