TEAM NUMBER:_____ **INSPECTOR:_____ _____**
INITIALS (after passing):_____ **DATE (after passing):_____/_____/_____**
REINSPECTION (initial**)** _____ **FINAL INSPECTION (**initial**)** _____

Initial Inspection

Robot Inspectors – Please initial all checklist items for tracking reasons. Do not use checkmarks.

____ **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**
____ **Additional Items.** Does the team have additional configurations**? ___ No ___Yes –** If Yes, Weight of all items <=150lbs <I3>_____**pounds**
____ **Weight of 2nd configuration** (must be <=125 lbs (~56kg) excluding bumpers and battery) <R5> _____ **pounds**
If more than 2 configurations, How many? _____ Track weights here_____
____ **FRAME PERIMETER** – Frame must be non-articulated. Minor protrusions <1/4" (6mm) OK.<R1>
____ **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 not taller than 45 in. (~114 cm) <R3>
____ **Playing Configuration –** Robot may not extend beyond the FRAME PERIMETER by more than 12 in. (~30 cm) <R4>
____ **Standard Bumpers** - must follow all specifications in Sec. 9.5, **BUMPER RULES**.

- ☐ Bumpers must protect at least 6" (~16cm) on **both** sides of **all** outside corners. (Wood within ¼" of corner) <R17>
- ☐ Hard bumper parts defined by bumper backing, may not extend >1" (~25mm) beyond robot frame. < R24-B >
- ☐ No bumper segment may be unsupported by robot structure/frame for a length greater than 8" (~20cm), if the gap is greater than ¼". Gaps must be less than or equal to ¼" (~6mm) Bumpers must be supported by at least ½" (~13mm) of robot frame at each end (< ¼" (~6mm) gap OK) <R26>
- ☐ Corners must be filled with pool noodle such that no "hard parts" are exposed. <R25 & Fig 9-7>
- ☐ Must use ¾" (~19mm) thick x 5" (+/- ½") (~127 mm ± 12.7 mm) tall plywood. OSB, or solid robust wood backing with no extraneous holes that may affect structural integrity. (clearance pockets and/or access holes are acceptable). <R24-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. <R24-C>. Must use a durable fabric cover for the noodles secured as in Fig 9-6 cross section. <R24-D>
- ☐ Must be able to display red or blue to match alliance color. < R21>
- ☐ Team number displayed with Arabic Font, 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 comparable to 2020 Virtual KOP may also be applied <R21& R22>
- ☐ Must be securely mounted when attached and be easily removable for inspection. <R24-G & R20>
- ☐ 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. <R18 & R19>

Mechanical

____ **BOM Cost –** Team must present worksheet with total cost <= $5000, and no single component > $500. <R11 thru R13>
____ **No Sharp Edges or Protrusions that are a hazard for participants, robots, arena, or field.** <R7 >
____ **No Prohibited Materials** – e.g. sound, lasers (other than class 1), flammable gases, or untreated hazardous materials <R8>
____ **No Unsafe Energy Storage Devices** - carefully consider safety of stored energy or pneumatic systems <R8>
____ **No Risk of Damage to Other Robots** - e.g. damaging, entangling, upending or adhering <G23 & R8 >
____ **No Risk of Damage to Field** – e.g. metal cleats on traction devices or sharp points on frame. <G26 & R6 & R7>
____ **Decorations** - Cannot interfere with other robots' electronics or sensors, be in spirit of "Gracious Professionalism". <R8>
____ **End Game –** Game pieces can be removed from robot and robot from field without power. <R9>

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.<R28, R66>
____ **Battery** - A single 12 volt, 17-18.2 Ah robot battery (or listed equivalent), securely fastened inside robot. <R32, R36, R37>
_____ **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. <R33>
____ **PDP Visibility** –The single PDP and PDP breakers must be easily visible for inspection. <R44 >
____ **Main Breaker Accessibility** – the single 120A main breaker must be readily accessible with labeling preferred. <R43>
____ **Allowable PD Breakers** - Only VB3-A, MX5-A or MX5-L Series (40A or lower), Snap-Action breakers may be inserted in the PDP <R50>
____ **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. <R47,R48,R58, R64>
____ **CAN BUS –** The RoboRio and PDP must be connected via CAN wiring even if no other CAN devices are used. <R72>
____ **RoboRio Power** – Only the RoboRio must be connected to dedicated power terminals on PDP. <R46>

____ **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 <R40 & Fig.9-9>
- ____ 40 amp breakers must have min 12 AWG (13 SWG or 4 mm^2) wire <R53>
- ____ 30 amp breakers must have min 14 AWG (16 SWG or 2.5 mm^2) wire <R53>
- ____ 20 amp breakers must have min 18 AWG (18 SWG or 1 mm^2) wire <R53>

____ **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 <R55>

____ **Copper Wire Only –** All wire used on robot must be copper wire, stranded preferred. (Signal wire excluded) <R53>

____ **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 <R49>

____ **Motors** – Only motors listed per table 9-1<R27>

____ **Actuators** – Electrical solenoid actuators, max. 1 in. stroke and no greater than 10 watts@12V continuous duty <R27>

____ **Motor/Actuator Power** –Each motor controller may have one motor connected to the load terminals with exceptions in Table 9-2, <R30>, and single specified motors may be connected to Spike or Automation Direct Relay (however multiple pneumatic valves may be driven by a single Spike). Specified motors must be fed by speed controllers only. Two PWM controllers can be connected by a PWM "Y" cable. <R29, R30 & Table 9-2>

____ **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.<R29, R68-R73>

____ **Custom Circuits, Sensors and Additional Electronics** - cannot directly control speed controllers, relays, actuators or servos. Custom Circuits may not produce voltage exceeding 24V.<R45 & R56>

____ **Pneumatic Control Module (PCM) -** PCM modules must be connected to RoboRio via CAN bus<R71>

____ **Isolated Frame** – Frame must be electrically isolated from battery, RoboRio must be insulated from frame. (>3k Ohm between either PDP battery post and chassis) <R42>

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

____ **No Modifications** - Actuator mounting pins may be removed, small labels allowed. No painting or large labels.<R76>

____ **Compressor** - Only one (on robot only) compressor (max 1.1 CFM flow rate) may be used. <R79>

____ **Compressor Power** - must use a PCM or Relay module <R30 & Table 9-2>

____ **Compressor Control** – A Pressure Switch must be wired directly to the PCM or RoboRio to control compressor. <R85>

____ **Vent Plug Valve** – must include an easily-accessible manual vent plug valve to release <u>all</u> system pressure.< R86>

____ **Tubing** – Equiv. to KOP with a maximum OD of ¼" (~6 mm) with screen printed rating or documentation. <R77-D>

____ **Gauges -** must be present at both the high pressure side and low pressure regulator outlet(s) and be readily visible. <R78, R83>

____ **Pressure Rating** - all pneumatic components at <u>pressure</u>, must be rated for at least 70 psi (~483 kPa. <R75> All components at <u>stored pressure</u> must be rated for at least 125 psi (~862 kPa). <R75>

____ **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 9-2, R77-C, & R87>

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<R63, R92 >

____ **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. <R80>
- ____ **Check that Main Pressure** <= 120 psi <R80> and Working Pressure <= 60 psi <R80 & R81>
- ____ **Compressor Relief Valve** – set to 125 psi, attached to (or through legal fittings) compressor outlet port.<R84>
- ____ **Relieving Pressure Regulator** – Set to <= 60 psi, providing all working pressure. <R81>

____ **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. <R65>.

____ **Verify Team Number on DS –** team has programmed the OpenMesh Wireless Bridge at kiosk for this event. < R61>

____ **Software Versions** – The RoboRio image (FRC_2020_v10 or later) and DS (20.0 or later) must be loaded <R57 & R88>

____ **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**.** <R91>

Team Compliance Statement

We, the Team Mentor and Team Captain, attest by our signing below, that our team's ROBOT was built after the 2020 Kickoff, and we are not aware of any rules it violates. We confirm that it and its MAJOR MECHANISMS are products of our team's work.

Team Captain:_____ Team Mentor:_____