2016 FRC Inspection Checklist

TEAM NUMBER: ___________________________ INSPECTOR: ________________________

INITIALS (after passing): ___________________________ DATE (after passing): __/__/____

REINSPECTION (initial) ___________________________ FINAL INSPECTION (initial) __________

Initial Inspection

Weight - Robot Weight (< 120 lbs excluding bumpers, and battery) <R05>
Bumper Weight (< 20 pounds per set) <R20>
Red Bumper _______ Blue Bumper _______ pounds

Size - FRAME PERIMETER may not exceed 120". <R03>
Height - Starting configuration height may not exceed 54". <R03>
Extensions - No part of the robot shall extend past the frame perimeter in the starting configuration. <R04>
Standard Bumpers - must follow all specifications in Sec. 4.7 Bumper rules.

- Bumpers must cover at least 8" on both sides of all outside corners of the Frame Perimeter. <R19>
- Hard bumper parts defined by bumper backing, may not extend > 1" beyond robot frame. <R21B>
- No bumper segment may be unsupported by robot frame for a length greater than 8" unless the gap is ≤ ¼". <R26>
- Bumper ends must be supported by at least ½" of robot Frame Perimeter. <R26>
- Must use ¾" thick x 5½" tall plywood or solid, robust wood, backing and a pair of vertically stacked 2.5" pool noodles with no extraneous holes that may affect structural integrity. (Clearance pockets and/or access holes are acceptable). Pool noodles must be round, petal, or hex in shape, solid or hollow, and all be identical in shape and density. <R21>
- Corner joints must use pool noodles to fill corner space. <R24>
- Must use a durable fabric to cover and secure the pool noodles. <R21D>
- Must be able to display red or blue (color similar to FIRST Logo) Bumpers to match alliance color. <R21D & R27>
- Team number displayed with minimum 4" tall x ½" stroke, in white or outlined in white and be easily determined when walking around the perimeter of the robot. <R28>
- Must be securely mounted when attached and be easily removable for inspection. <R25>
- When on flat floor, bumpers must reside entirely between 4" and 12" above floor and may not be articulated. <R22-R23>

Mechanical

- No Sharp Edges or Protrusions that pose a hazard for participants, robots, or arena. <R08-R09>
- No Prohibited Materials -- e.g. sound, lasers, noxious or toxic gases or inhalable particles or chemicals. <R09>
- No Unsafe Energy Storage Devices - carefully consider safety of stored energy or pneumatic systems. <R09 & R35>
- No Risk of Damage to Other Robots - e.g. spearing, entangling, upending or adhering. <G24 & R09>
- No Risk of Damage to Field -- e.g. metal cleats or traction devices or sharp points on frame. <R06 & R08>
- Decorations - Cannot interfere with other robots’ electronics and sensors (particularly via color distraction) and be in spirit of “Gracious Professionalism”. <R09>
- CAW Cost – Team must present worksheet with total cost ≤ $4000, and no single component > $400. <R10-R12, T16>
- FRAME PERIMETER – Frame must be non-articulated. <R02>
- Playing Configuration – Robot attachments may not extend more than 15” beyond Frame Perimeter. <R03B>
- End Game – Balls and robot can be removed from field without power. <R07>

Electrical

- COTS Components -- No motor or Control System components may be modified, except for motor mounting and output shaft, motor wires may be trimmed, window motor locking pins may be removed, connectors on automotive motors may be modified, and servos may be modified per manufacturer’s instructions, along with those listed in R66. <R30 & R66>
- Battery - A single 12 volt, 17-18.2 AH battery or listed equivalent, securely fastened inside robot. <R31-R33>
- Visibility – PDP and breakers must be easily visible for inspection. <R40>
- Main Breaker Accessibility – the single 120A main breaker must be readily accessible with labeling preferred. <R39>
- Robot Radio – the OpenMesh Wireless Bridge must be powered via the VRM +12 volt, 2 amp output and must be the only load connected to those terminals. Radio must be mounted so that its LEDs are visible. Ethernet must be directly connected to roboRIO. <R43, R58 & R64>
- Wire Size - obey the wiring size conventions.
  - All wire from battery to main breaker to PD have min #6 AWG (4.11mm) wire. <R36>
  - 40 amp breakers have min #12 AWG (2.052mm) wire. <R49>
  - 30 amp breakers have min #14 AWG (1.628mm) wire. <R49>
  - 20 amp breakers have min #18 AWG (1.024mm) wire. <R49>
- Wire Colors – non-signal level wiring must be color coded - red, white, brown, yellow, or black w/stripe for +24, +12, +5
  VDC supply wires and black/blue for supply (-) return wires. <R51>
- Motors – No more than 6 CIMs Qty: ___, unlimited quantity of select (Window, Door, Windshield Wiper, Seat and Throttle) automotive motors and unlimited quantity of:

<table>
<thead>
<tr>
<th>Motor</th>
<th>Part Numbers</th>
<th>Weight West Coast Products RS775 Pro</th>
<th>AndyMark 9015, PG, and Snow Blower</th>
<th>VEX BAG and mini-CIM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M7-RS775-18 / RS775WC-8514</td>
<td>217-4347</td>
<td>am-0912 am-2194 (am-2766)</td>
<td>217-3351</td>
</tr>
<tr>
<td></td>
<td>M5-RS550-12 / RS 550VC-7527 / RS550</td>
<td>217-4347</td>
<td>am-2235 am-2161 (am-2765)</td>
<td>217-3371</td>
</tr>
</tbody>
</table>
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1 Wire per WAGO - only 1 wire may be inserted in each WAGO connector on the PDP, 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. <R45>

Actuators – Electrical solenoid actuators, max. 1 in. stroke and no greater than 10 watts at 12V continuous duty. <R29>

Motor/Actuator Power – CIMs, Banebots, AM 9015, WCP RS775 Pro, VEX Bag and MiniCIM motors must be fed by only one motor controller. A motor controller may have up to two of the other motors connected to the load terminals. Single specified motors may be connected to a relay module (multiple pneumatic valves may be driven via one relay module). <R53>

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. <R68-R73>

Servo Control/Power – Servos must be connected to only the PWM ports on the roboRIO. <R54>

Custom Circuits, Sensors and Additional Electronics – Cannot directly control speed controllers, relays, actuators or servos and may not produce voltage in excess of 24 volts. <R41 & R69>

Pneumatic Control Module (PCM) - PCM modules must be connected to roboRIO via CAN bus. <R71>

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). <R48 & R66D>

PD P fuse – The fuses in the PDP must be mini automotive blade fuses rated for either 10 or 20 amps. <R47>

Allowable PD Breakers - Only Snap-Action breakers that are ≤ 40 Amps may be installed in the PDP. <R46 & R48>

Isolated Frame – Must be electrically isolated from battery, roboRIO must be insulated from frame. (>3k Ohm between either PDP battery post and chassis) <R38>

Terminals – Each terminal on the battery, main breaker, and connectors must be fully isolated. <R34>

Pneumatic System W/ On Board or Off Board Compressors (n/a for robots that do not use pneumatics)

Compressor - Only one compressor with a max 1.1 CFM flow rate at 12 VDC may be used (on or off robot). <R79>

Compressor Power - Must use the PCM or Spike to power the compressor. <R53>

Compressor Control – A Nason P/N SM-2B-115R/443 switch must be wired directly to the PCM or roboRIO. <R88>

Compressor Relief Valve - Set to 125 psi, attached to (or through legal hard fittings) to compressor outlet port. <R87>

Vent Plug Valve – Must include an easily-accessible manual vent plug valve to release system pressure. <R78.D, R89>

Off-Robot Compressor (if used) – Must include an additional vent valve and relief valve. The robot control system must be used to control and power the compressor. The high pressure switch and gauge can be located off-board. <R85-R89>

Tubing – Equiv. to KOP with a maximum ID of 0.160” with screen printed rating or supporting documentation. <R77E>

Relieving Pressure Regulator – Set to ≤ 60 psi, providing all working pressure. <R82>

Gauges - must be present at both the high pressure side and low pressure regulator(s) outlet and be easily visible. <R84>

Pressure Rating - All pneumatic components must be rated for at least 120 psi working pressure except solenoid valves. If valves are rated for less than 120 psi, another relief valve must be installed on working pressure side to vent at the lower pressure. <R75 & R77D>

Valve Control - Pneumatic solenoid valves must have a max 1/8” NPT, BSPP, or BSPT ID, be controlled by either a PCM or Spike. Valve outputs may not be plumbed together. <R53, R77C & R90>

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 & R95>

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. <R79-R81>

Main Pressure ≤ 120 psi and Working Pressure ≤ 60 psi. <R81 & R82>

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>

PDP CAN Bus – PDP CAN bus must be wired to the roboRIO CAN bus. <R72>

Verify Team Number on DS – Check that the Team Number is correct on the DS Status Pane. <R61>

Confirm programing of wireless bridge - Confirm the Team has programmed the OpenMesh Wireless Bridge at kiosk for this event. <R57>

Firmware Versions - Software/firmware for devices is at or above listed versions below:

Driver Station – 16.0.2 <R91>

roboRIO (Image - FRC_2016_v19 and Firmware - v3.0.0) <R56>

Talon SRX – V1.01 (cannot be greater than V10.0) <R70>

Power Off – Remove power from the robot, confirm all LEDs not on COTS computing devices of self-contained cameras are off, actuate pneumatic vent plug valve and confirm that all pressure is vented and all gauges read 0 psi pressure. <R31 & R89>

Driver Console - Less than 60” x 14”. May have hook tape to secure to Driver’s Station shelf. <R94>

Team Compliance Statement

We, the Team Mentor and Team Captain, attest by our signing below, that our team’s robot was built after the 2016 Kickoff on January 9, 2016, in accordance with all of the 2016 FRC rules, including all Fabrication Schedule rules, and that any software or designs that were created before kickoff were publicly available before January 9th, 2016. We have conducted our own inspection and determined that our robot satisfies all of the 2016 FRC rules for robot design.

Team Captain: _______________________ Team Mentor: _______________________

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