2014 FRC Inspection Checklist Rev B

TEAM NUMBER: _____ DATE: _____ INSPECTOR: _____

INITIAL (after passing):_____ REINSP. _____ FINAL INSP (initial**) _____**

Initial Inspection

____ **Weight** Robot Weight (≤ 120lbs, excluding bumpers & battery, <R05>) = _____pounds
Total Finals Weight = _____pounds

____ **Bumper Weight** (≤ 20 pounds, <R20>) Red Bumper: _____pounds Blue Bumper: _____pounds

____ **Size** - FRAME PERIMETER sides may not exceed 112", nor exceed a 6" diameter, vertical cylinder above 60" <R3>

____ **Starting Configuration** – constrain itself such that no part of the ROBOT extends outside the vertical projection of the FRAME PERIMETER <R4>

____ **Standard Bumpers** - must follow all specifications

- ☐ Bumpers must provide protection of at least 8" on both sides of all outside corners. <R19>
- ☐ All segments as defined by backing may not extend >1" beyond robot frame. <R21-B>
- ☐ No bumper segment may be unsupported by robot frame for a length greater than 8". <R26-B>
- ☐ Bumpers may have gaps between frame and bumper up to ¼". <R26-A>
- ☐ Bumper Ends must be supported by at least ½" of robot Frame Perimeter. <R26>
- ☐ Must use ¾" thick x 5"±½" tall plywood or solid, robust wood, backing <R21-A> and a pair of vertically-stacked 2.5" pool noodles <R21-C> with no extraneous holes that may affect structural integrity. (clearance pockets and/or access holes are acceptable). Pool noodles may be any shape cross section, solid or hollow. <R21-C.> Corners must include pool noodles within corners. <R24 >
- ☐ Must use a durable fabric cover for the noodles secured as in Fig 4-8 cross section. <R21-D>
- ☐ Must be able to display red or blue (color similar to *FIRST* Logo) Bumpers to match alliance color. < R27.>
- ☐ Team number displayed with 4" tall x ½" stroke, on the bumpers, in white or outlined in white and be easily determined when walking around the perimeter of the robot. Numbers may not wrap around corners. <R28>
- ☐ Must be securely mounted when attached and be easily removable for inspection. <R21-F>, <R25>
- ☐ When on flat floor, bumpers must reside entirely between 2" and 10" above floor <R22> and are not articulated. <R23>

Mechanical

____ **No Sharp Edges, or Protrusions that pose a hazard for participants, robots, arena, or field.** <R08 & R09>

____ **No Prohibited Materials** – e.g. sound, lasers, noxious or toxic gases or inhalable particles or chemicals <R08>

____ **No Unsafe Energy Storage Devices** - carefully consider safety (release and transport) of stored energy or pneumatic systems . Lockouts may be required for safe inspection, operation, and transport. <R08> <T12>

____ **No Risk of Damage to Other Robots** - e.g. spearing, entangling, upending or adhering <R09>

____ **No Risk of Damage to Field** – e.g. metal cleats on traction devices or sharp points on frame. <R06>

____ **Decorations** - Cannot interfere with other robots' electronics and sensors (particularly via color distraction) and be in spirit of "Gracious Professionalism". <R08>

____ **BoM Cost** – Cost must not exceed $4000 of additional components with no single component > $400. <R10 thru R12>

____ **FRAME PERIMETER** – Frame must be non-articulated. <R02>

____ **Playing Configuration –** Robot may not extend more than 20" beyond Frame Perimeter. <R03 & Fig 4-2>

____ **MATCH End –** Balls and robot can be removed from field without power. <R07>

Electrical

____ **Components –** <u>None</u> may be modified, except for motor mounting, output shaft modification, motor wires trimmed, window motor locking pins removed, connector housings modified, VEX 393 encoder or gear change, and/or certain devices repaired with parts identical in specification and performance to the originals. <R30, R64>

____ **Battery** - A single EnerSys NP18-12 battery or listed equivalent, terminals insulated, must be securely fastened to robot. <R31, R32, R33>. Check all batteries for compliance.

____ **Visibility** – PD and breakers must be easily visible. <R39>

____ **Power Distribution** – powered per Figure 4-11, only cRIO (and one breakout board) powered from dedicated 24V supply <R41, R42>

____ **Main Breaker Accessibility** – the single 120A main breaker must be readily accessible with labeling preferred. <R38>

____ **Allowable PD Breakers** - Only Snap-Action breakers, up to 40 amp, may be installed in the PD <R45>

____ **Robot Radio** – the DAP-1522 Rev B, wireless adapter must be powered via the KOP +5 volt power convertor connected to the dedicated +12 volt connector on the PD. Radio must be mounted so that its LEDs are visible to field personnel, plugged into port 1 on cRIO-FRC. <R43, R55 & R62>

____ **Wire Size** - obey the wiring size conventions.

- o All wire from battery to PD have min #6 AWG (4.11mm) wire <R35 & Fig.4-11>
- o 40 amp breakers have min #12 AWG (2.052mm) wire <R47>
- o 30 amp breakers have min #14 AWG 1.628mm) wire <R47>
- o 20 amp breakers have min #18 AWG (1.024mm) wire <R47>

____ **Wire Colors** - must be color coded - red/white/brown/black w/stripe for +24, +12, +5 VDC supply wires and black/blue for supply return wires <R49>

____ **1 Wire per WAGO** - only 1 wire may be inserted in each WAGO, splices and/or terminal blocks, may be used to distribute power to multiple Breakouts and Sidecars but all wires in the splice are subjected to the Wire Size rules <R44>

____ **Servos** – Must be a maximum power rating of 4 watts, wired to Digital Sidecar PWM outputs only. <R29, R52 & R66>

____ **Motors** – No more than Qty ea: ___6 CIM, ___4 Banebots (M7-RS775-12, M7-RS775-18, M5-RS550-12, M5-RS550-12-B, M5-RS545-12, M5-RS555-12, M5-RS540-12, and M3-RS395-12, M3-RS390-12, ___4 AM-0912, ___4 Denso throttle motors, ___4 VEX mini CIM or BAG motors, ___3 AM-2161 or2194, ___2 ARA or *FIRST* Choice window, wiper, door or seat motors___2 VEX 393 2-wire motors, ___1 Snow Blower Motor AM-2235. <R29>

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

____ **Motor/Actuator Power** –Each Victor, Talon or Jaguar may have up to two (2) motors connected to the load terminals depending on motor type and single specified motors may be connected to Spike (however multiple pneumatic valves may be driven by a single Spike). CIMs and specified other motors must be fed by speed controllers only.<R51 & Table 4-4>

____ **Motor/Actuator Control** – Motors/actuators must be controlled by Spike, Talon, Victor or Jaguar and driven directly by PWM signals from a Digital Sidecar or by CAN bus.<R50, R51, R66-R68>

____ **Custom Circuits, Sensors and Additional Electronics** - cannot affect power path or directly control speed controllers, relays, actuators or servos, and cannot produce more than 24V. <R40, R53, R71>

____ **Solenoid Breakout** –Outputs from each Solenoid Breakout shall not cumulatively exceed 16W for the cRIO-FRC (8-slot) and 21W for the cRIO-FRC II (4-slot) if powered from 24V <R69>

____ **Spike Fuse** – Spike must have 20 amp fuse installed. When used with compressor, fuse may be replaced with 20 amp, Snap Action, breaker (recommended). <R64-E>

____ **Isolated Frame** – Must be electrically isolated from battery, cRIO must be insulated from frame. (>10k Ohm between either PD battery post and chassis) <R37>

Pneumatic System W/ On Board or Off 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. <R76>

____ **Compressor** - Only one KOP compressor (or equivalent, max 1.05 CFM flow rate) may be used (on or off robot). <R79>

____ **Compressor Power** - must use a Spike (recommend, replace Spike's 20A fuse with a 20A breaker) <R64-E & Table 4-4>

____ **Compressor Control** – A Pressure Switch must be wired directly to a Digital Sidecar to control compressor. <R78,R88-B>

____ **Compressor Relief Valve** – set to 125 psi, attached to (or through legal fittings not tube) comp. outlet port.<R87, R78-B>

____ **Pressure Vent Plug** – must have an easily-accessible manual pressure vent plug to release system pressure. <R78-D, R89>

____ **Off-Robot Compressor (if used)** – must include an additional vent valve. The on-robot control system must be used to control and power the compressor. The High Pressure Switch & gauge, and regulator <R86> can be located off-board.<R80, R85, & R86>

____ **Components** – All must be COTS listed in R77 or KOP items, rated for 125 psi working pressure. <R75 & R77>

____ **Tubing** – Equiv. to KOP with a maximum ID of 0.160" with screen printed rating or supporting documentation. <R77-E>

____ **Pressure Regulator** – Set to ≤ 60 psi, providing all working pressure. Relieving (e.g. Norgren R07-100-RNEA.).<R82>

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

____ **Pressure Rating** - all pneumatic components must be rated for at least 125 psi working pressure except solenoid valves. If valves are rated for less than 125 psi, another relief valve must be installed on working pressure side to vent at the lower pressure. <R75 & R77-D>

____ **Valve Control** - pneumatic solenoid valves must have a max 1/8" NPT ID, be controlled by either a Spike or NI 9472 and only one valve per pneumatic actuator.<R77-C, R90, Table 4-4 in R51>

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 <R61, R95 >

____ **Confirm Pneumatics Operation** – With no pressure in system, compressor should start when robot is enabled.

- Compressor should stop automatically at ~120 psi under cRIO control. <R79-82, R88>
- Main Pressure ≤ 120 psi <R81, R87> and Working Pressure ≤ 60 psi <R82 & R86>

____ **Robot Signal Light** - The Robot Signal Light from the KOP must be visible from 3 ft in front of the robot, and be plugged into the RSL port on one of the Digital Sidecars. Confirm that the RSL flashes in sync with DSC. Confirm Jumper. <R63>

____ **Battery Voltage Monitoring** – the DS must display a battery voltage as monitored by analog module in slot 1. <R70>

____ **Team Configuration –** DAP-1522 programmed at kiosk for this event, Driver Station shows correct team number. <R59>

____ **Firmware Versions** - The cRIO image (FRC_2014_v52, <R54>) and DS (01.04.14.00, <R91>) and Jaguar firmware (Grey-101 & Black-107, <R67>) must be up-to-date.

____ **Power Off –** remove power from the robot, confirm all LEDs are off, actuate pneumatic vent plug valve and confirm that all pressure is vented and all gauges read 0 psi pressure. <R89>

____ **Operator Console is less than 60" x 14". May have velcro 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 2014 Kickoff on January 4, 2014 and in accordance with all of the 2014 FRC rules, including all Fabrication Schedule rules. We have conducted our own inspection and determined that our robot satisfies all of the 2014 FRC rules for robot design.

Team Captain:_____ Team Mentor:_____