2011 FRC Inspection Checklist Rev B – March 7, 2011

TEAM NUMBER: _____ **INSPECTOR:_____ _____**

INITIALS (after passing):_____ **DATE (after passing):_____/_____/_____**

REINSPECTION (initial**) _____** **FINAL INSPECTION (**initial**) _____**

Initial Inspection

____ **Weight** -

Robot Weight (<= 120lbs excluding bumpers, minibot and battery) <R11> _____ pounds

Bumper Weight (Bumpers must be <= 20 pounds) <R07.I> + _____ pounds

____ **Size** - Fit within a 28"x38"x60" rectangular volume <R11> Total Finals Weight = _____pounds

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

- ☐ Bumpers must provide complete protection of the FRAME PERIMETER with no openings. <R07.A>
- ☐ All segments must be >= 6" as defined by backing and backing may not extend beyond robot frame. <R07.D>
- ☐ No bumper segment may be unsupported by robot frame for a length greater than 8". <R07.K>
- ☐ Bumpers may have gaps between frame and bumper up to ¼".<R07.K>
- ☐ All corners must be protected by bumpers on both sides and include pool noodles within corners. <R07.C >
- ☐ Must use ¾" thick x 5" tall plywood 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). <R07.F>
- ☐ Must use a durable fabric cover for the noodles. <R07.G>
- ☐ Must have either complete sets of both blue and red bumpers (with solid colors similar to the FIRST logo) or be able to easily change bumper color between red and blue over the entire bumper perimeter. <R07.H>
- ☐ Team number displayed with 4" tall x ¾" stroke, on the bumpers, 4 locations at approximately 90 deg spacing, in contrasting color or background.<R9>
- ☐ Must be securely mounted when attached and be easily removable for inspection. <R07.J & K>
- ☐ When on flat floor, bumpers must reside entirely in region between 1" and 7" above floor. <BUMPER ZONE>

Mechanical

____ **No Sharp Edges, or Protrusions that pose a hazard for participants, robots/minibots or field.** Carefully look for sharp edges on manipulators that may cause damage to game pieces. <R04>

____ **No Prohibited Materials** – e.g. sound, lasers, noxious or toxic gases or inhalable particles or chemicals <R02>

____ **No Unsafe Energy Storage Devices** - carefully consider safety of any springs or pneumatic systems <R01.D>

____ **No Risk of Damage to Other Robots** - e.g. spearing, entangling, upending or adhering <R05 >

____ **No Risk of Damage to Field** – e.g. metal cleats on traction devices or sharp points on frame. <R4 & R6>

____ **Decorations** - Cannot interfere with other robots' electronics and sensors (particularly via color distraction) and be in spirit of "Gracious Professionalism". <R2.A & C, R15>

____ **BoM Cost** – Cost must not exceed $3500 of additional components with no single component > $400. <R18, R19, R82>

____ **Team Name** - Prominently and proudly display the team's school name and primary sponsor(s) name/logo <R13>

____ **Excursion Beyond FRAME PERIMETER** - No robot components can extend beyond the FRAME PERIMETER in the STARTING CONFIGURATION. Introduction & <R14>

____ **FRAME PERIMETER** – Frame must be non-articulated. Introduction and<R12>

____ **Playing Configuration –** Robot may not extend beyond 84" diameter, right cylindrical volume. <R11>

____ **Game Piece Retrieval –** Game pieces must be capable of removal from robot without power. <R17>

Electrical

____ **Components –** <u>None</u> may be modified, except for motor mounting, motor wires may be trimmed, window motor locking pins may be removed, and certain devices may be repaired with parts identical in specification and performance to the originals. <R47, R55.M, R93>

____ **Battery** - Only a single MK ES17-12 battery or a single EnerSys NP18-12 is permitted on robot. Battery must be securely fastened to robot frame structure, belt or strap recommended. <R16 & R34>

____ **Mounting** – Electrical components must be mounted securely, PD and breakers must be easily visible. <R16 & R37>

____ **Insulated Battery Terminals and connecting lugs** - must be well-covered with insulation <R37.C>

____ **Main Breaker Accessibility** – the single 120A main breaker must be readily accessible with labeling preferred. <R37.G>

____ **Allowable PD Breakers** - Only 20, 30 and 40 Amp Snap-Action breakers may be installed in the PD <R39.A>

____ **Robot Radio** – the wireless adapter must be powered via the KOP +5 volt power convertor which must be powered by the dedicated +12 volt connector on the PD. Radio must be mounted so that it's LEDs are visible<R38.B & R53>

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

- o All wire from battery to PD have min #6 AWG (4.11mm) wire <R37.F>
- o 40 amp breakers have min #12 AWG (2.052mm) wire <R40>
- o 30 amp breakers have min #14 AWG 1.628mm) wire <R40>
- o 20 amp breakers have min #18 AWG (1.024mm) wire <R40>

____ **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 <R41>

____ **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 <R38.D&R40>

____ **Servos** – Must be a maximum power rating of 4 watts, wired to Digital Sidecar PWM outputs only. <R38&R45.B>
____ **Motors** – No more than: __4 CIM, __4 KOP window (2 Left & 2 Right), __1 Fischer Price 00801-0673, combination of up to __4 Banebots (M7-RS775-12, M7-RS775-18, M5-RS550-12, M5-RS550-12-B, M5-RS540-12, and M3-RS395-12 <R45>
____ **Actuators** – Only compliant electromagnetic actuators are allowed. No electrical solenoids are permitted. <R46>
____ **Motor/Actuator Power** – only one motor or load may be attached to each Spike, Victor or Jaguar (however multiple pneumatic valves may be driven by a single Spike). CIM and FP motors must be fed by speed controllers.<R48>
____ **Motor/Actuator Control** – Motors/actuators must be controlled by Spike, Victor or Jaguar and driven directly by PWM signals from a Digital Sidecar or by CAN bus.<R48, R57, R58>
____ **Custom Circuits, Sensors and Additional Electronics** - cannot be attached to the cRIO's serial port or Ethernet port 2 (except DAP-1522 and electronics that meet <R50> exceptions), cannot directly control Victors, Jaguars, Spikes or servos. <Sec 4.3.10, R50, R59.B, R62>
____ **Powered Decorations (if any)** – can only draw power from a 20A breaker on the PD <R42 & R44>
____ **Solenoid Breakout** – only pneumatic valves and photoelectric sensors, PN 42EF-D1MNAK-A2, may be driven by the Solenoid Breakout module. The breakout board can be powered from the 24 volt supply. <R60>
____ **Spike Fuse** – Spike must have 20 amp fuse installed. When used with compressor, fuse may be (recommended) replaced with 20 amp, snap action, breaker.<R55.E>
____ **Isolated Frame** – Must be electrically isolated from battery, cRIO must be insulated. (>10k Ohm between either PD battery post and chassis) <R36>

Pneumatic System (n/a for robots that do not use pneumatics)

____ **No Modifications** - pneumatic parts may not be modified except actuator mounting pins may be removed. <R67>
____ **Compressor** - Only one KOP compressor (or equivalent, max 1.03 CFM flow rate) may be used (on or off robot). <R69>
____ **Compressor Power** - must use a Spike (recommend replacing Spike's 20A fuse with a 20A breaker) <R55.E>
____ **Compressor Control** – A Pressure Switch must be wired directly to a Digital Sidecar to sense high side pressure. <R72>
____ **Compressor Relief Valve** – set to 125 psi, attached to (or through suitable brass fittings) to compressor outlet.<R71>
____ **Vent Plug Valve** – must include an easily-accessible manual vent plug valve to release system pressure.<R73>
____ **Off-Robot Compressor (if used)** – must include an additional vent valve. The on-robot control system must be used to control the compressor. Pressure switch, high pressure gauge and regulator can be located off-board. <R69, R70.D, R73>
____ **Components** – All must be COTS or KOP items, rated for 125 psi working pressure and 250 psi burst pressure. <R66>
____ **Tubing** – Equiv. to KOP with ID 0.160" with screen printed rating or supporting documentation. <R66.D>
____ **Norgren Regulator** – Set to <= 60 psi providing all working pressure. <R70>
____ **Gauges** - must be present at both the high pressure side and Norgren regulator outlet and be readily visible. <R68, R70>
____ **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. <R66.C & R67>
____ **Valve Control** - pneumatic solenoid valves must have a max Cv of 0.32, be controlled by either Spike or NI 9472 and only one valve per pneumatic actuator.<R66.B, R74>

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

____ **Unauthorized Wireless Communication** – no wireless communication to/from ROBOT or OPERATOR CONSOLE without FIRST permission. No radios allowed on the OPERATOR CONSOLE or in the pit<R52, R55, R79>
____ **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. <R69, R72>
- Main Pressure <= 125 psi <R68.B, R72, R75> and Working Pressure <= 60 psi <R70>

____ **Robot Signal Light** - The Robot Signal Light from the KOP must be visible from 3' 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. <R54>. Note that only one RSL is allowed, as noted in GDC Q&A http://forums.usfirst.org/showthread.php?t=17077
____ **Battery Voltage Monitoring** – the DS must display a battery voltage. <R61>
____ **Verify Team Number on DS –** team has succeeded in setting DAP-1522 at kiosk for this event. <R51>
____ **Firmware/Software Versions** - cRIO image must be FRC_2011_v28, Driver Station software must be revision 01.05.11.00 or newer <R75, R49>
____ **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.

Team Compliance Statement

We, the Team Mentor and Team Captain, attest by our signing below, that our team's robot was built after the 2011 Kickoff on January 8, 2011 and in accordance with all of the 2011 FRC rules, including all Fabrication Schedule rules. We have conducted our own inspection and determined that our robot satisfies all of the 2011 FRC rules for robot design.

Team Captain:_____ Team Mentor:_____