Third Hand Bicycle Co-Op

Public Tools Construction & Information

6/16/20

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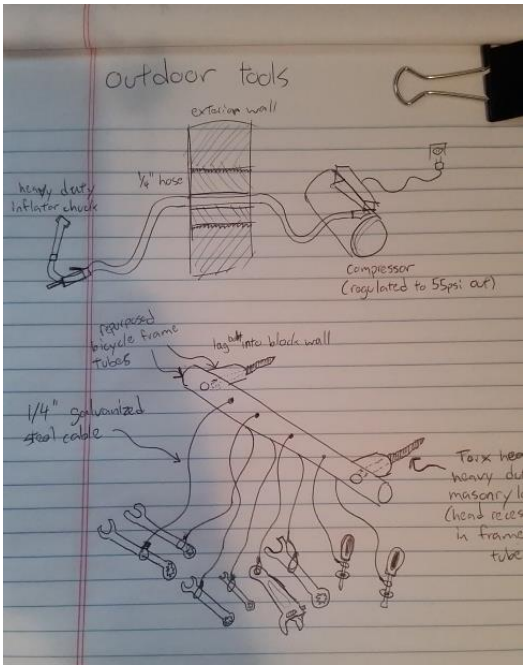
Third Hand Coordinators had considered installation of an outdoor public tool station for a while. When the Covid-19 Pandemic came and shut down normal operation of the shop I decided to expedite building a tool station to provide our bike rider community with the means of doing simple bike adjustments. The tool station is custom made with off the shelf tools and parts and some salvaged and repurposed parts. The construction involved basic shop tools and some metalworking and welding. This document serves to demonstrate the tool station and its construction and give insight for those maintaining Third Hand's tool station or wishing to build similar tool stations.

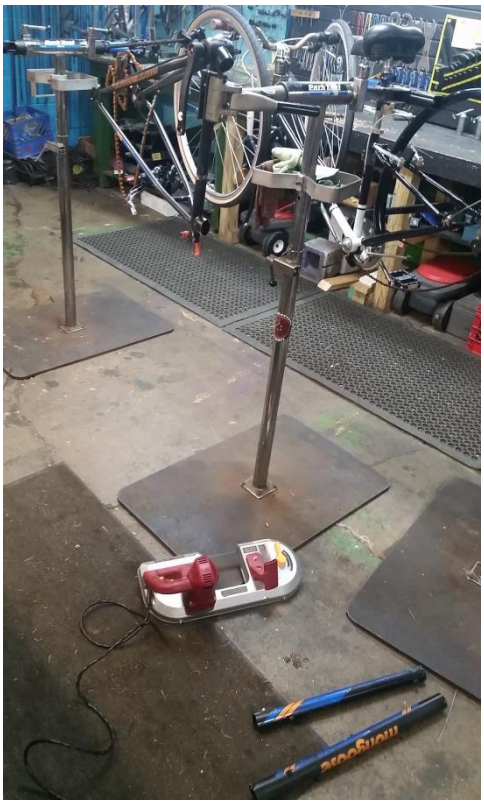
The final tool set installed in front of our shop



Concept sketch for public tool station

Cheap tools purchased and gathered for the public tool rack. Final tools installed are 10” adjustable wrench, “dogbone” multi socket tool, combination wrenches 10,12,13,15,17mm, metal tire lever, metric folding hex keys (1.5-8mm, chrome plated), Philips and flat screwdrivers

Scrap bike frame selected as tubing donor for the tool rack



Frame was cut into some straight tube sections

Holes were drilled for mounting and for cable threading. The mounting holes are horizontal and the cable holes are at alternating angles around 30° up and down to reduce tangling and prevent weakness in the tube. The front mounting holes were later enlarged to about ¾” to accommodate the bolt head inside the tube.

The support tubes were cut to length (about 4”) and fishmouthed to fit the main tool holder tube. The support tube gives clearance away from the wall so the sliding tool security cables can move freely. The attachment bolts go through the center of the support tubes (the tubes are centered on the mounting holes)

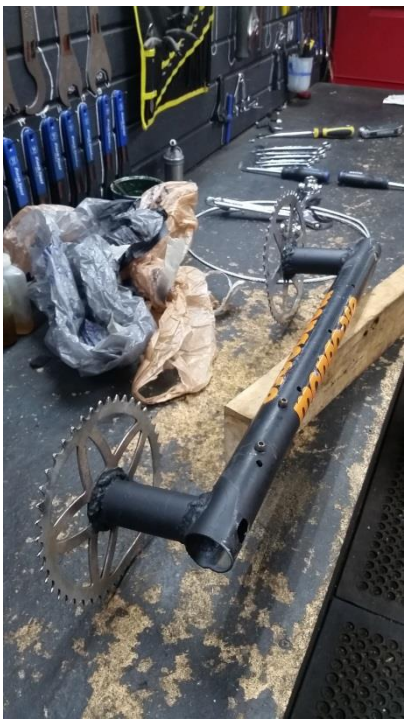
The areas to be welder were ground free of paint/decals/rust

Two chrome 1-piece crank chainrings of the same tooth count and similar construction were selected as backing/decorative plates for the tool rack

The chainrings were cleaned of grease/residue and ground to base metal at the weld areas. The assembly was dry fitted and checked for alignment.

The pieces were tack welded as the assembly was built up and aligned and then final weld beads were made. Welding was done with a DC Stick welder and 1/16” 6013 electrodes. The results on thin bike tubing and mixed materials were not very good in appearance but good enough to hold this tool rack together securely.





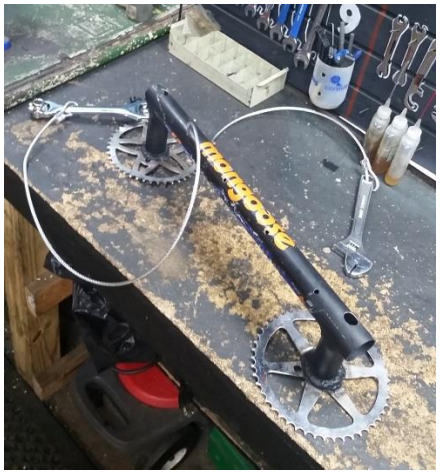
The weld areas were cleaned of slag then masked around the welded/burned areas then primed and painted black to prevent rust

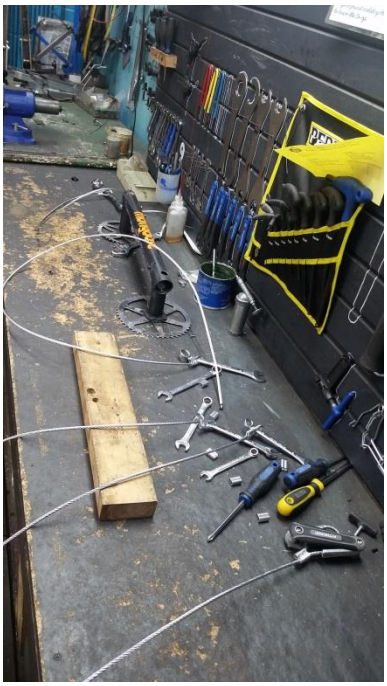
The tools were engraved with our Co-op initials to discourage theft. The engraver tool is a common carbide point electric reciprocating engraver tool (not a rotary tool).

A cable ferrule swaging tool insert for a bench vise was made. It is simply a 7/32 ball bearing tack welded onto a small piece of angle steel. A ferrule crimping tool can be bought for ≈$50 that will produce better cable crimps easier.

The cable was cut to a length of about 5’10”; the loops consume about 5” of cable each so there is about 5’ of free sliding cable when done. Cutting the cable squarely without fraying is rather difficult. Cable was cut with an angle grinder cutting wheel. The best result was achieved by first wrapping 3 or more wraps of electrical tape centered evenly at the cut line, clamping in a vise ½” from the cut, then cutting slowly (1-2min per cut), with light pressure, cooling pauses and squirts of cooling water. Don’t let the cable get hot enough to melt the tape. The cut cable is fed through 1 hole of the ferrule looped around a part of the tool it can’t slip off then cinched securely and crimped.

Crimping was done by aligning the ball of the tool with the ferrule then squeezing the vice jaws tightly. 2 indents on each side of the ferrule were made.





After the cable was looped and crimped around one tool the cable was passed though the main tool rack tube then it was looped around a second tool and crimped. The tools were grouped by similar types and arrnaged in increasing size. The rest of the tools were crimped and installed to the bar.

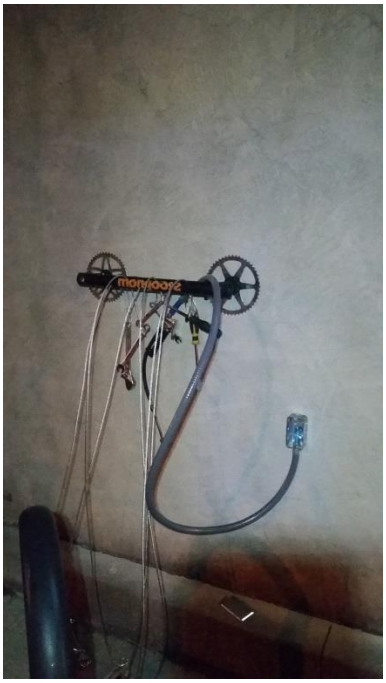


The screwdrivers could be tethered through the peg hole but using a washer stop allows ergonomic grip and free spinning of the driver. ¼” fender washers were used, they had to be ground out slightly to fit over the flat head. The screwdrivers and washers were ground at the weld zone to remove plating then they were aligned and welded to allow a narrow cable zone. The plastic melted slightly from welding, better insulation and cooling water might prevent that. After welding the screwdrivers were masked and painted to prevent rust. The screwdrivers were attached with cable loops and the tool rack was completed.

Our front exterior wall is cinderblock with about 3/4” of stucco on top, so fasteners were chosen to hold securely in this wall. The fasteners were ¼”x6” LumberLok / Lumbertite wafer head type screws. They are not designed for use in cement/block but worked fine with adequate predrilling. They have a medium flat flange head which worked well inside the tool rack tube. They also have a Torx drive type increasing security somewhat. Recessing the fastener inside the tube prevents tampering with pliers.

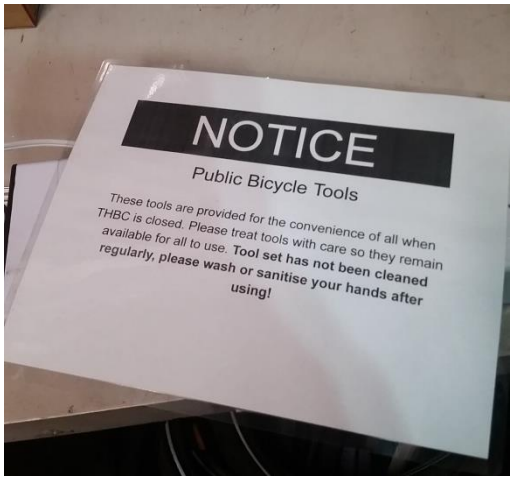
Our tool station was completed with a compressed air supply source. Hand pump options were considered but there is no pump device I'm aware of that has proven durable enough for prolonged public outdoor use. The air hose is like a gas station air machine and has limited, cheap, rugged, replaceable parts for public interaction. The inflator head is schraeder only as there was no good durable inflator known that fit both common bike valve types, riders with presta tires must use a schraeder adapter. The air hose routes inside through a hole in the wall to the air compressor. The PVC air hose is shielded inside electrical flex conduit to make it more cut and kink resistant. The air hose hole terminates in a repurposed electrical box to provide security and maintenance access.





Our exterior walls are stucco, double cinderblock, studs, and drywall so it required a rotary hammer and 16” bits to penetrate the full depth of the wall. The air hose is very small(3/8” OD) as CFM is minor and this reduces the size of hole drilled into our building. The fitting was cut off one end and the hose was snaked through the conduit and fittings then through the snug hole into the interior. A barb/NPT fitting was installed on the interior end of the hose. The hose and air chuck are secured with a variety of electrical fittings, hose clamps, and zip ties.

There was concern about tampering or malfunction of the compressor to cause it to overrun and overheat so a solution was implemented to protect against that. The compressor is on a timer allowing it to refill 12 times a day. It is powered on for two minutes every two hours allowing just enough time to refill for another use. If the hose is ruptured the compressor can still only run for a total 24 minutes a day in two minute intervals. Under heavy use the compressor may be empty for patrons so this current solution is not perfect. The timer used is Intermatic DT620, It has 28 program slots and a 15A rating. To reduce loss of stored air all the compressor connections were leak checked and sealed.



Due to Covid-19 we want to minimize the chance of contagious bacteria or virus spreading through high contact objects such as these public tools. This sign warns people to use cation and wash their hands after using. The tools are also routinely sanitized.

Supplies Cost		
Item	**Cost**	**w/ tax**
3/16x50 Galvanized Wire Rope	$ 20.98	$ 22.55
1/4 Fender Washer (4 Pieces)	$ 0.60	$ 0.65
25FT PVC Hose	$ 7.00	$ 7.53
11PC Metric Wrench	$ 7.97	$ 8.57
1/4 IN X 6 Powerpro Lumber screw (2 pieces)	$ 2.36	$ 2.54
10 IN Adjustable Wrench	$ 5.99	$ 6.44
2PC SAE/METRIC FOLDING HEX WRENCH	$ 5.99	$ 6.44
8-IN-1 Metric Socket Wrench	$ 11.99	$ 12.89
Industrial Air Hose Quick Coupler	$ 3.99	$ 4.29
2PC Screwdriver Set	$ 3.49	$ 3.75
Dual Chuck Inflator w/ Hose	$ 6.99	$ 7.51
Sigma 1/2 Knock Out Bu	$ 0.28	$ 0.30
1/4 IN Barb X MIP Adaptor	$ 3.48	$ 3.74
Sigma 1/2 In Flex Squez Clamp	$ 0.78	$ 0.84
#8 Hose Clamp (2 pieces)	$ 2.14	$ 2.30
Handy Box 1-7/8 in Deep	$ 0.99	$ 1.06
Handy Box Cover Blank	$ 0.59	$ 0.63
PowerPro 5/16-IN x 6-IN ST CS L (2 Pieces)	$ 4.96	$ 5.33
1/2-IN LQ TITE FLEX CONDUIT (8 FT)	$ 5.76	$ 6.19
Cost minus Returns		$ 103.55
Cost Tool rack only		$ 69.15