

2. MATERIALS LIST

Spring 2021 Hopper Kit Items

The items below provide the maximum quantities/sizes of materials that may be used for the construction of your final hopper design. You may replenish your supplies as needed during your iterative design process.

| Item | Name | Quantity | Description |
|------|--------------------|-----------|---|
| 1 | Safety glasses | 1 | self-explanatory...use them! |
| 2 | Wooden dowel | 4, total | 12in long Birch dowel rod with diameters (in) of 1/8, 3/16, 1/4 |
| 3 | Craft stick | 6, total | 1/4in wide by 6in long by 1/16in thick craft stick, or mini popsicle |
| 4 | Fence wire | 1 | 6in length of 14ga multipurpose |
| 5 | HDPE sheet | 1 | 1in x 2in x 1/8in sheet of HDPE |
| 6 | PTFE rod | 2, total | 1in length of solid PTFE (Teflon) rod with diameters (in) of ¼, ½ |
| 7 | Aluminum foil | 1 | 6in x 6in square of heavy duty aluminum foil |
| 8 | Machine screw | 10, total | 4-40 thread pan head phillips machine screw with lengths (in) of ½, ¾, 1.25 |
| 9 | Hex nut or locknut | 10, total | 4-40 thread nut or nylon-insert locknut |
| 10 | Retaining ring | 6 | 3/16in shaft diameter external self-locking retaining ring |
| 11 | Compression spring | 3 | 3.0in long, 5/16in outer diameter, stainless steel compression spring |
| 12 | Torsion spring | 2, total | 90° torsion spring, one left hand, one right hand |
| 13 | Rubber tubing | 1 | 1 ft length of 1/4in outer diameter by 1/8in inner diameter latex rubber tubing |
| 14 | Rubber band | 2 | #64 rubber band |
| 15 | Plastic tubing | 1 | 6in length, 4mm outer diameter, black or white polyurethane plastic tubing |
| 16 | Steel ball bearing | 2, total | stainless steel ball bearing with diameters (in) of ½ and 3/8 |
| 17 | Electrical wire | 1 | 1ft length of insulated solid 22AWG hook-up wire |
| 18 | Heat shrink tubing | 1 | 6in length of .09in inner diameter black heat shrink tubing |
| 19 | Magnet | 2 | neodymium cylindrical 1/8in outer diameter x 1/8in height |
| 20 | Safety pin | 1 | basting pin, size 2 - 1.5in |
| 21 | Cable tie | 6, total | black Nylon cable tie with lengths (in) of 4, 8 |
| 22 | Clear line | 1 | 3ft length, 0.022in diameter, 30lb load limit, clear monofilament nylon line |
| 23 | Aluminum rod | 1 | solid aluminum rod of 1/8in diameter x 2in length |
| 24 | Balloon (large) | 1 | 12in diameter deep tone |
| 25 | Balloon (small) | 2 | 5in diameter |
| 26 | Balloon (long) | 1 | long, twisty balloon |
| 27 | Pencil | 1 | #2 wooden pencil with eraser |
| 28 | Golf ball | 1 | yellow recycled golf ball |
| 29 | Golf tee | 2 | 2 1/8in long golf tee |
| 30 | Ear plug | 1 | orange noise-reduction foam ear plug |
| 31 | Binder clip | 1 | mini binder clip |
| 32 | Clothespin | 2 | ultramini clothespin |
| 33 | Sandwich baggie | 1 | foldover sandwich baggie |
| 34 | IDEAS ruler | 1 | 6in lasercut ruler |

ITEMS BELOW ARE NOT PHYSICALLY IN KIT, BUT ARE AVAILABLE FOR USE

| | | | |
|----|-------------------------------------|---------------------|--|
| 34 | Fiberboard sheet | 1, total | 24 by 16 inch area, 1/8in or 1/4in thick, smooth Medium Density Fiberboard (MDF) |
| 35 | Super capacitor† | 2 | 10F, 2.7V, 34mOhm equivalent series resistance, super capacitor |
| 36 | Rocket igniter† /resistance wire | 1 | Estes solar model rocket starters, or custom resistance wire |
| 37 | Water | 1 | 100ml, tap water |
| 38 | Solder | - | 0.031in diameter lead free solder with flux for joint making as needed |
| 39 | Hot glue | - | Gorilla hot glue sticks |
| 40 | Wood glue | - | Titebond III water-proof wood glue for joint making as needed |
| 41 | Epoxy | - | two-part epoxy, 5 minute |
| 42 | 3D printed part† | <=3 parts, 6in^3 | No more than 3 printed parts, total volume on SolidWorks < 6 cubic inches |