### Overall Production Cost

The overall production cost is listed below. Please see the following sections in this Appendix for justification of these numbers.

Table 1: Overall production cost

|  |  |
| --- | --- |
| **Category** | **Cost** |
| Tooling/startup | $0.00 |
| Materials | $100 |
| Labour | $1555 |
| Off-Shelf Parts | $747.95 |
| Undefined | $208 |
| **Total** | **$2610.95** |

### Tooling and Setup Costs

Since most of our parts are off-the-shelf or hand-welded externally, there are no setup or tooling costs associated with the Trailrider. The customized, hand-welded components are the frame, propulsion lever, and chain covers. Each of these does not require special tooling beyond what is commonly available in an industrial machine shop.

### Material Costs

The materials listed in Table 2 below are applicable only for parts requiring out of house fabrication. The references to the mass of each material can be found in Appendix I. The prices are conservative estimates based on Mcmaster prices. The frame was assumed to be 2.5” hollow steel tubing, with approximately 10 ft of material needed for the Trailrider.

Table 2: Material costs for manufactured products

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Part / Assembly** | **Material** | **Mass (kg)** | **Price (ea.)** | **Qty.** | **Total Price** |
| Frame | Stainless Steel | 15 | $70 | 1 | $70 |
| Propulsion Lever | Stainless Steel | 0.56 | $10 | 2 | $20 |
| Chain cover | ABS Plastic | 0.6 | $5 | 2 | $10 |
| **Total** |  |  |  |  | **$100** |

### Labour Costs

Table 3 lists out of house fabrication costs for certain parts/assemblies. Please note that the cost of metal assembly (i.e. welding of frame) is included in this table as the fabrication cost. For mechanical assembly costs of the entire Trailrider, refer to Table 4. Labour and fabrication costs are estimated as the average hourly mechanical technician compensation as per Neuvoo. Please note also, that the frame includes items such as the foot plate, and the handlebars. The 3D printing costs are 35 cents per gram according to research.

Table 3: Fabrication costs

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Part / Assembly** | **Type** | **Cost/hr** | **Time (hr)** | **Total Cost** |
| Frame | Milling/ Welding | $130.00 | 6 | $780.00 |
| Frame | Painting | $60.00 | 2.0 | $120.00 |
| Propulsion Lever | Milling/ Welding | $70.00 | 1.0 | $70.00 |
| Chain cover | 3D Printing | $210.00 | N/A | $210.00 |
| **Total** |  |  |  | **$1180.00** |

The term ‘general assembly’ refers to the procedures required to put together the critical components of the Trailrider. For example, this includes fastening the drivetrain to the frame, attaching the handlebar grips, attaching velcros to the frame, etc. Each process is listed separately and given a conservative time estimate. The general assembly procedure is assumed to be done in-house at BCMOS.

Table 4: General assembly costs per Trailrider

|  |  |  |  |
| --- | --- | --- | --- |
| **Assembly Procedure** | **Cost/hr** | **Time (hr)** | **Total Cost** |
| Castor wheel to front fork | $30.00 | 1.0 | $30.00 |
| Drivetrain to frame | $30.00 | 6.0 | $180.00 |
| Velcros to frame seat | $30.00 | 0.5 | $15.00 |
| Braking system | $30.00 | 3.0 | $90.00 |
| Miscellaneous Other | $30.00 | 1.0 | $30.00 |
| **Total** |  |  | **$345** |

Additional cost estimates have been given for packaging costs of the Trailrider to the customer in Table 5. The shipping distance is conservatively estimated from Vancouver to Kelowna, assuming that the Trailrider is only shipped in BC during its first release.

The packing cost is given in Table 5 below is a conservative estimate determined as per the approximate dimensions of the frame and disconnected wheels.

Table 5: Packaging and shipping costs per Trailrider

|  |  |  |  |
| --- | --- | --- | --- |
| **Part / Assembly** | **Dimensions** | **Mass (Ib)** | **Cost** |
| Packaging box | 36” x 36” x 50” | 60 | $30.00 |
| **Total** |  |  | **$30.00** |

The total labour costs are the added values from Tables 3, 4, 5, making a total of $1555.

### Undefined Costs

Table 6: Undefined costs per Trailrider

|  |  |
| --- | --- |
| **Part Category** | **Conservative Cost** |
| Small parts (fasteners, brake housing, bearings, rivets, collars, etc) | $100.00 |
| Supporting brackets | $45.00 |
| Velcros, hand grips | $23.00 |
| Seat Cushion | $4.00 |
| **Total** | **$208.00** |

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### Off-Shelf Costs

The off-shelf costs listed below in Table 7 are limited to the critical systems that we focused on; drivetrain and rear-wheel assembly.

Table 7: Off-the-shelf component costs per Trailrider

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Reference #** | **Part Name** | **Use** | **PN** | **Qty.** | **Unit cost (CAD)** | **Total Price** |
| 1 | 17T Sprocket for #40 ANSI Roller Chain | Driving sprocket | 6280K711 | 2 | $28.50 | $57.00 |
| 2 | Low-profile mounted steel ball bearings | Connect driving shaft to frame | 5913K62 | 4 | $14.52 | $58.08 |
| 3 | Ball Bearing | For chain cover | 60355K602 | 4 | $11.44 | $45.76 |
| 4 | ⅝” Strut Clamp | Attach lever to sprocket | U-KDST0.63 | 2 | $34.32 | $68.64 |
| 5 | #40 ANSI Roller Chain, 4ft | Drivetrain | 6261K173 | 2 | $24.06 | $48.12 |
| 6 | Continental 2018 Cross King 26" ProTection MTB Tire | Rear-wheel assembly | 0101483 | 2 | $69.95 | $139.9 |
| 7 | Alex MD21 26" 32H Disc Rear Wheel - Unisex | Rear-wheel assembly | 6005-371 | 2 | $134.95 | $269.9 |
| 8 | SunRace MF-M20 5 Speed 14-28T Freewheel | Acts as 24T driven sprocket | 5019-493 | 2 | $12.00 | $24.00 |
| 9 | 6” Rubber Castor Wheel | Front wheel | 4429T31 | 1 | $36.55 | $36.55 |
|  | **Total** |  |  |  |  | **$747.95** |

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Off-the-shelf reference # links:

1. <https://www.mcmaster.com/6280k711>
2. <https://www.mcmaster.com/5913k62>
3. <https://www.mcmaster.com/60355k602>
4. <https://us.misumi-ec.com/pdf/fa/2009/inch_p457.pdf>
5. <https://www.mcmaster.com/6261K173>
6. <https://www.biketiresdirect.com/product/continental-2018-cross-king-26-protection-mtb-tire?fltr=3793>
7. <https://www.mec.ca/en/product/6005-371/MD21-26%22-32H-Disc-Rear-Wheel>
8. <https://www.mec.ca/en/product/5019-493/MF-M20-5-Speed-14-28T-Freewheel>
9. <https://www.mcmaster.com/4429t31>

Other References

<http://3dsmith.ca/prints?fbclid=IwAR2BV0hguk_fXpLbQq_gQ_el1qx_eWh6-Nj6kubmwkg4HtlR7n2FrNQdsK4> (3D printing costs)

<http://neuvoo.ca/salary/?job=mechanical+technician> (mechanical technician salary)

<https://www.uline.ca/Product/Detail/S-15109/Corrugated-Boxes-Heavy-Duty/36-x-36-x-40-76-2-piece-Telescopic-Bulk-Cargo-Box> (packaging costs)