Project 1

Jasmine Whelan
Whitney Fwu

Anthropometric Evaluation & Re-Dimensioning

CONTENTS

Parking Meter

For this project we decided to choose a parking meter located in the city of Coquitlam.

The meter is situated near the skytrain station “Lafarge Lake”. Many people choose to come to this location for the shops, trails, sports and activities the area provides.

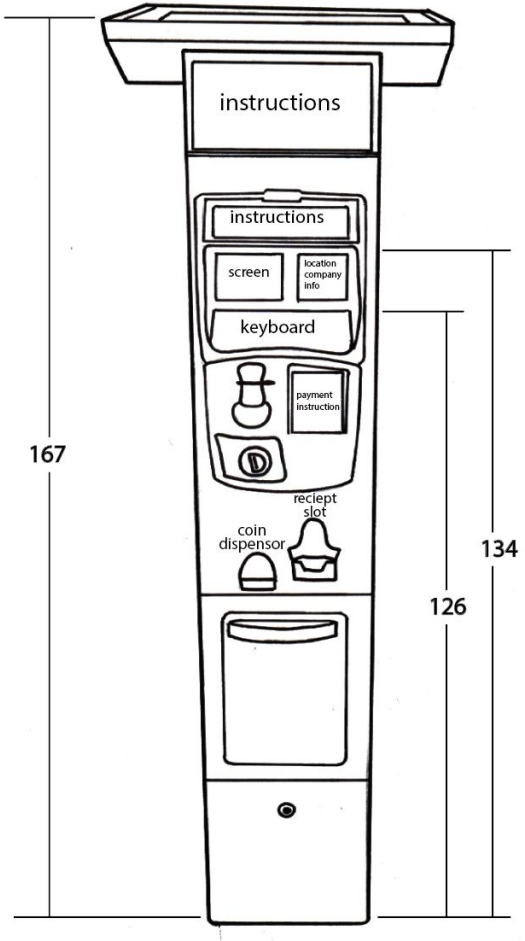
Though the activities are enjoyable, the interactions with this parking meter is the opposite.

*note all dimensions in cm

From using this Parking meter most days of the week, we noticed many underlying issues with the dimensions that do not fit the human body comfortably.

The **buttons on the keypad**, which are 2 dimensional, are sometimes unresponsive, making the user press harder in order for the machine to register the button being selected. This can be straining for the fingers and time consuming on a daily basis.

Not only is it uncomfortable in good weather, but when the temperature is below 0, gloves are not an option to press these keys as it does not recognize the piece of clothing.

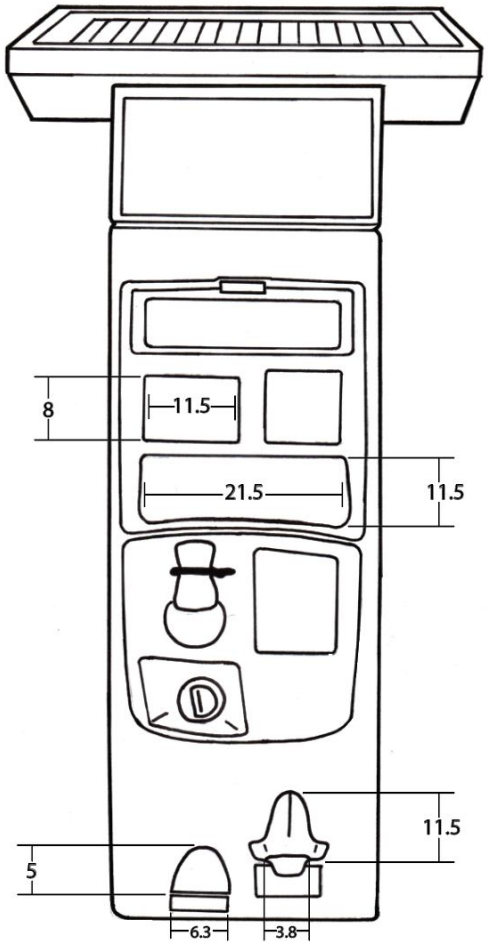


In regards to the only digital aspect, the **screen** on this machine is fairly small, along with the font size as well.

This can be straining on the users eyes, especially if this user has any visual impairments.

The colour choice does not help with this situation either. The screen displays a green background with navy font which demonstrates the usage of poor contrasting colours, especially in the dark.

Overall this screen can be improved size wise and colour wise for the benefit of the user.



*note all dimensions in cm

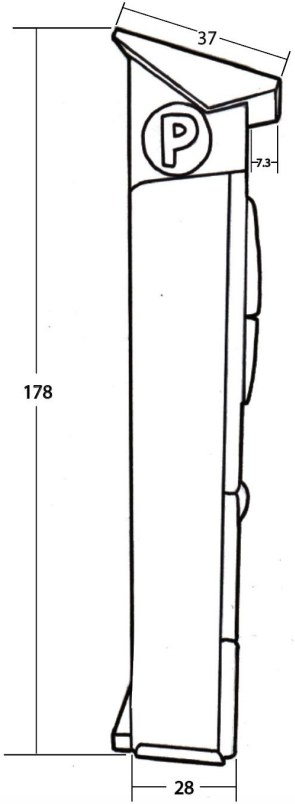
If the user chooses to pay with coins, they will receive their change in a small and deep **coin dispenser**. These dimensions are also not ideal for the fit of fingers nor the gripping motion during the extraction. Gloves were also not taken into consideration with these dimensions.

Once your fingers are sore and your eyes are strained, you then need to grab your receipt from the **receipt slot** down below, where only 2 fingers can fit. These dimensions demonstrate poor ergonomics as there is little room to easily grab the receipt without scratching your hands against the corners on the way out.

The height overall for this parking meter is fairly accurate relating to human stature.

The **solar panel platform** overhangs the front of the machine possibly making it uncomfortable for the taller percentile as there is a chance of the user's head bumping into it.

The users view may be obstructed or they may either bump their head on the overhang.



In the case of rainy weather, the overlap is slanting towards the user causing the runoff of water on the panel to drip onto the users arms or wrists.

TASK DESCRIPTION

Steps

- Goal: For the user to pay their parking
- Read the instructions to operate the machine
- Activate screen by clicking button
- Read and follow instructions on the screen
- Punch in license plate number by letter and number, press okay once complete

Option: Credit

- Insert credit card or visa
- Pull out when indicated on screen
- Select time using + or - symbols
- Press okay to print ticket
- Wait for ticket to print
- Take ticket with you (no need to display on dash)

OR

Option: Coins

- Insert coins to add time (value will show up on screen for hours parked)
- Press ok once complete
- If too much money was given change will deposit at bottom of machine*
- Wait for ticket to be printed
- Take ticket with you

Revelvent Body Dimensions

Button

- Index finger breadth
  95th percentile of men
  23 mm

Coin slot

- Finger middle length
  5th percentile female
  69mm

- Hand breadth of men
  98th percentile male

MATH:

Standard deviation= 4

Mean= 87

Xp98= 87+(2.05*5)

= 97.25 mm

Receipt slot

- Finger Length
  5th percentile female
  69 mm

- Index Finger Breath
  95th percentile men
  23 mm

Screen

- Eye height
  5th percentile female
  1416 mm

Solar power platform

- Stature
  95th percentile men
  1870 mm

TARGET POPULATION

User Profile

- Intended to be used by anyone who parked their vehicle in that location
- Types of people: students, employed workers, people who want to use the skytrain or amenities around the area
- Motivation: To pay for parking, so vehicle doesn't get ticketed or towed

- Age: 16- 60 (teenagers-seniors)
- Gender: Non-Binary
- Size: Accommodates most of the population
- Previous Experience: none
- Language: English
- Education: grade 5 reading level
- Abilities: Vision & use of fingers and arms

Anthropometric Tables

TABLE 6.1
Anthropometric Estimates for the Hand (all dimensions in millimetres)

Dimension	Men 5th %ile	Men 50th %ile	Men 95th %ile	Men SD	Women 5th %ile	Women 50th %ile	Women 95th %ile	Women SD
1. Hand length	173	189	205	10	159	174	189	9
2. Palm length	98	107	116	6	89	97	105	5
3. Thumb length	44	51	58	4	40	47	53	4
4. Index finger length	64	72	79	5	60	67	74	4
5. Middle finger length	76	83	90	5	69	77	84	5
6. Ring finger length	65	72	80	4	59	66	73	4
7. Little finger length	48	55	63	4	43	50	57	4
8. Thumb breadth (IPJ)[a]	20	23	26	2	17	19	21	2
9. Thumb thickness (IPJ)	19	22	24	2	15	18	20	2
10. Index finger breadth (PIPJ)[b]	19	21	23	1	16	18	20	1
11. Index finger thickness (PIPJ)	17	19	21	1	14	16	18	1
12. Hand breadth (metacarpal)	78	87	95	5	69	76	83	4
13. Hand breadth (across thumb)	97	105	114	5	84	92	99	5
14. Hand breadth (minimum)[c]	71	81	91	6	63	71	79	5
15. Hand thickness (metacarpal)	27	33	38	3	24	28	33	3
16. Hand thickness (including thumb)	44	51	58	4	40	45	50	3
17. Maximum grip diameter[d]	45	52	59	4	43	48	53	3
18. Maximum spread	178	206	234	17	165	190	215	15
19. Maximum functional spread[e]	122	142	162	12	109	127	145	11
20. Minimum square access[f]	57	67	77	6	51	59	66	5

Reference:
Pheasant, S., & Haslegrave, C. M. (2006). *Bodyspace : anthropometry, ergonomics, and the design of work*. Taylor & Francis.

These are Anthropometric tables we used to design the re-dimensioning for the Parking Meter.

These tables are from the Bodyspace book (third edition) available in the ECUAD library. The pages are 144 & 254.

The table on the left includes various detailed measures of the hand, that was very helpful to us when designing the keyboard, coin dispenser, and receipt slot.

The table on the right includes basic measures of the body. From this table, we referenced the stature and eye height dimensions when designing the screen.

TABLE 10.11
Anthropometric Estimates for U.S. Adults Aged 19 to 65 Years (all dimensions in millimetres, except for body weight, given in kilograms)

Dimension	Men 5th %ile	Men 50th %ile	Men 95th %ile	Men SD	Women 5th %ile	Women 50th %ile	Women 95th %ile	Women SD
1. Stature	1640	1755	1870	71	1520	1625	1730	64*
2. Eye height	1529	1644	1759	70	1416	1519	1622	63
3. Shoulder height	1330	1440	1550	67	1225	1325	1425	60
4. Elbow height	1020	1105	1190	53	945	1020	1095	47
5. Hip height	835	915	995	50	760	835	910	45
6. Knuckle height	700	765	830	41	670	730	790	37
7. Fingertip height	595	660	725	39	565	630	695	40
8. Sitting height	855	915	975	36	800	860	920	36
9. Sitting eye height	740	800	860	35	690	750	810	35
10. Sitting shoulder height	545	600	655	32	510	565	620	32
11. Sitting elbow height	195	245	295	31	185	235	285	29
12. Thigh thickness	135	160	185	16	125	155	185	17
13. Buttock–knee length	550	600	650	31	525	575	625	31
14. Buttock–popliteal length	445	500	555	33	440	490	540	31
15. Knee height	495	550	605	32	460	505	550	28
16. Popliteal height	395	445	495	29	360	405	450	28
17. Shoulder breadth (bideltoid)	425	470	515	28	360	400	440	25
18. Shoulder breadth (biacromial)	365	400	435	21	330	360	390	19
19. Hip breadth	310	360	410	30	310	375	440	39
20. Chest (bust) depth	220	255	290	22	210	255	300	28
21. Abdominal depth	220	275	330	32	210	260	310	31
22. Shoulder–elbow length	330	365	400	21	305	335	365	18
23. Elbow–fingertip length	445	480	515	21	400	435	470	20
24. Upper limb length	730	790	850	36	655	715	775	35
25. Shoulder–grip length	615	670	725	33	560	610	660	30
26. Head length	180	195	210	8	165	180	195	8
27. Head breadth	145	155	165	6	135	145	155	6
28. Hand length	175	191	205	10	160	175	190	10
29. Hand breadth	80	90	100	5	65	75	85	5
30. Foot length	240	265	290	14	220	240	260	13
31. Foot breadth	90	100	110	6	80	90	100	6
32. Span	1670	1810	1950	84	1505	1625	1745	73
33. Elbow span	875	955	1035	48	790	860	930	44
34. Vertical grip reach (standing)	1950	2080	2210	80	1805	1925	2045	73
35. Vertical grip reach (sitting)	1155	1255	1355	61	1070	1160	1250	55
36. Forward grip reach	725	785	845	35	655	710	765	32
Body weight	55	78	102	14	41	65	89	15*

Notes: See notes in Sections 10.1, 10.2 and 10.4.

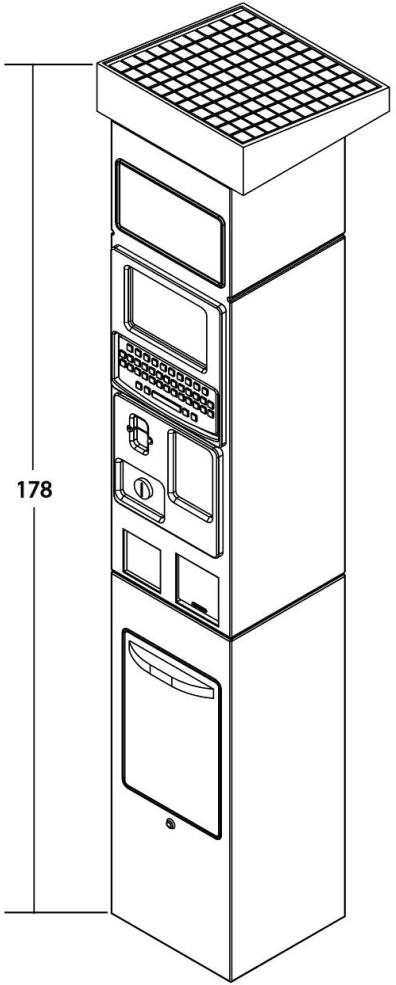
Dimensions marked with an asterisk (*) are quoted from the original source. The remainder have been estimated.

Final Design & Re-Dimensioning

We determined the new design of the parking meter's height in reference to the eye height of females at 5th percentile.

Overall, we made 5 dimensional changes to the parking meter:

1. Buttons on keypad
2. Screen
3. Receipt slot
4. Coin dispenser
5. Solar Panel



Screen:

The choices for size and colours for this screen is very straining on the users eyes, and with the possibility of sunglasses, the dark colours dim even more.

By expanding the overall size, (taking away a small extra instruction panel) the font size will be enhanced making it easier for all users to read.

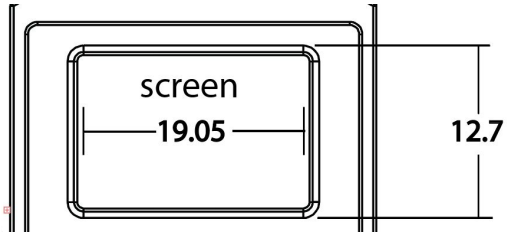
The colours will also change to a white background and black writing for easier visibility with or without sunglasses.

The screen will also have an anti glare filter put on so even when the sun is out, the user's vision will not be disrupted.

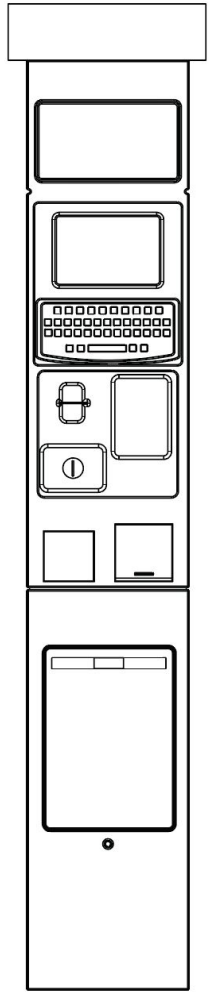
The height of the screen was also taken into consideration.

This screen is at a height that allows it to be visible for the majority of the population, although the taller users may need to look down.

Because shoes are a big factor of a person's height, this machine accommodates users wearing footwear.



note all dimensions in cm

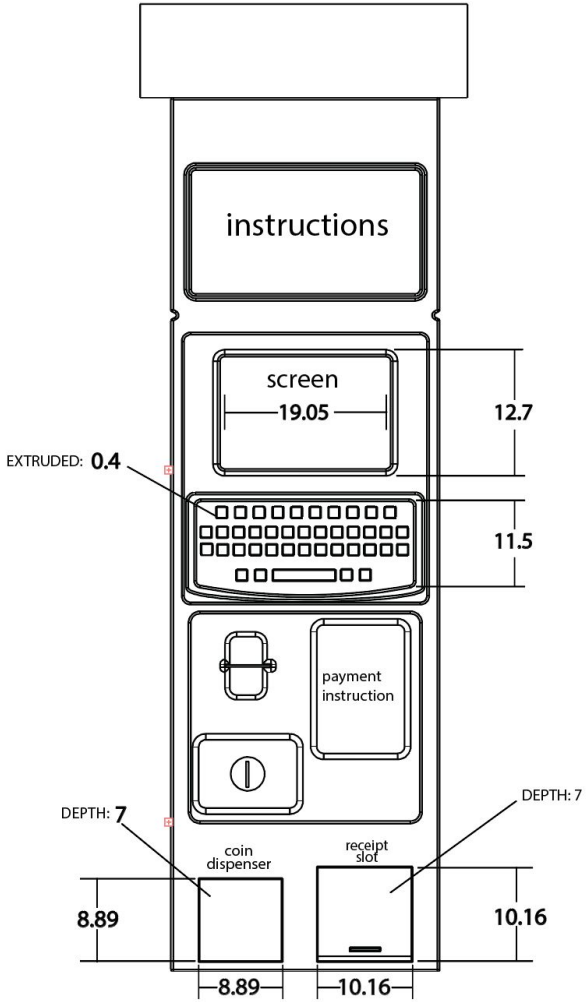


Buttons on Keypad

Having 2 dimensional buttons created an issue between the user and the machine.

Changing the buttons to be extruded by 4mm makes it easier for both the machine and user to understand that a key was pressed.

On colder days, the 3D buttons will also be usable for gloves, so that the user does not need to remove any articles of clothing. Overall, the keypad will be easier for use with or without gloves making it a faster process in general.



Receipt Slot

Once all of the necessary tasks are complete, the user will grab their receipt from the receipt slot, which is known to scratch the hands when retracting the receipt. When the receipt gets stuck, it worsens the situation even more.

The overall dimensions of this slot are fairly small for the necessary fingers to grab the receipt. With gloves, this would be even more difficult.

These dimensions are changed to become larger enabling larger fingers, hands and gloves to fit. For the shape, keeping it a rectangle is more practical along with rounding off any sharp edges.

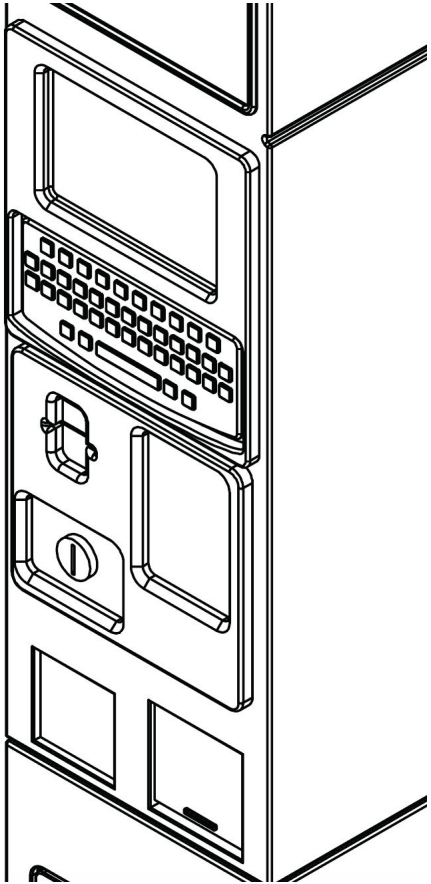
Coin dispenser

Similar to the receipt slot, the dimensions are small for access of larger fingers, or gloves.

The depth is also too deep, making it difficult to be able to retrieve the coins as fingers can not reach in all the way.

Taking these poor dimensions into consideration, we decided to retract the size of depth and expand the length and height, enabling the fingers to fit comfortably.

note all dimensions in cm



*note all dimensions in cm

Solar Power Panel

With the current layout of the solar panel unit on top of the body of the machine, a user may be obstructed by the overhang of 4.5 inches in front of them. The taller percentile was not accommodated in this feature, leaving possibilities of bumping their head or having obstructed views of the screen.

The solar panel is also tilting towards the user, and in cases of rainy weather, this allows the water to drip onto the user.

The improved design will eliminate the overhang completely, enabling all percentiles to stand in front without risk of bumping their head. The tilt will be reflected towards the back of the machine allowing water to run off the back.