



Design Development Record

Part A

Jason Yuan

DNB311 ID Studio 7: Capstone



Table of contents

Content	Page/s	Content	Page/s
Lecture notes	1, 11	CAD process	77-78
Existing products	2-5	Prototyping continued	79-83
Mood board	6-9	Cad process continued	84-92, 100
Research notes	10	Refined dimensions	93-95
Interview notes	12	Sketch renderings	96-99, 102, 106
Content ideas – notes	13	Model making	101
Initial concepts	14-32	Assembled CAD model	103-105
Research report elements	33-37	Technical drawings	107-114
Concept selection	38-45	Animation process	115-119
Concept refinement	46-63	Initial renderings	120-126
Ergonomics consideration	64-67	Video editing	127
Journey mapping	68	Presentation elements	128-132
Bike spatial measurement	69-72	Further model making	133-134
Initial prototyping	73	Final renders	135-142
Initial dimensions	74-76	Final model making	144-150

Lecture notes

Research

Qualitative - social & behavioural

Quantitative - numbers based

- testing a theory
- composed of variables
- measured w/ numbers
- analysed w/ statistical procedures

- ↳ inquiring into phenomena based on
 - building complex, holistic picture
 - w/ words, images, descriptions
 - reporting detailed views of participants/informants
 - conducted in natural settings

Research deployment Development

Consent

ethical research

Let the research guide the direction of the project

Vital element of research

- ethical conduct
- consistency
 - survey Q's straight forward
 - interviews - try best to keep conduct in the same way with all participants
 - avoid different approaches between participants
 - background info, provide the same level
- introduction, - purpose, time
- Q's keep some base Q's, can deviate slightly

pilot studies - find out best ways to conduct the research (trial run)

Limitations - acknowledge differences e.g. 2 in pm, 3 over pm

Observations - time, light etc differences can affect consistency.
- location, day, events. (variables)

Leading Q's - avoid as it can lead response down a path
- keep it open e.g. difficulty level vs. is it hard

Keep them specific Q's to begin with, be more specific if participant doesn't understand

Constant Q's but can have specific Q's relating to participant ^(context)

Existing products



Existing products



Existing products



Existing products



Mood Board



Mood Board



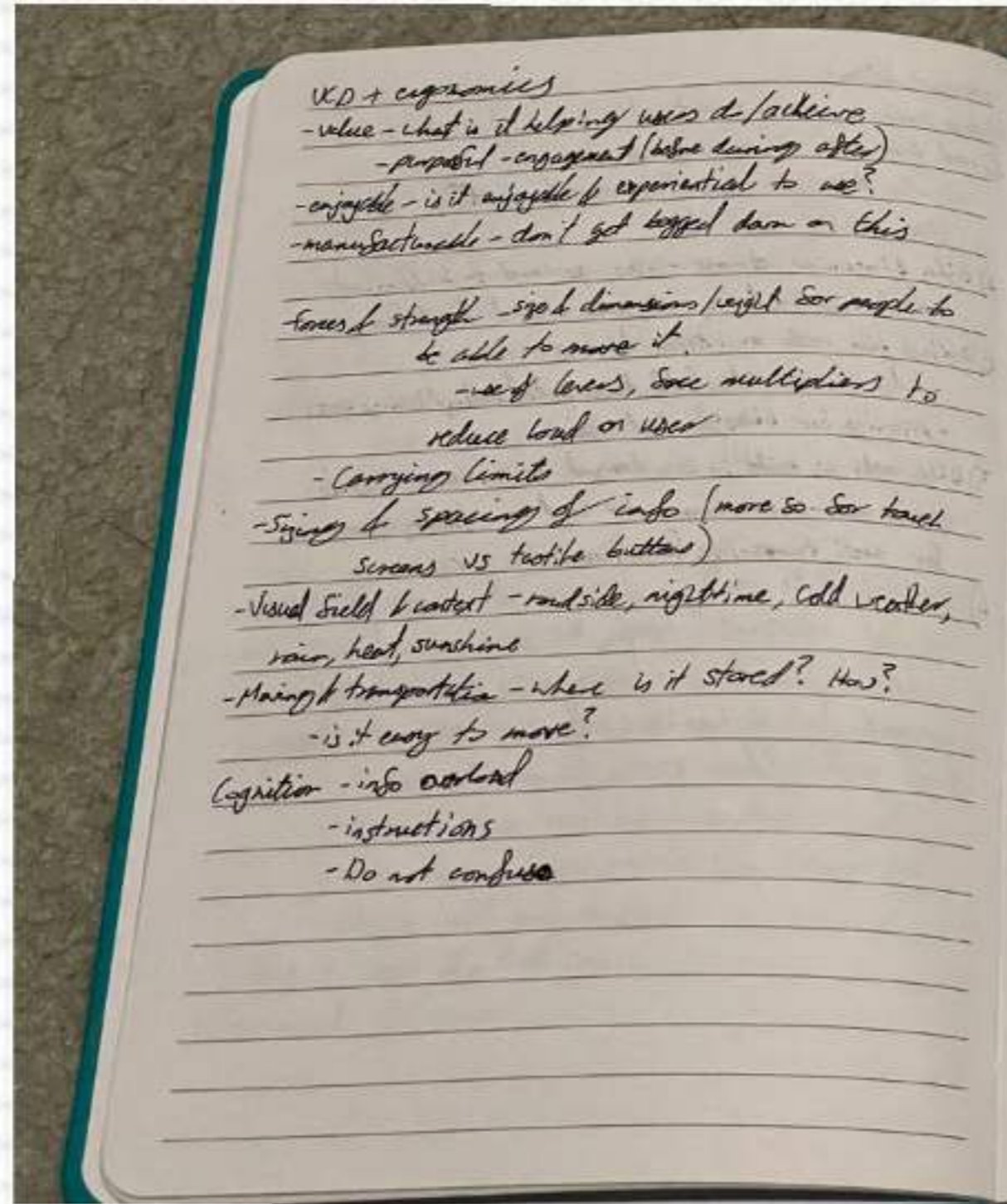
Mood Board



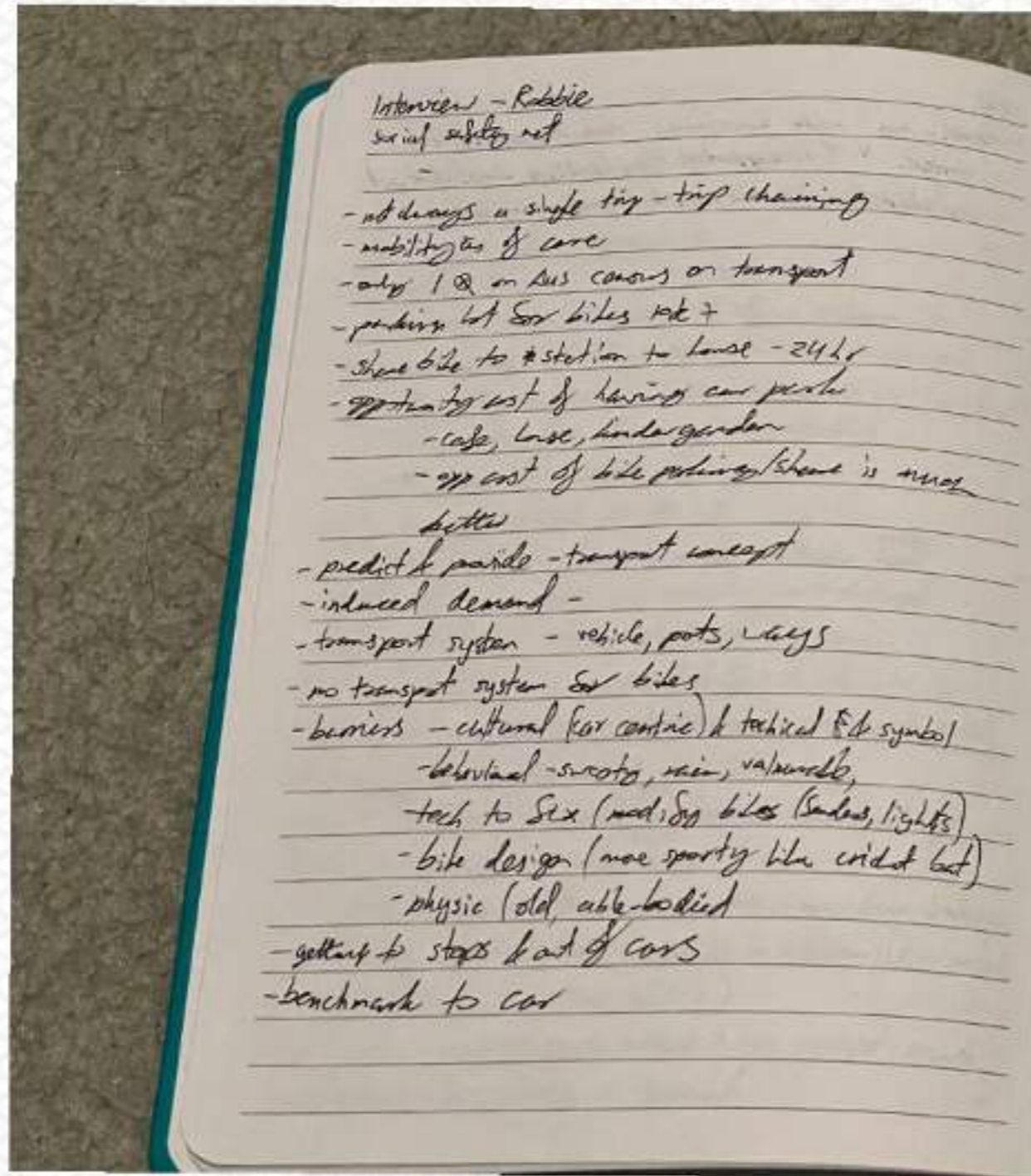
Mood Board



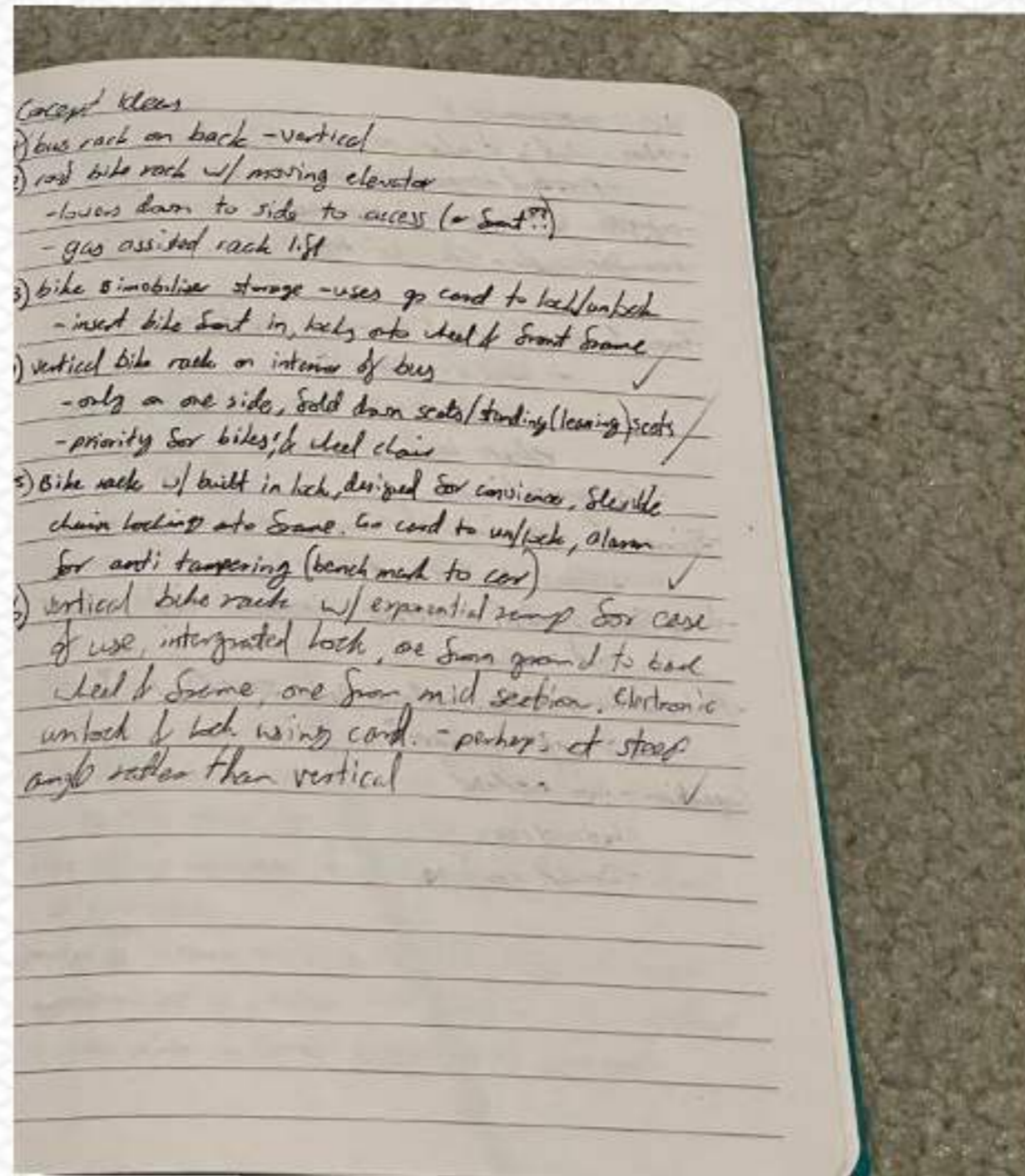
Lecture notes



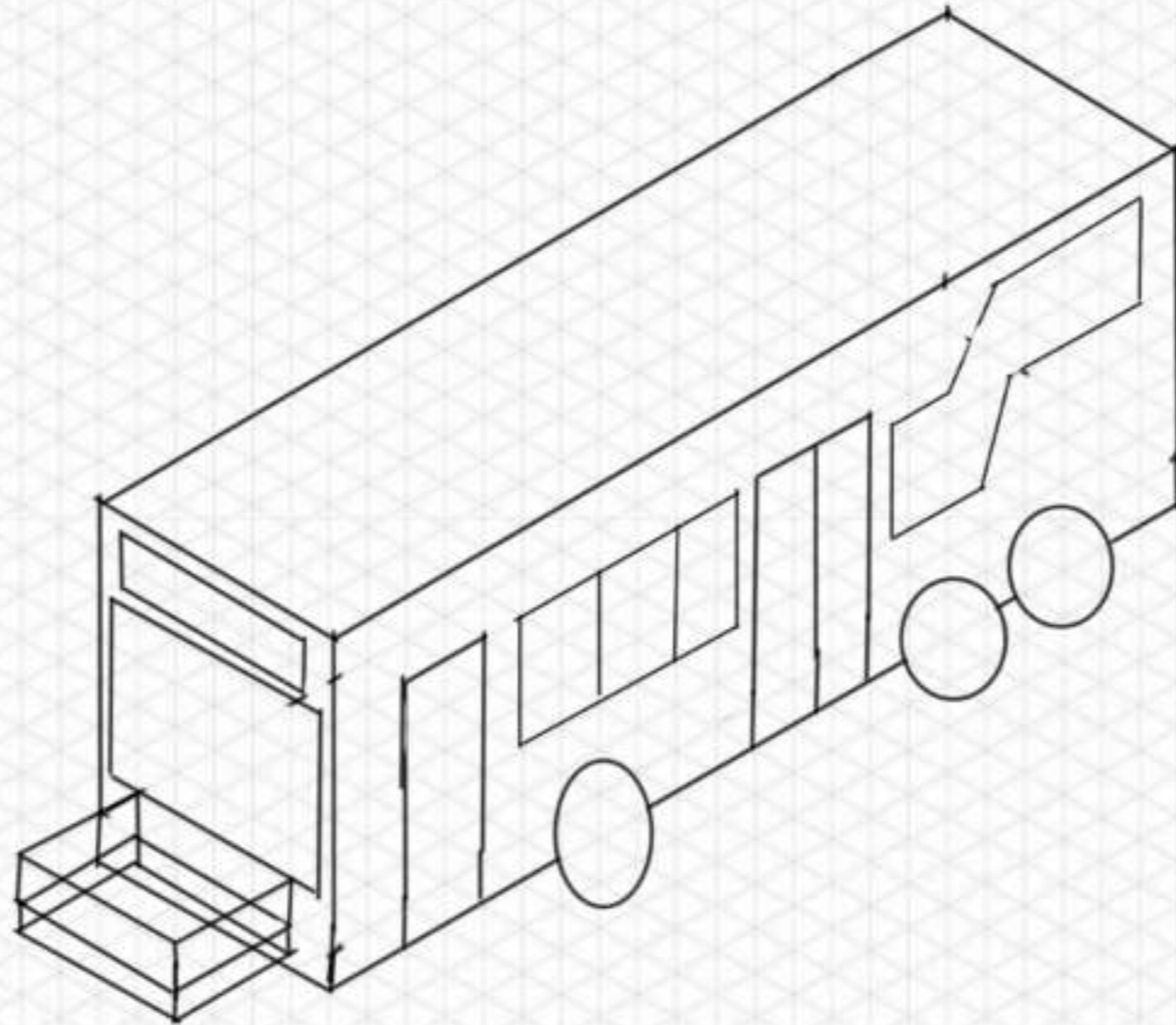
Interview notes



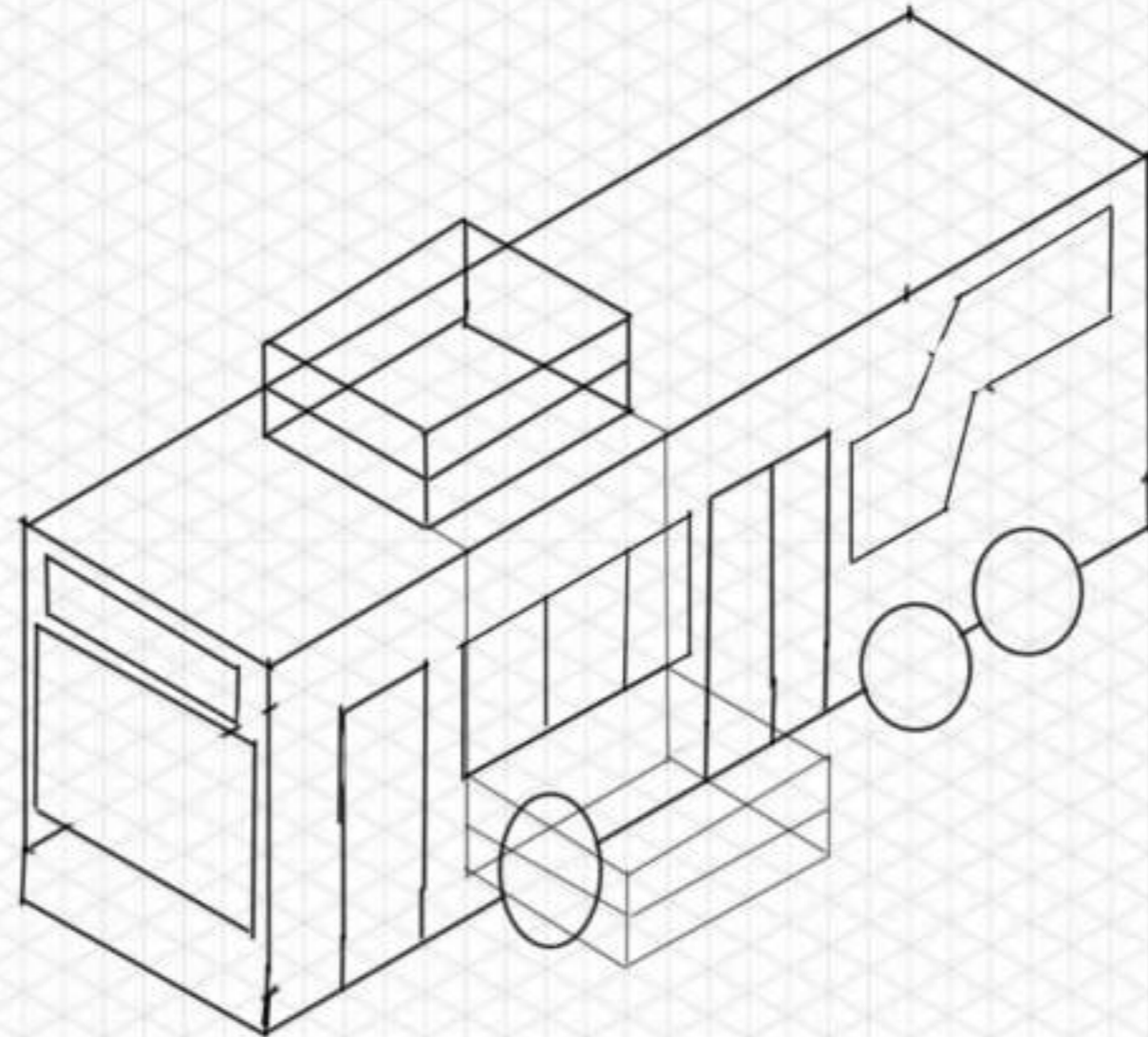
Concept ideas - notes



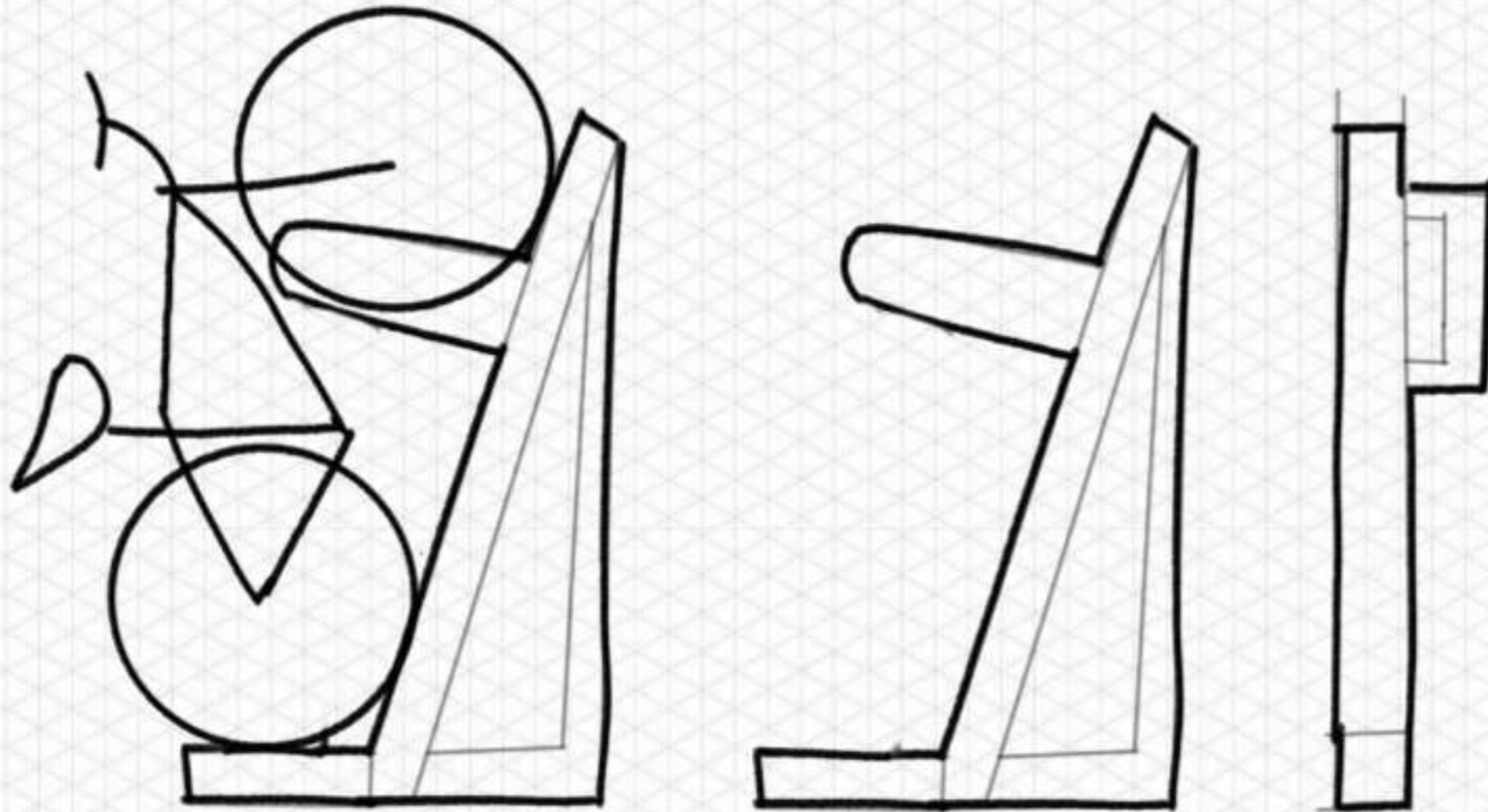
Initial concept idea 5



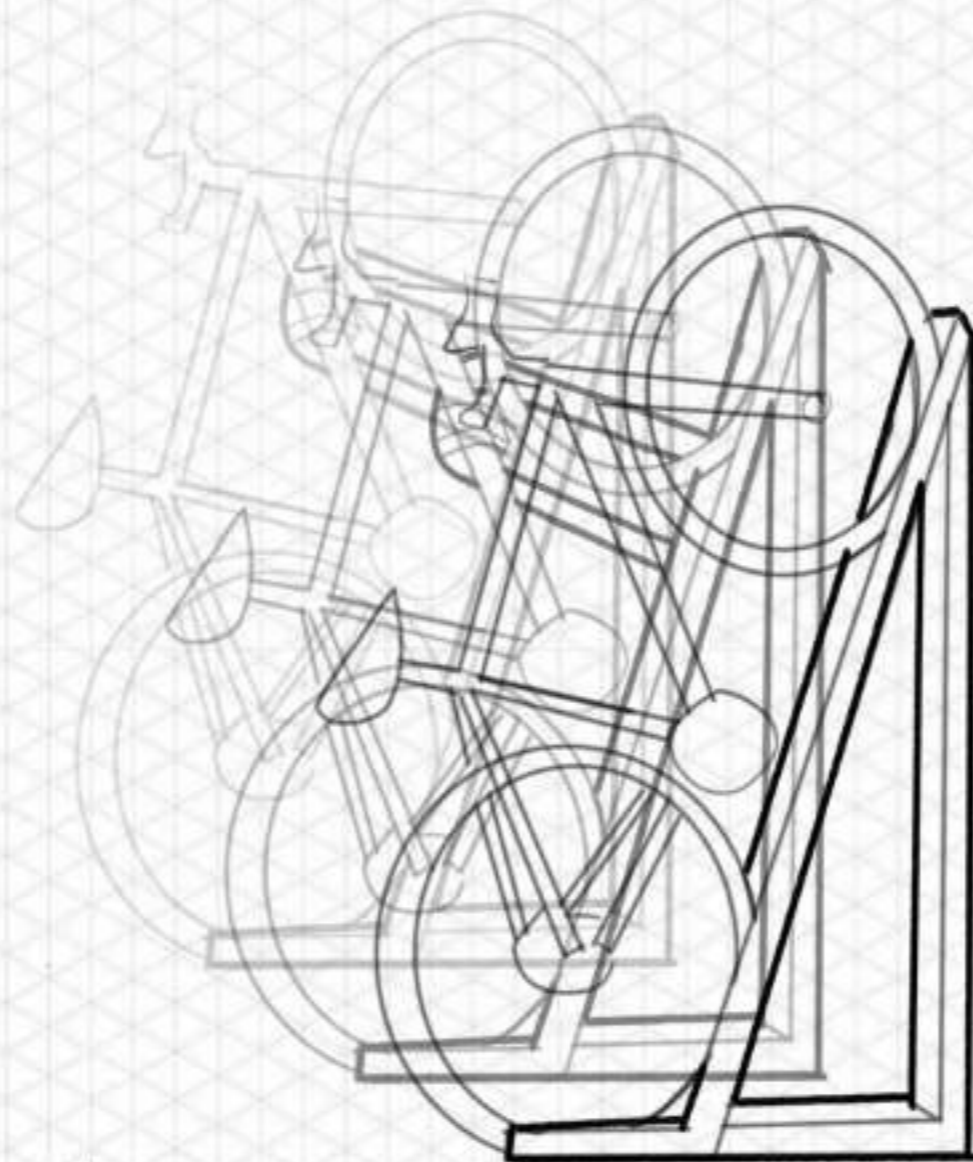
Initial concept idea 5



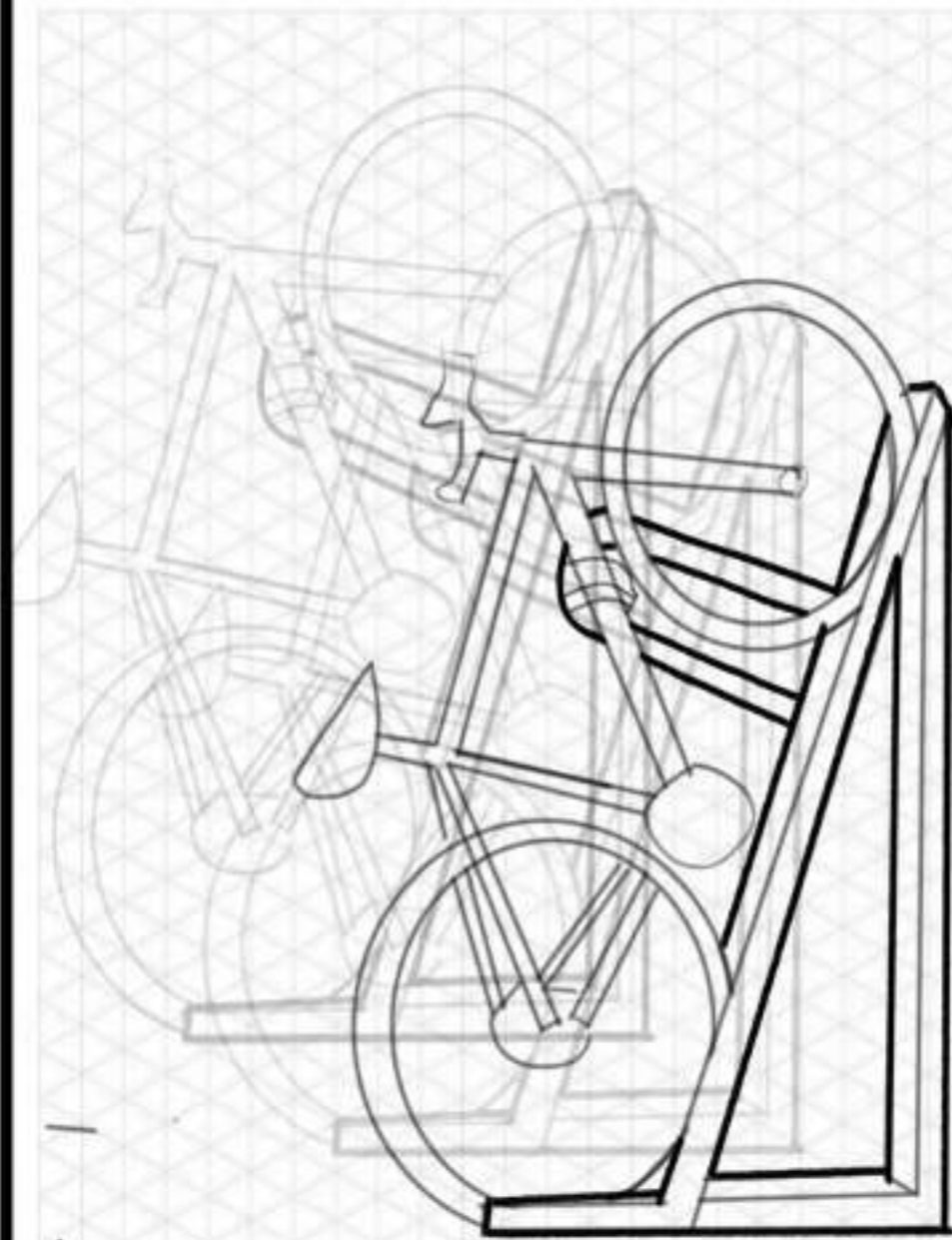
Initial concept idea 1



Initial concept idea 1



Initial concept idea 1



bike is pushed up
onto racking

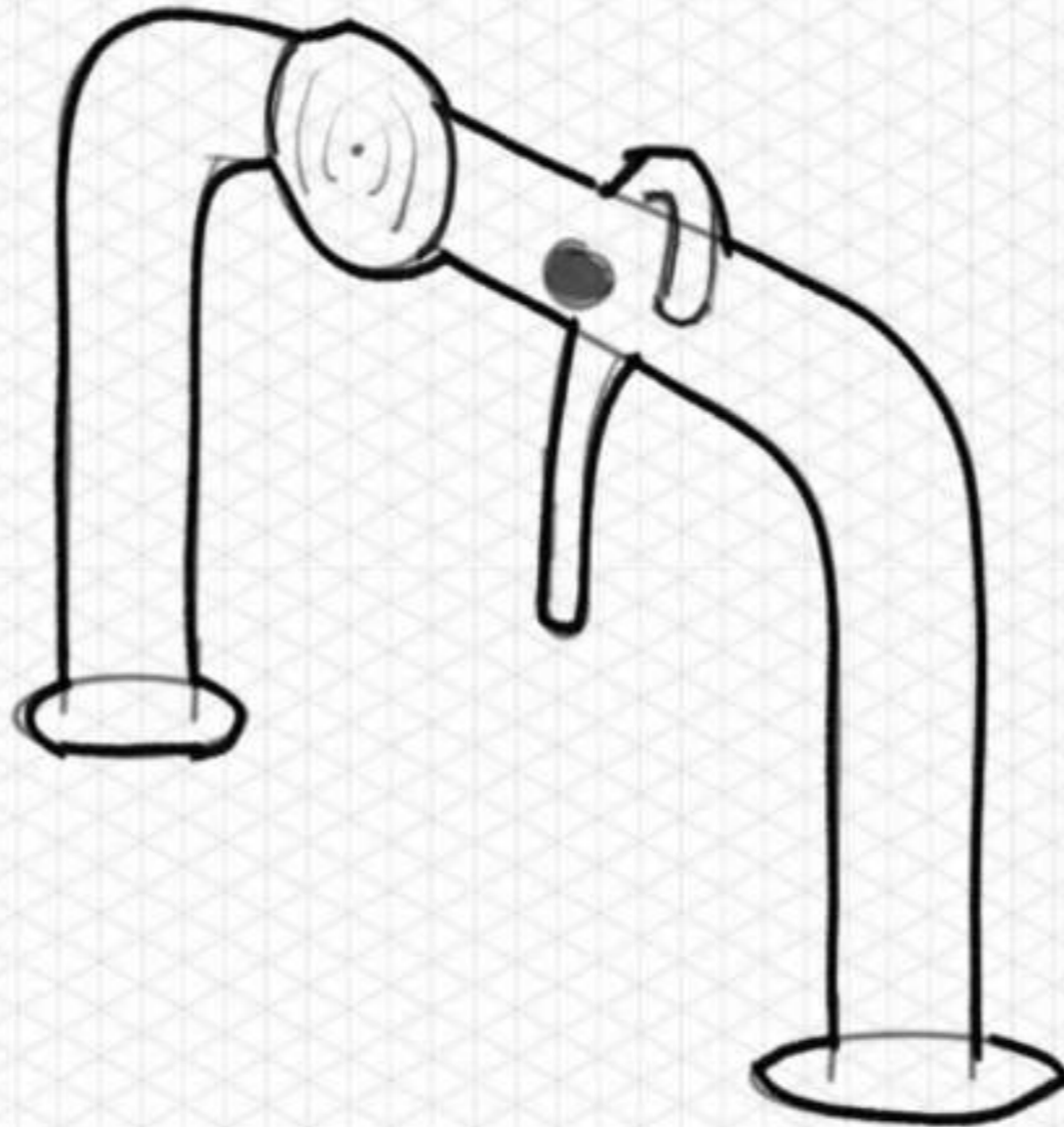


uses go card to
lock/unlock

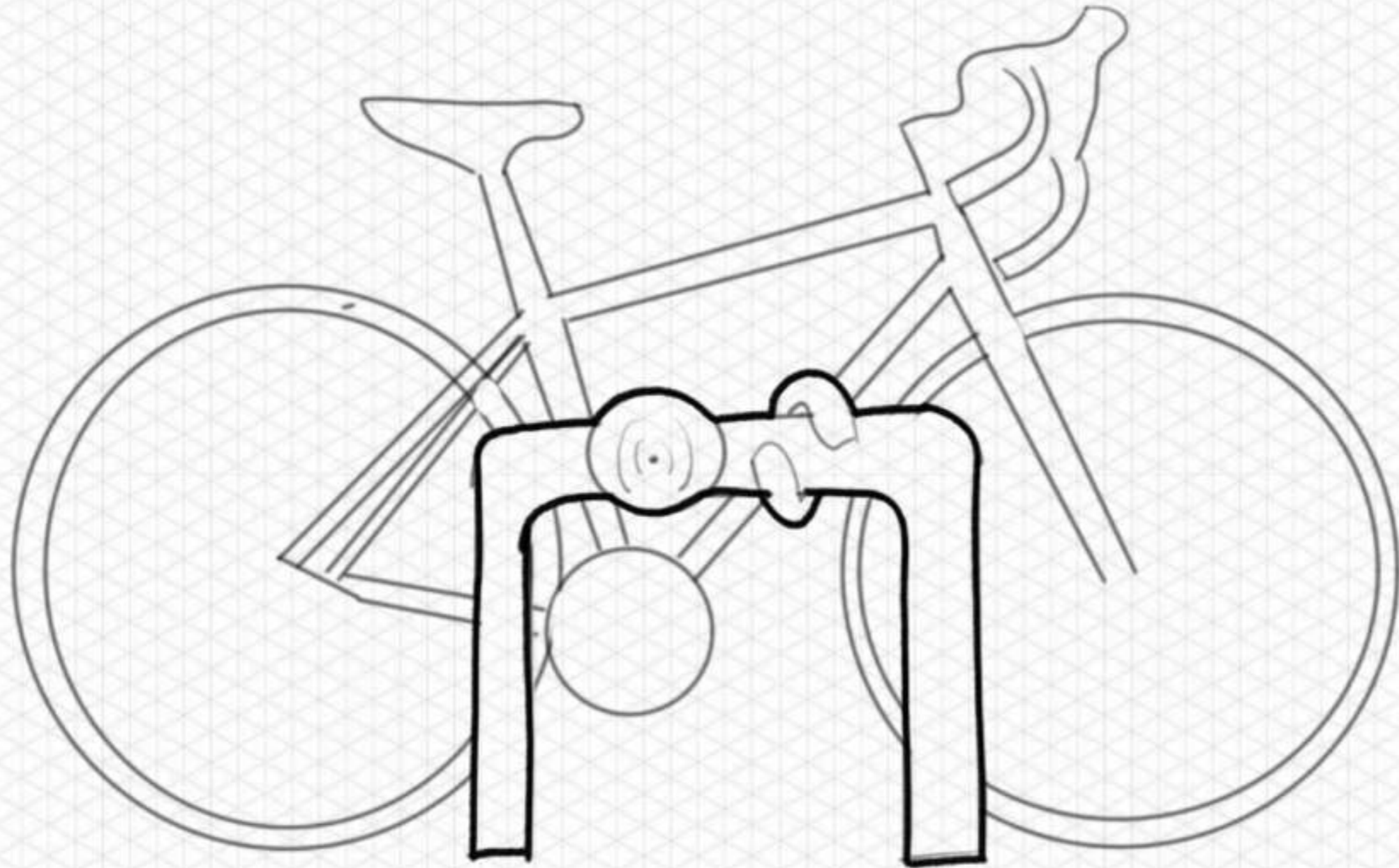


lock is
secured on
protruding
arm &
folds over
the frame
of the
bike

Initial concept idea 2



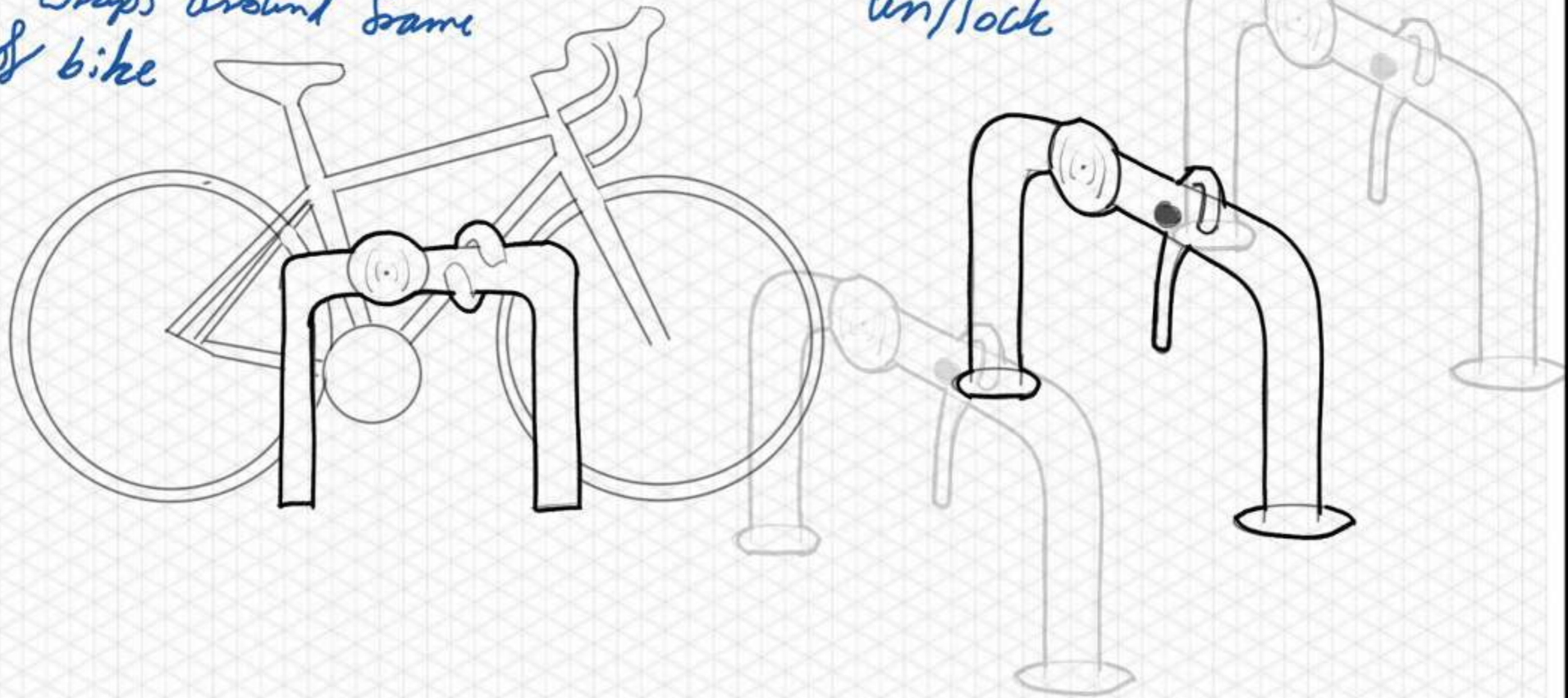
Initial concept idea 2



Initial concept idea 2

flexible lock chain
wraps around frame
& bike

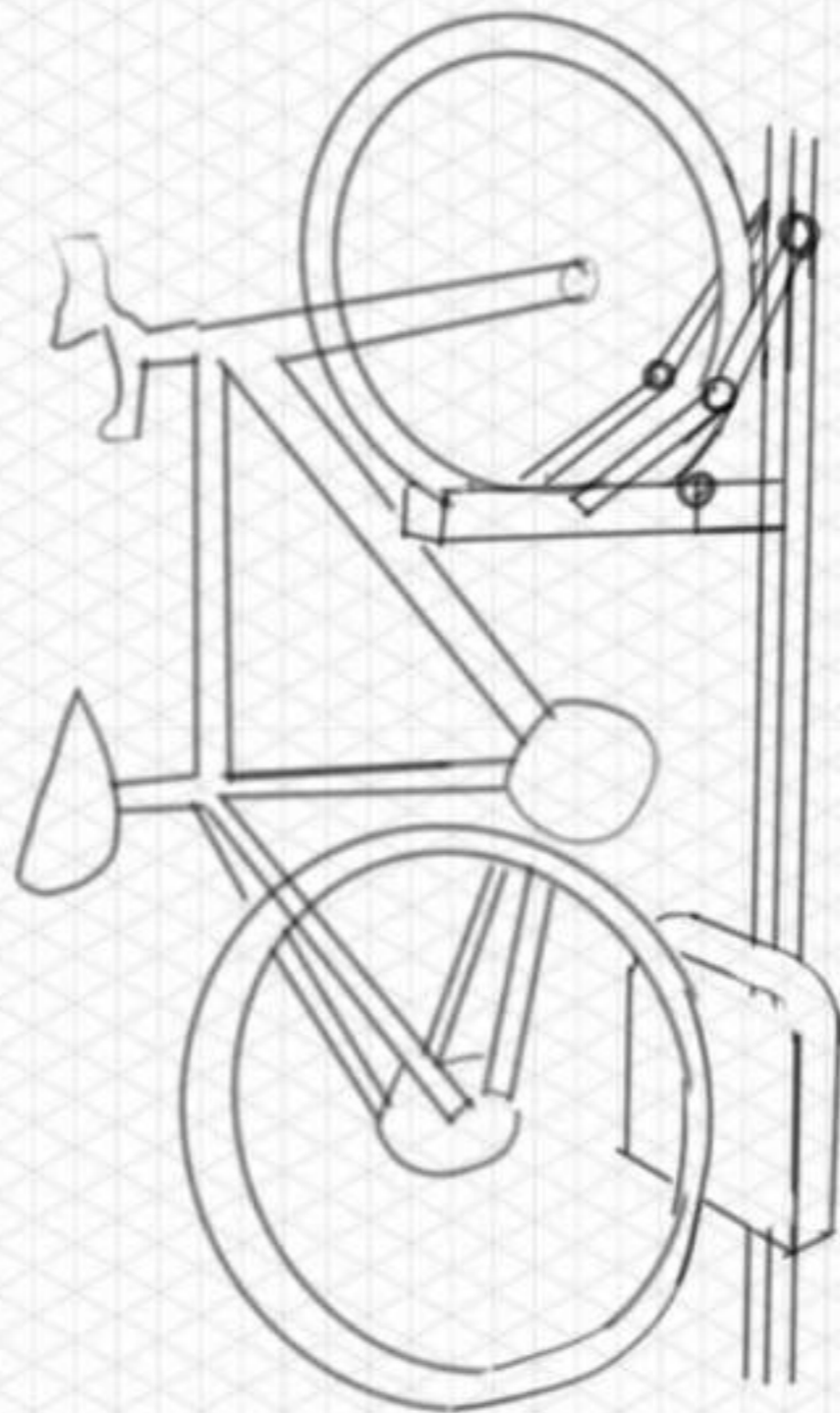
go card to
un/lock



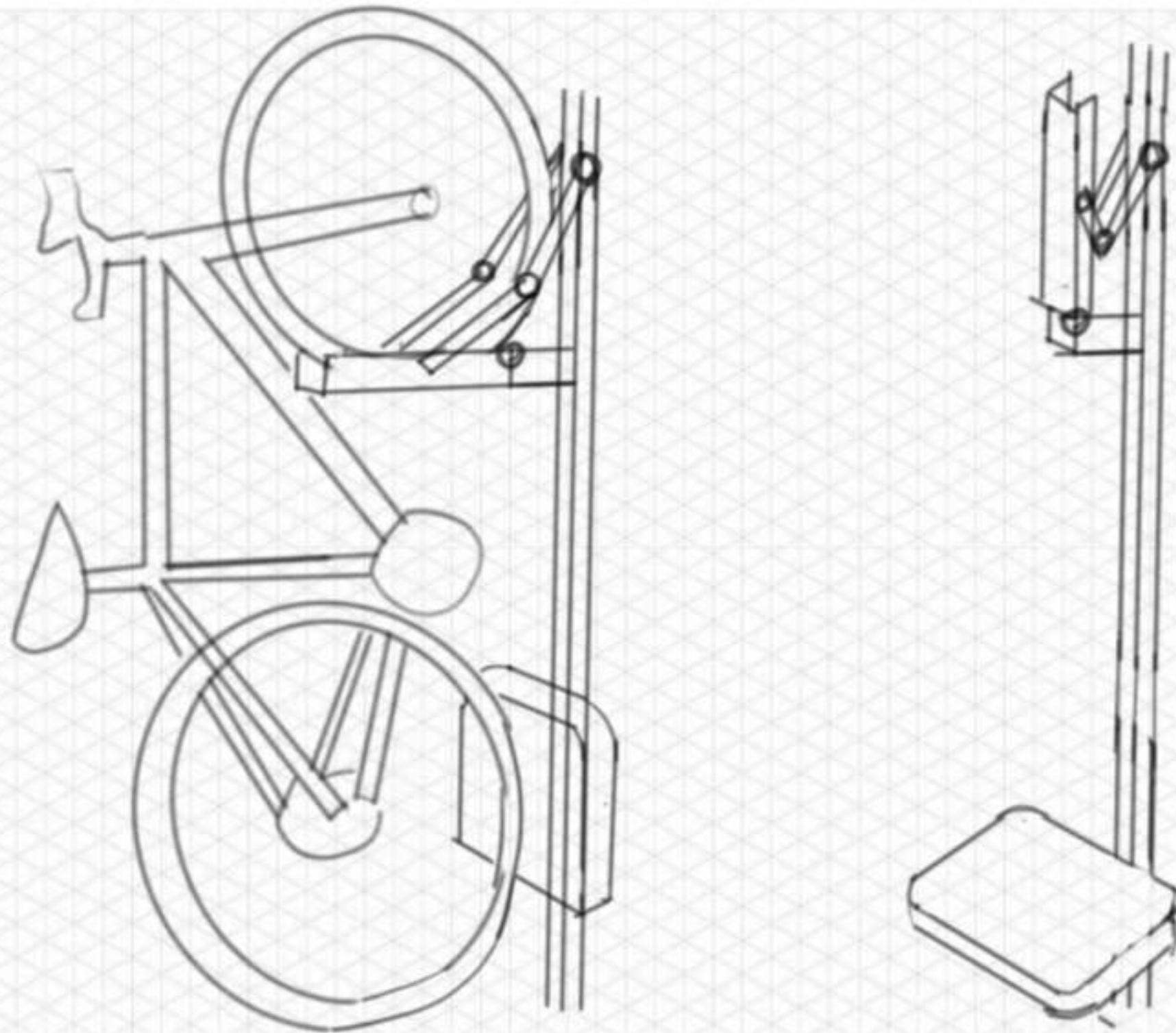
Initial concept idea 3



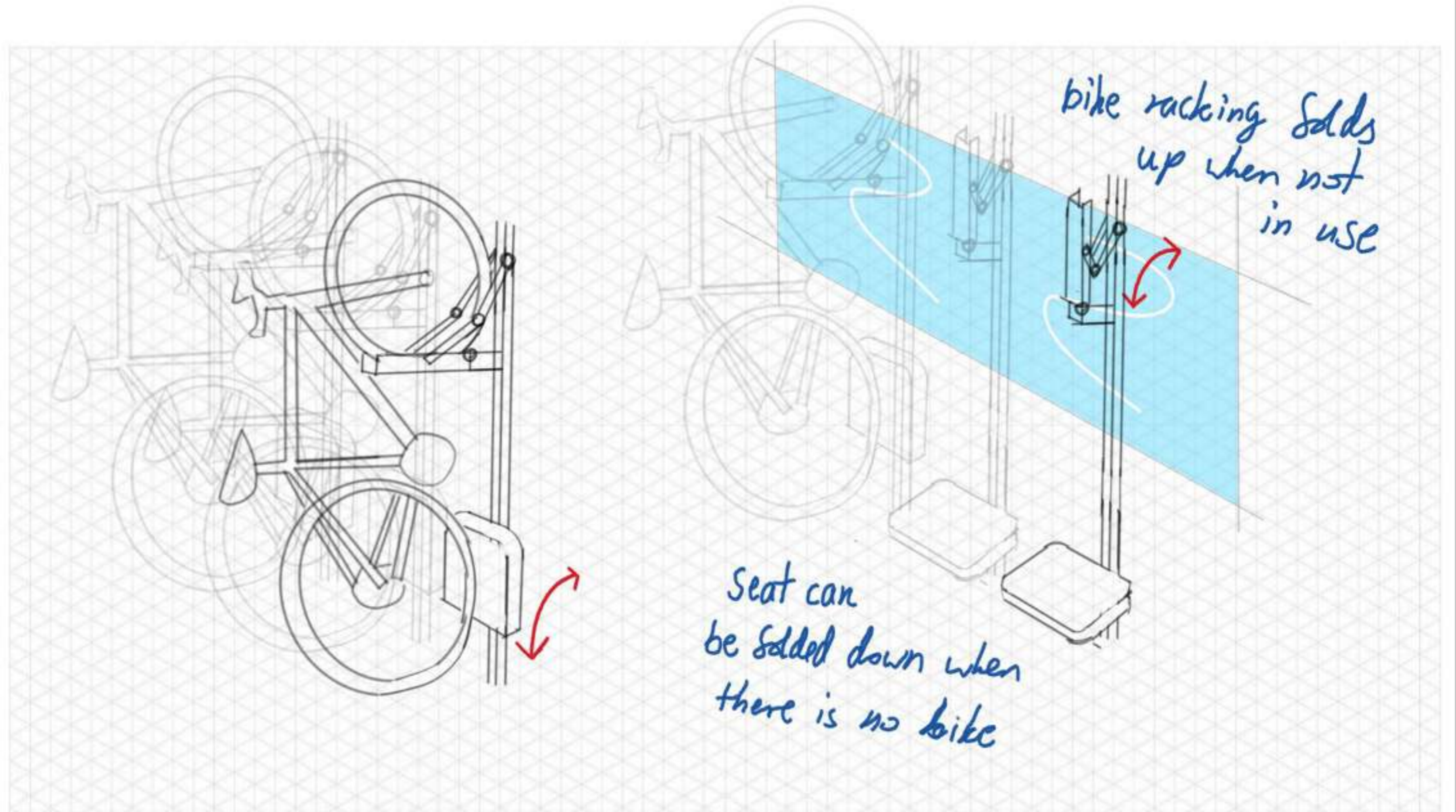
Initial concept idea 3



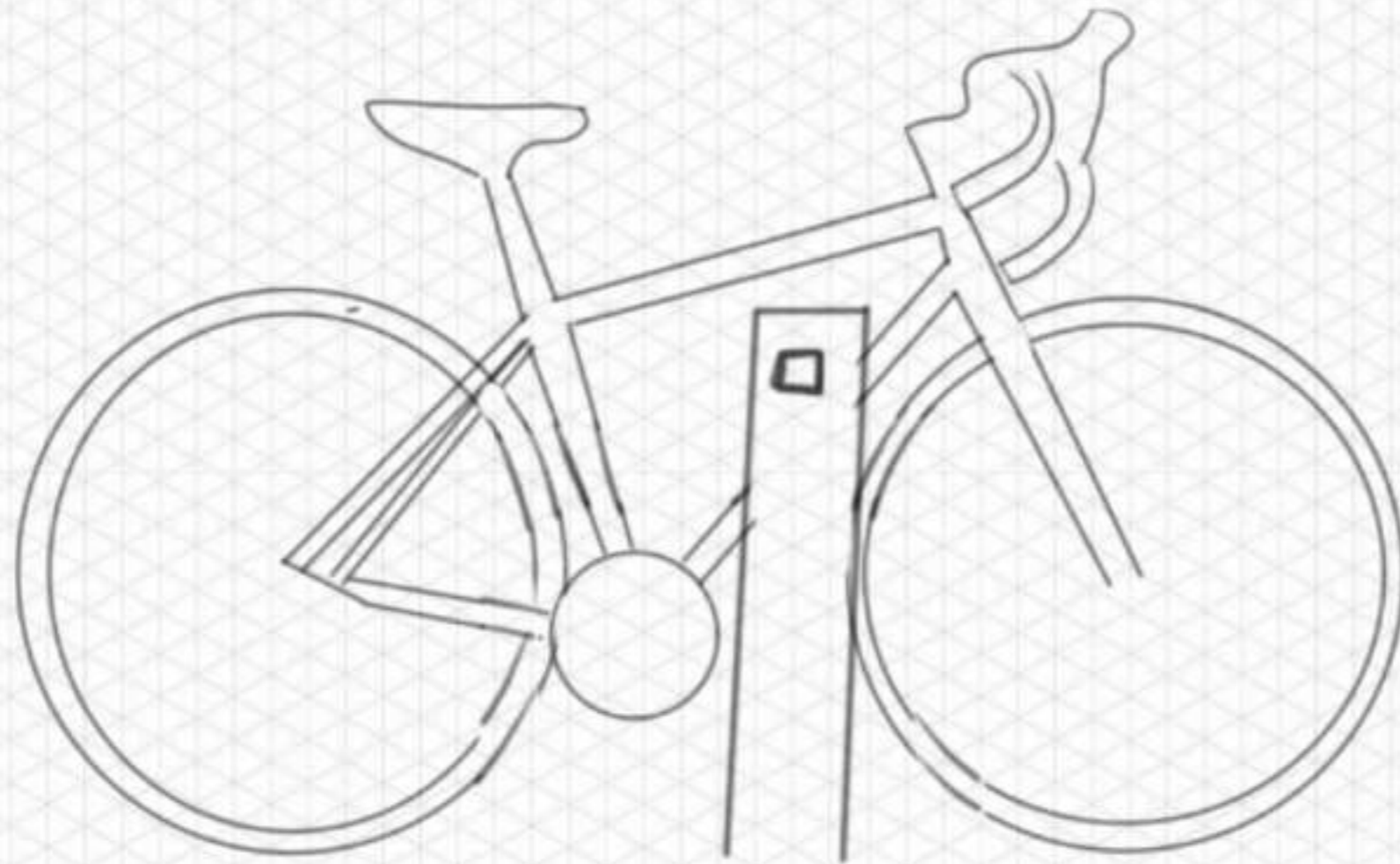
Initial concept idea 3



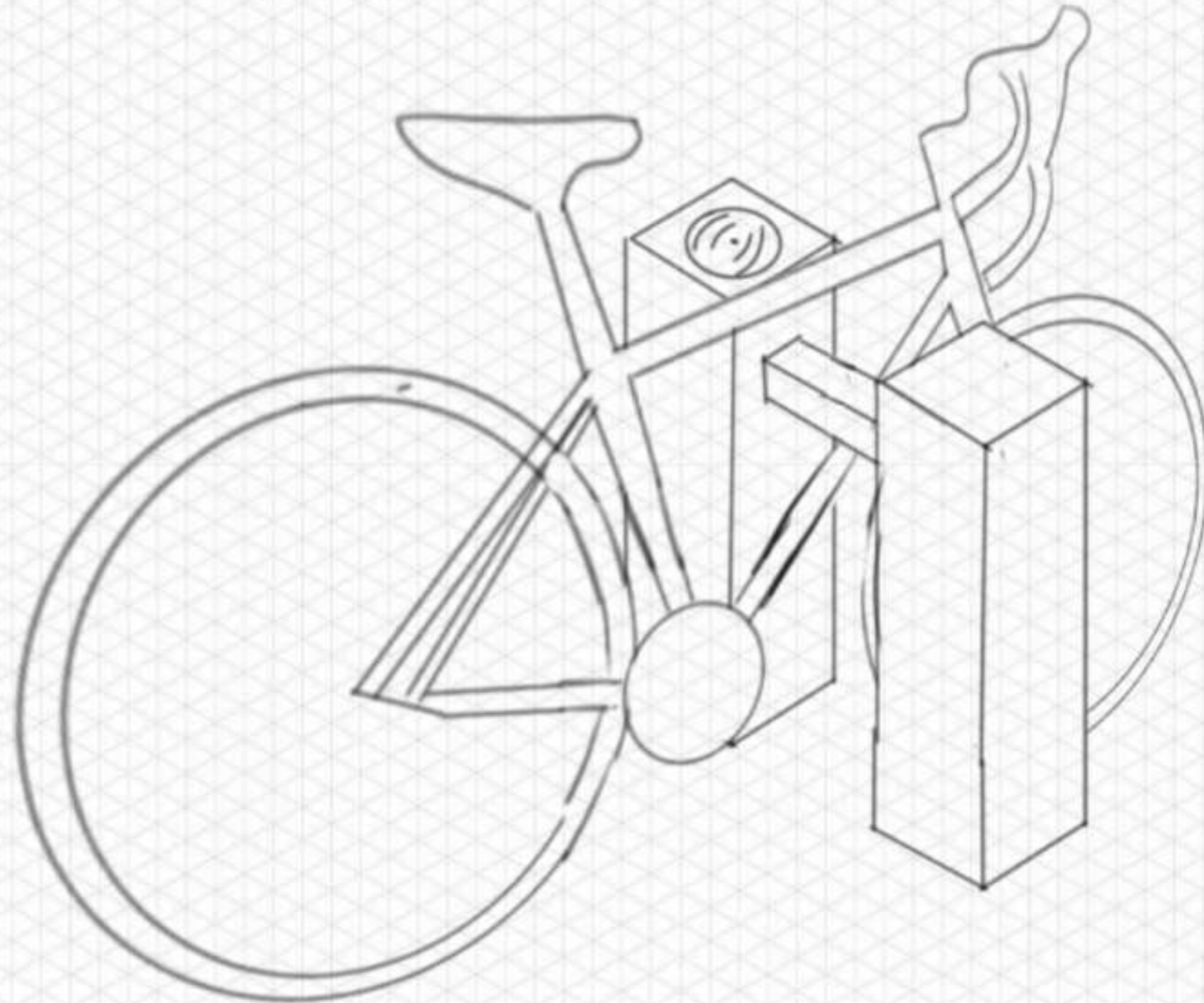
Initial concept idea 3



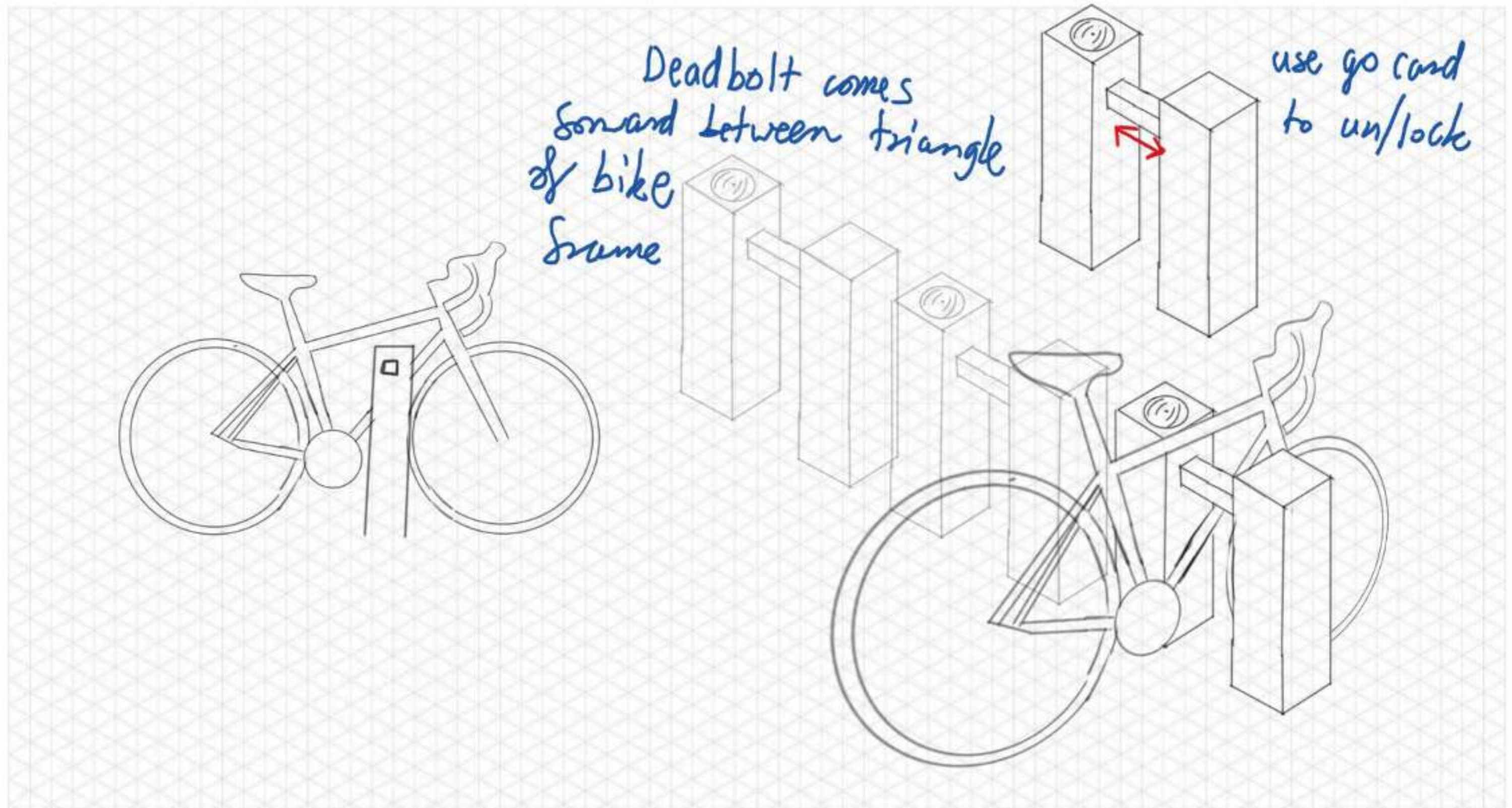
Initial concept idea 4



Initial concept idea 4



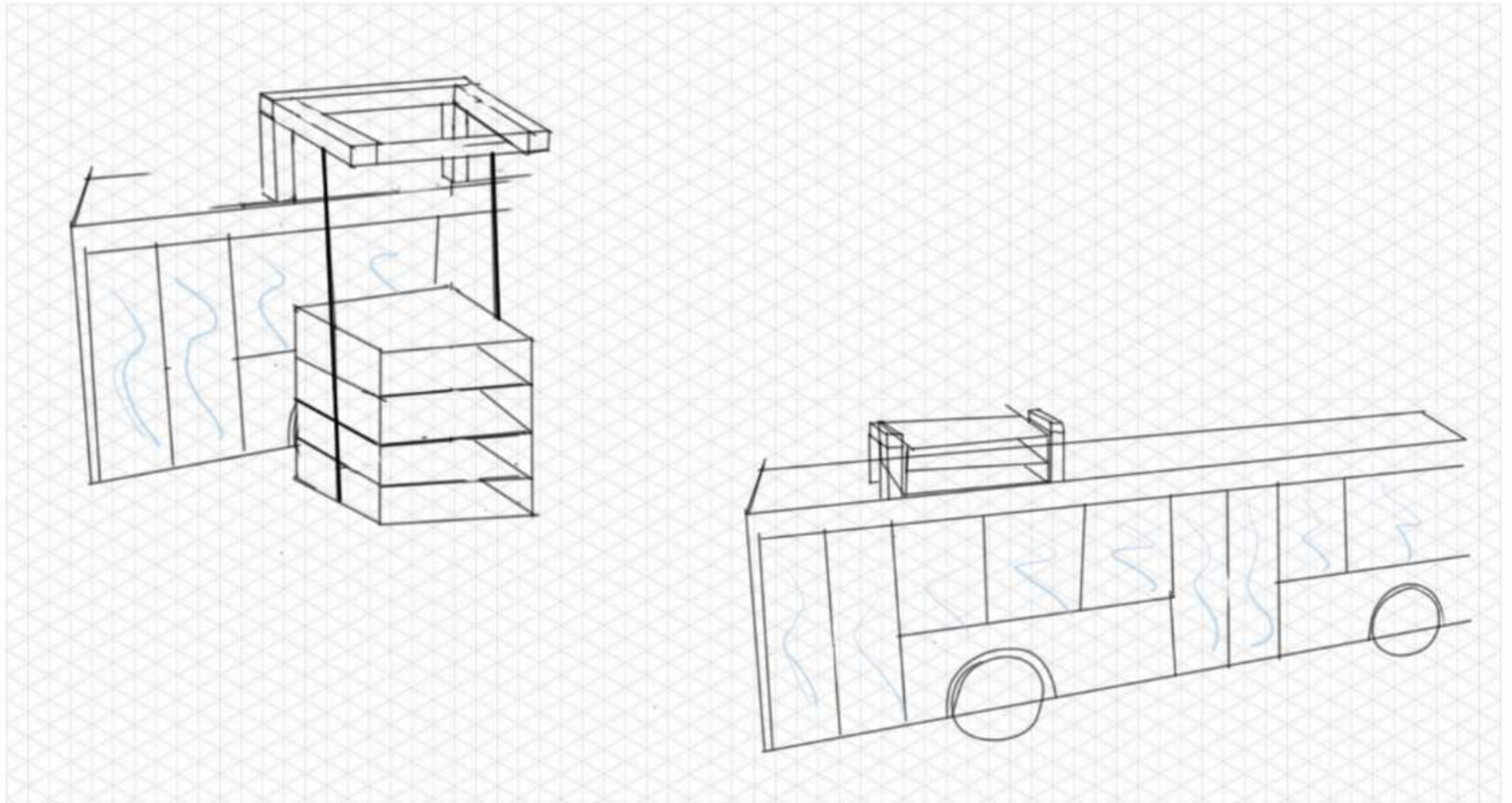
Initial concept idea 4



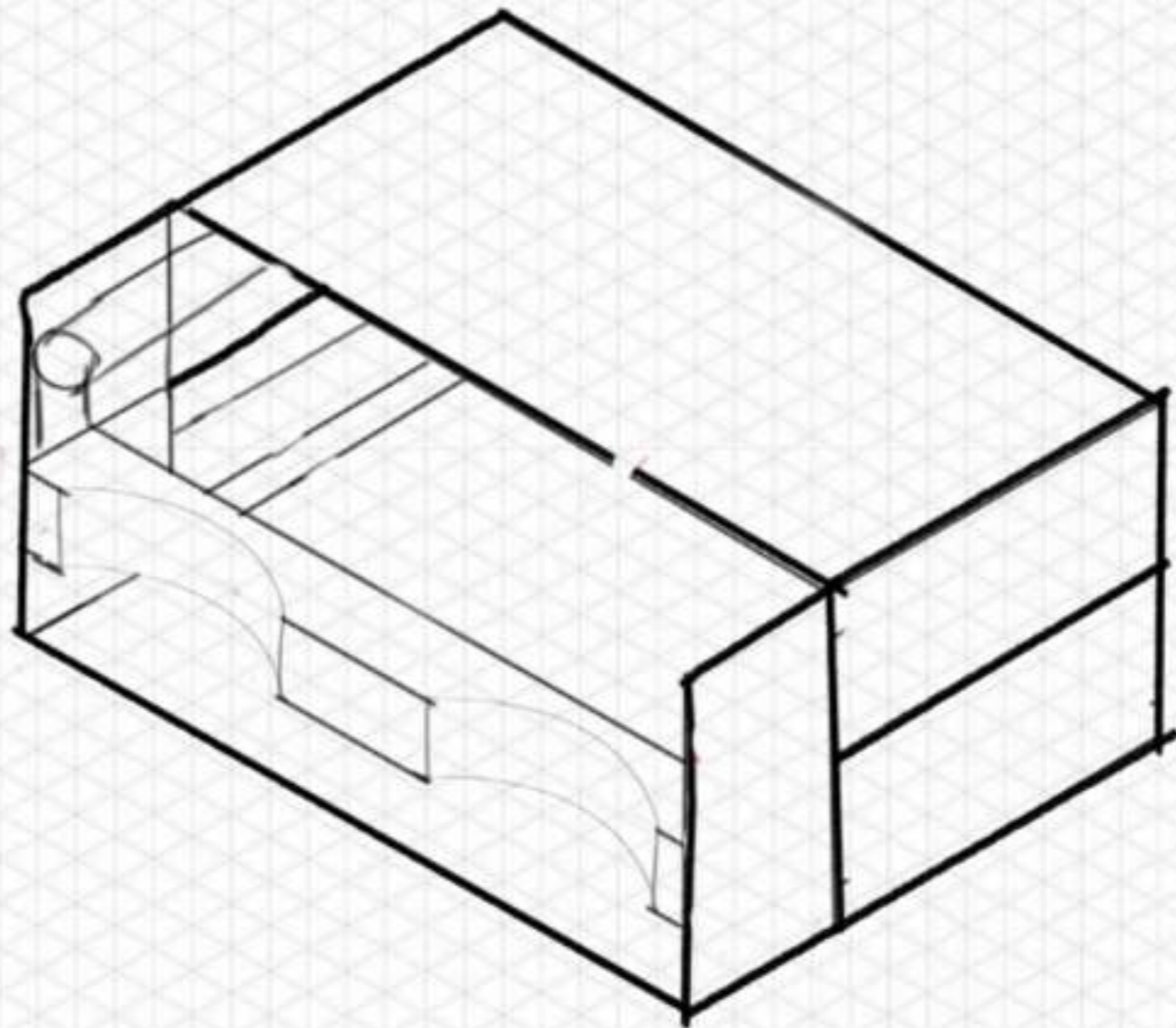
Initial concept idea 5



Initial concept idea 5

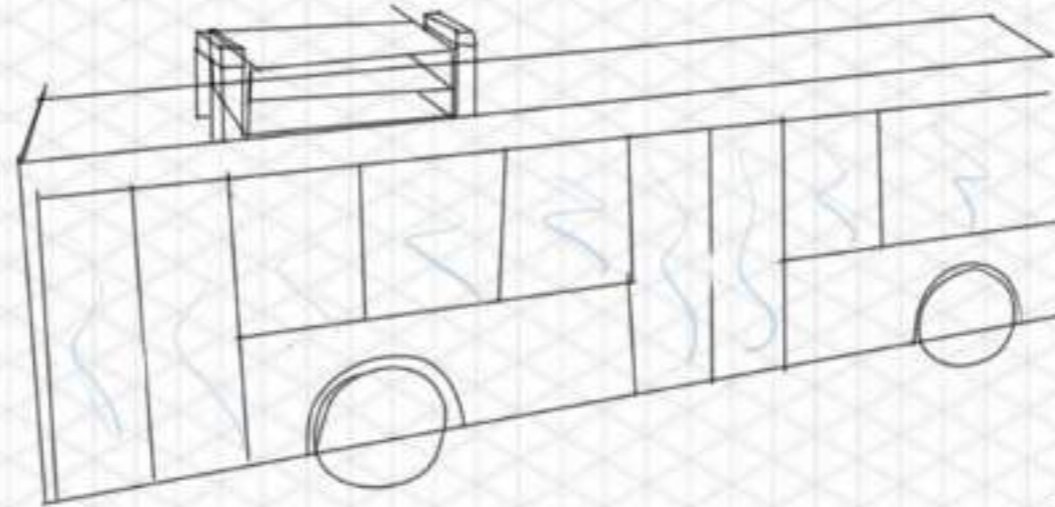
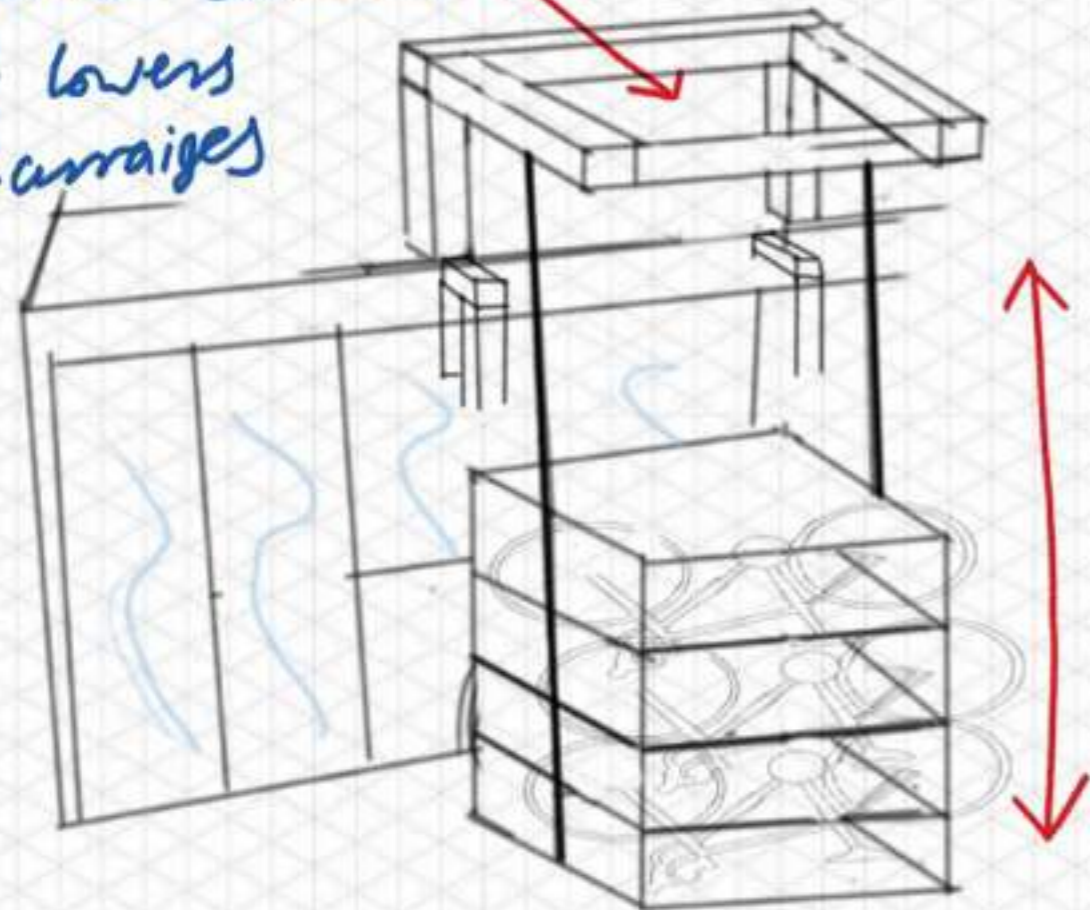


Initial concept idea 5

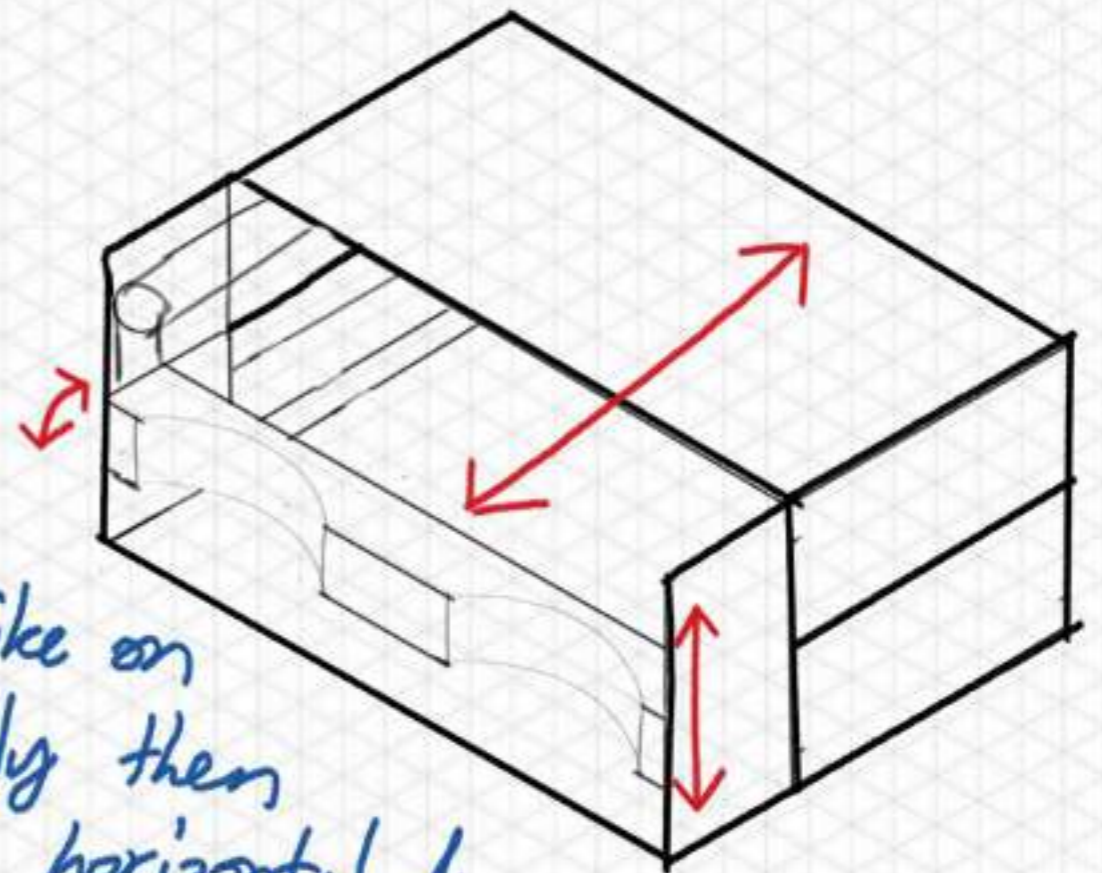


Initial concept idea 5

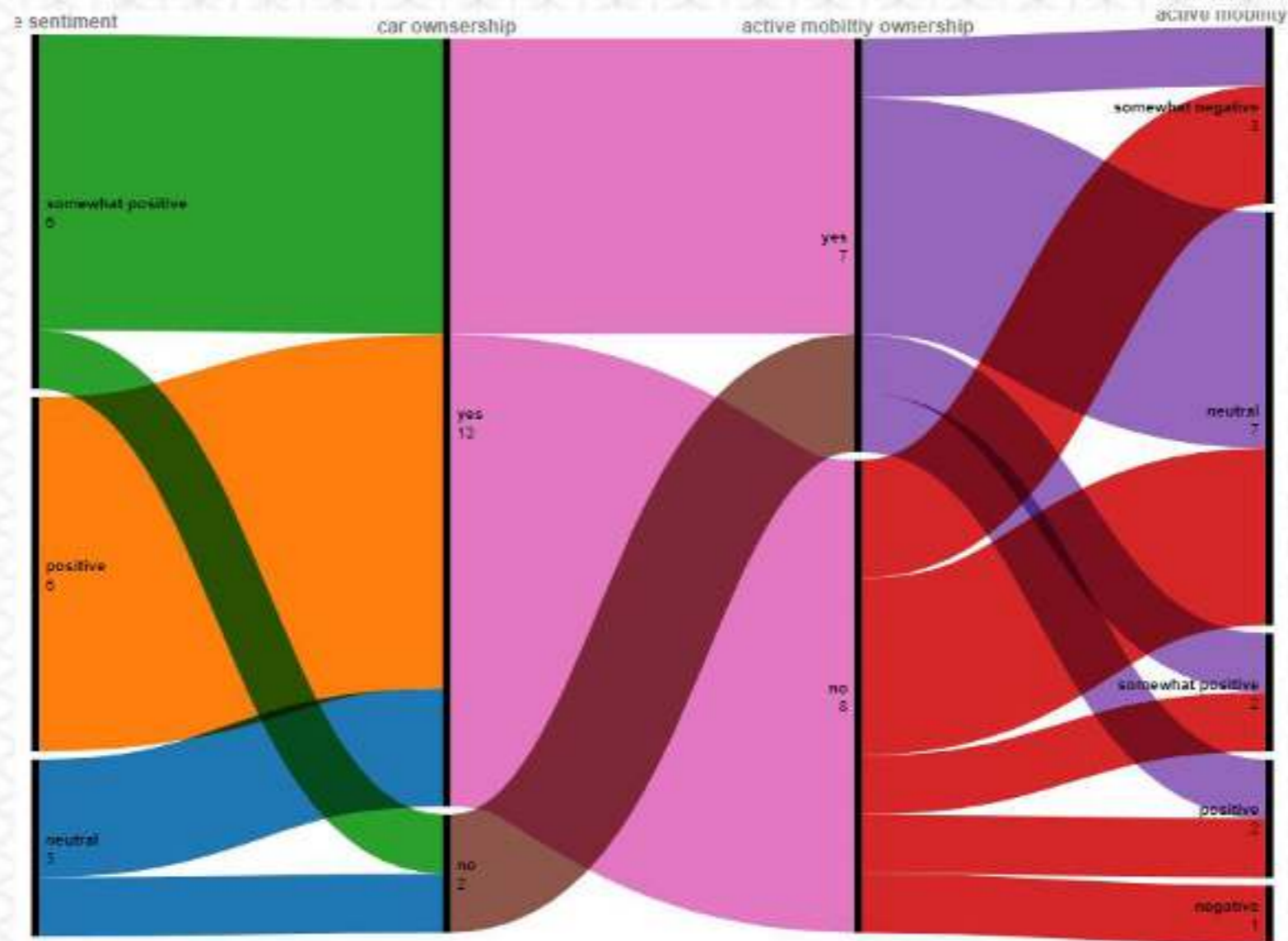
lifting arm
comes forward
& lowers
carriages



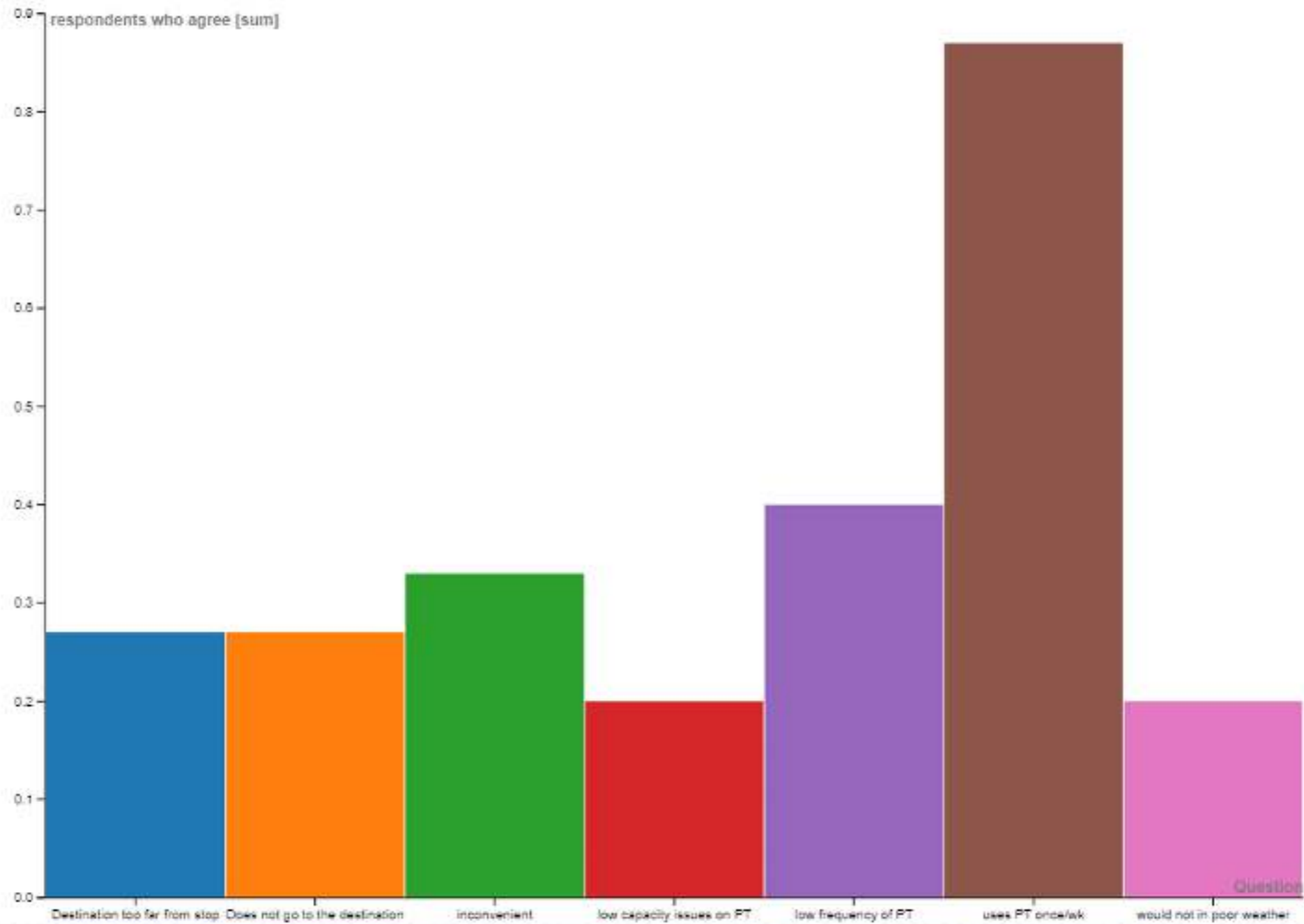
place bike on
vertically then
rotate to horizontal &
push in



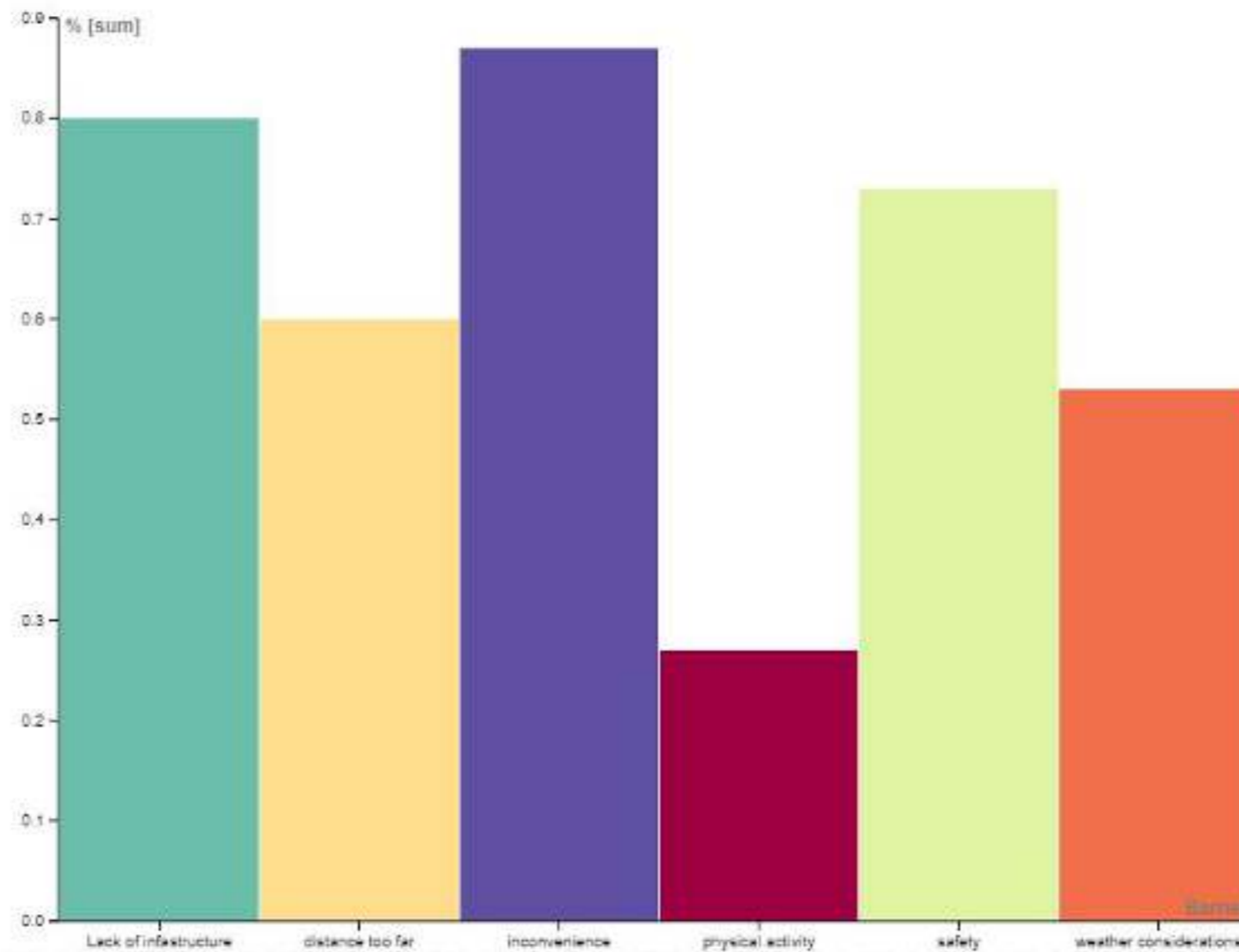
Survey Result Visualisation



Survey Result Visualisation



Survey Result Visualisation



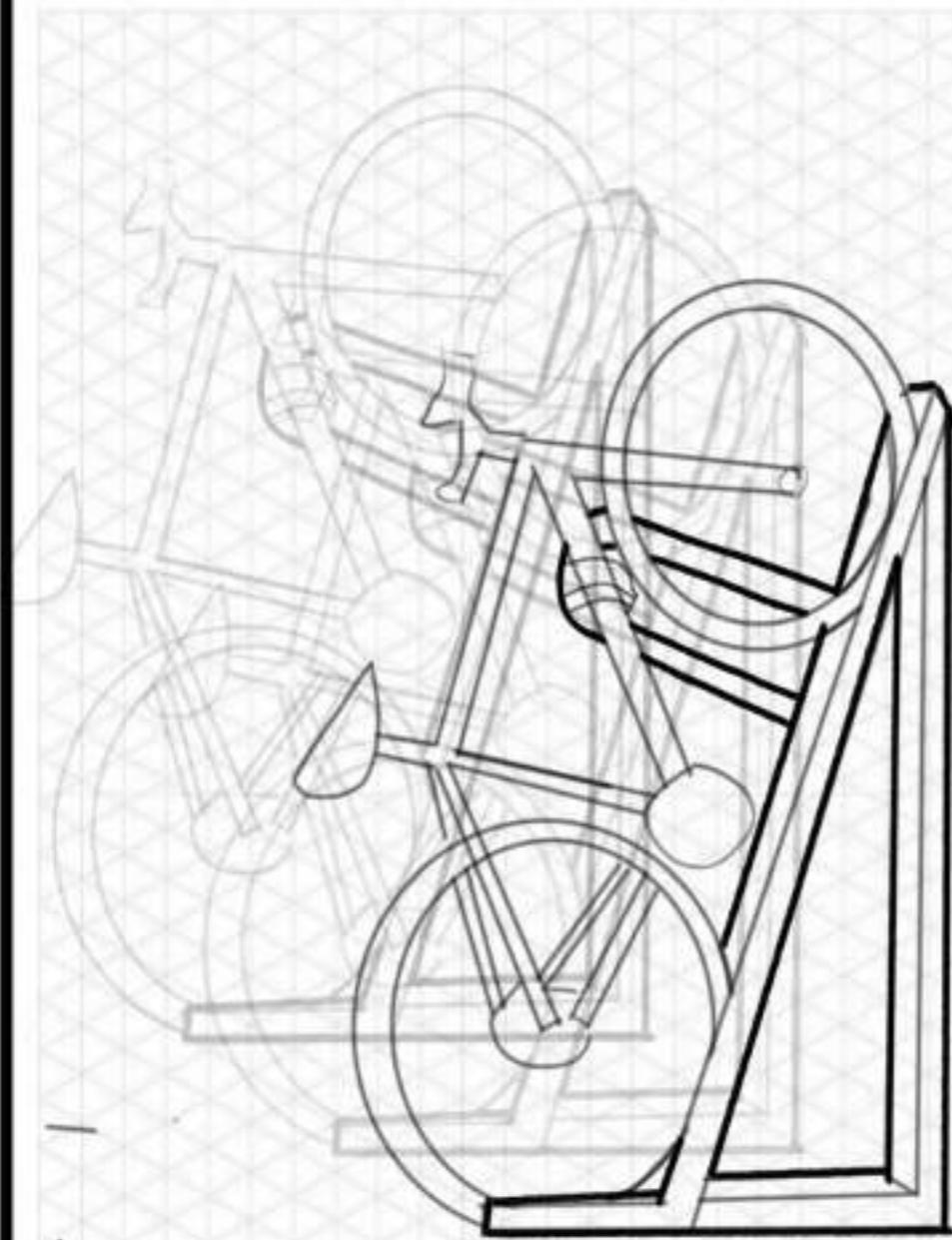
Utilised Sources in Report

- Anwar, M. (2012). Paradox between Public Transport and Private Car as a Modal Choice in Policy Formulation. *Journal of Bangladesh Institute of Planners*, 2. <https://doi.org/10.3329/bip.v2i0.9568>
- Brisbane City Council (2021). Brisbane's e-mobility strategy. https://www.brisbane.qld.gov.au/sites/default/files/documents/2021-06/20210623-Brisbanes-emobility-strategy_web-tagged.pdf
- Buehler, R., & Pucher, J. (2021). *Cycling for sustainable cities*. MIT Press.
- Coxon, S., & Napper, R. (2021). *Advancing a Design Approach to Enriching Public Mobility*. Berlin, Heidelberg: Springer.
- Debnath, A. K., Haworth, N., & Heesch, K. C. (2021). Women cycling in Queensland: Results from an observational study. *Accident Analysis & Prevention*, 151. <https://doi.org/10.1016/j.aap.2021.105980>
- Friman, M., Gärling, T., & Ettema, D. (2019). Improvement of public transport services for non-cycling travelers. *Travel Behaviour and Society*, 16, 235-240. <https://doi.org/10.1016/j.tbs.2018.03.004>
- Ghban, A. M., Kamruzzaman, Md., Deboose, A., & Coxon, S. (2023). The wider barrier effects of public transport infrastructure: The case of level crossings in Melbourne. *Journal of Transport Geography*, 108. <https://doi.org/10.1016/j.jtrangeo.2023.103554>
- Handy, S., Van Wee, B., & Kroesen, M. (2014). Promoting cycling for transport: research needs and challenges. *Transport reviews*, 34(1), 4-24. <https://doi.org/10.1080/01441647.2013.860204>
- Heinen, E., & Buehler, R. (2019). Bicycle parking: a systematic review of scientific literature on parking behaviour, parking preferences, and their influence on cycling and travel behaviour. *Transport reviews*, 39(5), 630-656. <https://doi.org/10.1080/01441647.2019.1590477>
- Heinen, E., Van Wee, B., & Maat, K. (2010). Commuting by bicycle: an overview of the literature. *Transport reviews*, 30(1), 59-96. <https://doi.org/10.1080/01441640903187001>
- Limb, M., & Collyer, S. (2023). The effect of safety attire on perceptions of cyclist dehumanisation. *Transportation research part F: traffic psychology and behaviour*, 95, 494-509. <https://doi.org/10.1016/j.trf.2023.05.008>
- Napper, R. (2014). Modular route bus design—A method of meeting transport operation and vehicle manufacturing requirements. *Transportation Research Part C: Emerging Technologies*, 38, 56-72. <https://doi.org/10.1016/j.trc.2013.11.002>
- Napper, R. (2020). What is a parked bicycle? Vehicle fleet characteristics in Australia. *Transportation Research Interdisciplinary Perspectives*, 7. <https://doi.org/10.1016/j.trip.2020.100204>
- Napper, R. (2023). Napper cycling typology: Identifying and understanding different bicycle trip purposes. *Transportation Research Interdisciplinary Perspectives*, 17. <https://doi.org/10.1016/j.trip.2022.100740>
- Translink (2023). *Benefits of Public Transport*. <https://translink.com.au/travel-with-us/benefits-of-public-transport>
- Walsh, A., Washington, T., Estrupoff, M., & Heesch, K. (2021). Commuter Choices: A clustered, quasi-experimental trial of a social cognitive approach to increasing active commuting among office workers. *Journal of Transport & Health*, 20. <https://doi.org/10.1016/j.jth.2020.100998>
- Washington, T., Heesch, K., Wilson, S., & Ng, A. (2021). A Report on Good Practices in E-Bike Charging at Workplaces. https://eprints.qut.edu.au/209749/1/Best_Practice_for_ebike_Charging_Report_April_2021.pdf
- Zhang, H., Shaheen, S. A., & Chen, X. (2014). Bicycle evolution in China: From the 1900s to the present. *International Journal of Sustainable Transportation*, 8(5), 317-335. <https://doi.org/10.1080/15568318.2012.699999>

Research Report Graphics & Colour Palette



Concept Selection & Reasoning



bike is pushed up
onto racking



uses go card to
lock/unlock

Quite a simple design
w/out too much opportunities
to take it further.

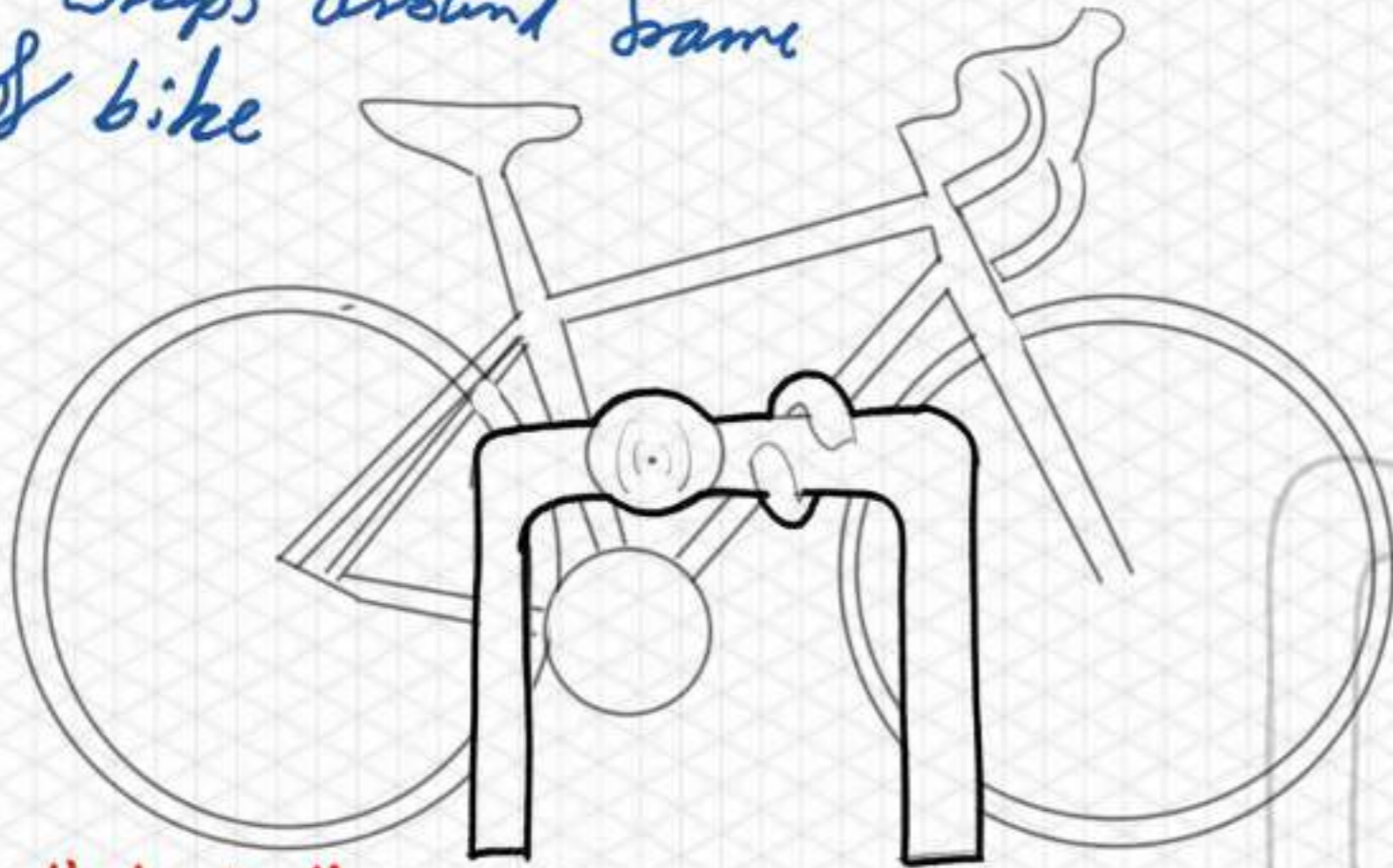


lock is
secured on
protruding
arm &
folds over
the frame
of the
bike

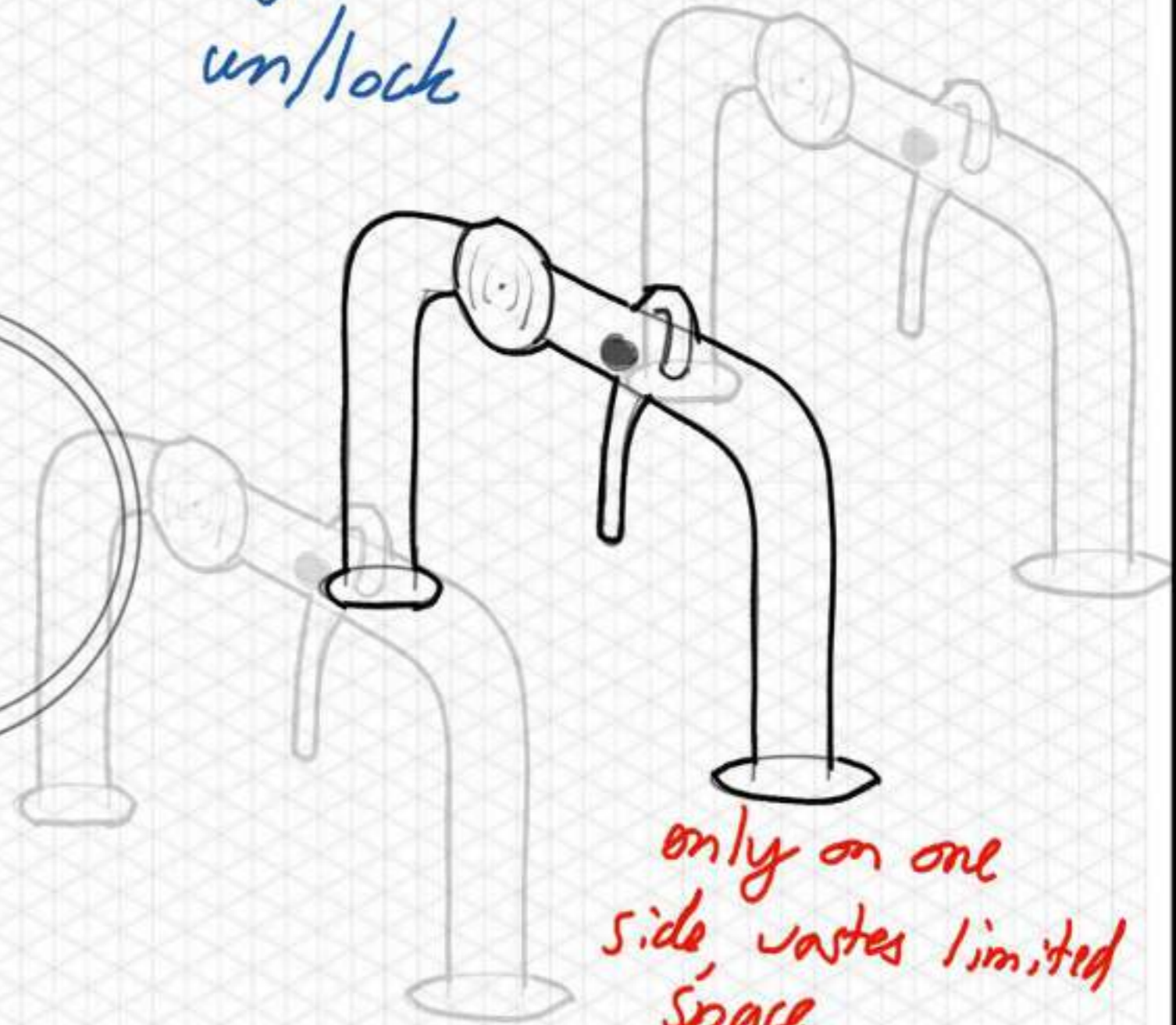
Simple is not bad but
limited

Concept Selection & Reasoning

flexible lock chain
wraps around frame
& bike



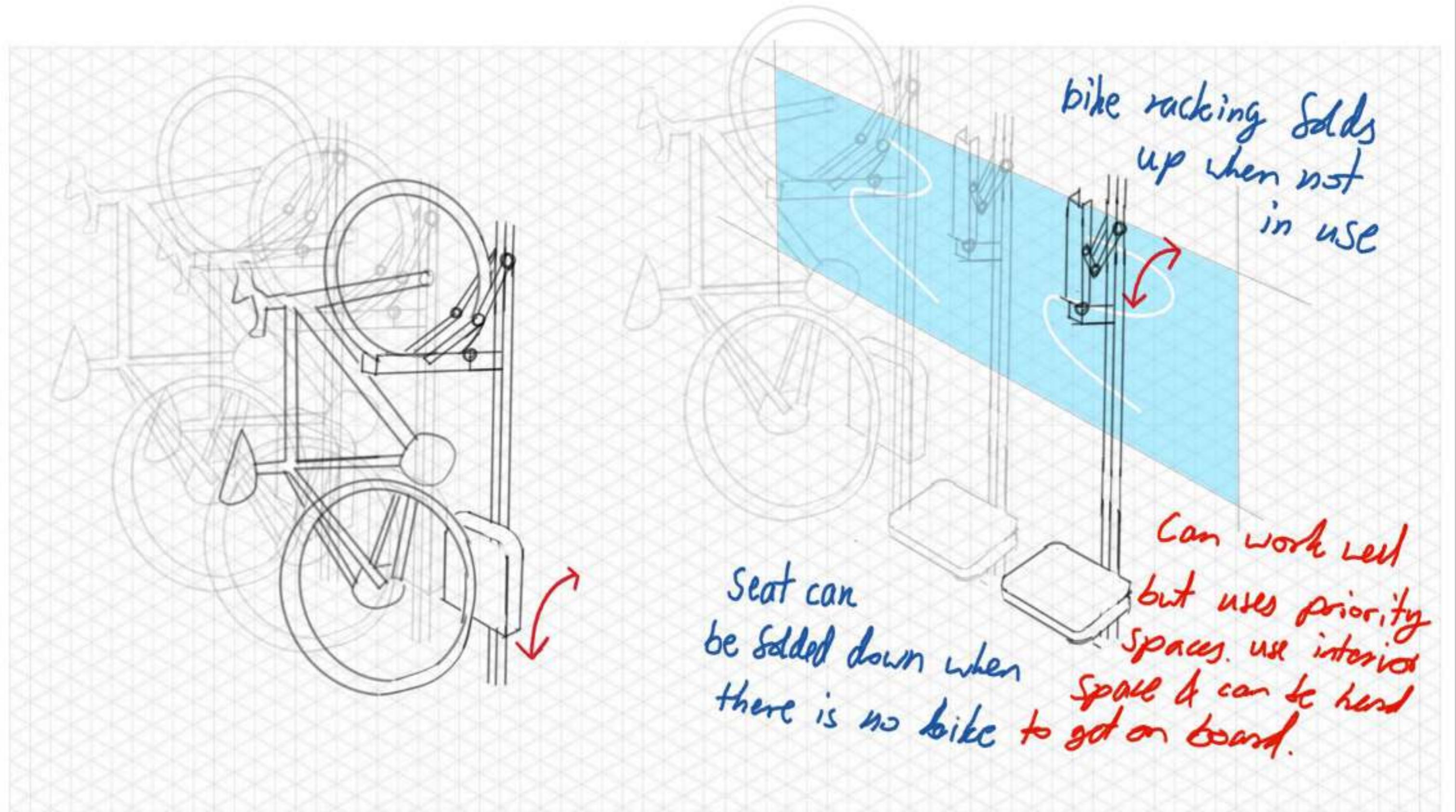
go card to
un/lock



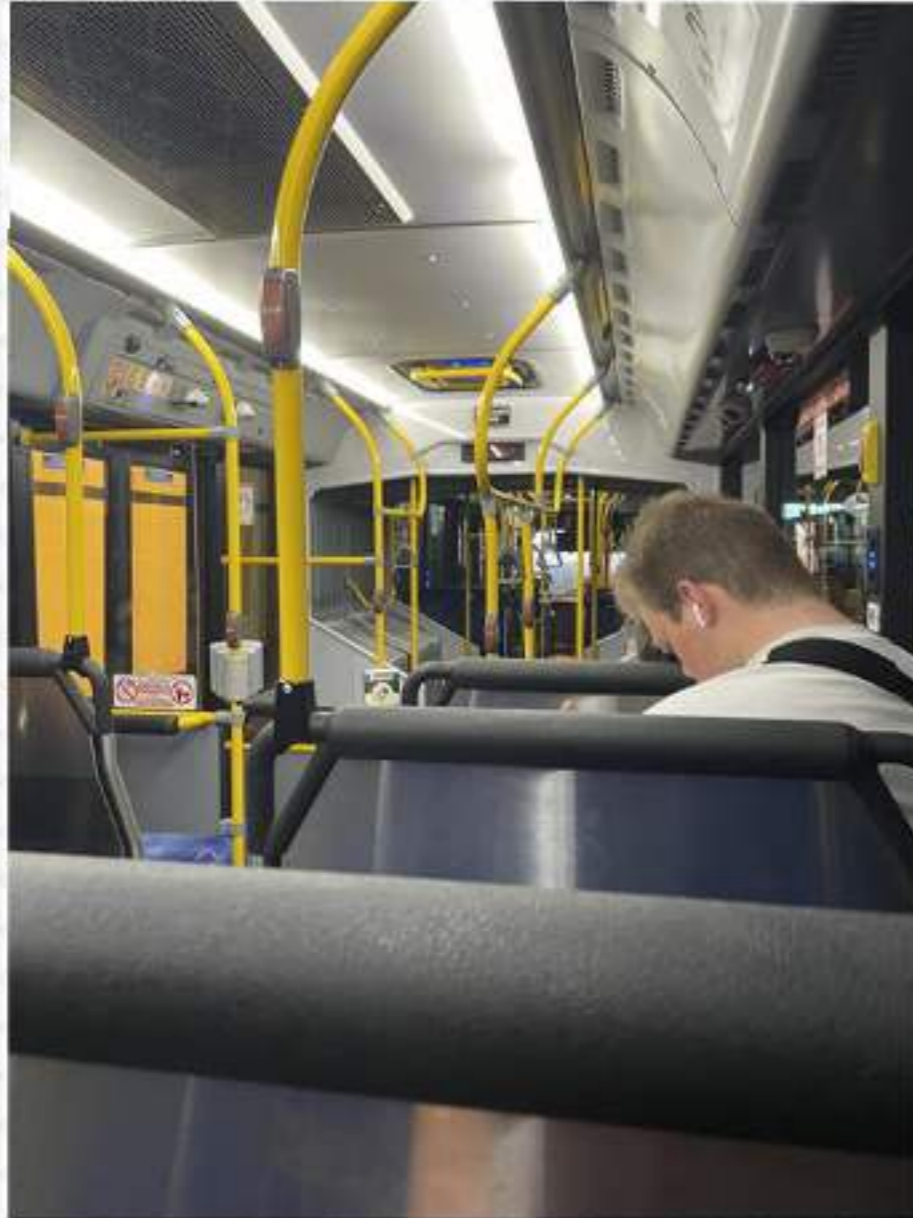
good that it offers
ride up & park convenience
but flexible lock chain can
still be cut relatively easily

only on one
side, wastes limited
space.

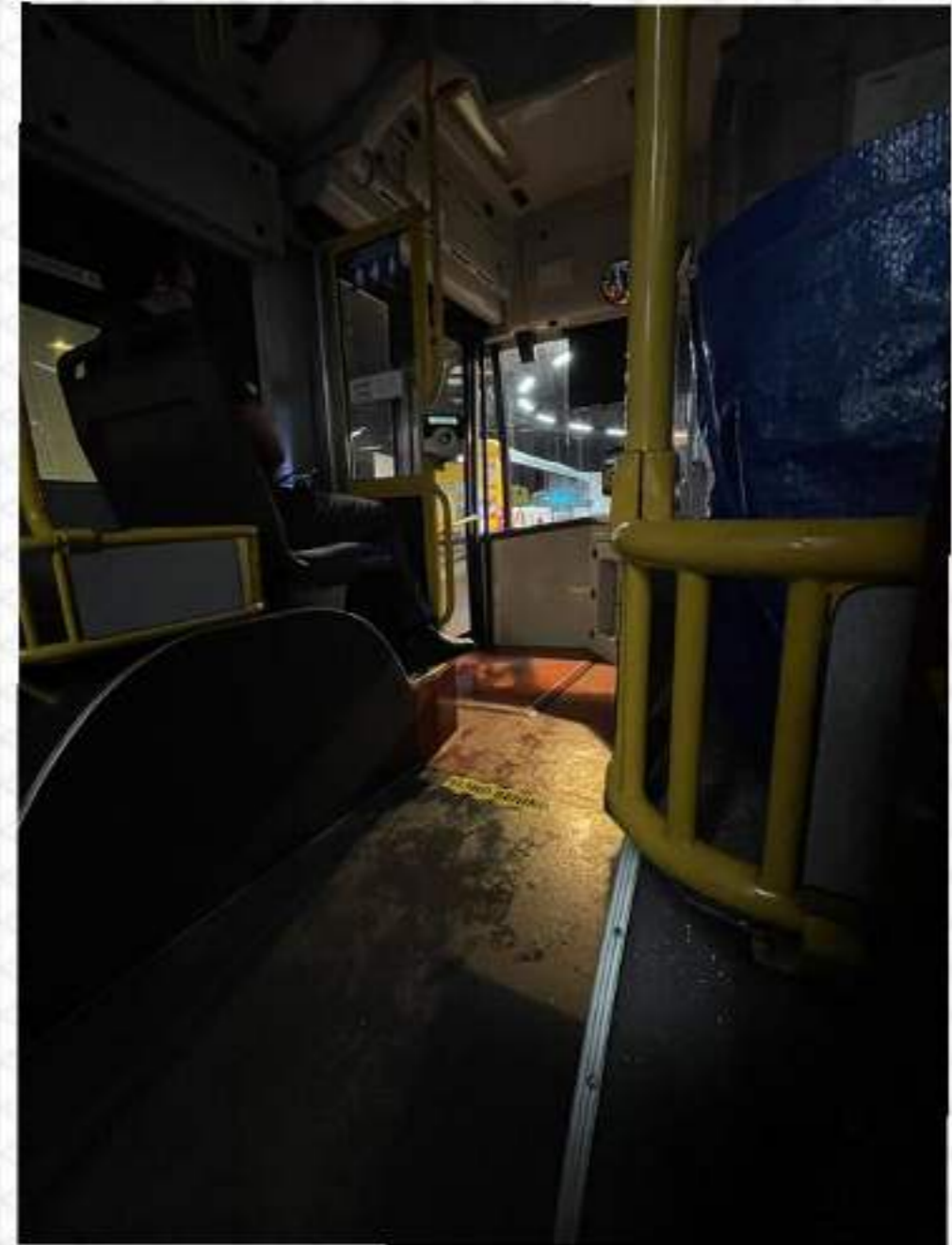
Concept Selection & Reasoning



Concept Selection & Reasoning



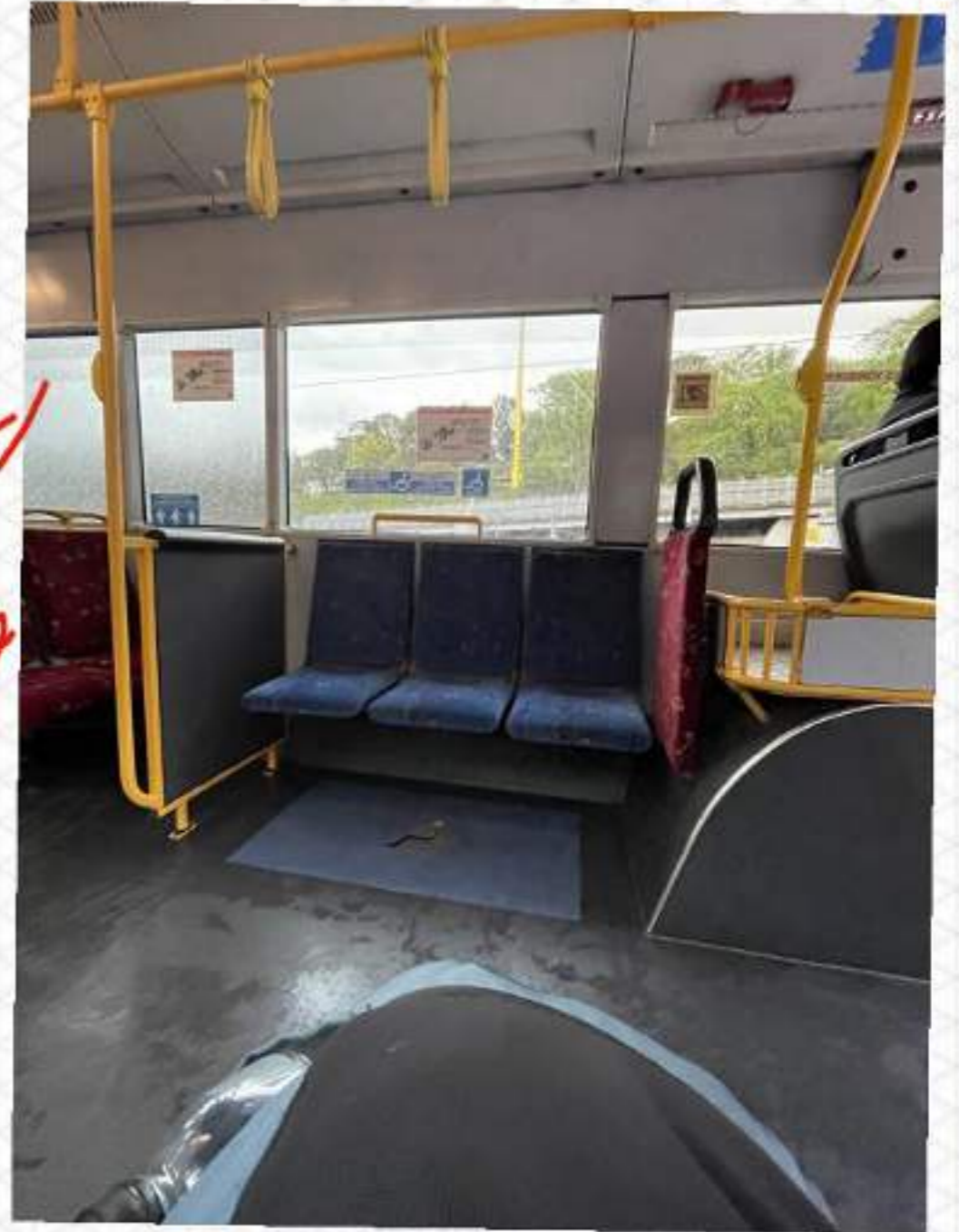
Narrow
entry ways
make it hard
to maneuver
a 1750 bike
around onto
bus especially
at peak hours
w/ packed bus.



Concept Selection & Reasoning



Limited priority seating. Ethical question of denying service to wheel(chair)/pram etc. uses ~~As~~ When space is already in use & filled by bikes.



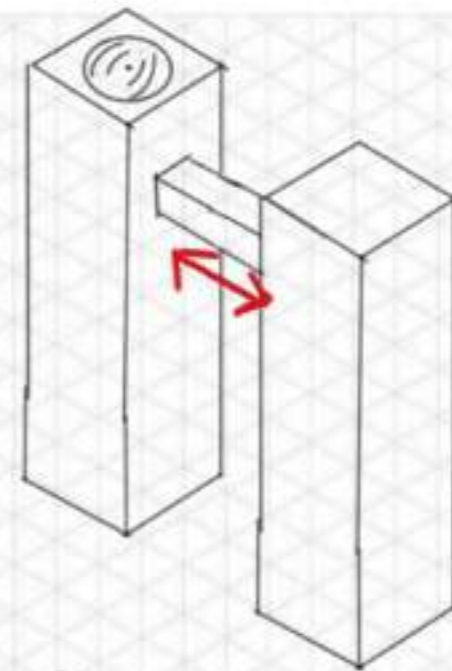
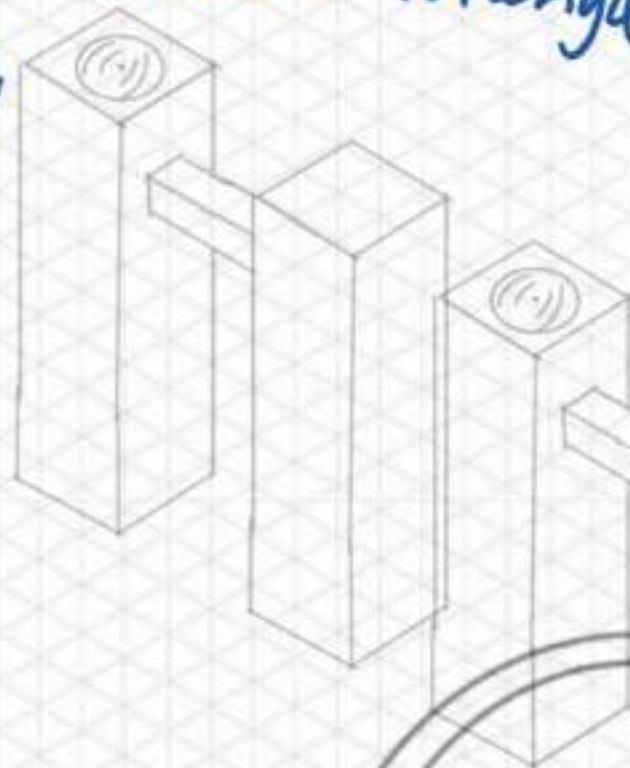
Concept Selection & Reasoning

Offers better security with thick deadbolt. But seat, handle bar & wheels can still be randomly stolen.



Offers ride & park convenience.

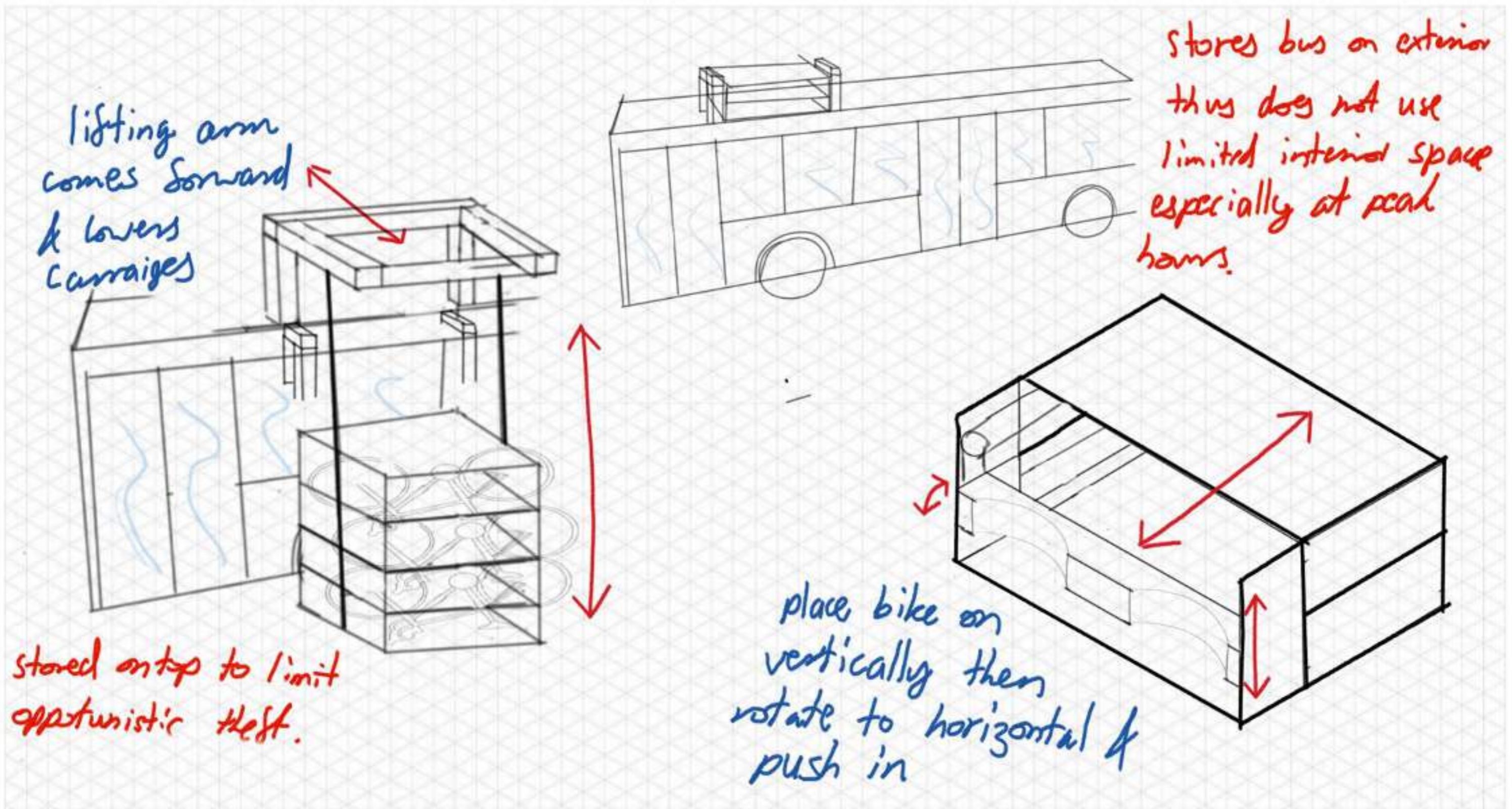
Deadbolt comes forward between triangle of bike frame



use go card to un/lock



Concept Selection & Reasoning



Concept Selection & Reasoning

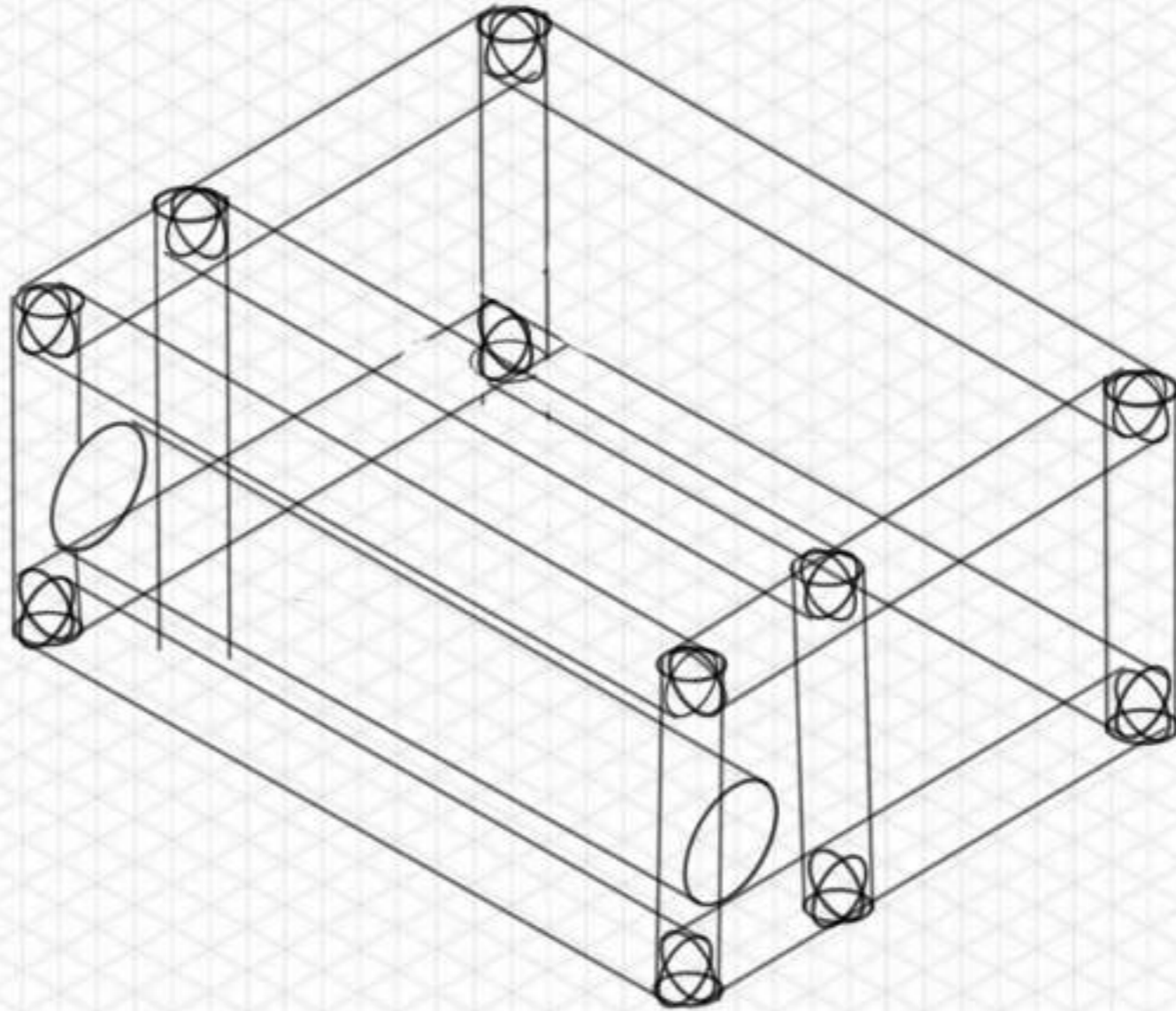
When on front or behind, increases bus turning circle. Harder to navigate narrow / underground roadways



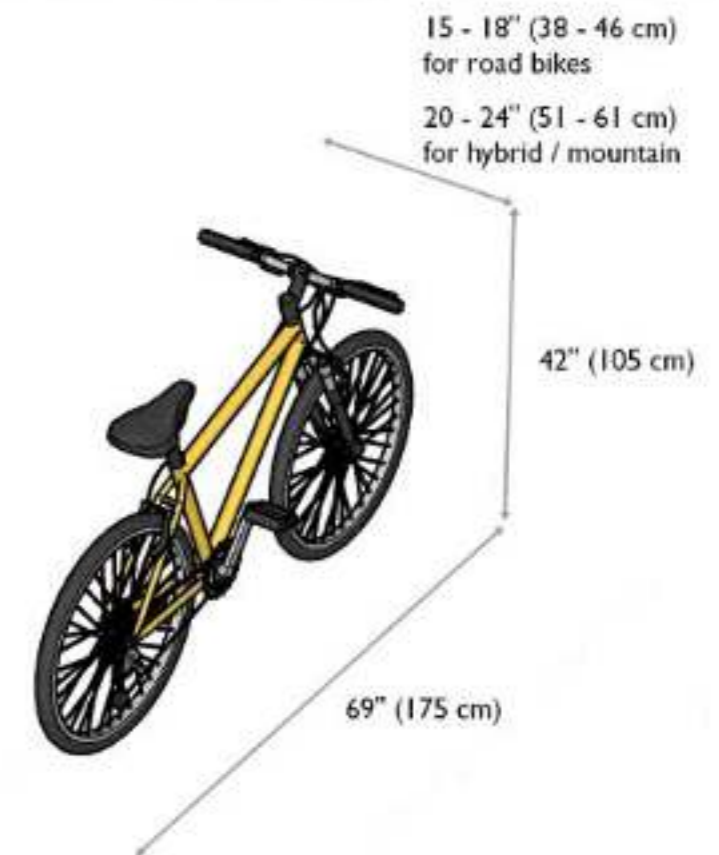
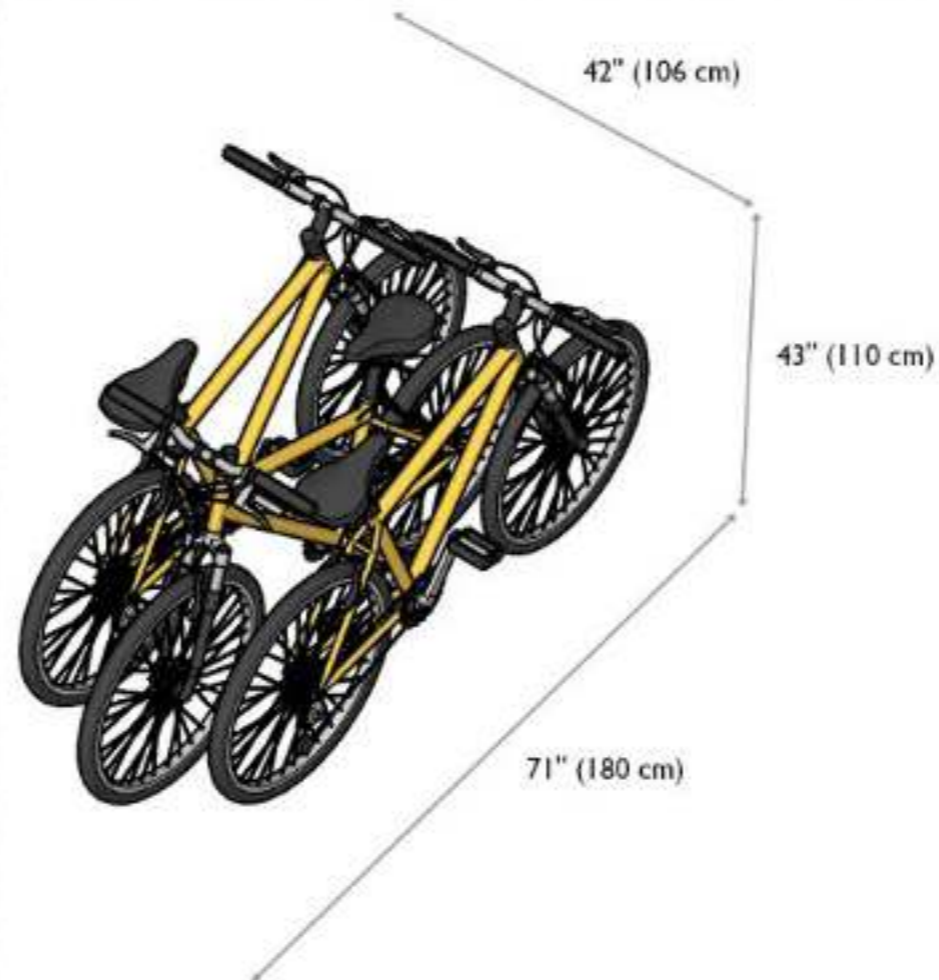
Also presents as a theft opportunity when ever bus is stopped. too easy to be taken quietly. At traffic lights, quiet stops etc.



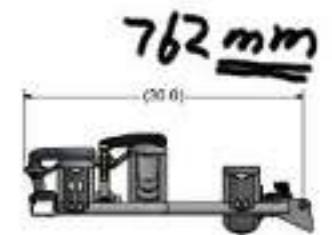
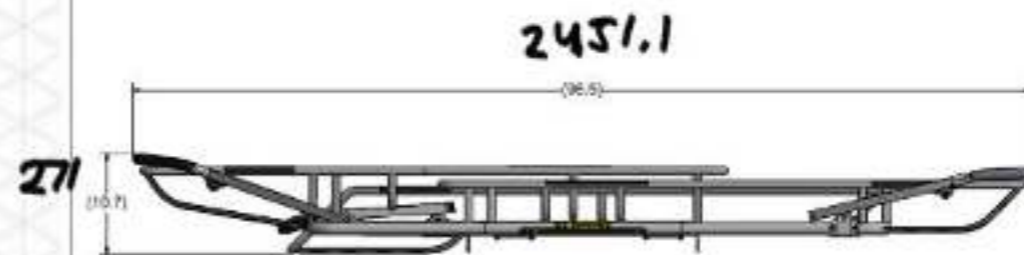
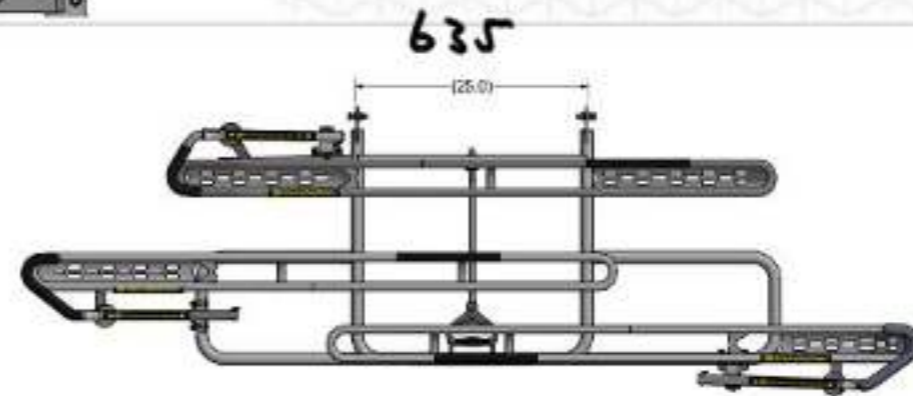
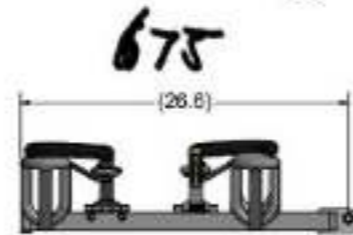
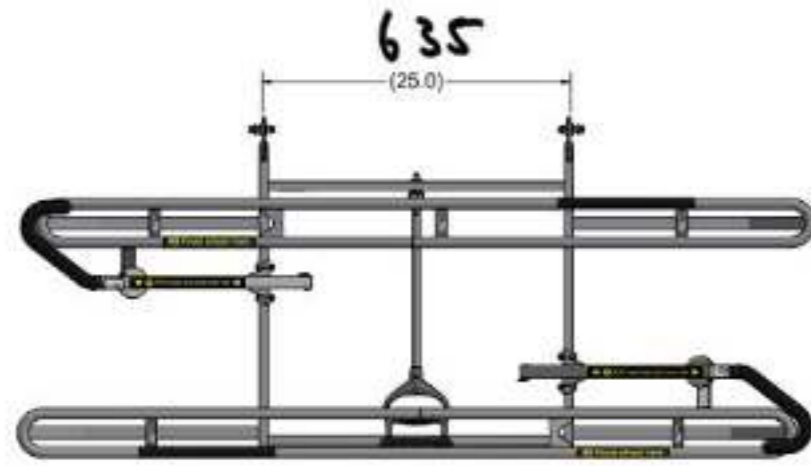
Concept Refinement



Concept Refinement - Avg Bike Dimensions



Concept Refinement - Bus Bike Rack Measurements

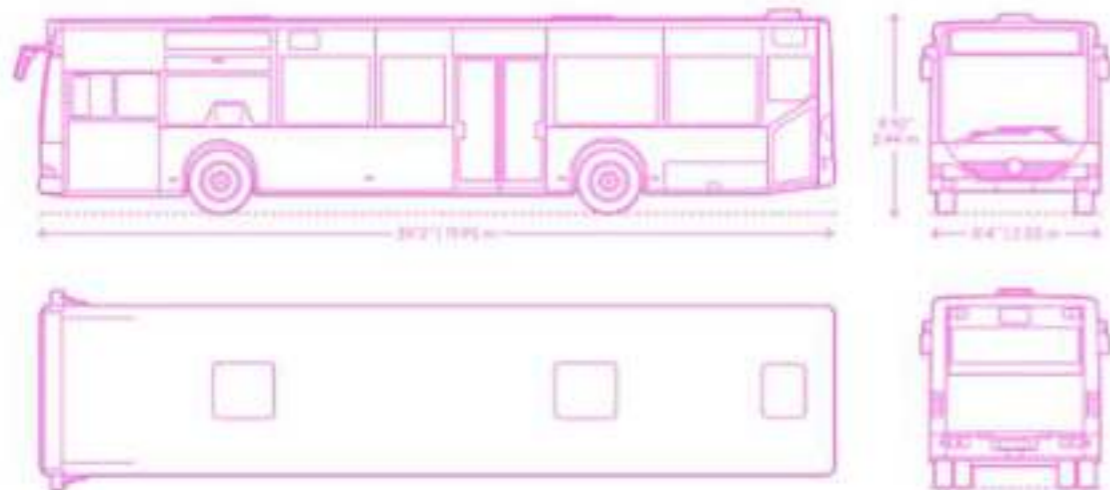


= 24kg

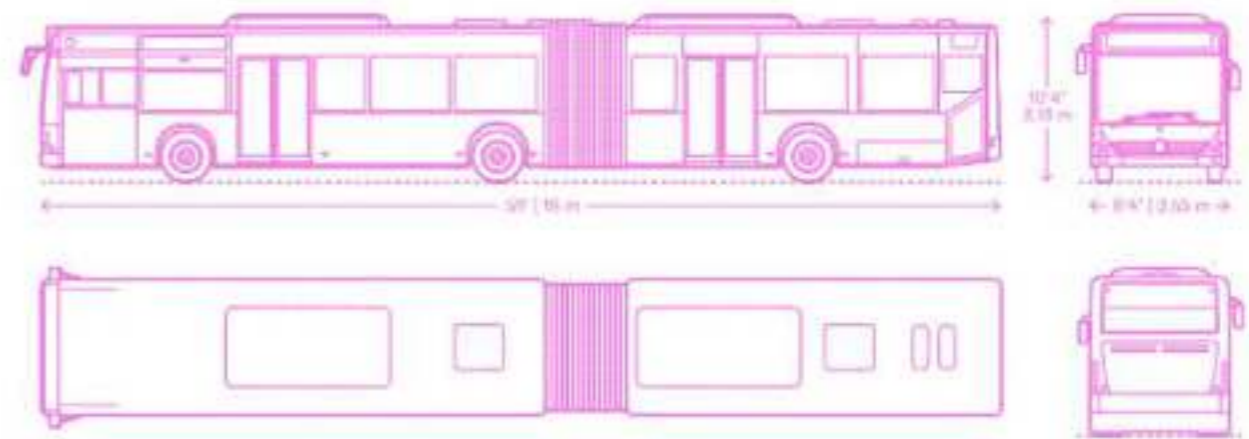
PRODUCT WEIGHT
53 LBS

Concept Refinement - Avg BW Dimensions

City | Transit Buses have average lengths of 39'2" (11.95 m), widths of 8'4" (2.55 m), heights of 9'10" (2.99 m), and have a capacity of 29 (+1) seats with standing room for 76.



Articulated Buses have average lengths of 59' (18 m), widths of 8'4" (2.55 m), heights of 10'4" (3.13 m), and have a capacity of 48 (+1) seats with standing room for 98.



Concept Refinement - Lifting Mechanisms

extends out
then moves back
with load



Capacity to lift
2000kg

lifting arm
moves with
carriage



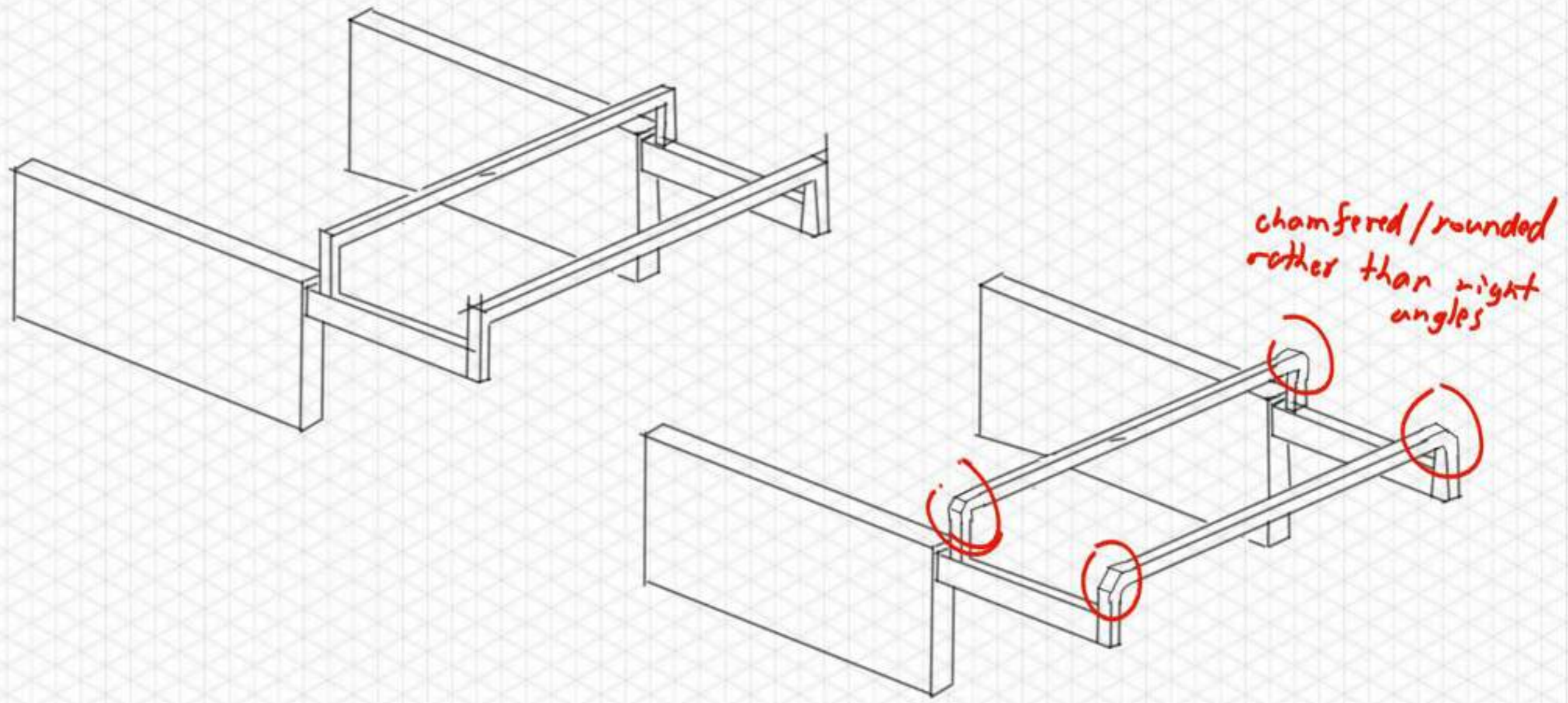
rests in
cage

lowers
after moving
out of storage
position

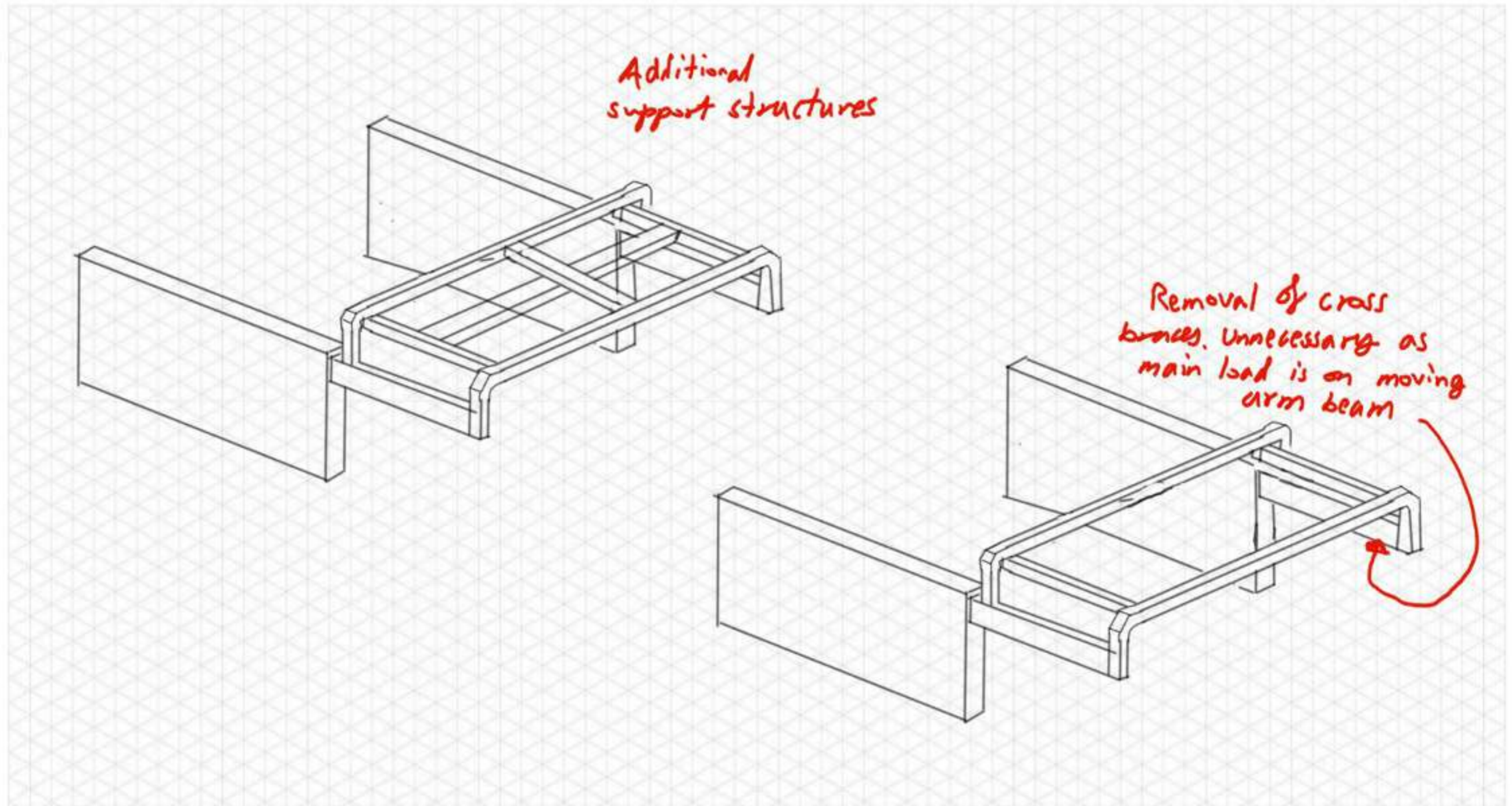


may need more than
1 set of cables for
stability

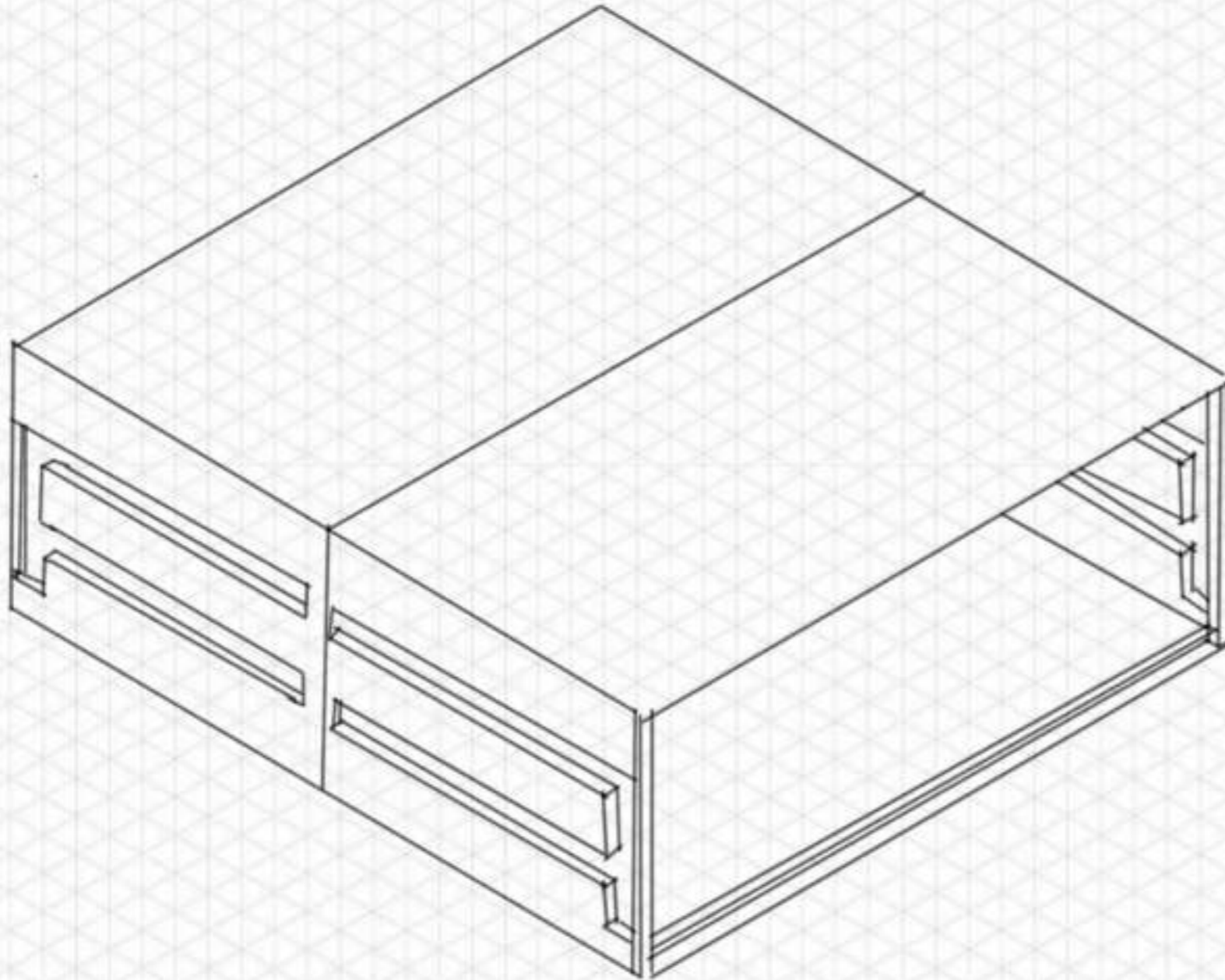
Concept Refinement



Concept Refinement

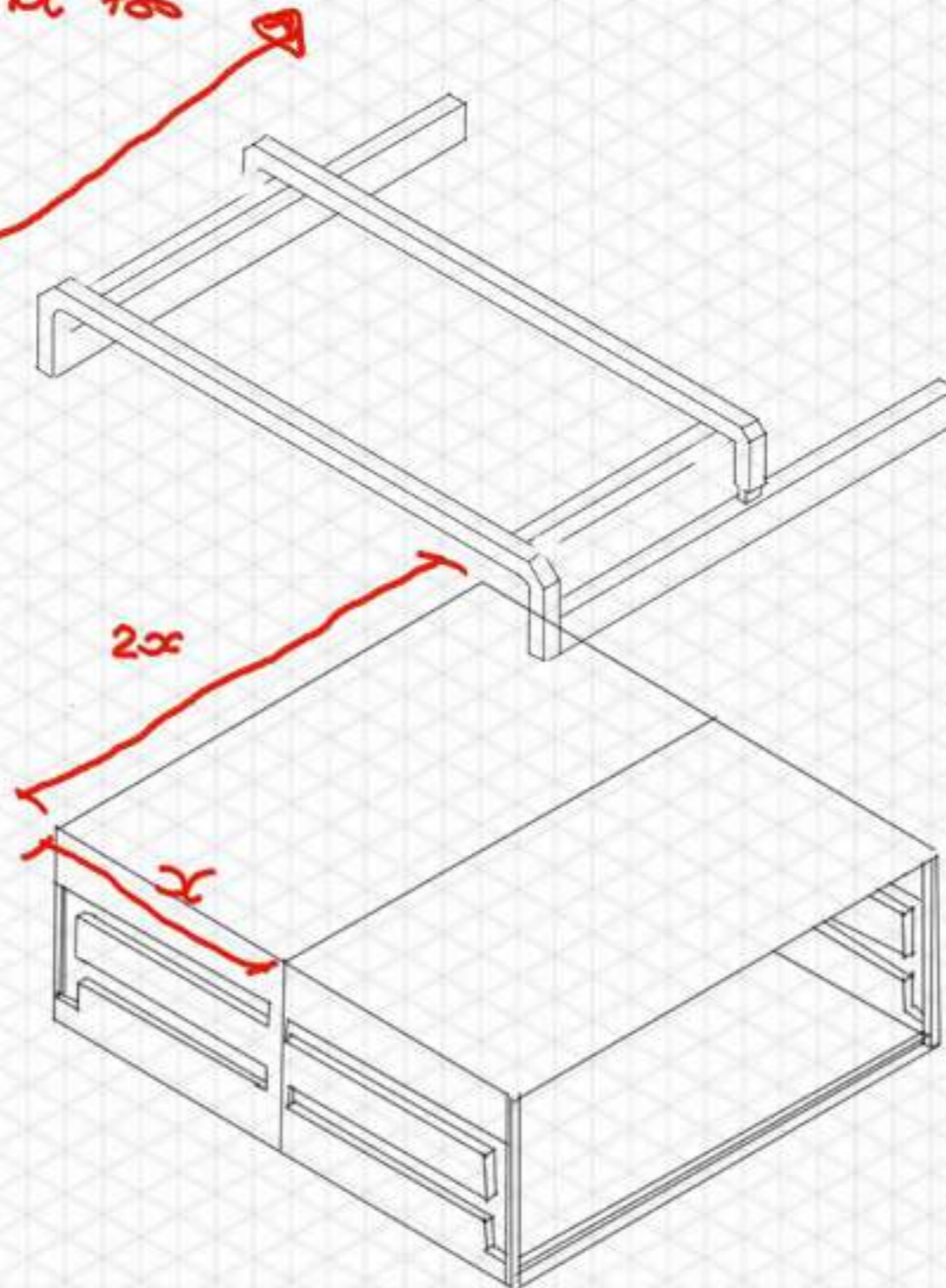


Concept Refinement



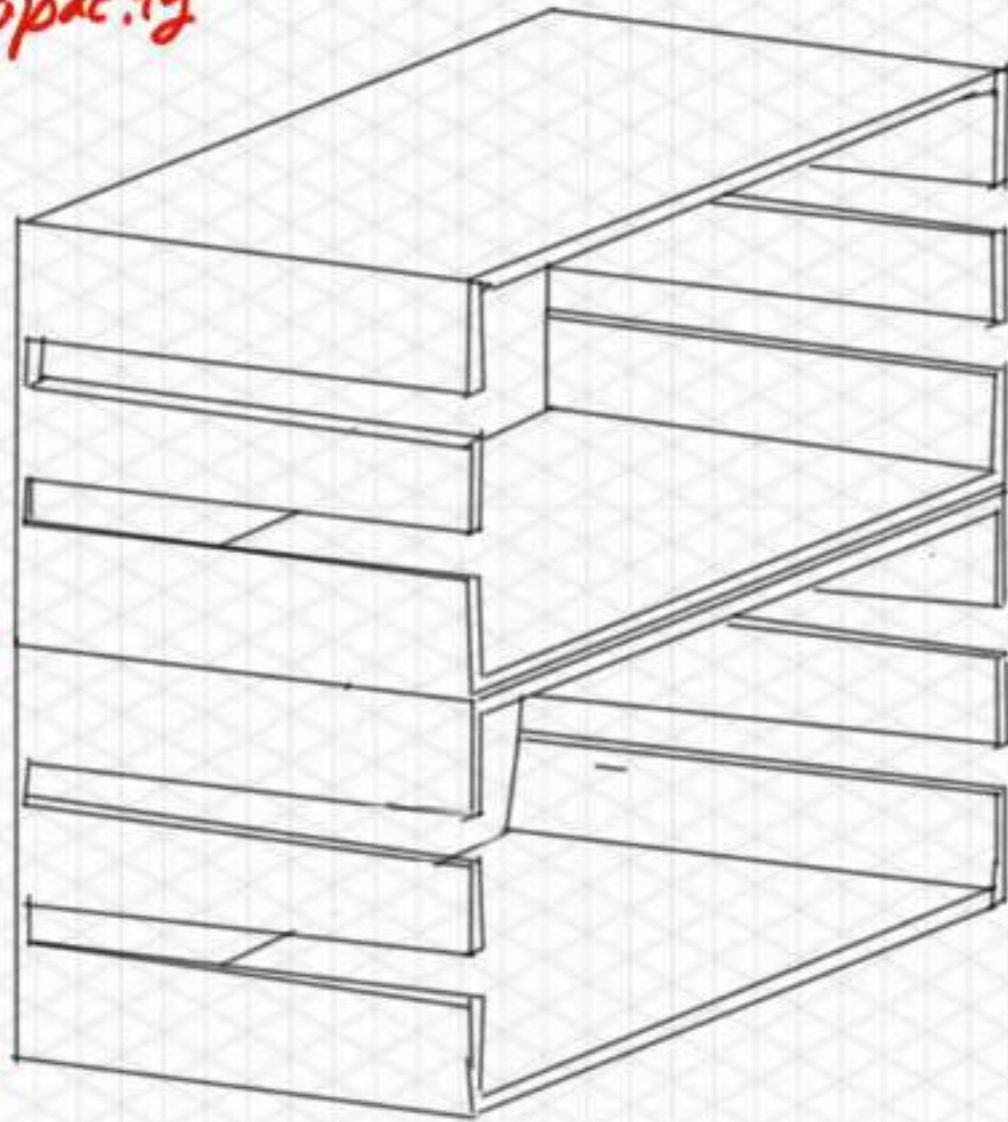
Concept Refinement

Distance may be too great
Whilst it removes need for 2 stacked horizontal dis may be too much causing structural issues to lifting arm brams (bending) & may cause bus to lean too much

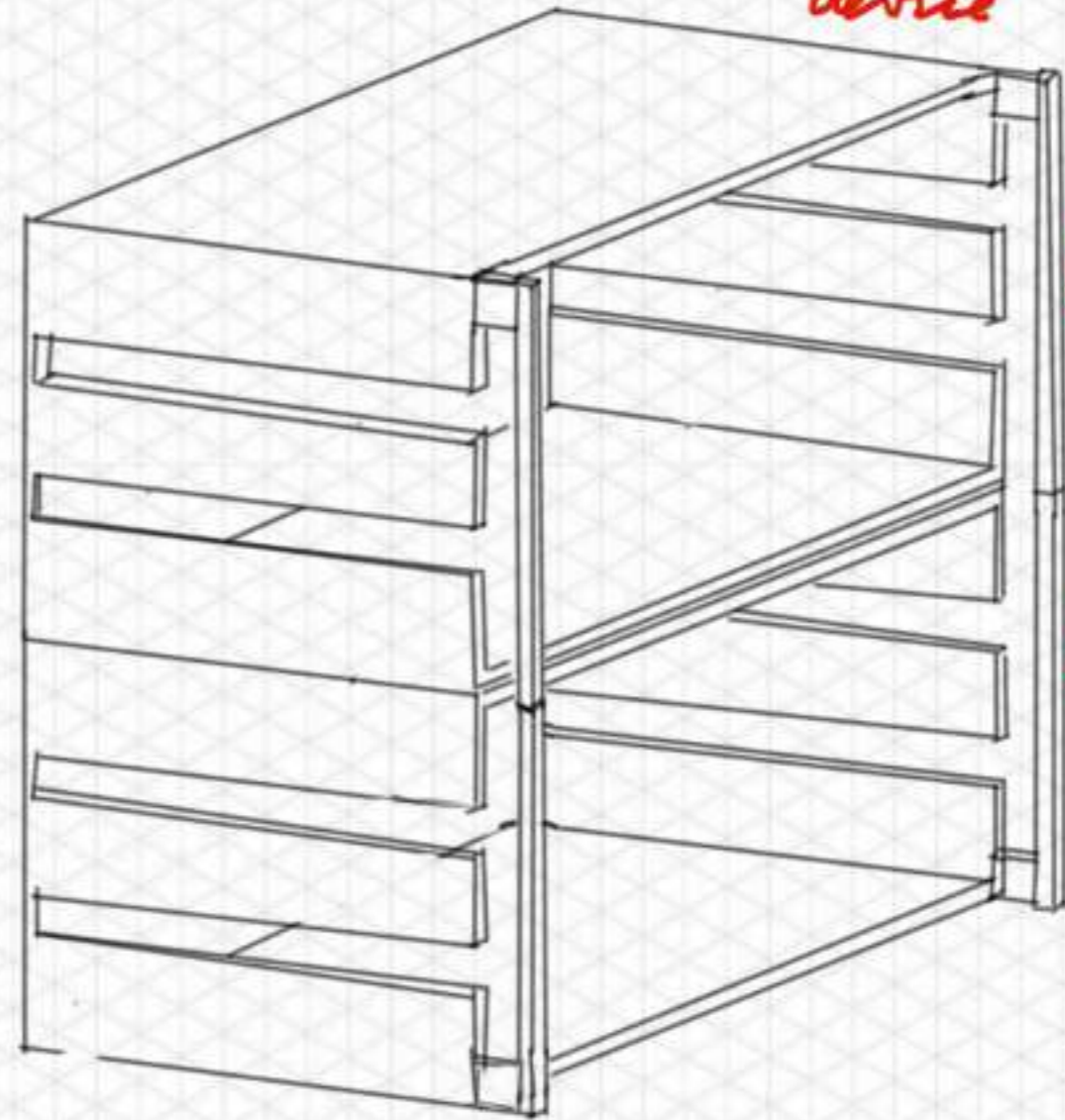


Concept Refinement

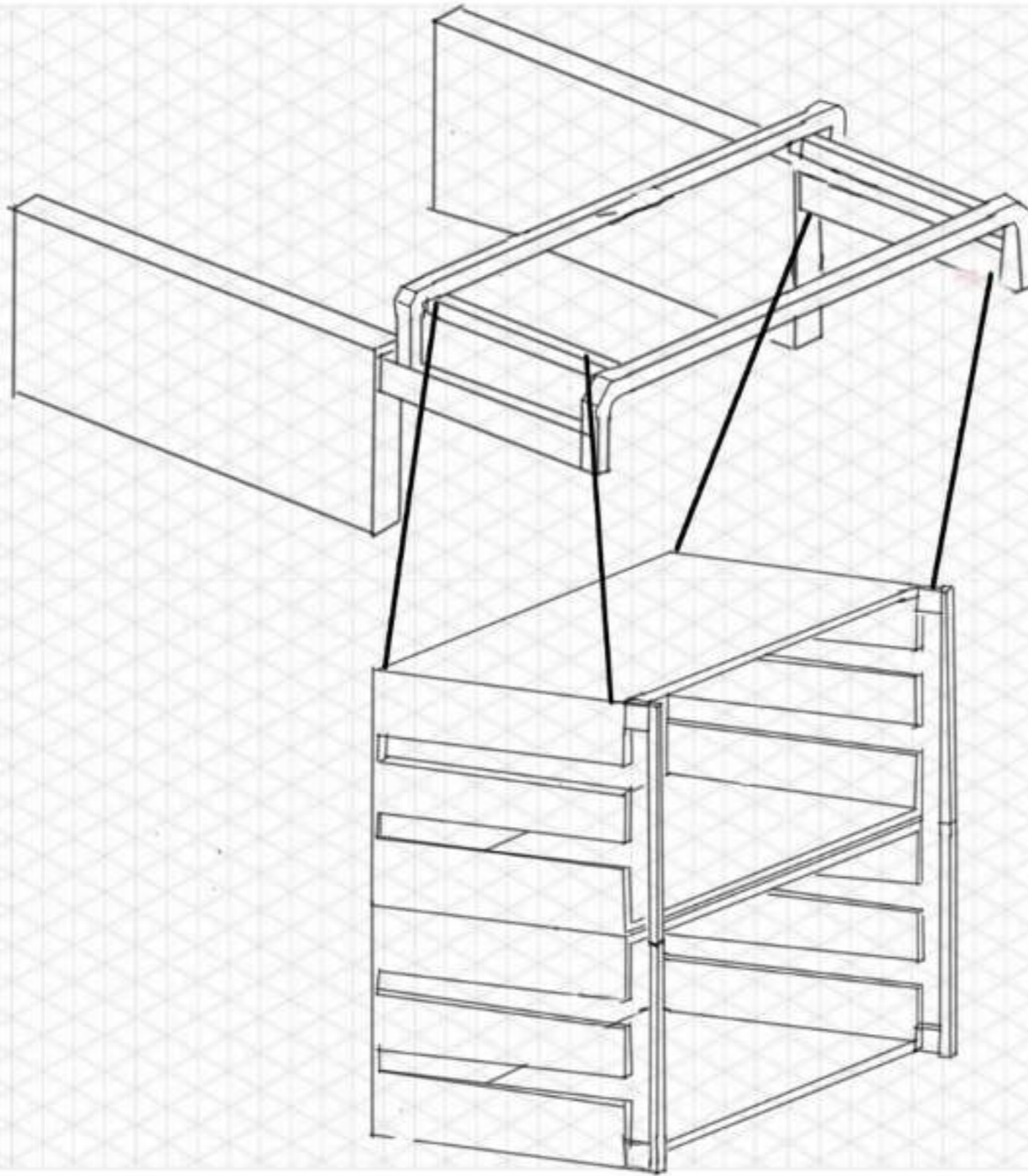
Can't be unitary piece due to height restrictions & required storage capacity



Front beams to guide bike racks up & down. Also houses load assistance device



Concept Refinement

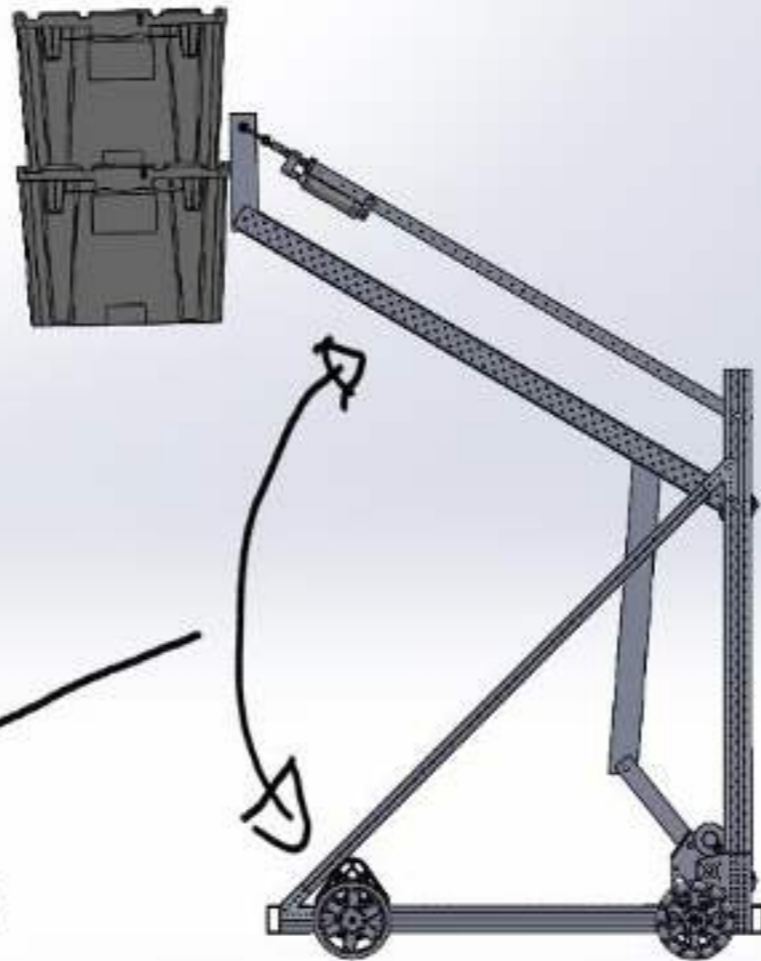


Concept Refinement - Lifting Mechanisms



4 points of contact,
provides more stability
on horizontal axis

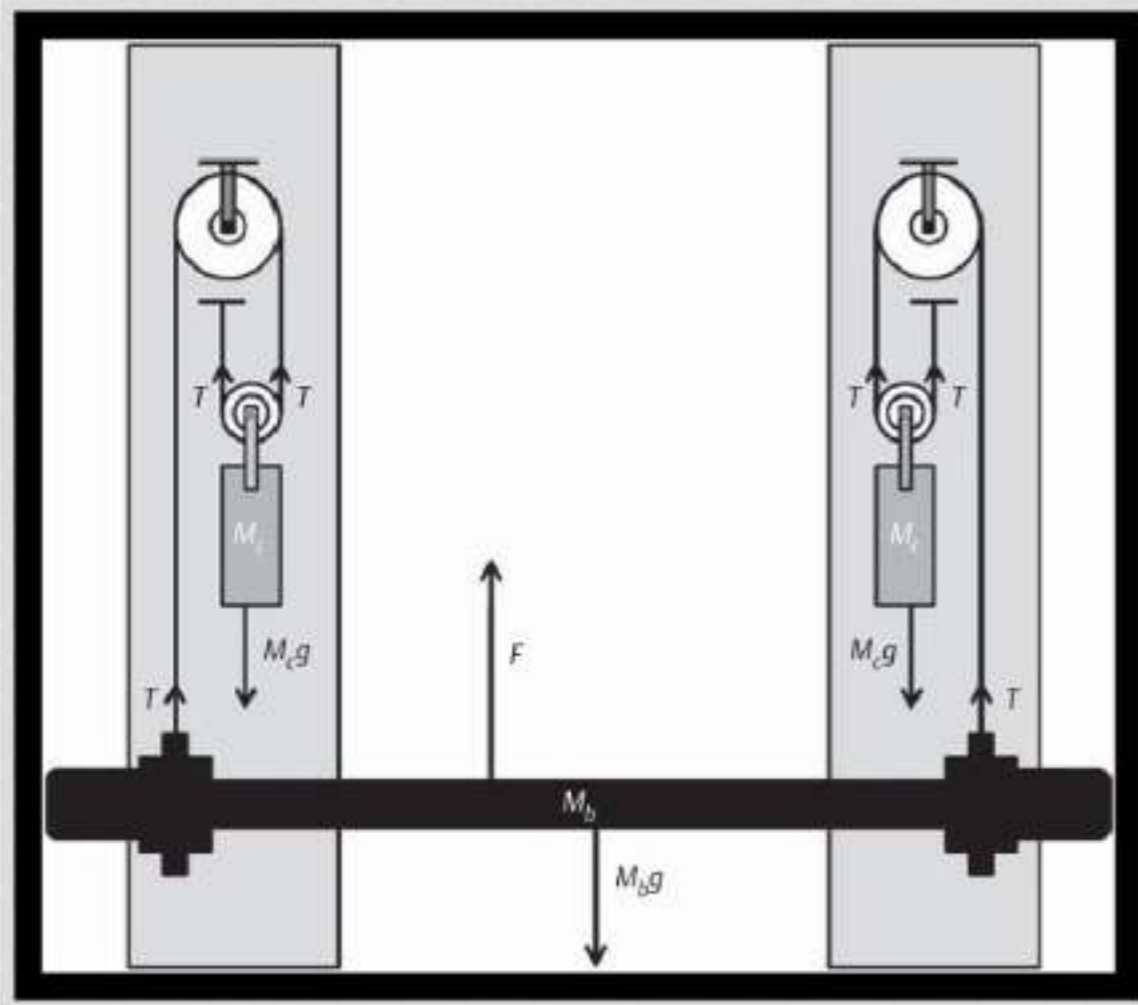
requires
unobstructed area to
lower down at an angle



2 points of contact, more liable to
swing



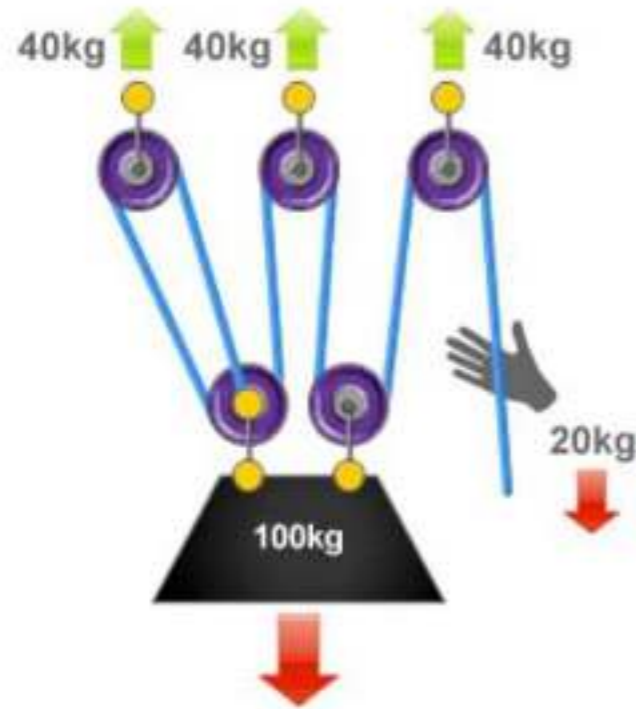
Concept Refinement - Load Reduction



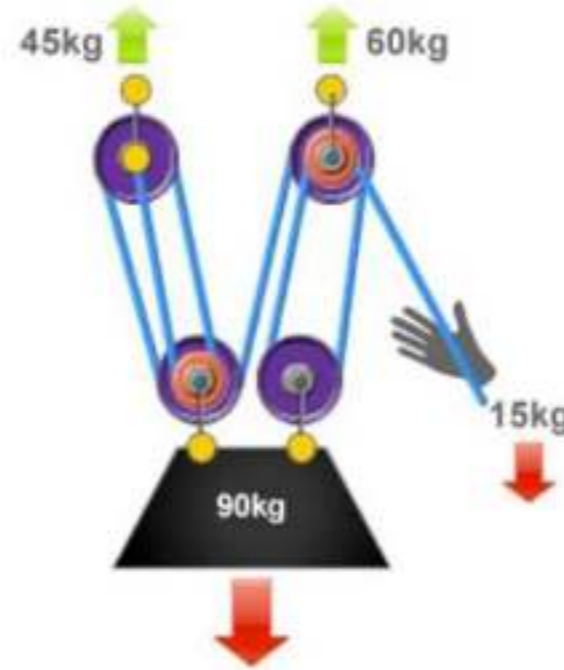
Smith machine counter weight system

- assists in lifting by reducing load
- also assists in lowers by reducing speed of descent.

Concept Refinement - Pulley Systems



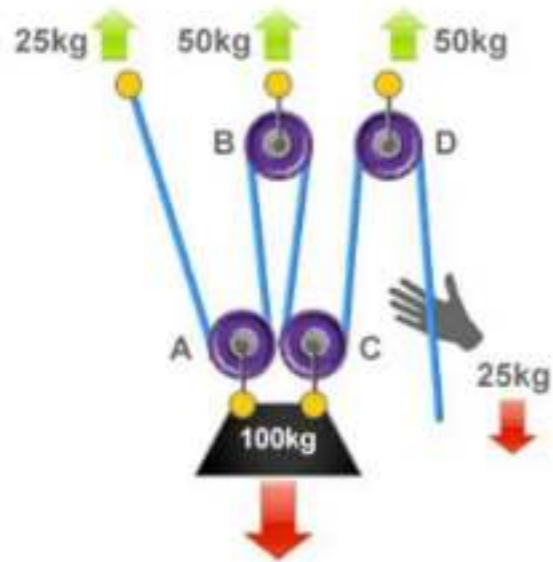
A 5:1 Pulley System



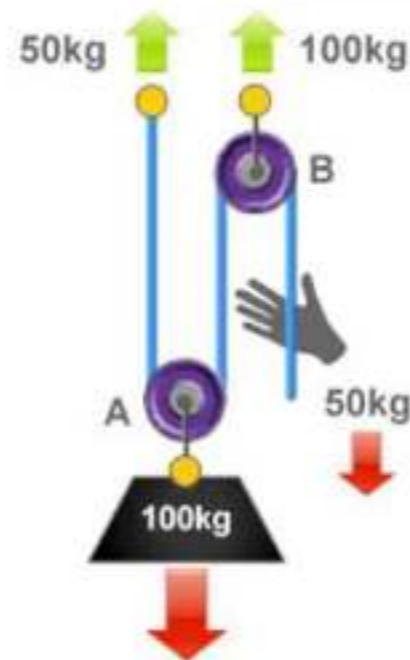
The 6:1 Pulley System

Pulley system to reduce load user needs to place bike in storage slots.

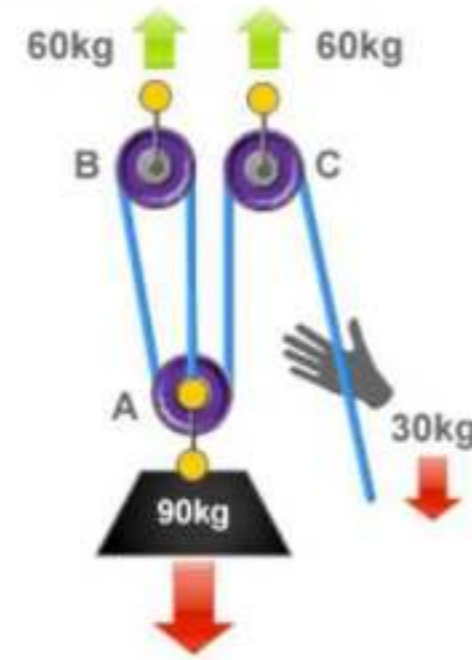
Also, reduces motor load requirements to pull up carriages.



The 4:1 Pulley System

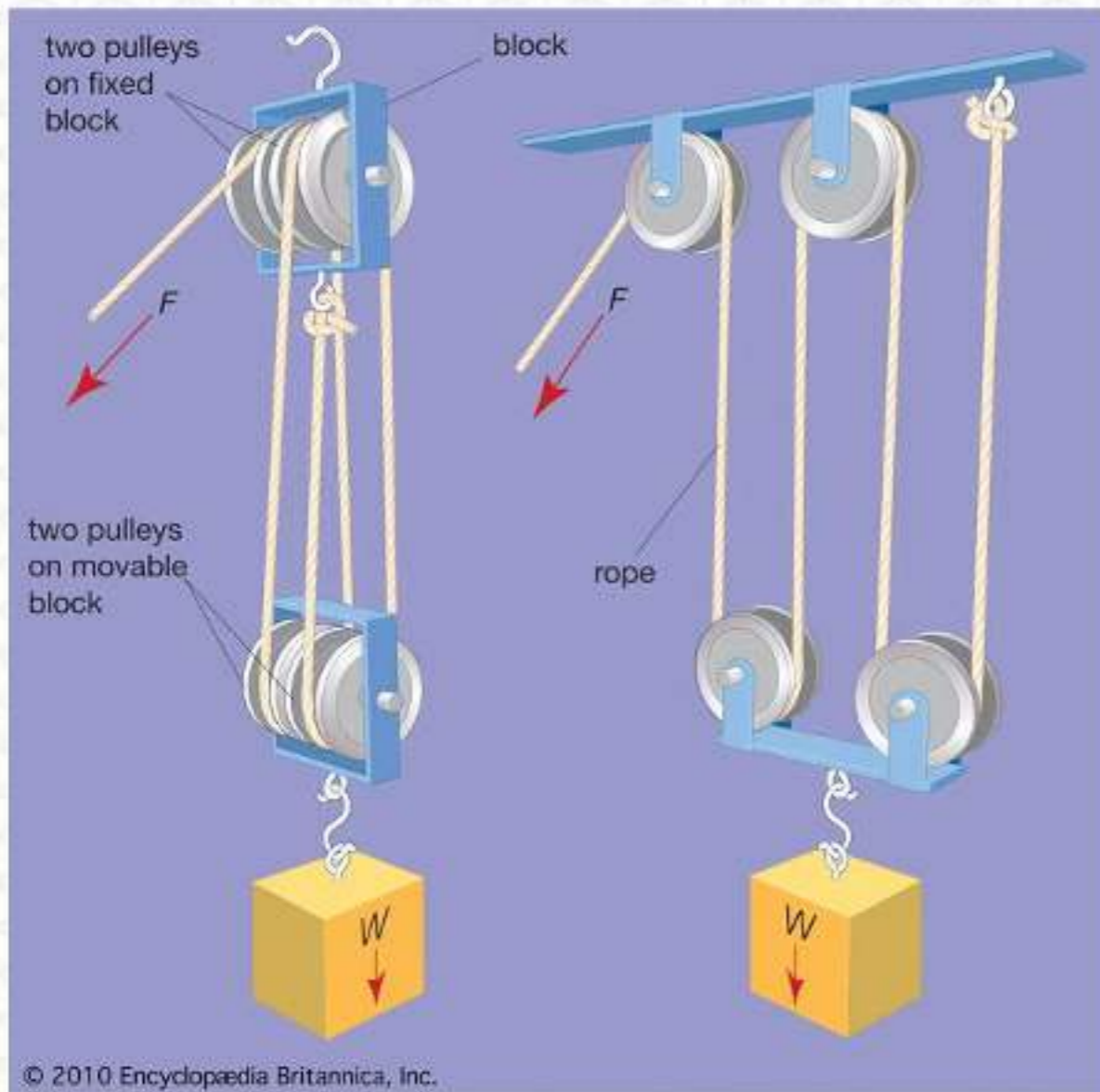


The 2:1 Pulley System

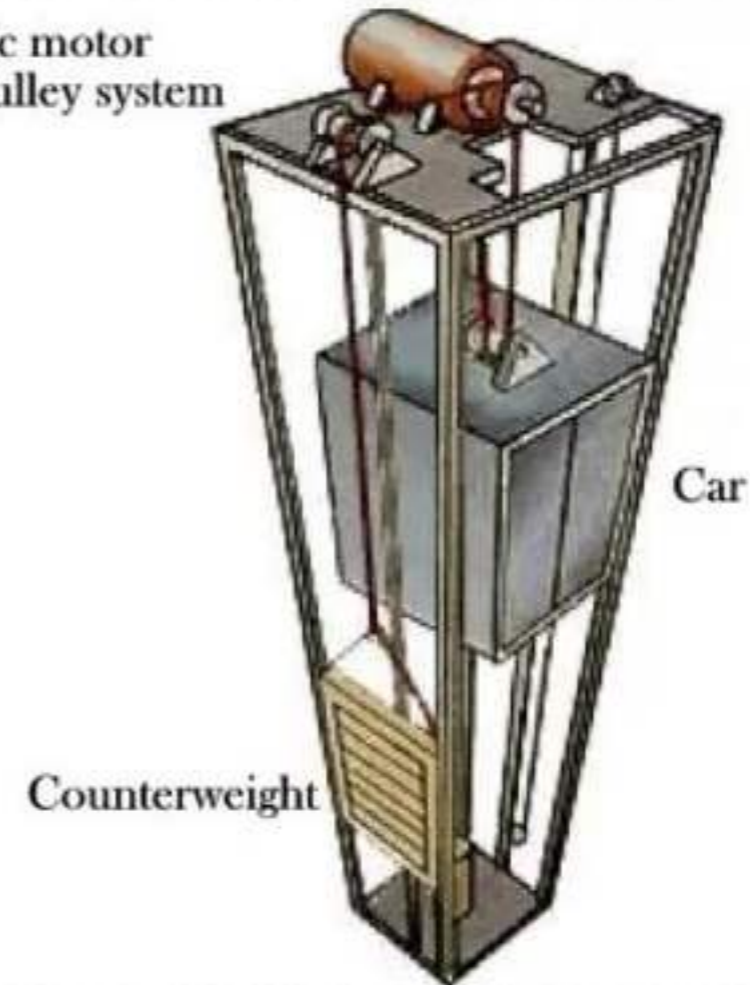


The 3:1 Pulley System

Concept Refinement - Elevator Pulley Systems



Electric motor with pulley system

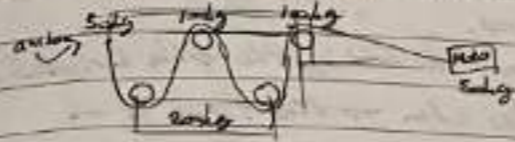


Elevator uses counter weights rather than just a lifting motor

Concept Refinement

Concept refinement ideas

- 4:1 pulley system
- ~20kg load, = 5kg effort, 5kg bar, 1kg mid, 1kg disc.

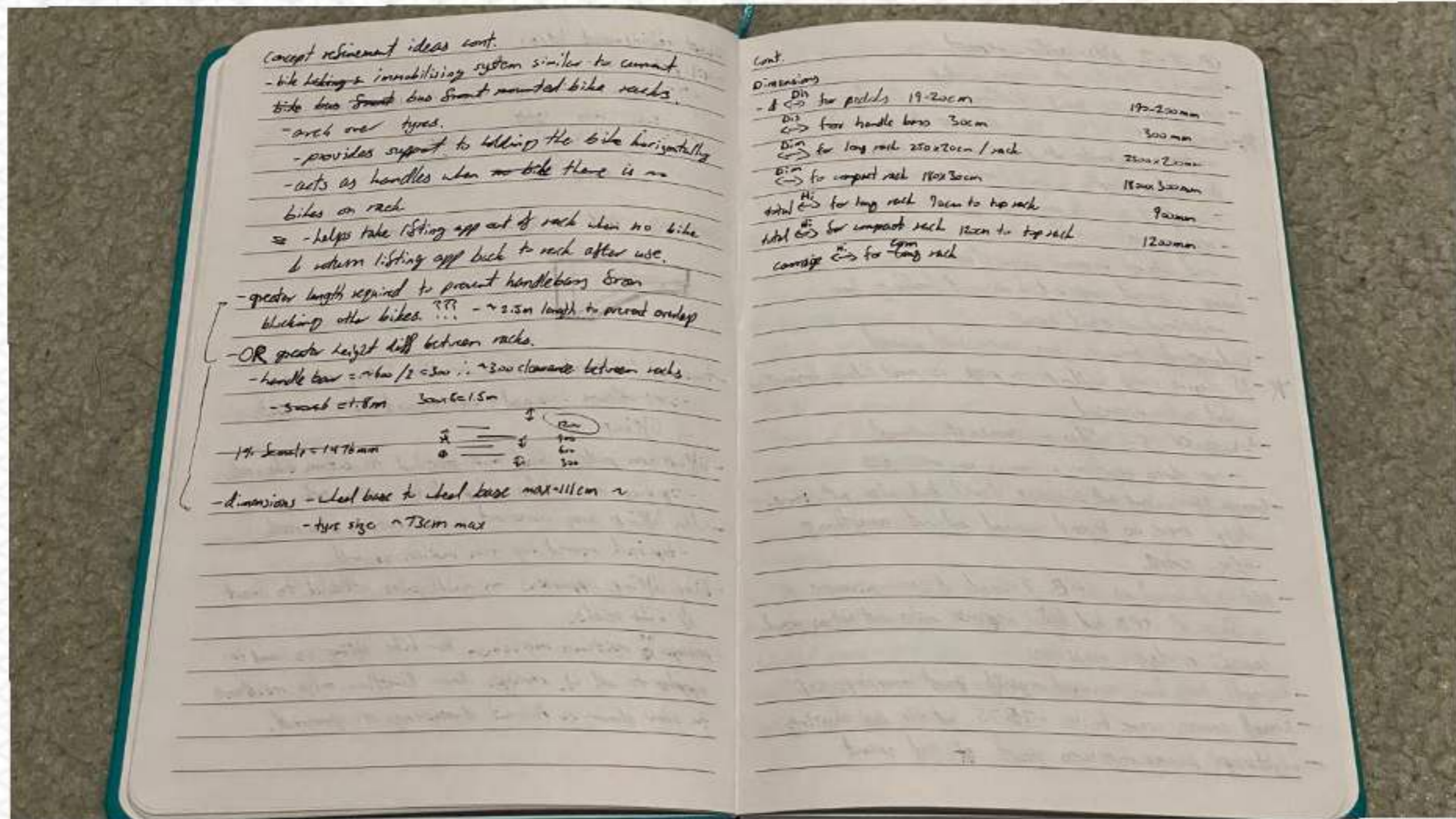


- overhang support for lifting arm - arch



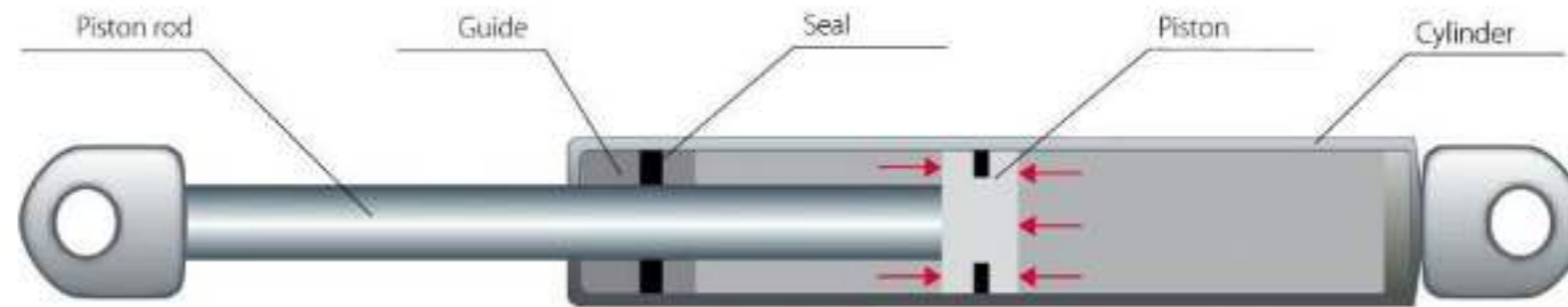
- tensioned / stop release cable for bike lifting apparatus
- stop release tensioned = stop released down + assists in lifting up.
- lifting arm pulley load point attached to bottom bike rack
- top bike rack slides on top of the bottom rack
- when lifting arm moves out, so does bottom bike rack
- top rack moved by this motion as well.
- bike lifting apparatus on guide poles attached to front of bike racks.
- perhaps ^{no} resistance mechanism for bike lifting is hard to apply to all 4. perhaps down direction only, resistance to stop down to prevent dropping on ground.

Concept Refinement



Concept Refinement - Load Reduction Systems

Gas spring

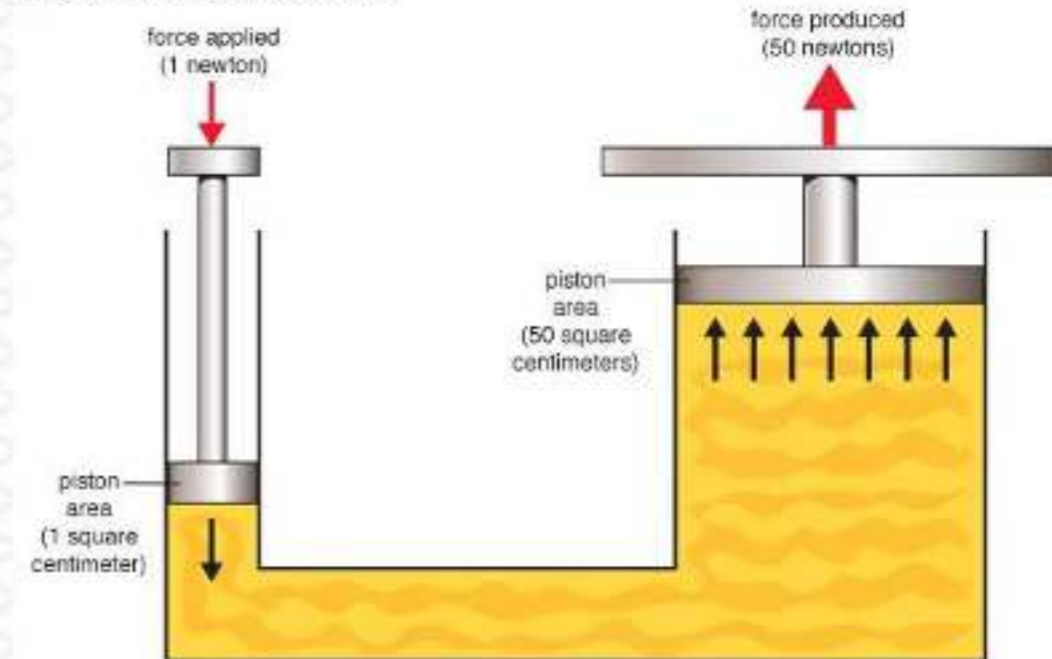


Chain belt system



Hydraulics

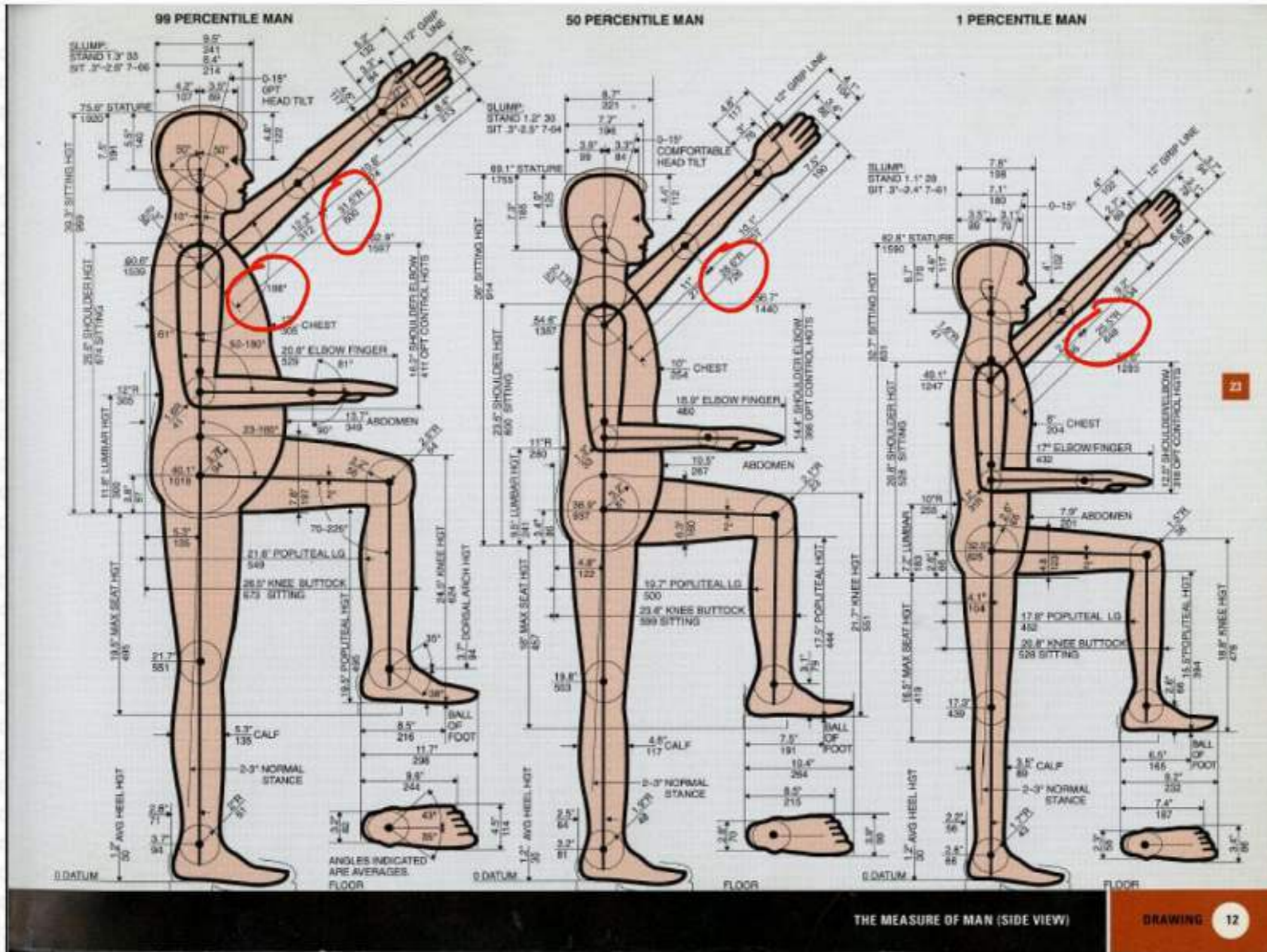
Application of hydraulic pressure



1 newton=3.6 ounces. 1 square centimeter=0.16 square inch.

© 2018 Encyclopædia Britannica, Inc.

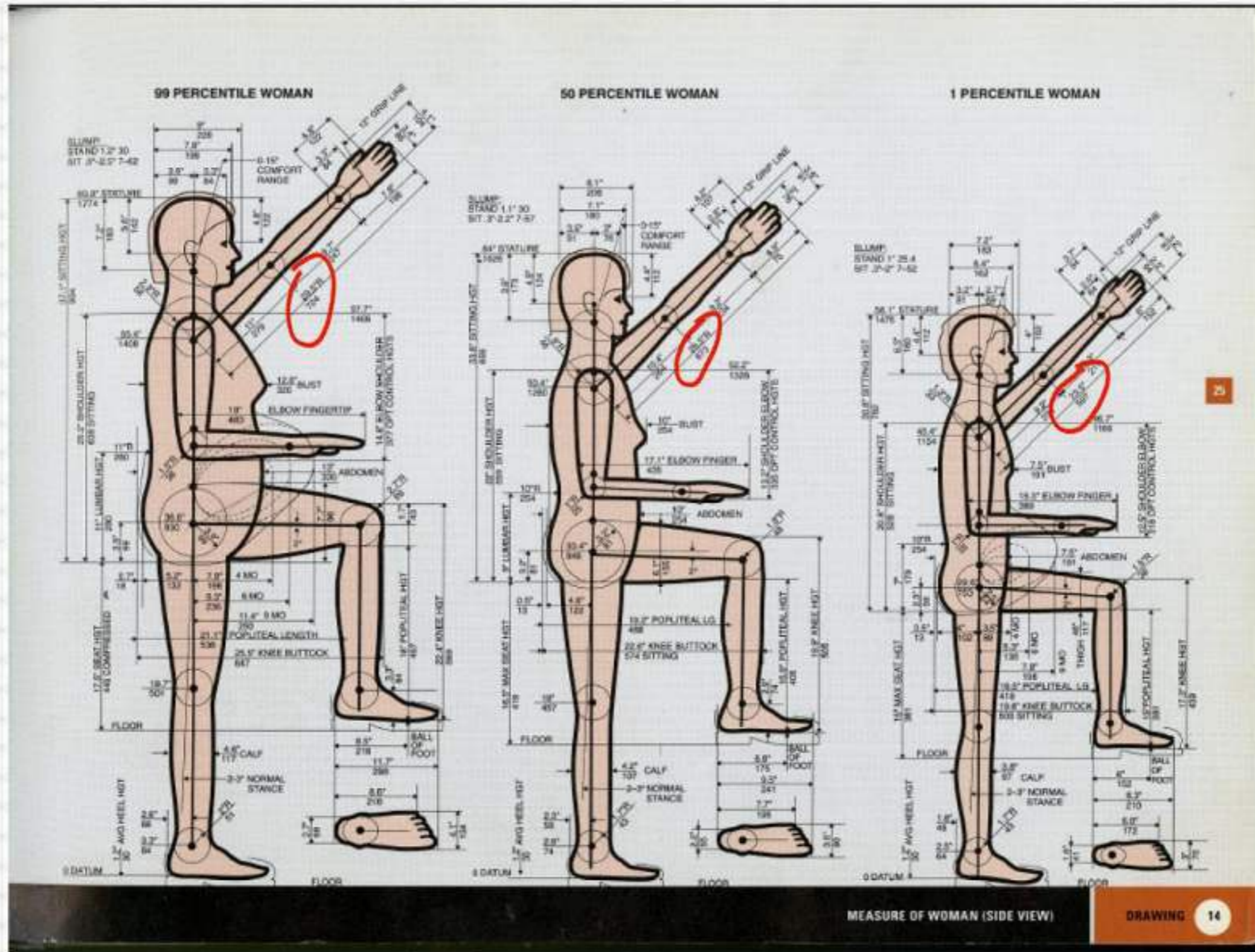
Ergonomics



Jason Yuan QUT DNB311

date: 4/10 pg. 65

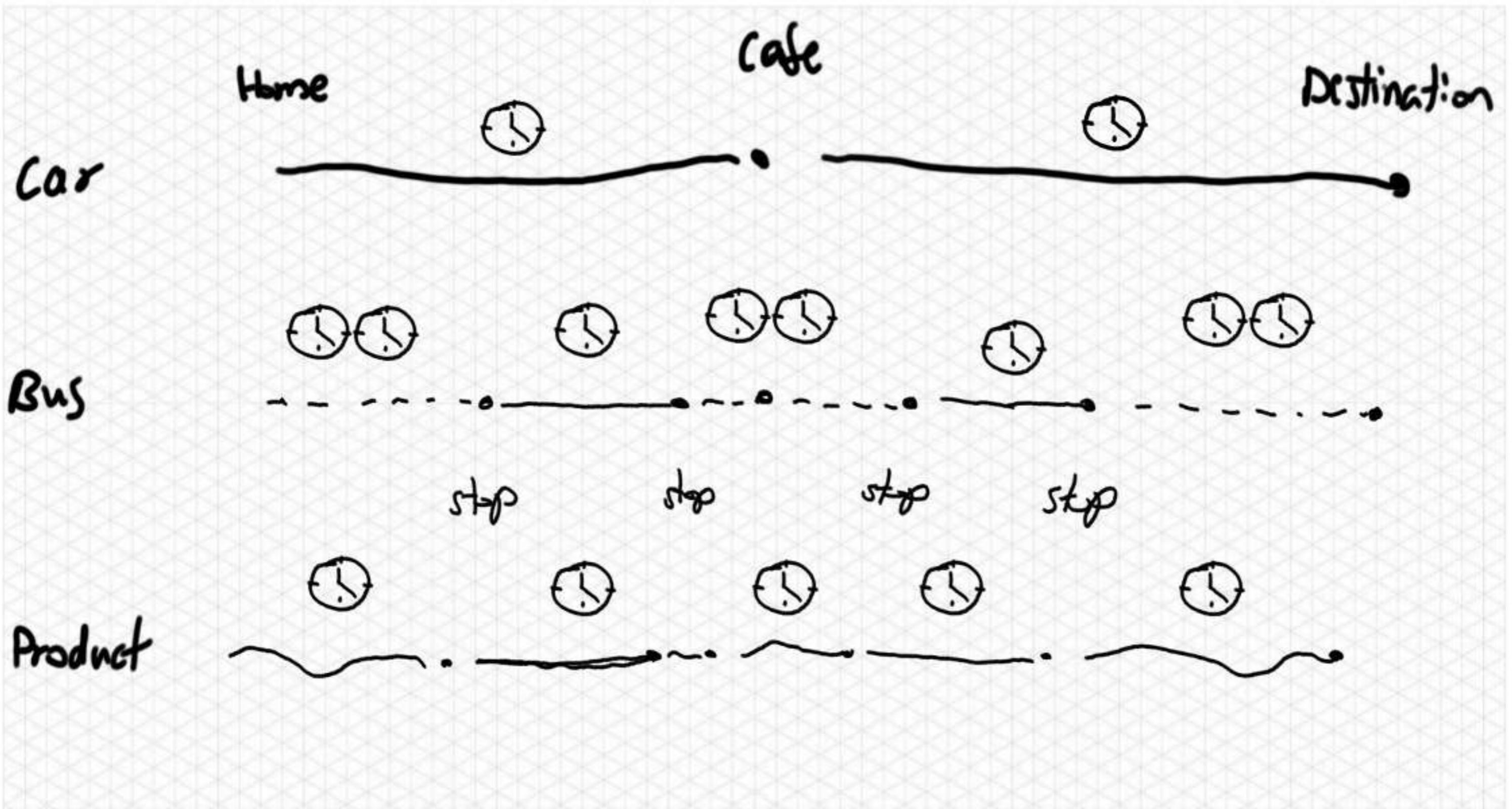
Ergonomics



Jason Yuan QUT DNB311

date: 4/10 pg. 67

Journey / user mapping - Planning



Bike Spatial Measurement



100

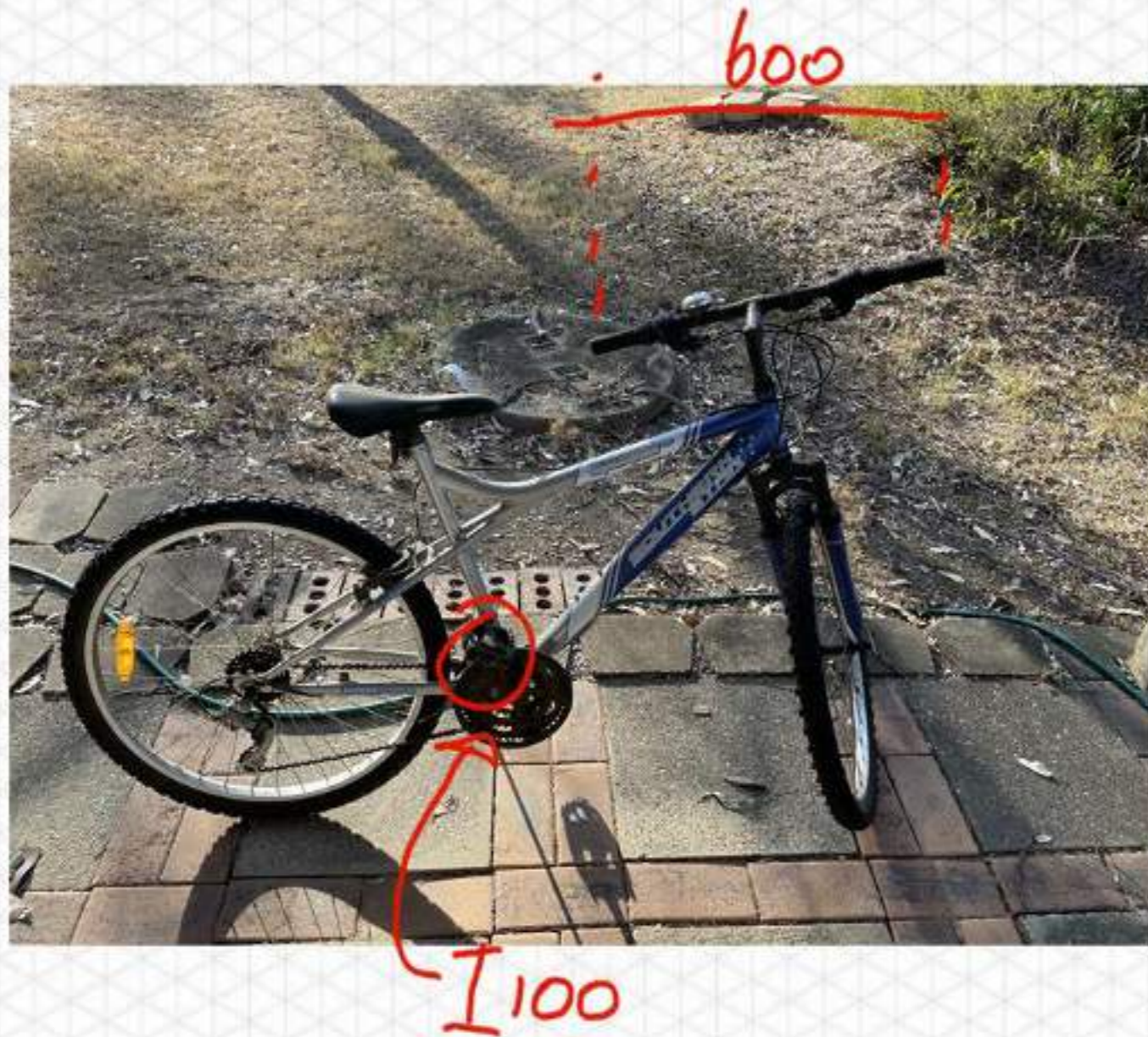


2200

Bike Spatial Measurement



Bike Spatial Measurement

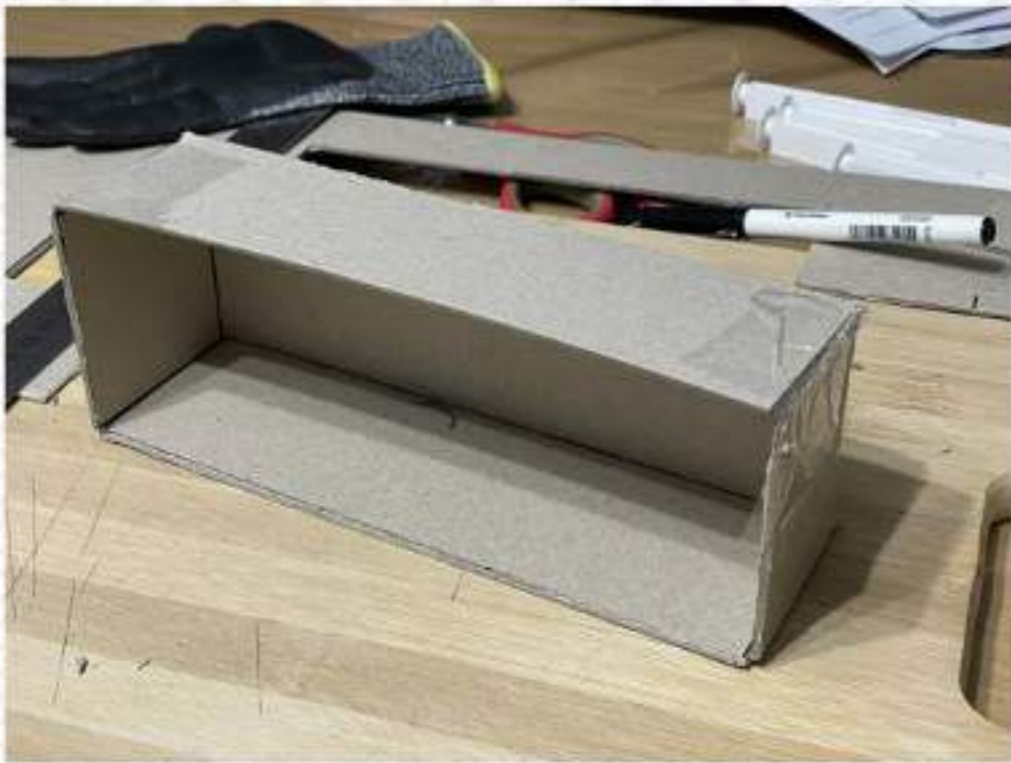
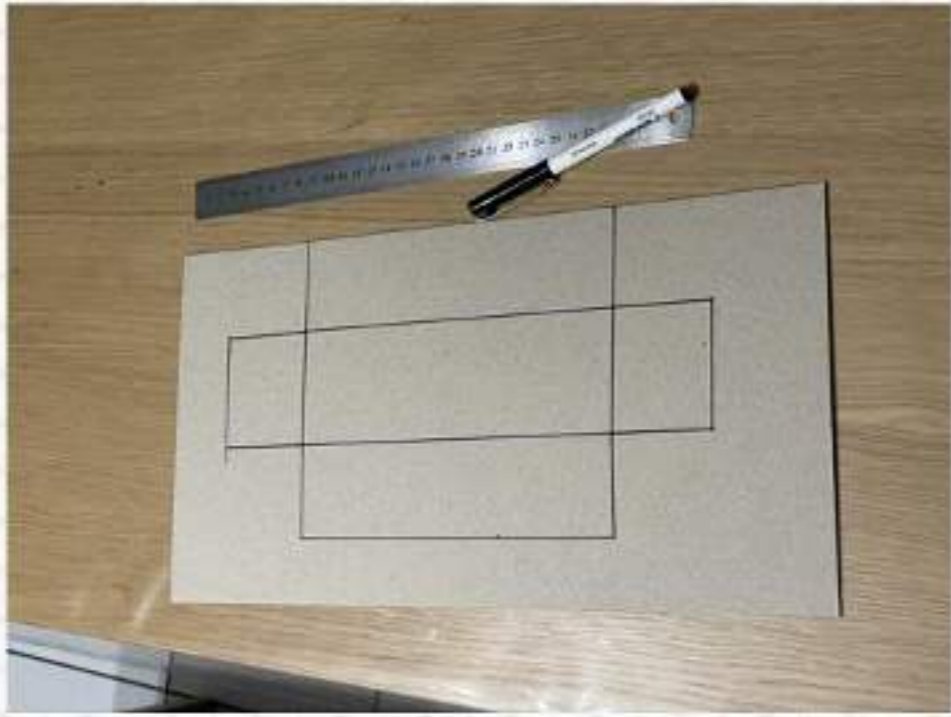


Bike Spatial Measurement

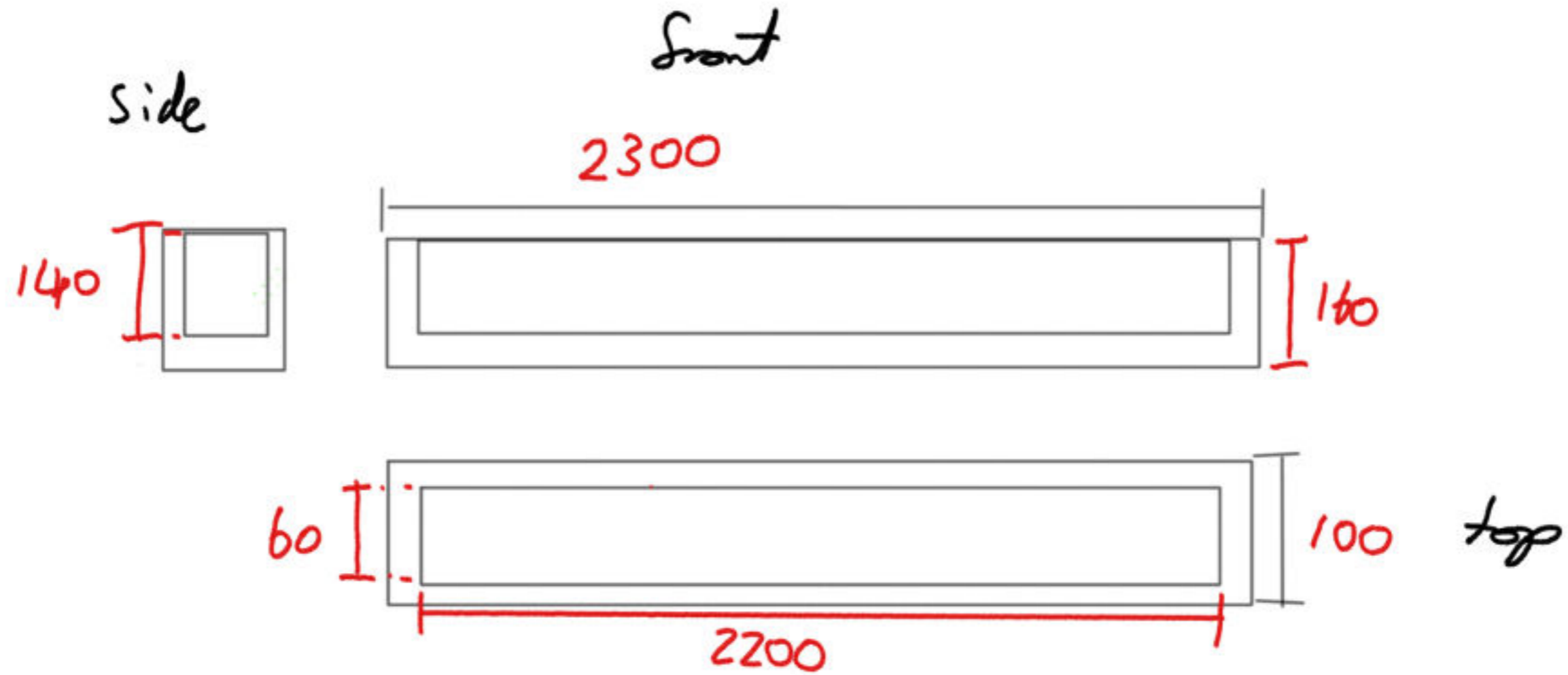


Can be lifted with some effort
by women

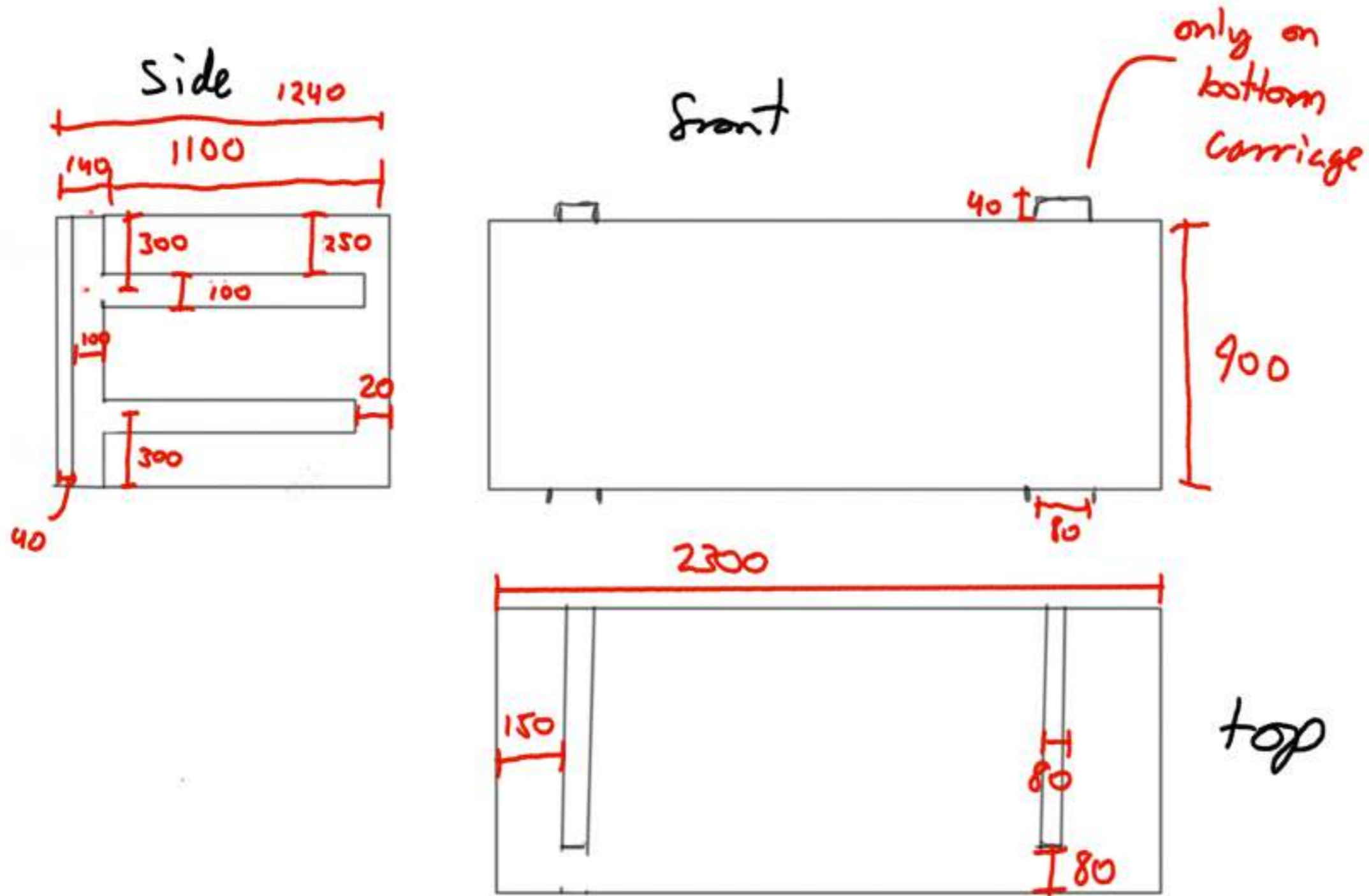
Prototyping



Dimensions



Dimensions



Dimensions

Beam nominal thickness 80mm

