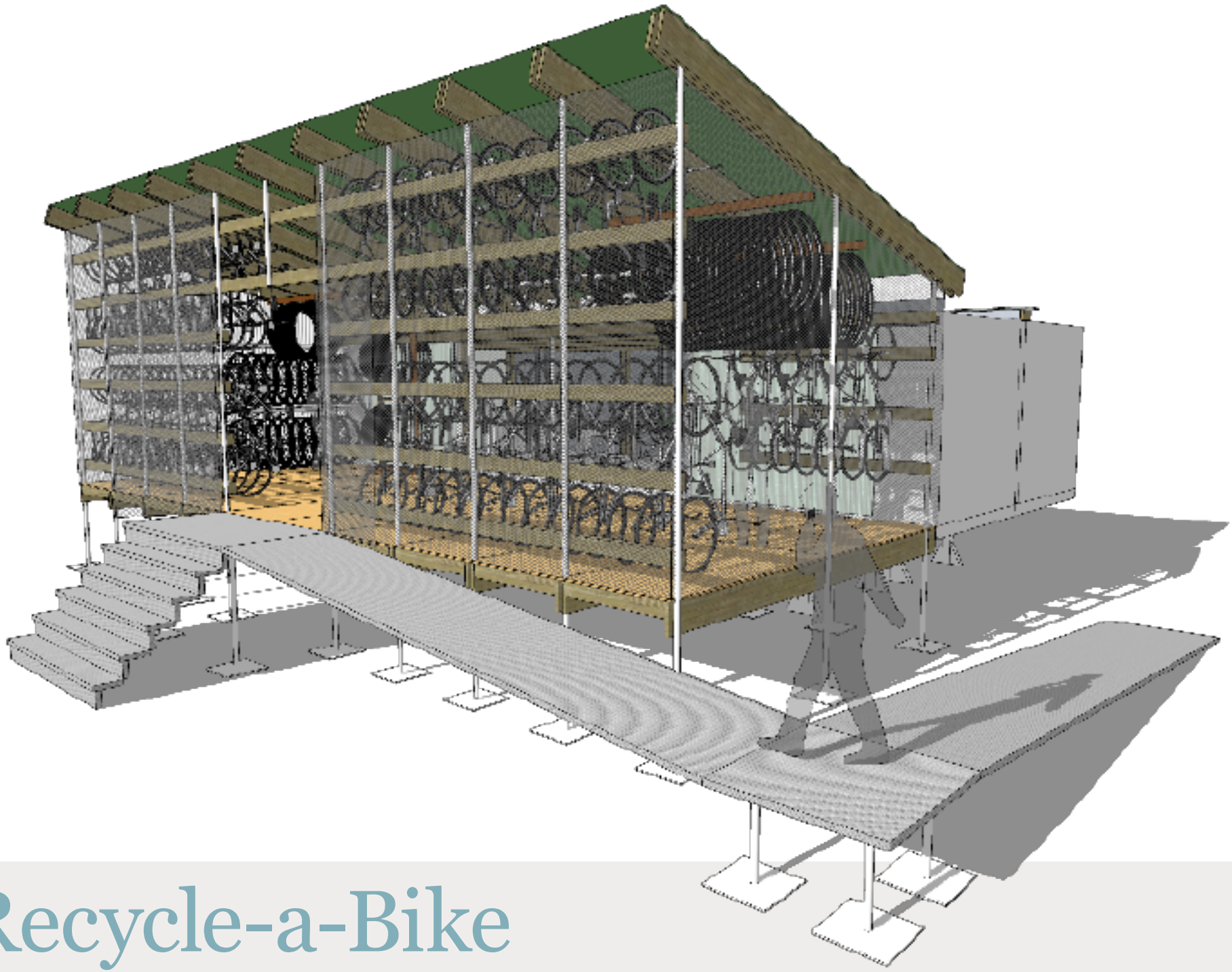

# Recycle-a-Bike

a Design/Build Proposal

*A collaborative study project at the Rhode Island School of Design*
*Providence, Rhode Island, 2009*


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*The Steel Yard*

**Special Thanks to**

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*Lynnette Widder*

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*The Steel Yard*


*Rhode Island School of Design*

## Project Description

*This is the result of a student-initiated collaborative study project at the Rhode Island School of Design.*
*Our goal was to create a facility that would serve as a vehicle for a new partnership between two community organizations, Recycle-a-Bike and The Steel Yard.*


*www.recycleabike.org*

## Recycle-a-Bike Mission

Recycle-a-Bike is a volunteer-run community bicycle education and maintenance collective that promotes bicycling as a safe, fun, sustainable, and empowering mode of transportation. Established in 2001, they provide the greater Providence community access to the skills to maintain, repair, and build bikes in a workspace where all are welcome.

## Brief History

Recycle-a-Bike was started as a grassroots organization in 2001 to enable greater access to bikes and bike maintenance. It has existed in various temporary locations donated by community partners. There has been great enthusiasm for the need of Recycle-a-Bike's programs and a strong volunteer interest, but a lack of organizational structure, leadership, and a stable location have historically limited Recycle-a-Bike's capacity.

## Recycle-a-Bike's programs provide a balance of education and resources to build and maintain one's own bicycle.

**Adult Classes**
$170 for a six-session course, or $115 for an intensive weekend course. The staple course is Basic Bike Maintenance. Other courses offered include Building Bike Trailers and Wheel Building.

**Youth Build-a-Bike**
Recycle-a-Bike partners with local youth organizations to provide grant-funded after-school programs in at-risk middle schools in which students build themselves a bike out of used parts and take it home at the end of the class. These programs take place on site at the middle schools participating.

**Earn-a-Bike**
Clients pay a fee and/or work-trade with hours helping with shop tasks to assemble bicycles of their own from used parts. Volunteer mechanics guide participants through the process.

**Open Shop**
$5 per hour or a $20 monthly membership buys stand time with access to Recycle-a-Bike volunteer mechanics, tools, and workspace to maintain one's own bike.

**Mechanics a Go-Go**
Volunteer mechanics are available once a week at the park to perform some basic bike repairs while you wait. Donations accepted.

**Volunteer Night**
Time to put in volunteer hours toward working off a bike. Volunteer tasks include general cleanup, culling inventory, and sorting parts.

## Relationship with The Steel Yard

Recycle-a-Bike has been incubated by The Steel Yard, which has offered Recycle-a-Bike fiscal sponsorship with its non-profit status for grants, donated space on its grounds, and office support.

As Recycle-a-Bike develops internally, the two organizations are exploring a more formalized organizational partnership.

*The Steel Yard*
*for more information, visit www.thesteelyard.org*

## About The Steel Yard

The Steel Yard acts as a catalyst in the creative revitalization of the industrial valley district of Providence, Rhode Island. In fostering the industrial arts and incubating small business, the Corporation seeks to cultivate an environment of experimentation and a community strengthened by creative networks.

The Steel Yard offers community courses in ceramics, glass, welding, blacksmithing, jewelry, and bike maintenance (in collaboration with Recycle-a-Bike). They also offer youth programs including youth classes and a summer camp called Camp Metalhead, which provides an introduction into the industrial arts along with teaching practical, vocational and business skills. Through their public projects, The Steel Yard collaborates with local artists to produce functional public sculpture such as custom-made trash cans and recycling bins, bike racks, and tree guards.

## Current Site and Space


*Providence, Rhode Island*

*The Steel Yard*

*Recycle-a-Bike Workroom*

*Recycle-a-Bike Storage Trailers*

Recycle-a-Bike currently uses space on site at The Steel Yard. This consists of a small workroom of approximately 350 square feet inside of The Steel Yard's foundry building for bike classes and workshops and two 40-foot trailers parked on site which serve as storage for bikes and parts. Both of these spaces are donated for temporary use and are not secured for Recycle-a-Bike's operation long-term.

## New Space Parameters

### Program
The new space must accomodate teaching space and workspace for the following programs: Adult Classes, Earn-a-Bike, Open Shop, and Volunteer Night. Other programs take place off-site.

### Demountable Structure Requirements
The purpose of the space is to explore a potential long-term partnership with the two organizations. In the early phases of the trial, the space must remain somewhat autonomous from the site and be easily demountable.

### Site and Timing
The Steel Yard will be undergoing a soil remediation and redevelopment led by Klopfer Martin Design Group in summer 2009.

Upon completion of the first phase, there will be a concrete pad designated for the new Recycle-a-Bike space. Construction on the new Recycle-a-Bike space can begin tentatively September / October 2009.

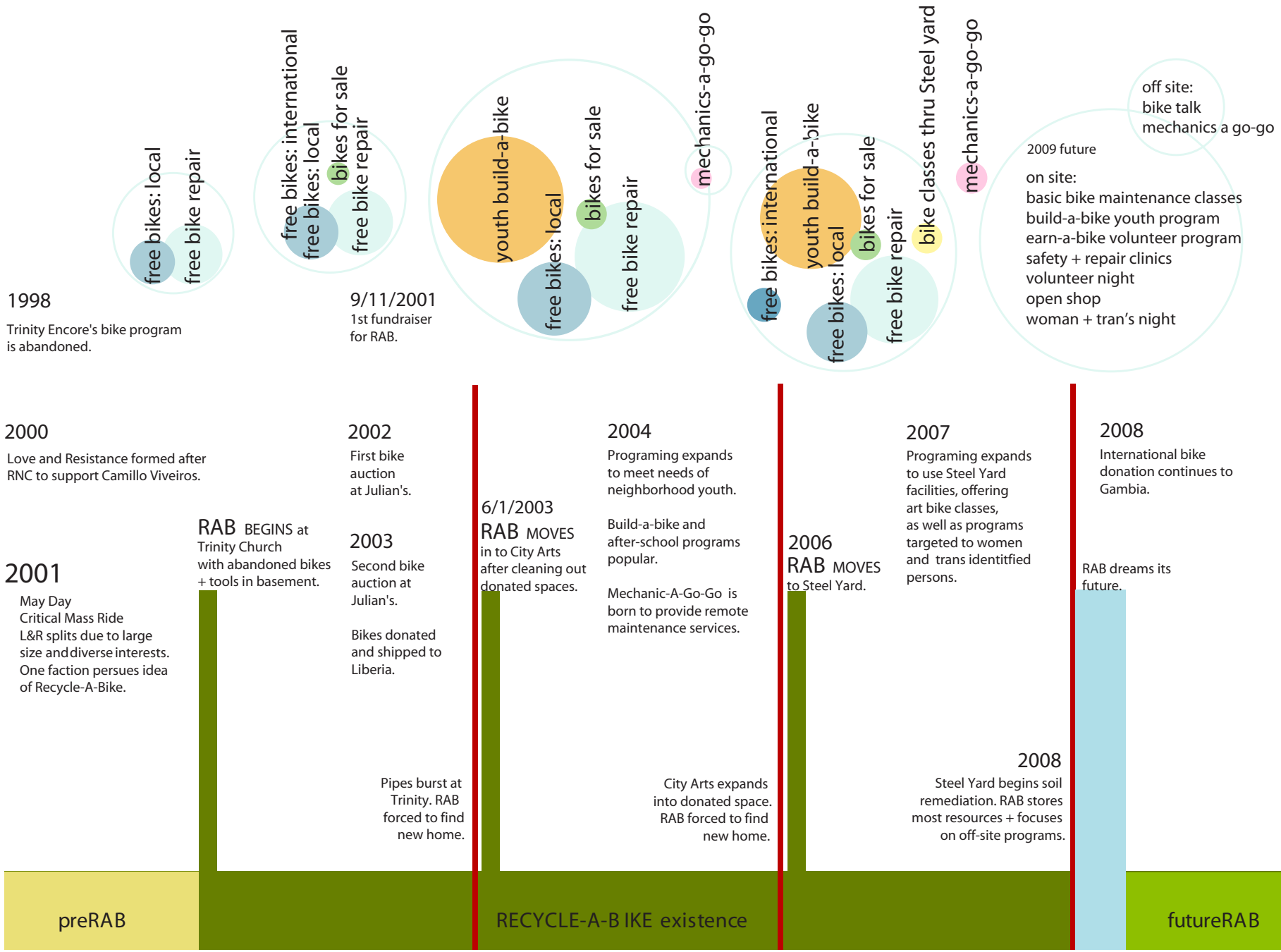
### Footprint
The concrete pad on the site was originally sized at 32 x 40 feet - to accomodate two shipping containers with a 16-foot space between them. However, there will be some leeway in the footprint.

### Budget
At the onset of this project, Recycle-a-Bike had approximately $3000 in its bank account. Recycle-a-Bike will need to fundraise for the remainder of money needed for construction and labor, so the budget is minimal.

### Efficiency / Re-use
Environmental sustainability and materials re-use are at the heart of Recycle-a-Bike's mission. Therefor, the space must be energy -efficient both in construction and operations, and it will be desirable to re-use material wherever possible.


*The Steel Yard redevelopment plan.*
*Image: Klopfer Martin Design Group*

## A Graphic History of Recycle-a-Bike



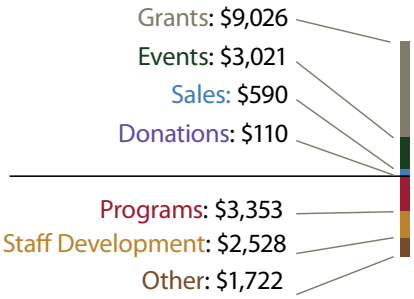
## Recycle-a-Bike Future Organizational Development

### Capacity

| | Responsibilities | Privileges |
|---|---|---|
| VISTA<br># = 1 | Meet and report on VISTA goals<br>Point of contact for RAB<br>Liaison with Steel Yard<br>Coordinate volunteers<br>Manage budget<br>Manage programs<br>Manage shop | VISTA stipend<br>RAB-furnished bicycle |
| Volunteers :<br># ≈ 40 | Assist as desired with tasks | Trade in hours for shop time<br>Trade in hours for parts / bikes<br>Receive volunteer e-mails<br>Identify as RAB volunteer |

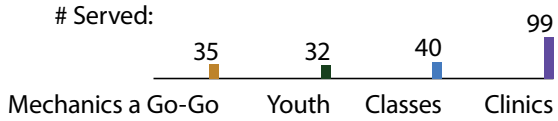
### Cash Flow

Total Income: $12,747




Total Expenditures: $7,603

### Programs

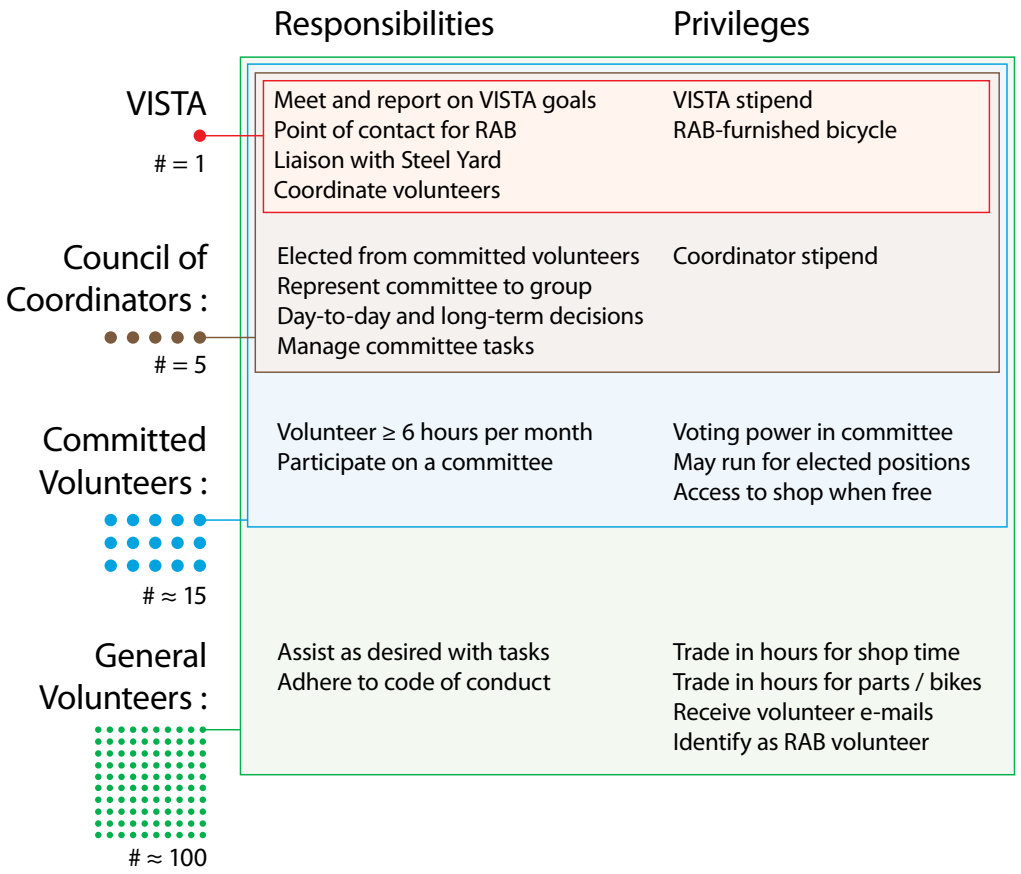



*Phase 1: September 2008 - August 2009*

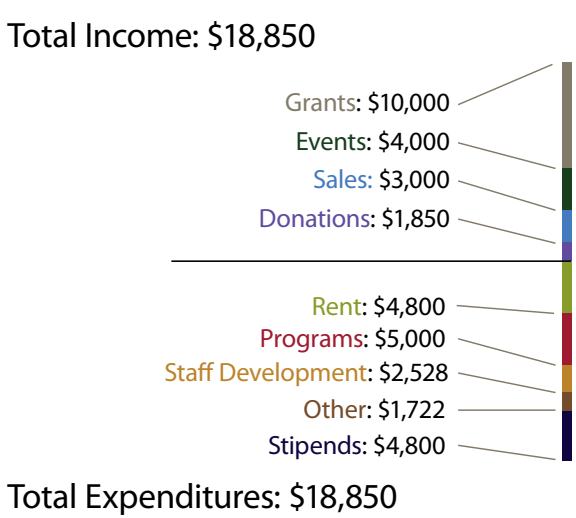
Recycle-a-Bike is developing its structure to build a generated income and increased staff support.

In phase 1, a VISTA (Volunteer in Service to America - a full time employee sponsored by a federal Americorps grant) is building the structure and participating in decision-making with current volunteers who also help carry out everyday tasks. Expenses are minimal, with much in-kind support from The Steel Yard.

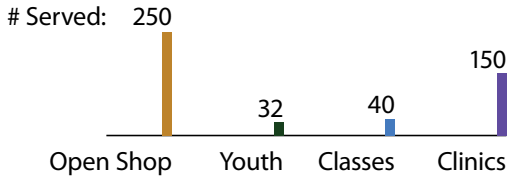
## Capacity




## Cash Flow (projected)




## Programs

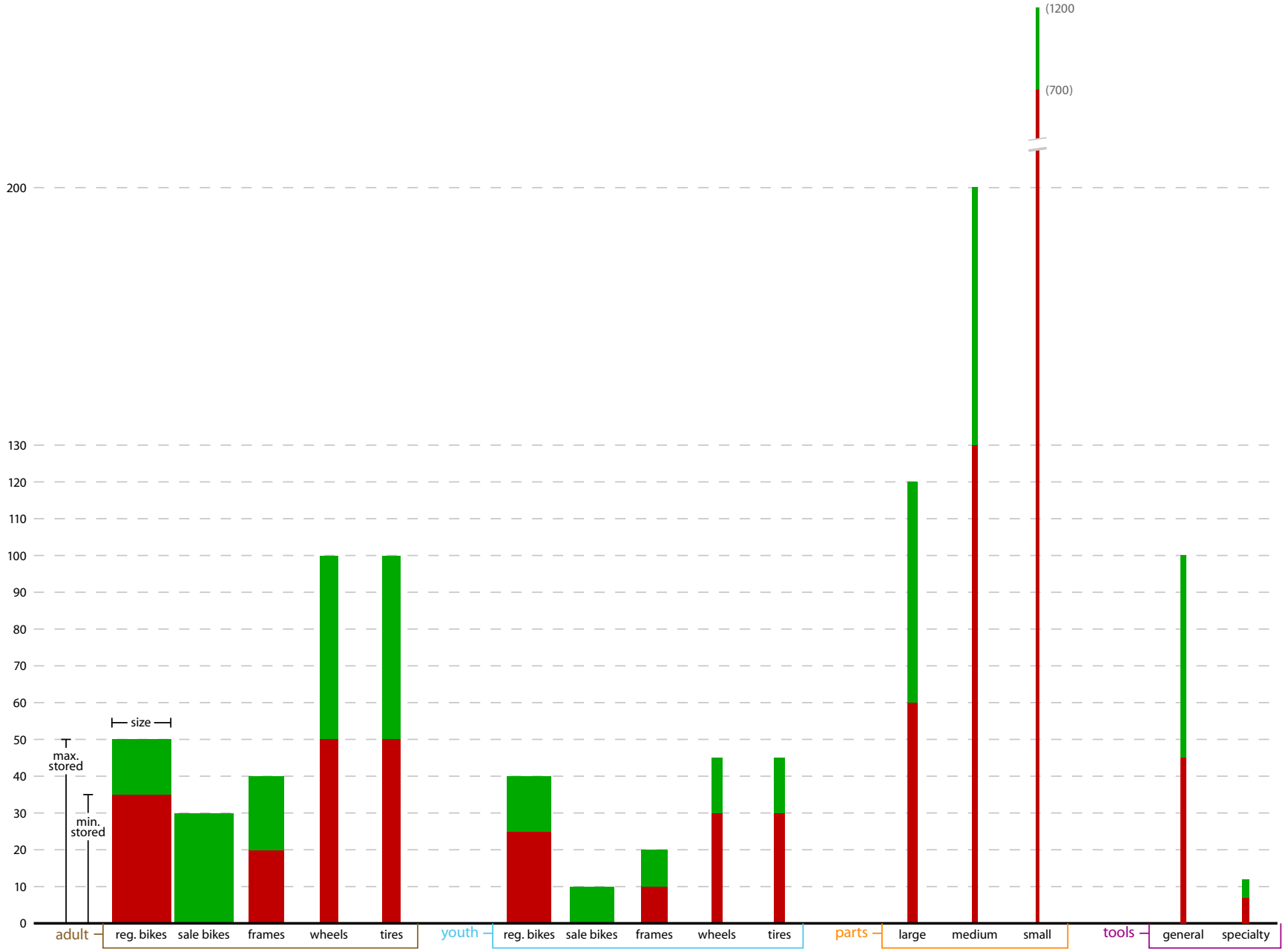



*Phase 2 (projected): September 2009 - August 2010*

In phase 2, a new VISTA will be developing the internal structure as well as building the partnership structure with The Steel Yard. A council of coordinators will coordinate four groups of volunteers to work on programs, funds, shop maintenance, and communication, respectively.

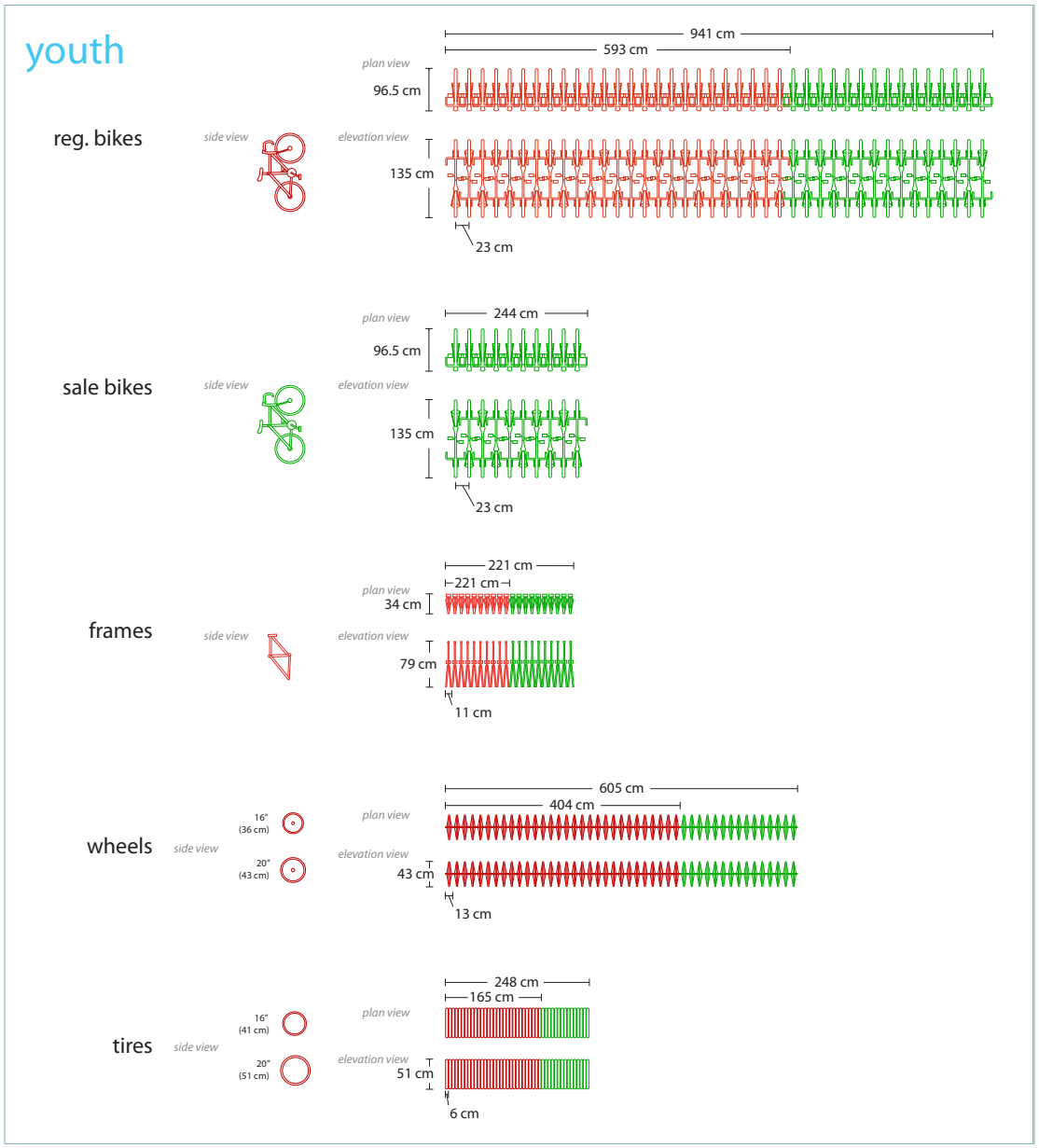
**Recycle-a-Bike / Steel Yard Partnership**
The partnership with The Steel Yard will balance rent payment, participation on the Steel Yard board of directors, and program overlap by Recycle-a-Bike with accounting, space, liability, and non-profit sponsorship from The Steel Yard. The details will be laid out leading up to September 2009.

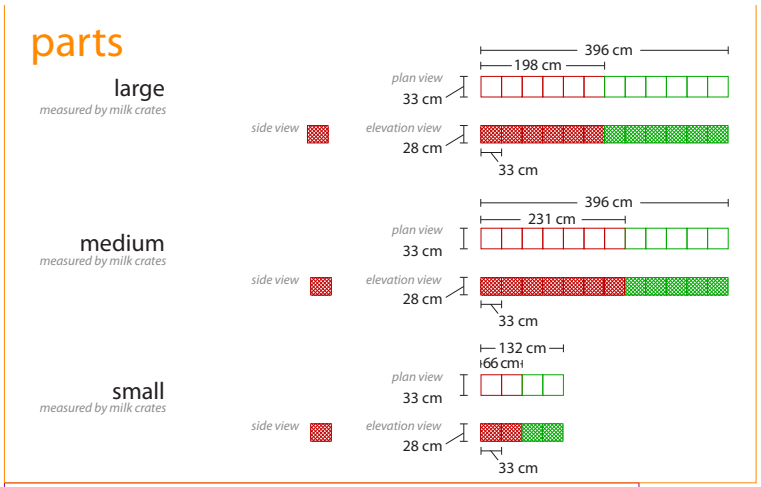
## Part Storage Requirements

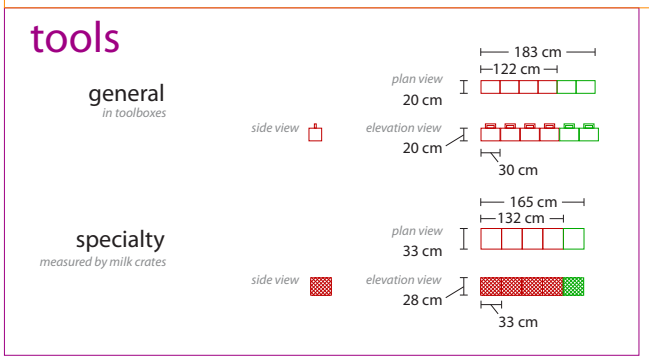



There is a need to store 35 - 50 adult bikes as well as youth bikes and several types of parts and tools.

## Dimensions Occupied by Desired Parts

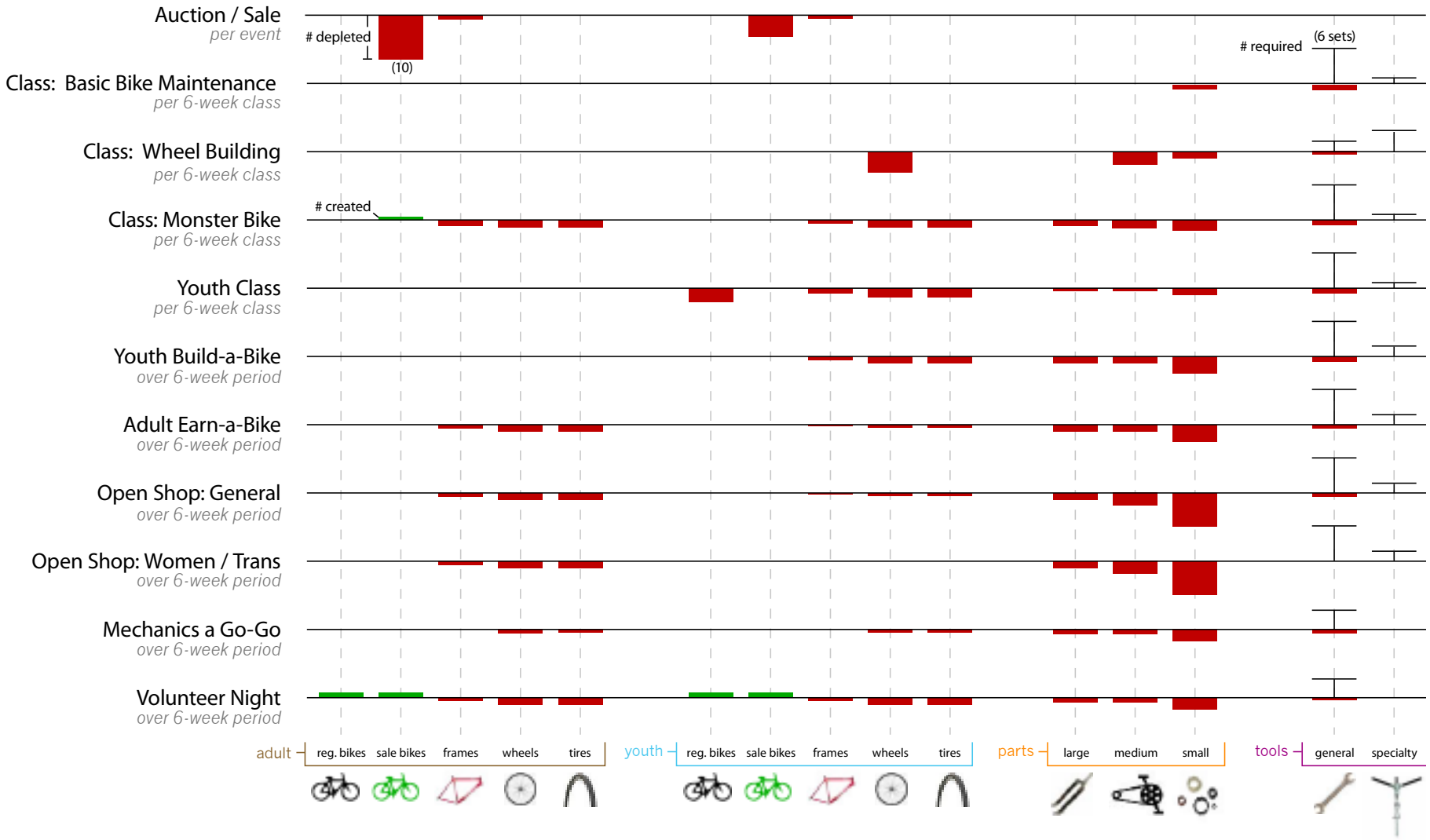


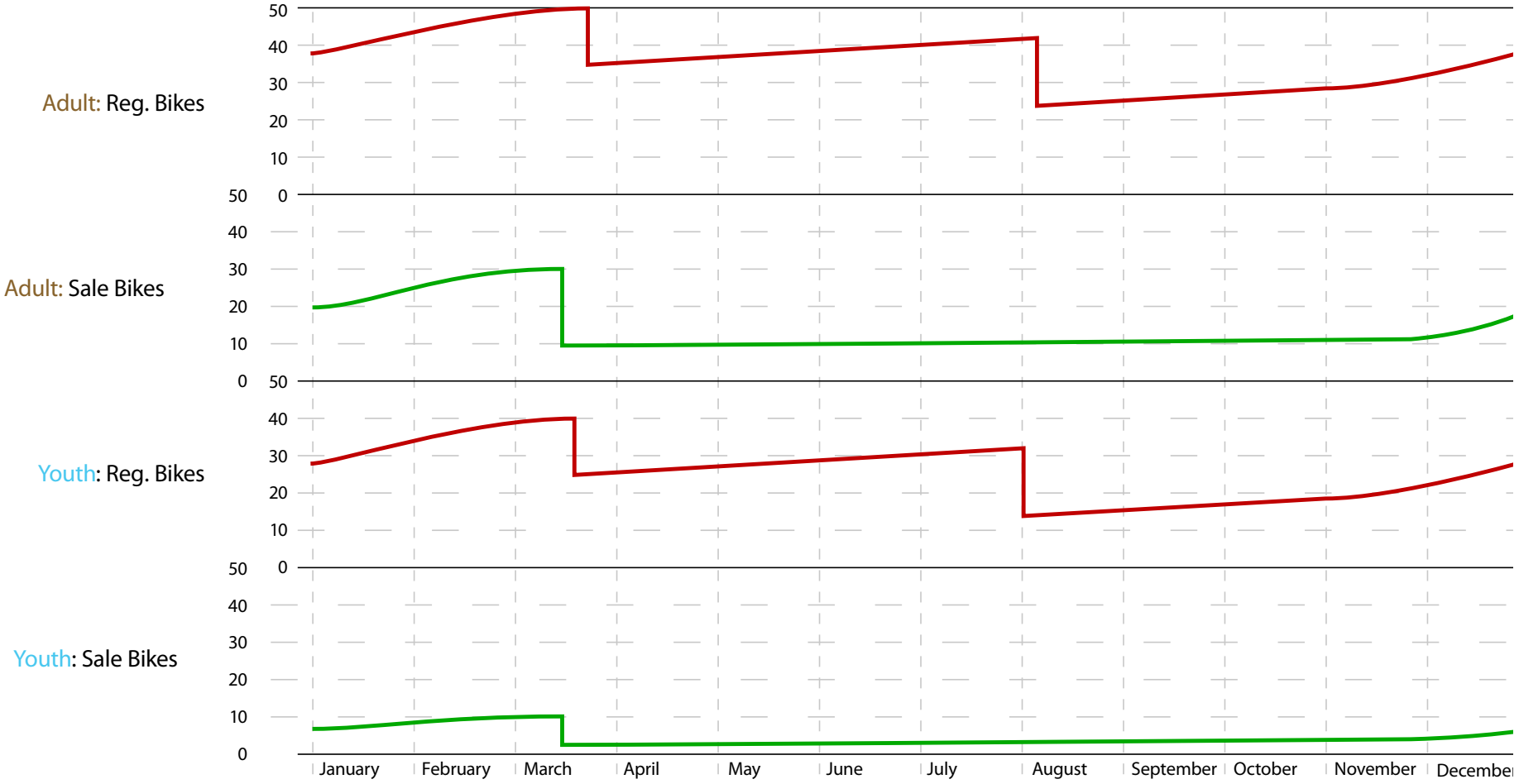

Bikes take up the largest physical footprint. Wheels also pose a significant challenge in terms of storage space.

## Part Loss / Gain by Program



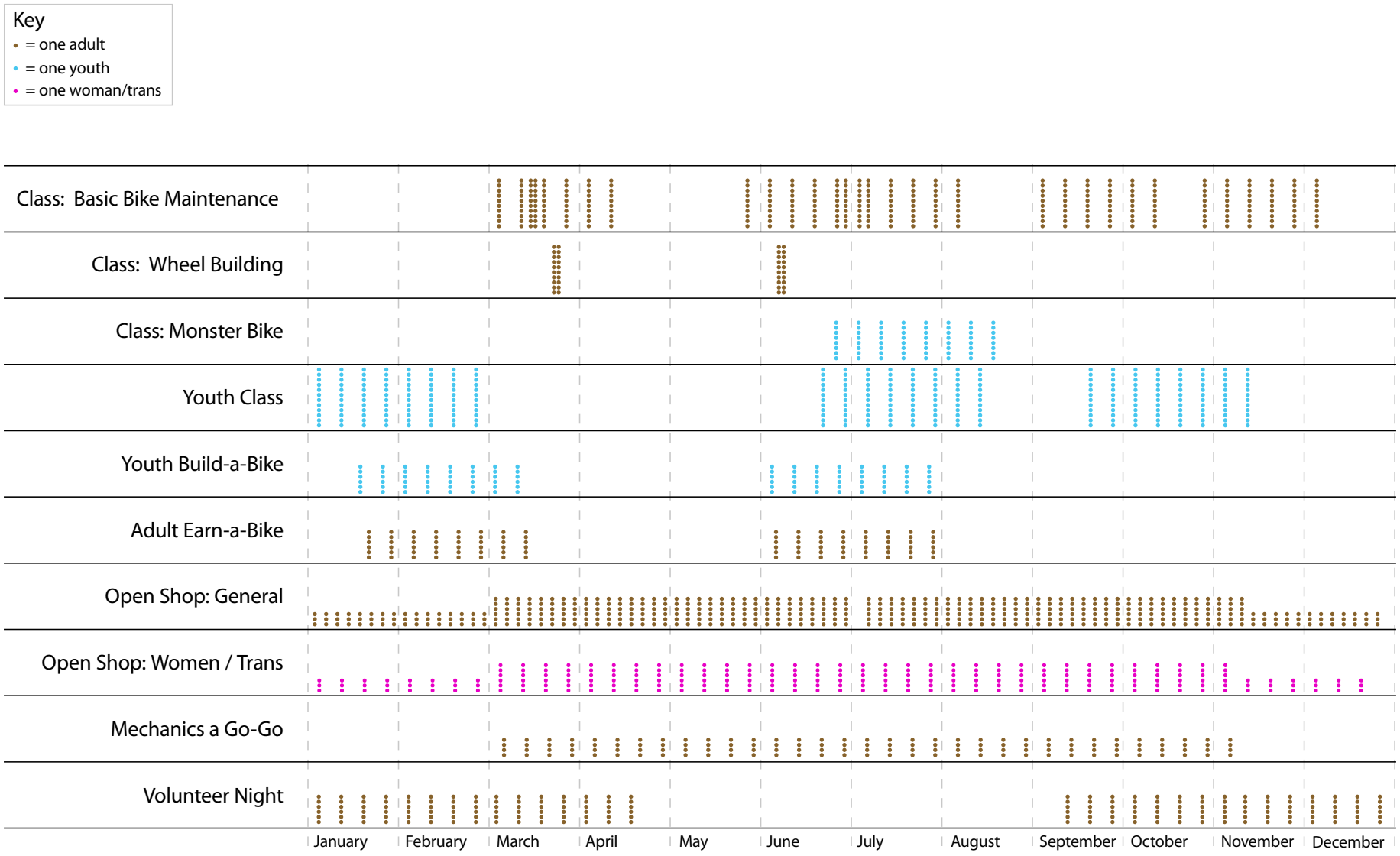

Periodic used bike sales comprise the biggest acute outflow of bikes. Otherwise, many of the programs gradually consume many small parts. Not shown here are the steady bike donations from individuals, universities, and police departments.

## Number of Bikes Stored Over a Year




The flow of bikes stored represents a gradual build interrupted by sharp drops with large used bike sales and culminations of earn-a-bike programs.

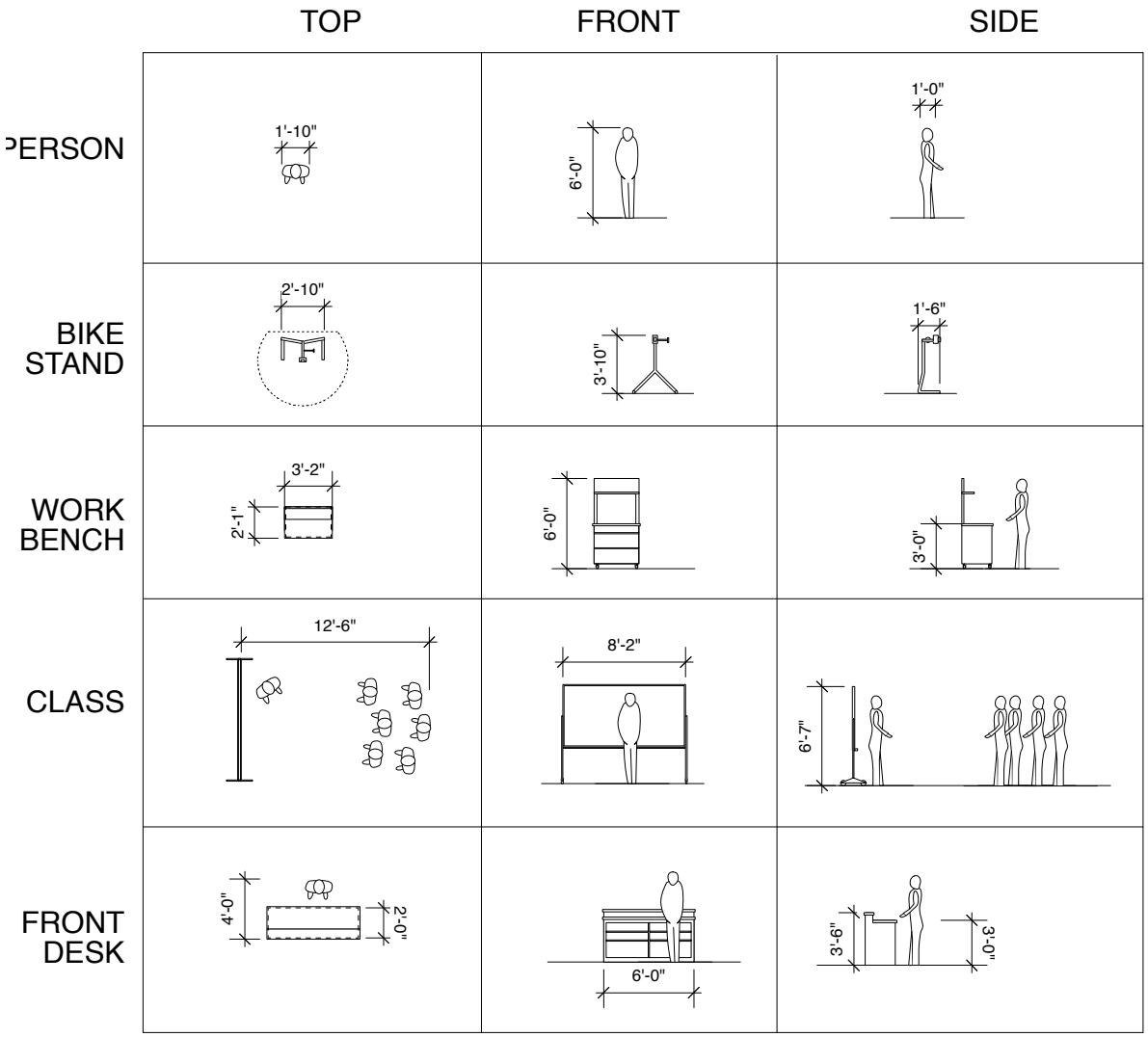
## Program Attendance Over a Year




Laid out over a year, the program capacities vary with more people in the open shop during the warmer months and more volunteer activity in the colder months.

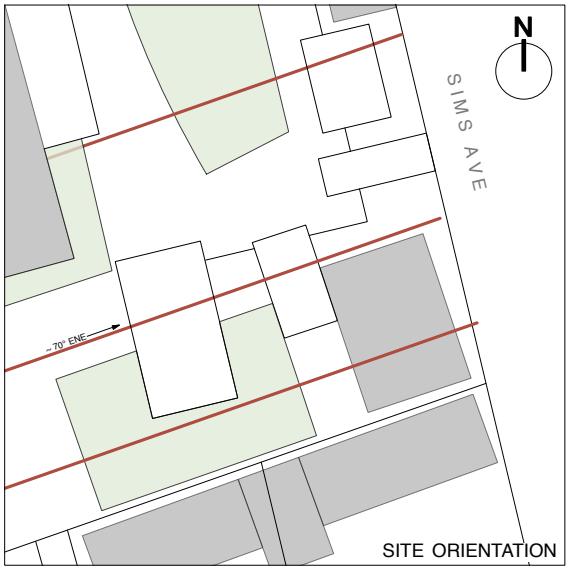
In the warmer months, more space is needed for workspace, whereas in the colder months, there is more of a need for storage.

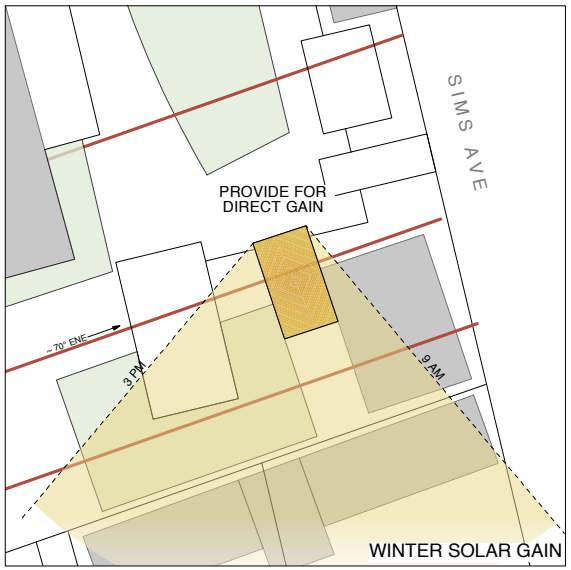
## Workspace Measurements

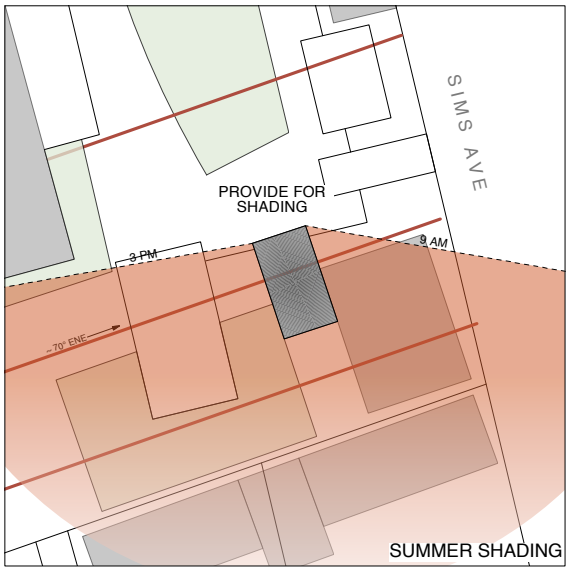


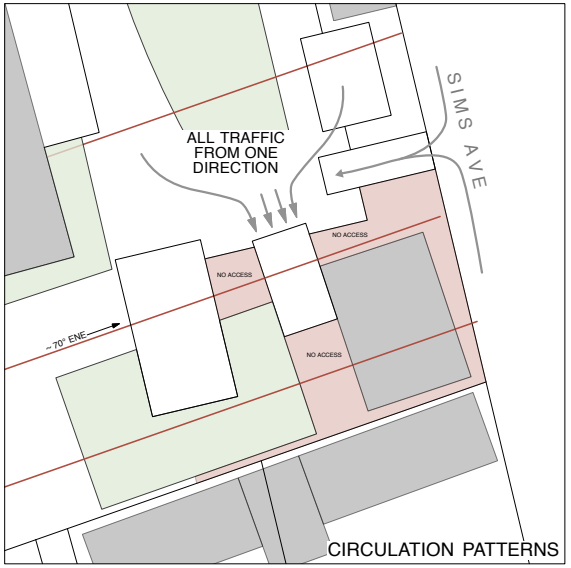

*measurements of common workspace components*

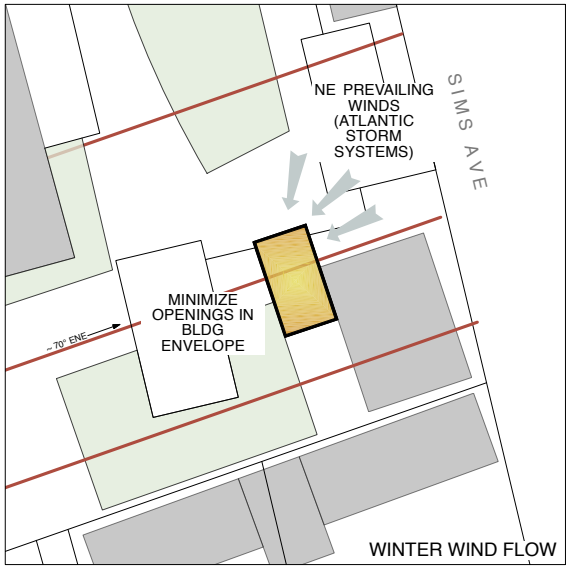
## Site Conditions

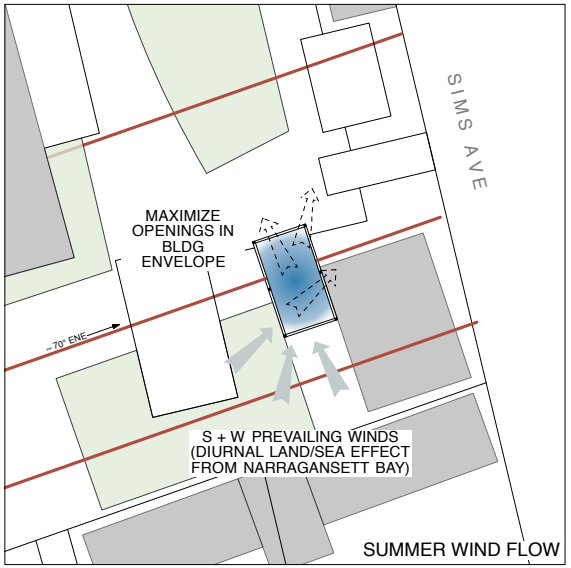


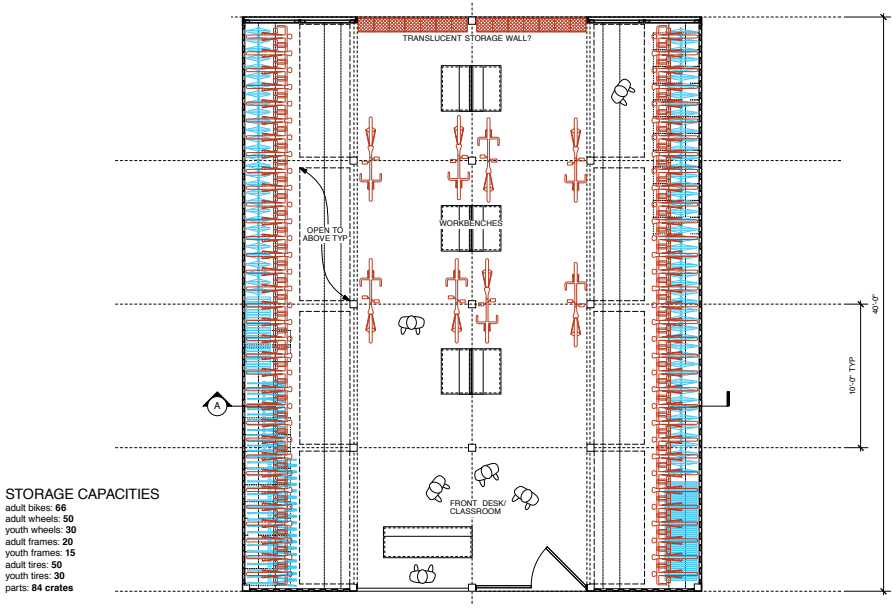

Understanding site conditions was key for passive heating and lighting techniques.

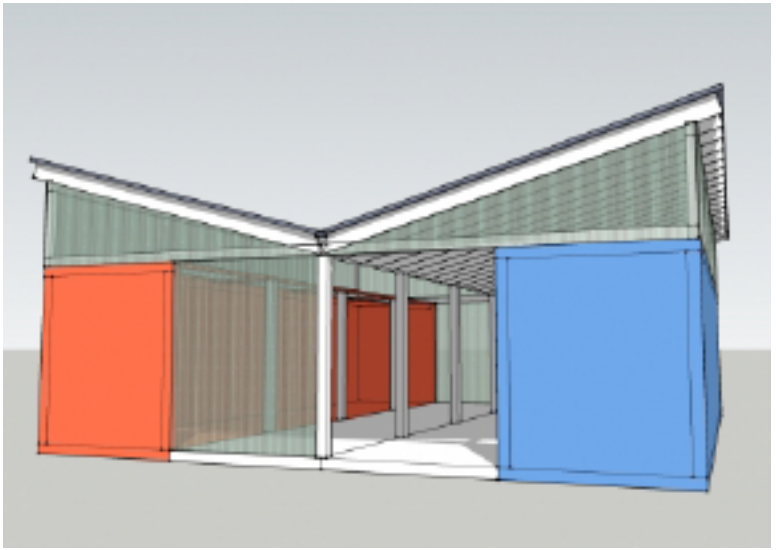
## Early Schematics

With the early schematics, we worked with the unit of a shipping container, which was selected as a possible low-cost, recycled solution for a structure. We explored various configurations of workbenches to allow sufficient space while encouraging collaboration. Given the small footprint, we maximized the use of overhead storage.

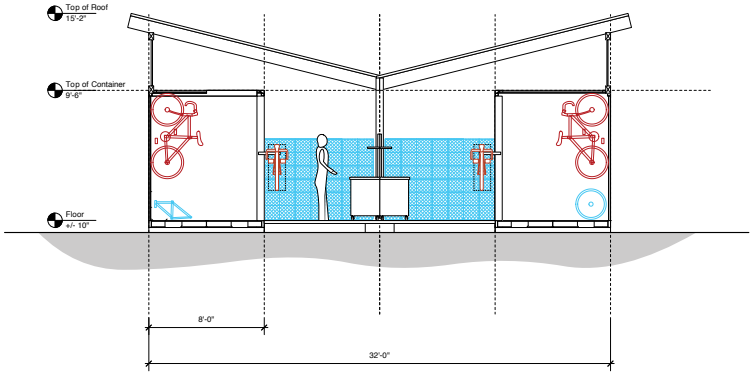
We assessed each schematic on the following criteria:
**Efficiency** - Energy efficiency in operations and in construction
**Mobility** - Ease of assembly / disassembly in the case that the structure had to move
**Function** - Utility of the space for workspace and storage
**Affordability** - Costs of labor and materials
**Aesthetics** - Effectiveness of visually conveying the ideas of material re-use and openness to the community

## Early Schematic: Container + Canopy



It was quickly determined that the width of one shipping container was insufficient for any comfortable workspace. Here, a butterfly roof spans two cut-away shipping containers and creates a large enclosure between them. The trough formed in the center could be adapted into a rainwater collection system.



# Container + Canopy Early Schematic

## EFFICIENCY

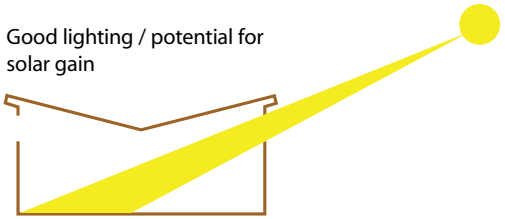
### OPERATIONS

Thermal envelope

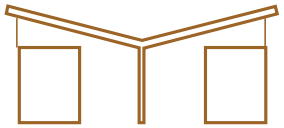
Roof can be easily insulated

Containers and floor need insulation

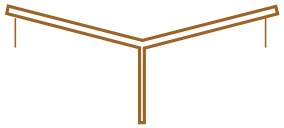
Good lighting / potential for solar gain



### CONSTRUCTION



Roof and windows require large amount of new material

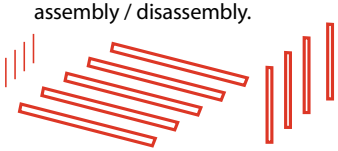


Containers are used material

## MOBILITY

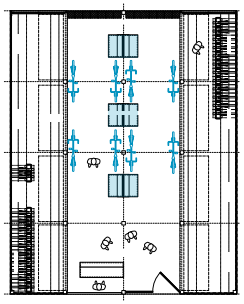
Containers are modular

Roof, windows, and posts require many parts. Time-consuming assembly / disassembly.

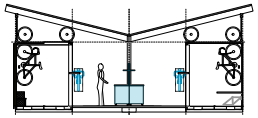


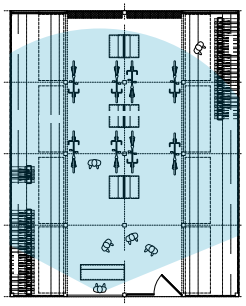
## FUNCTION

Storage space somewhat small. Overhead wheel storage, but no overhead bike storage.



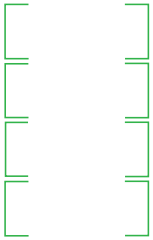
Ample work space





Excellent visibility from counter

## AFFORDABILITY

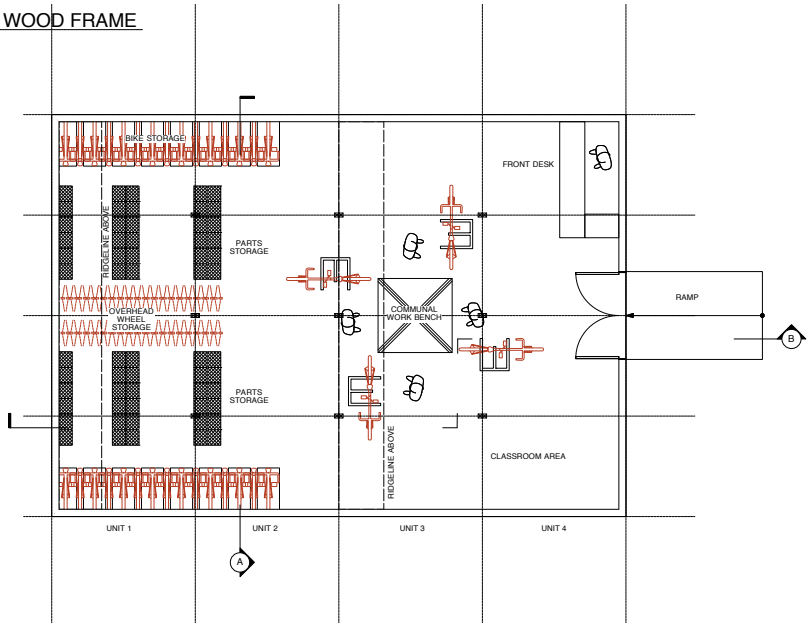


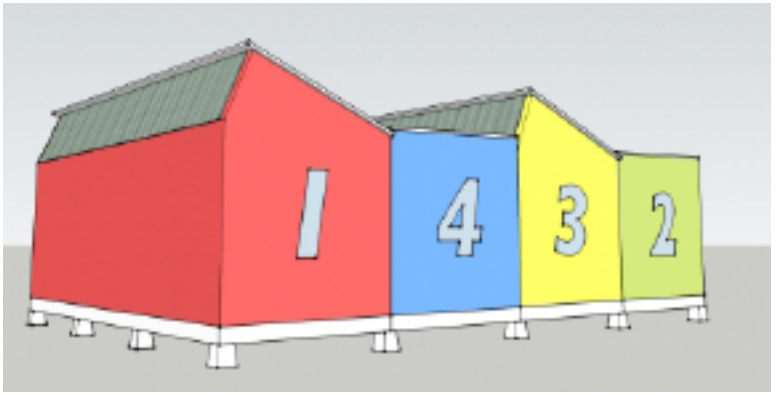
Containers require several cuts.

Opportunity for participatory assembly of roof, but construction may be complicated with many parts.

## Early Schematic: Modular Frame

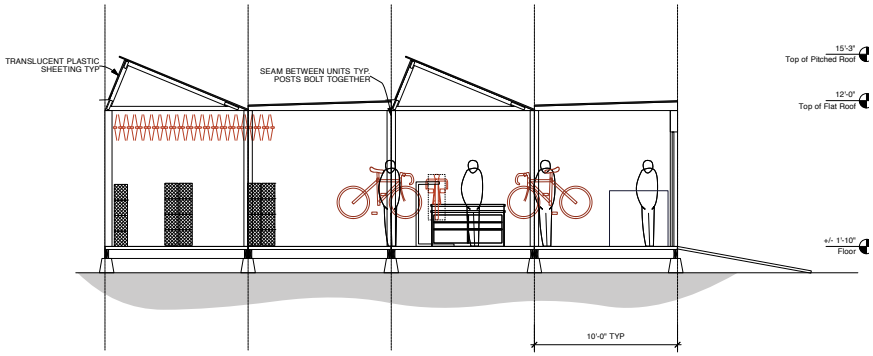
MODULAR WOOD FRAME



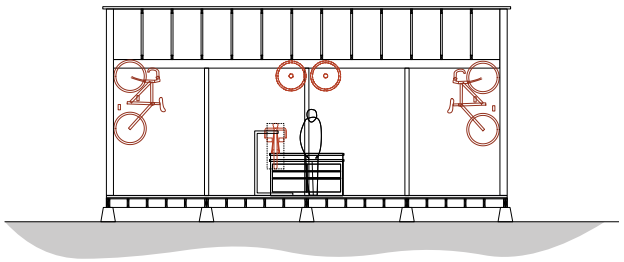




Four modular units are designed to be built in two phases. The first phase would combine unit 1 and 2 above and allow the organization to raise money to construct units 3 and 4 which would then go in between and double the length.

MODULAR WOOD FRAME



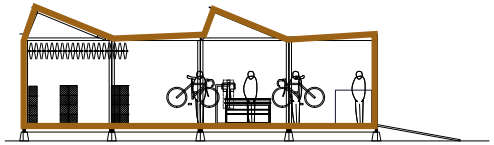

MODULAR WOOD FRAME



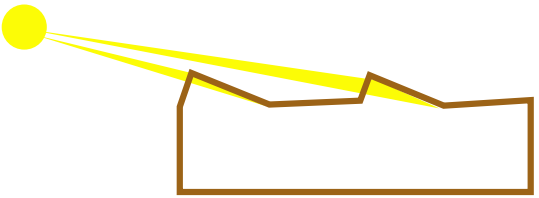
## Modular Frame Schematic Assessment

### EFFICIENCY

#### OPERATIONS

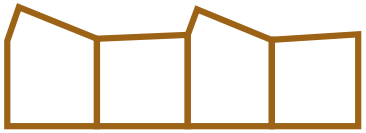


Thermal Envelope
- with all new construction, could be very efficient.



Solar gain may be excessive.
Consider facing windows north.

#### CONSTRUCTION

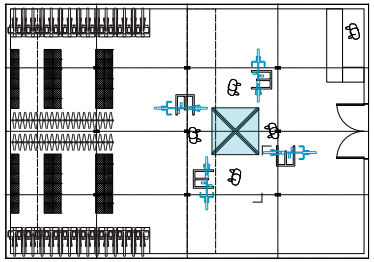


Energy-intensive with mostly new materials

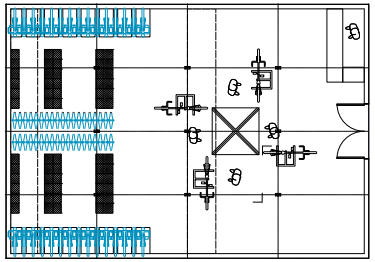
### MOBILITY

Construction could be modular and bolted.

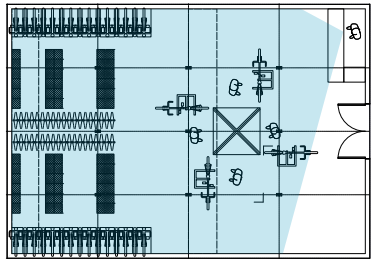
### FUNCTION



Open workspace



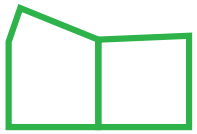
Good storage space



Good visibility from counter

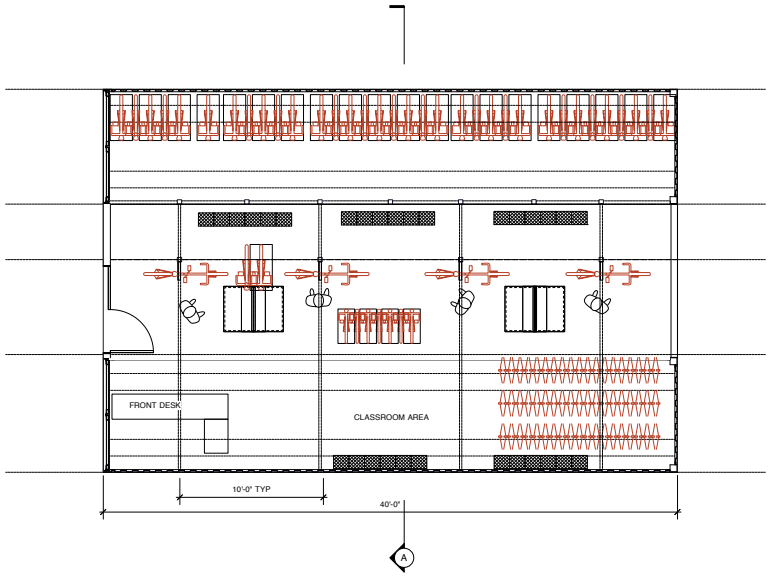
### AFFORDABILITY

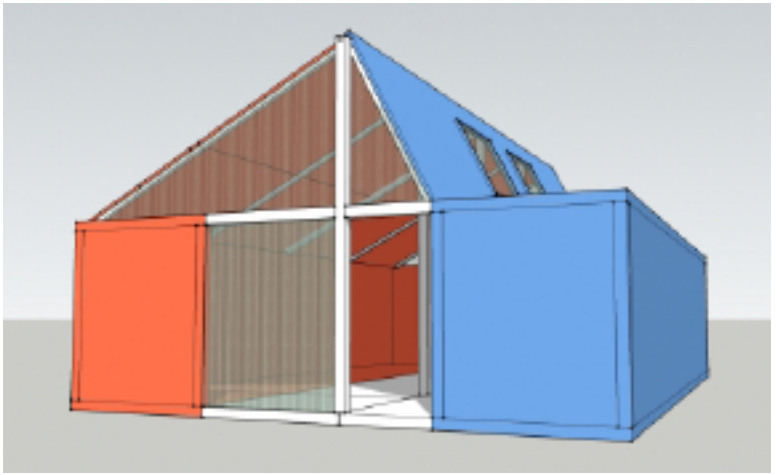
High material cost



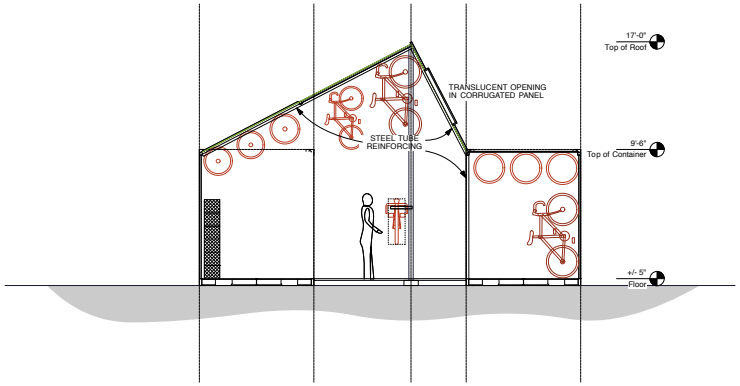
Construction could be easily phased.

## Early Schematic: Folding Containers



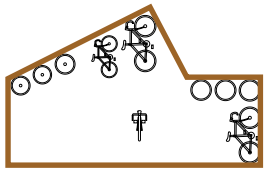
Deconstructed and folded walls of shipping containers create a high ceiling for overhead bike storage. Work area is made available in the center, and one wall accommodates more frequently accessed storage.



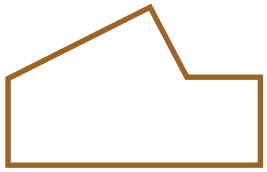
# Folding Containers Schematic Assessment

## EFFICIENCY

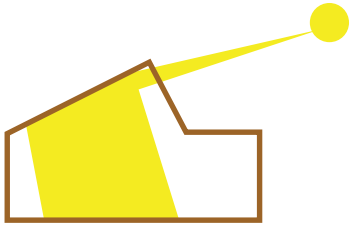
### OPERATIONS



Thermal Envelope



Entire structure can be easily insulated around outside.



Decent lighting / potential for solar gain

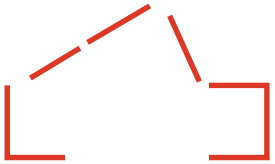
### CONSTRUCTION

Containers are used material and comprise majority of structure.

## MOBILITY

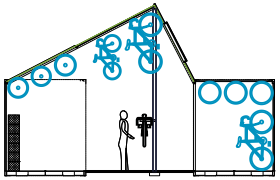
Containers are modular.

Side walls could be modular.

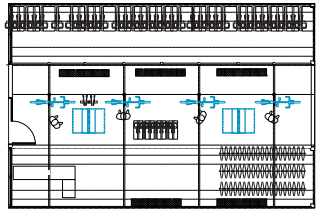


Containers require significant modifications, need to bolt pieces together to allow for disassembly, requires crane for assembly.

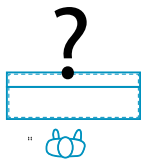
## FUNCTION



Good overhead storage



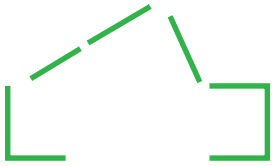
Fair workspace



Uncertain location for front desk

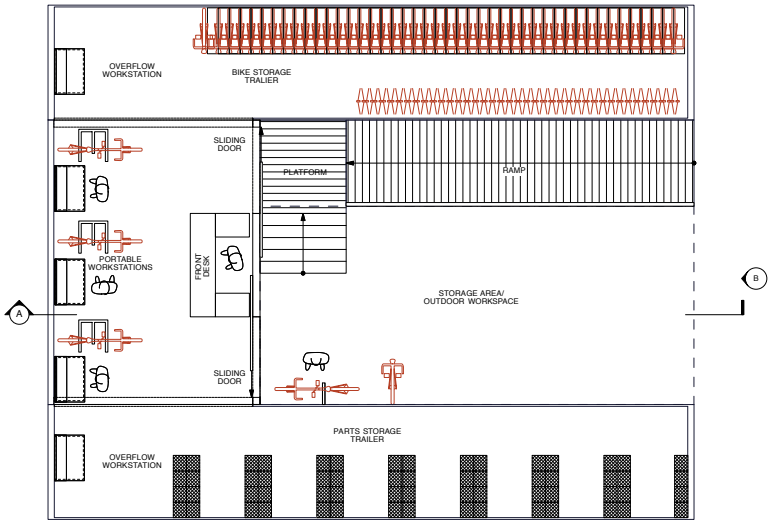
## AFFORDABILITY

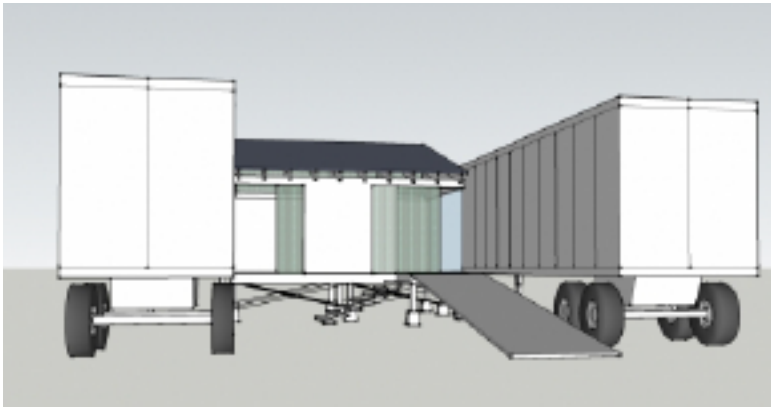
low material cost



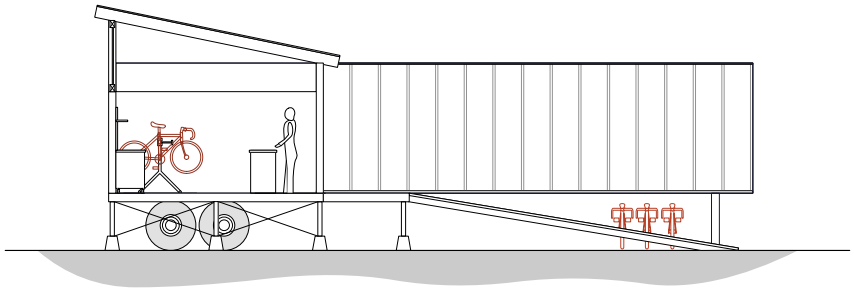
High cost, high skill engineering and building required.

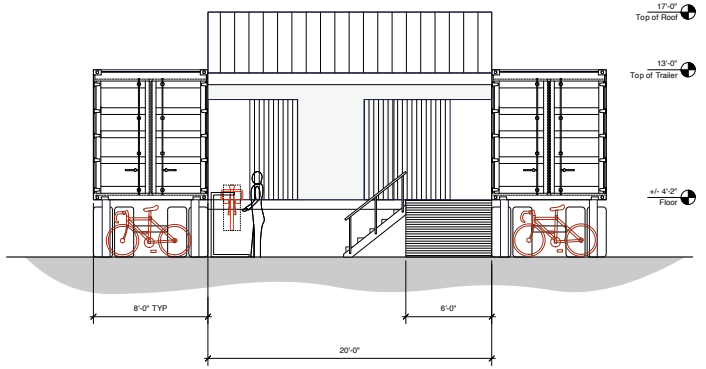
## Early Schematic: Trailer Re-use



The two existing Recycle-a-Bike storage trailers are cut and bridged with a component that becomes a work area, retaining the trailers as storage. The structure also partially encloses an outdoor area which can be used as overflow workspace.

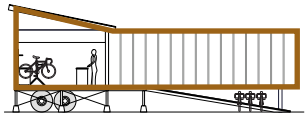




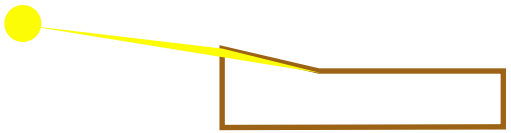
# Early Schematic: Trailer Re-use

## EFFICIENCY

### OPERATIONS

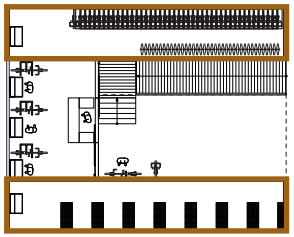


Thermal Envelope
- inherently not well insulated

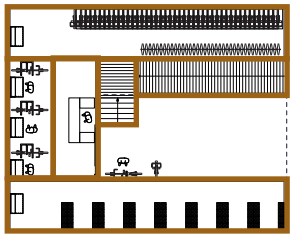


Good solar gain on workspace side.
Storage side is dimmer and colder.

### CONSTRUCTION

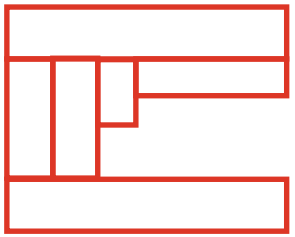


Trailers are mobile and already on site.



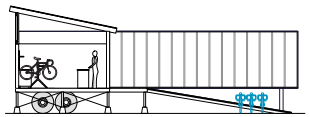
Pieces could be made modular and assembled on site.

## MOBILITY

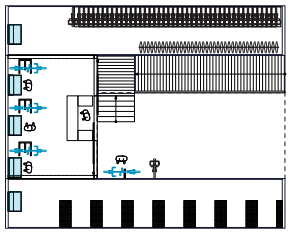


Construction could be modular and bolted.

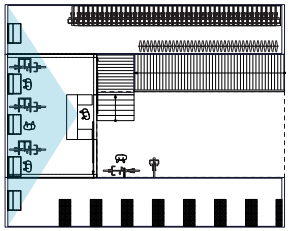
## FUNCTION



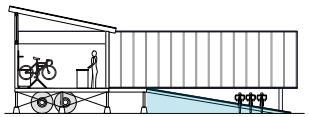
Ample storage, but requires walking around structure to access in some cases.



Less than ideal workspace

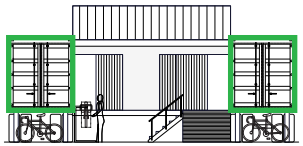


Good visibility of workspace, but poor visibility of storage.

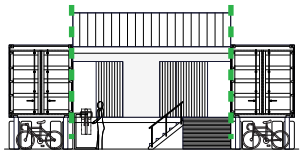


Difficult circulation dealing with height of trailers.

## AFFORDABILITY

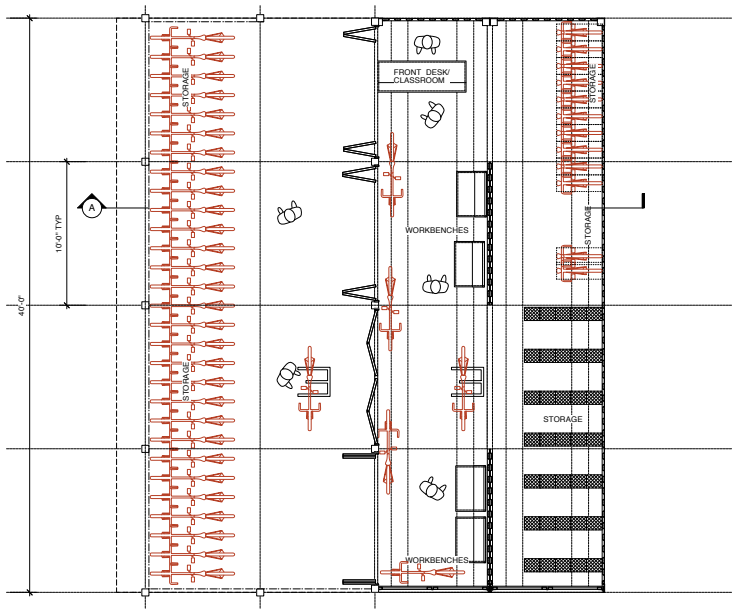


Trailers already on site - small area requiring new construction.



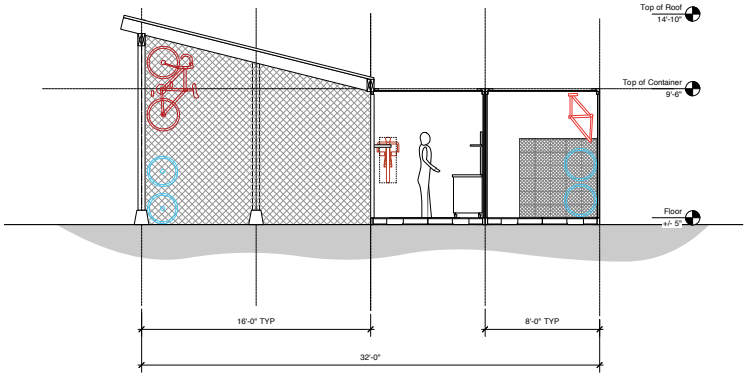
May be difficult to seal connections between units.

## Early Schematic: Workyard



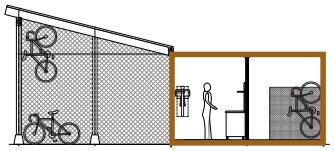

Two shipping containers are placed side by side, and a roof is built outside, which is slanted to allow more passive lighting and to store two rows of bicycles on the outer end.

The design is made to accommodate the change in seasons. During the winter, the outdoor enclosure would be used as storage, and in the summer, it would provide overflow workspace when storage requirements are less.



## Workyard Schematic Assessment

### EFFICIENCY



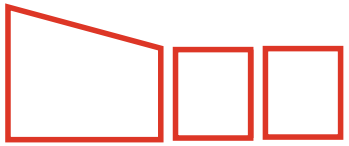
#### OPERATIONS

Thermal envelope. Containers easy to insulate around outside.

#### CONSTRUCTION

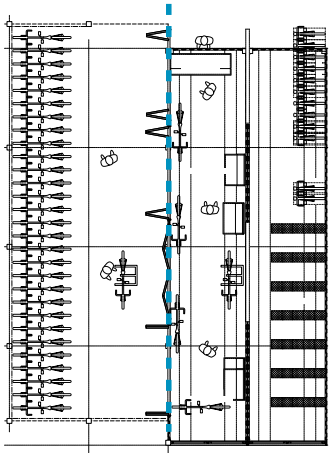
Re-used containers cut down construction energy.

### MOBILITY

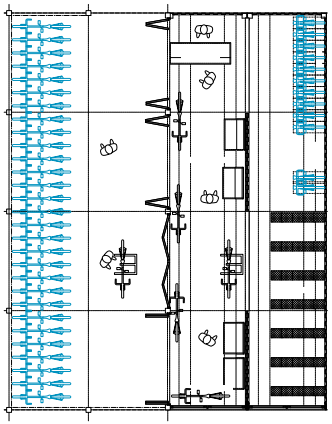


modular, but needs a way to split the roof.

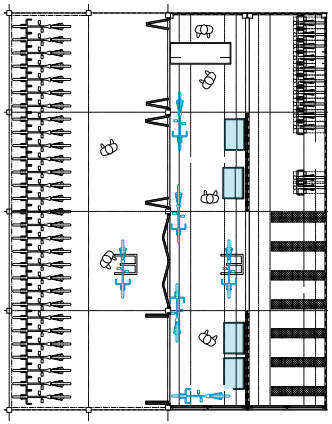
### FUNCTION



Adjustable seasonally

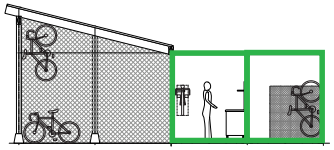


Storage is challenging.

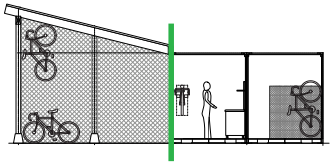


Workspace is tight in wintertime.

### AFFORDABILITY



Containers are cheap. Possibility of using some recycled material for fence



Doors may be costly

## Final Direction

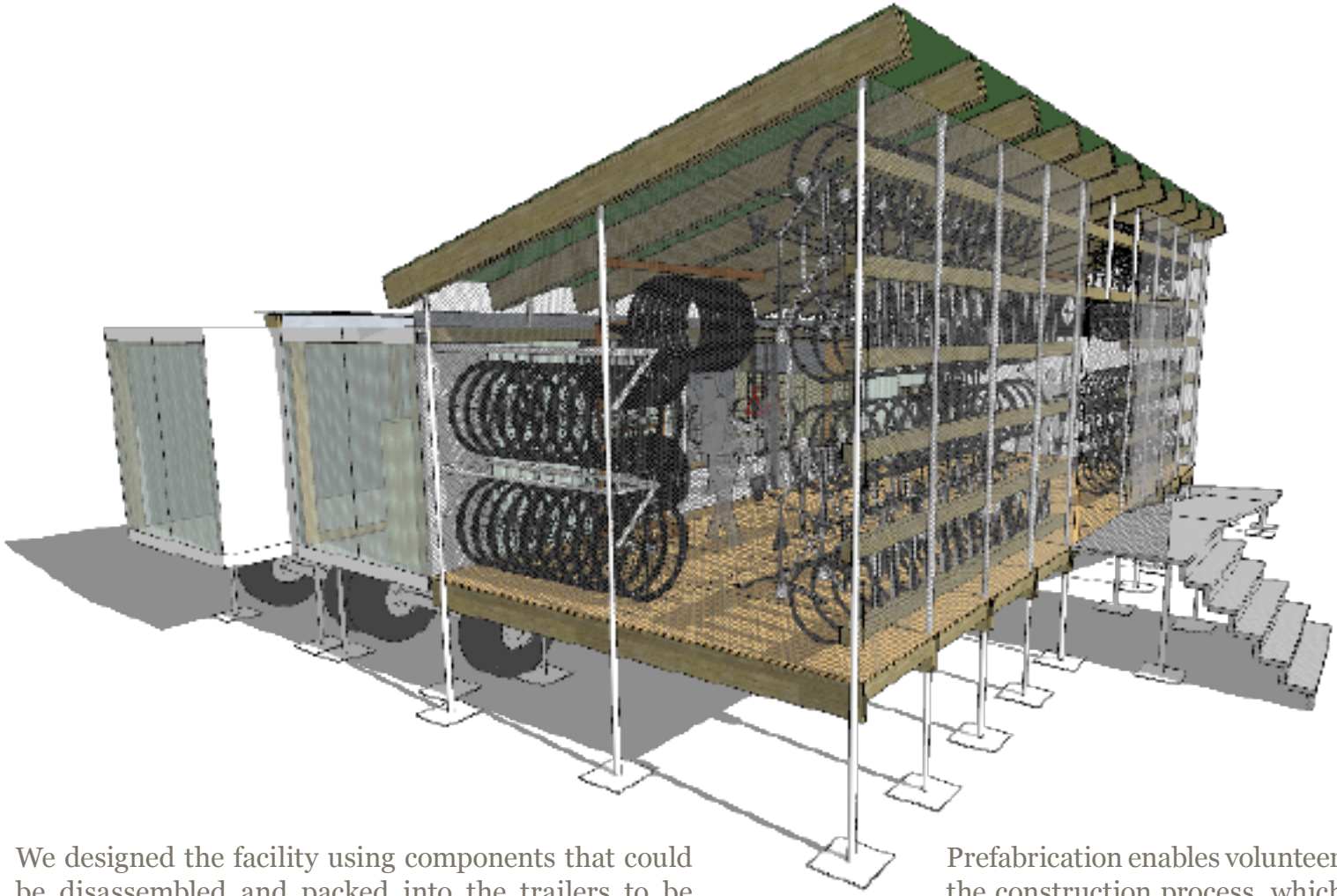
We chose to incorporate the existing trailers (rather than shipping containers) into the new facility for a few reasons.

First, unloading shipping containers onto the site is difficult. Typically, containers are unloaded using a crane, but the gantries overhead (see image at right) interfere with the use of a crane.

Second, the shipping containers are an additional cost. At approximately $3000 each, it is a significant price for an organization with a shoestring budget.

Third, utilizing the trailers would allow for easy transportation of the facility in the case that it had to move off-site.

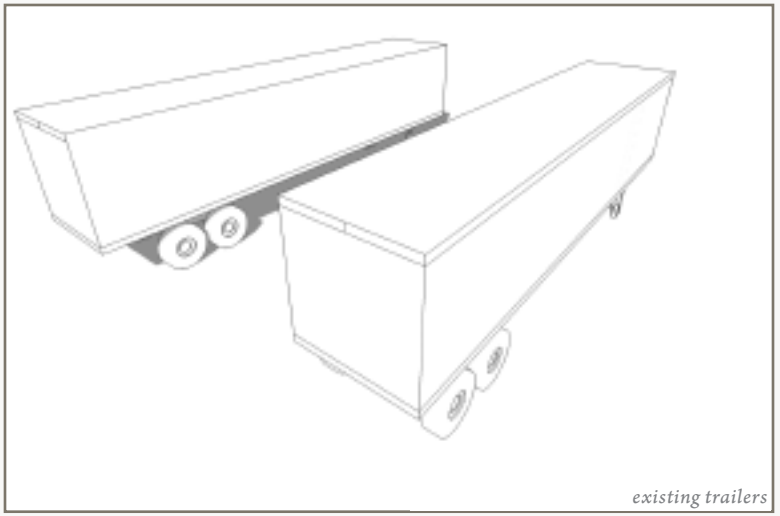
*view of gantry above trailers*



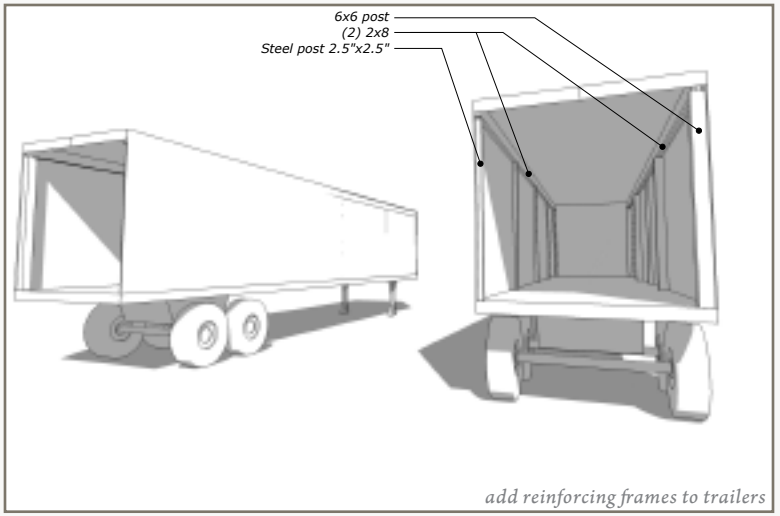
We designed the facility using components that could be disassembled and packed into the trailers to be hauled to another location if necessary. Switching locations would require liquidating the majority of bikes in inventory, but acquiring donations to replenish the inventory has never been a problem.

Prefabrication enables volunteers to perform the bulk of the construction process, which keeps costs low while generating a sense of community ownership.

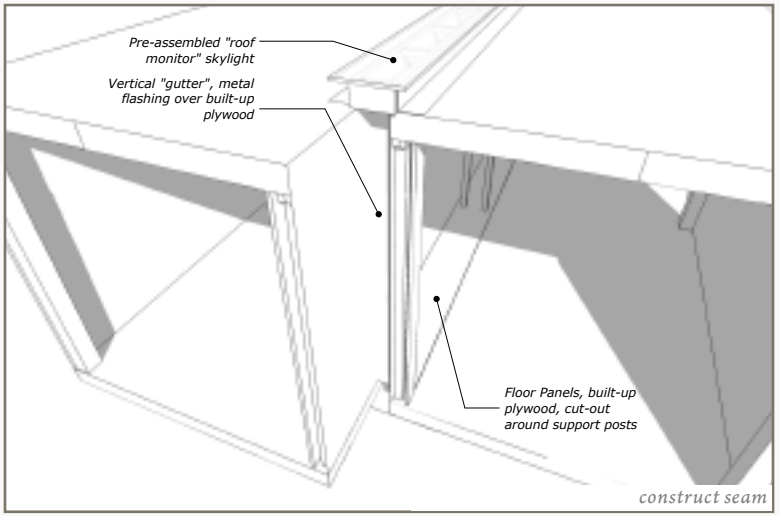
## Construction Sequence



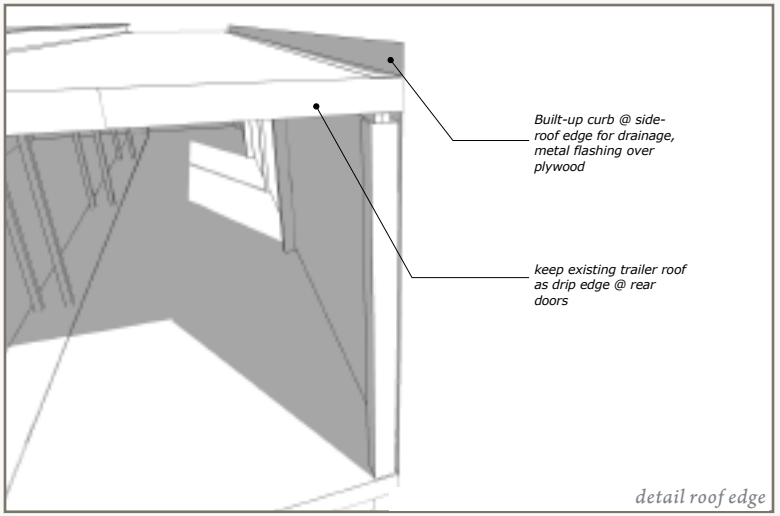

1.



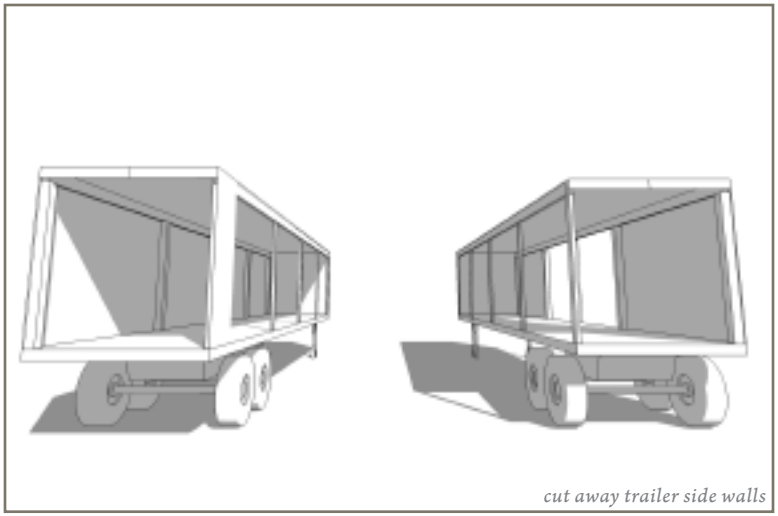

2.




5.

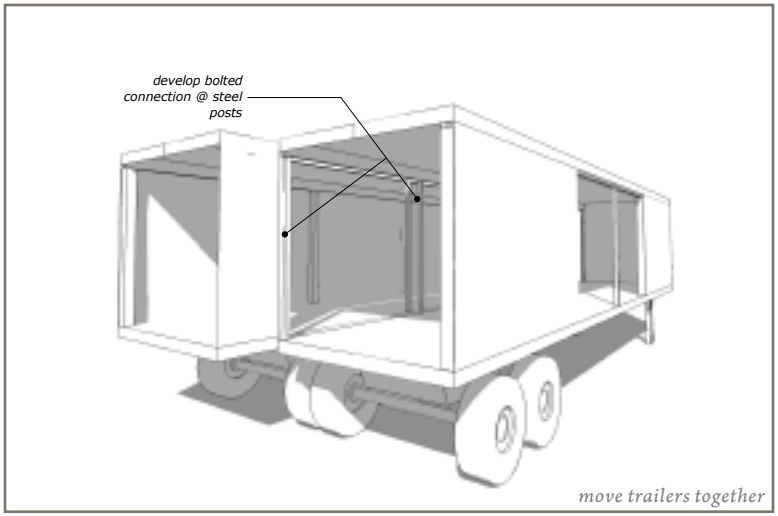



6.



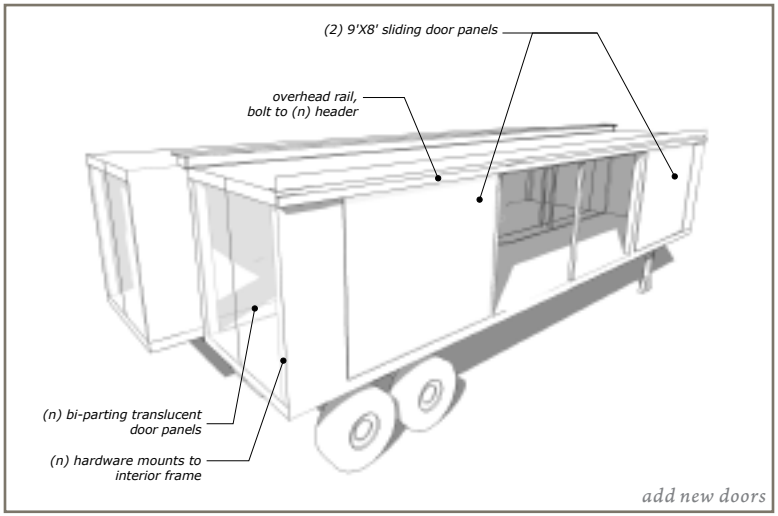
*cut away trailer side walls*

3.



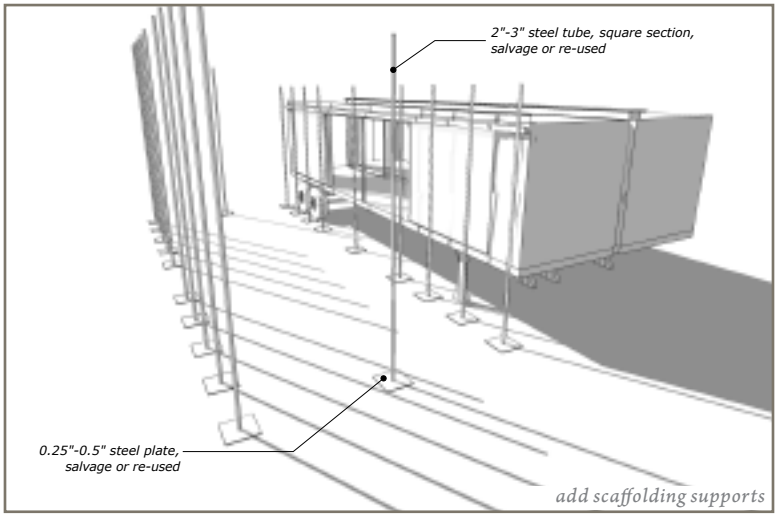

*move trailers together*

4.




*add new doors*

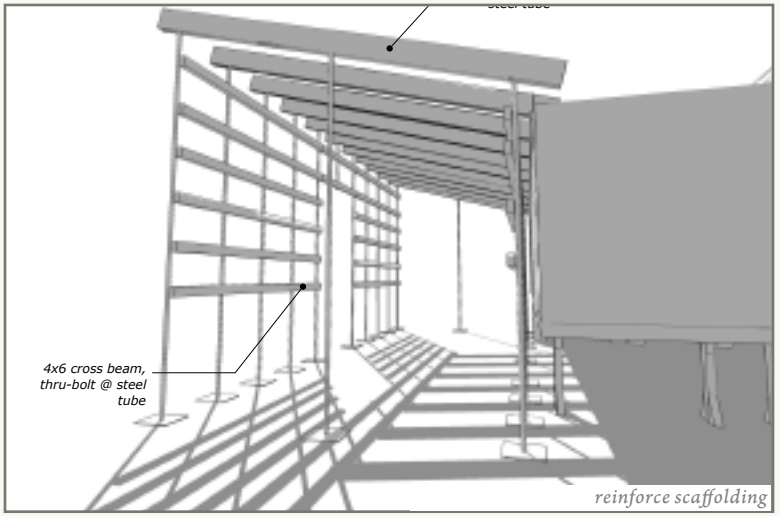
7.



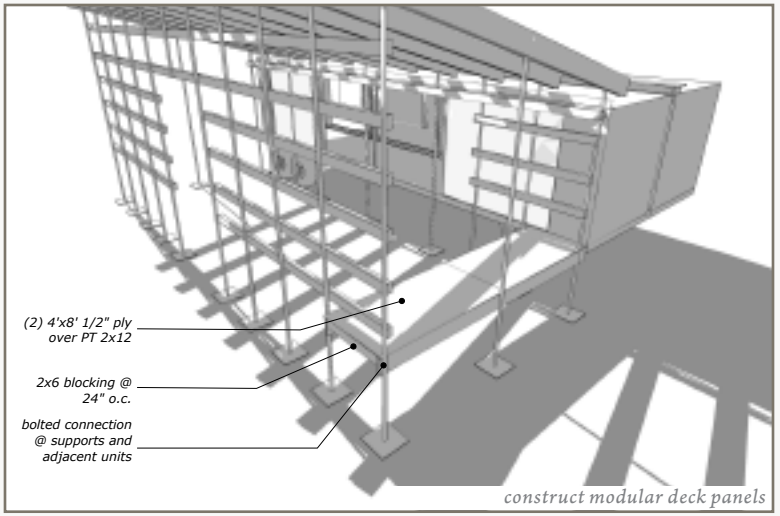

*add scaffolding supports*

8.

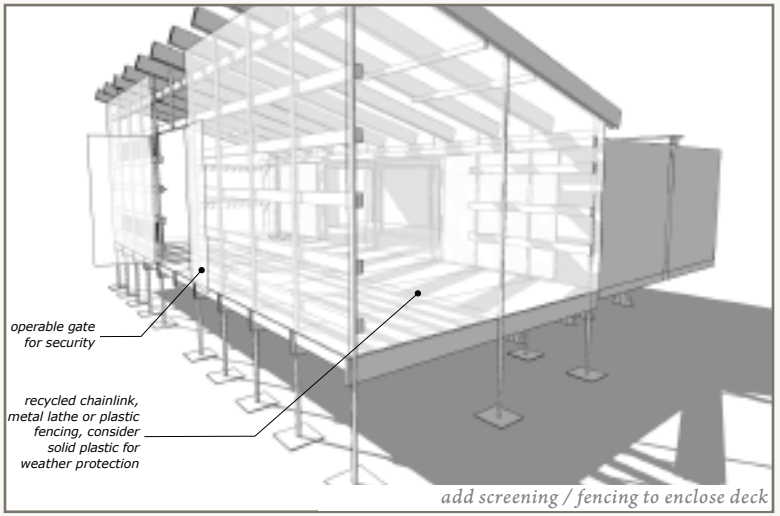
## Construction Sequence



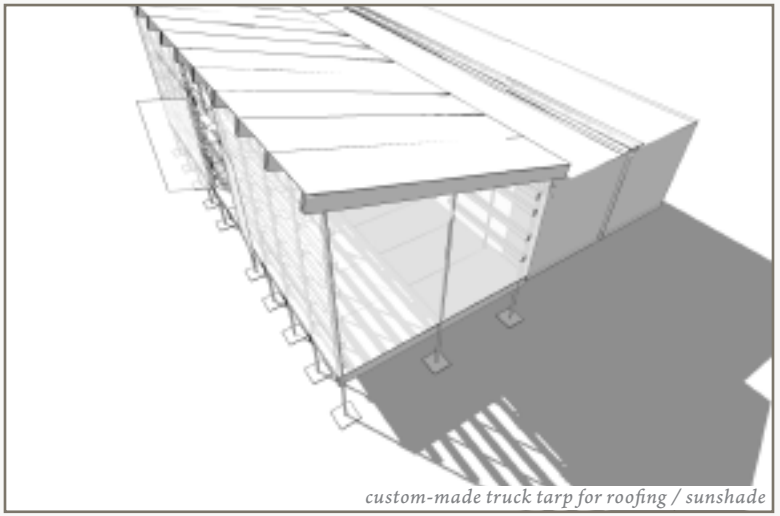

9.



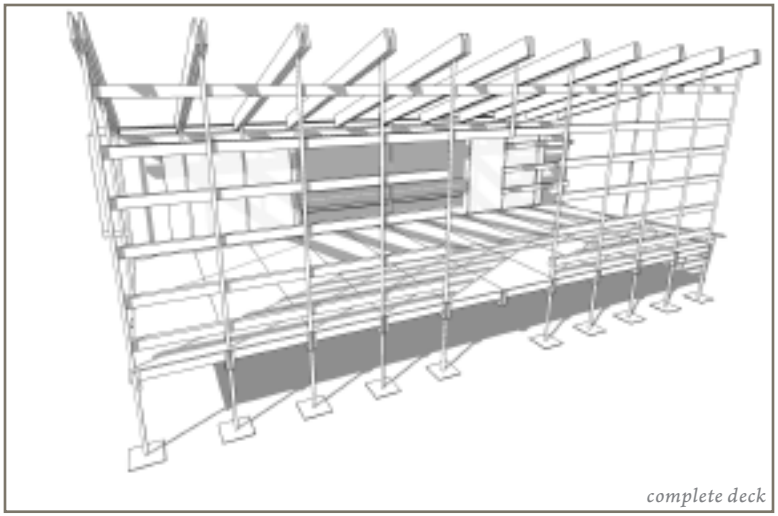

10.




13.

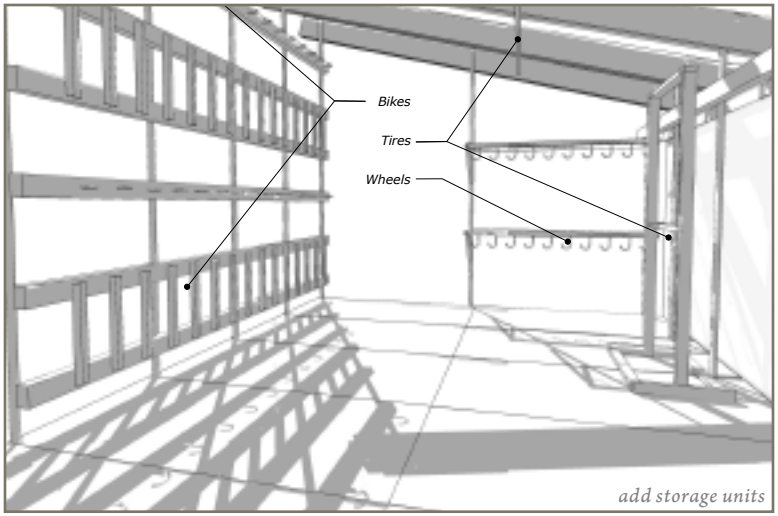



14.



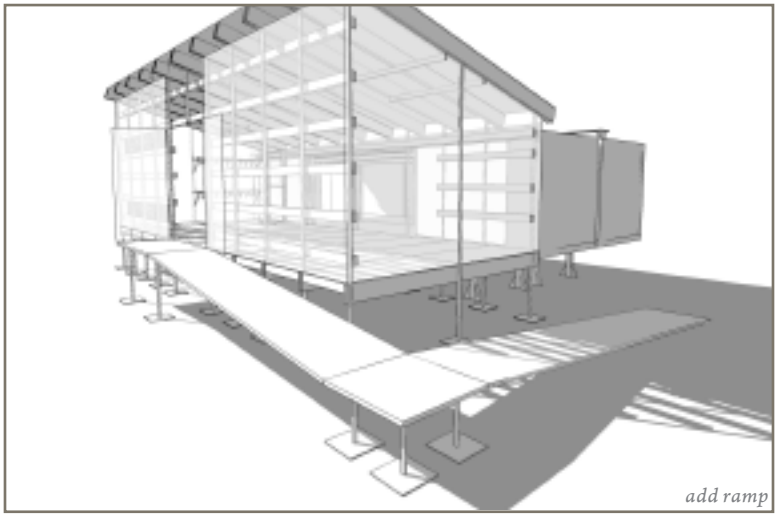
*complete deck*

11.



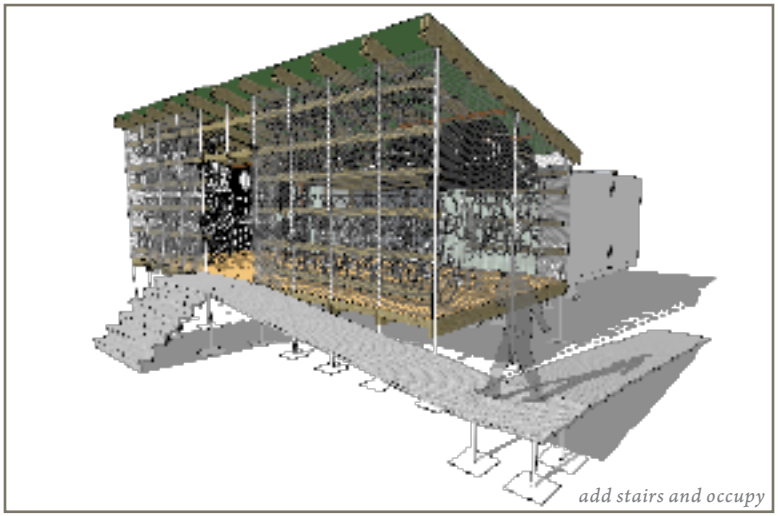

*add storage units*

12.



*add ramp*

15.



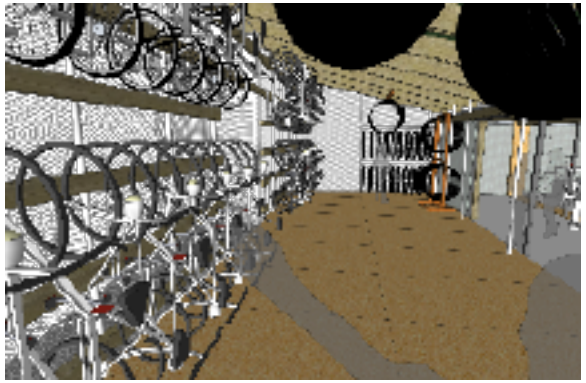
*add stairs and occupy*

16.

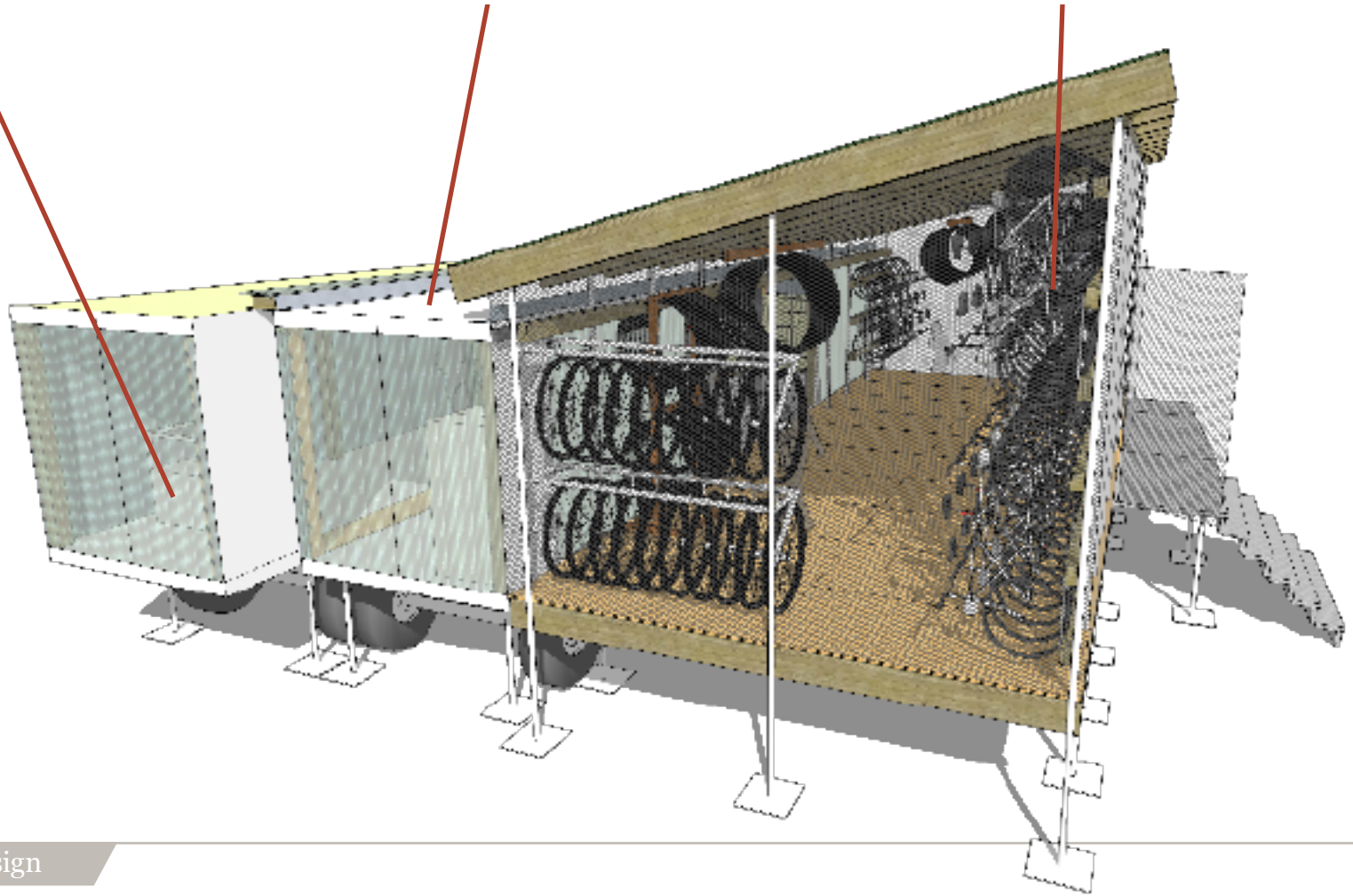
## Additional Views

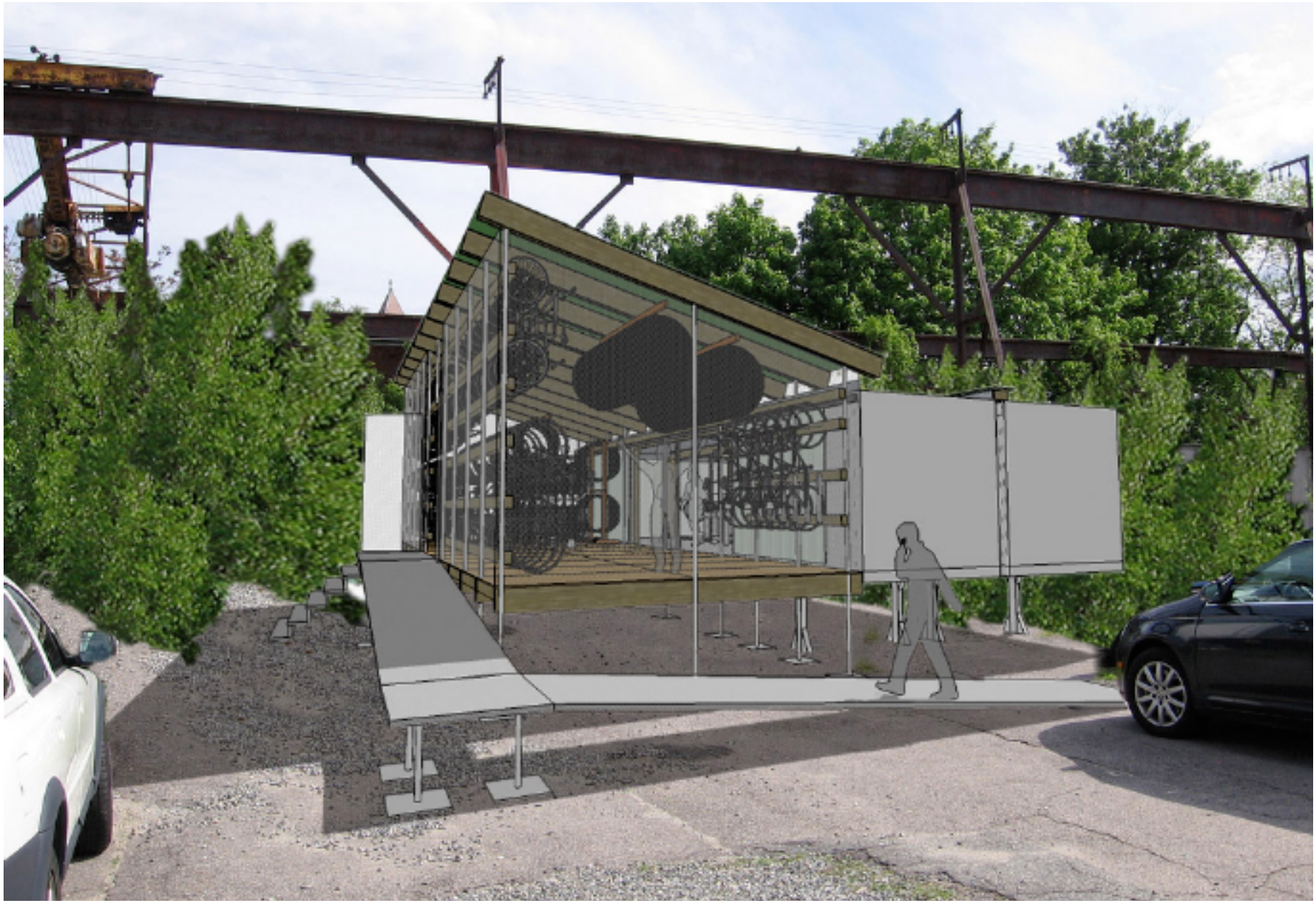
*front desk*

*workspace / small part storage inside trailers*



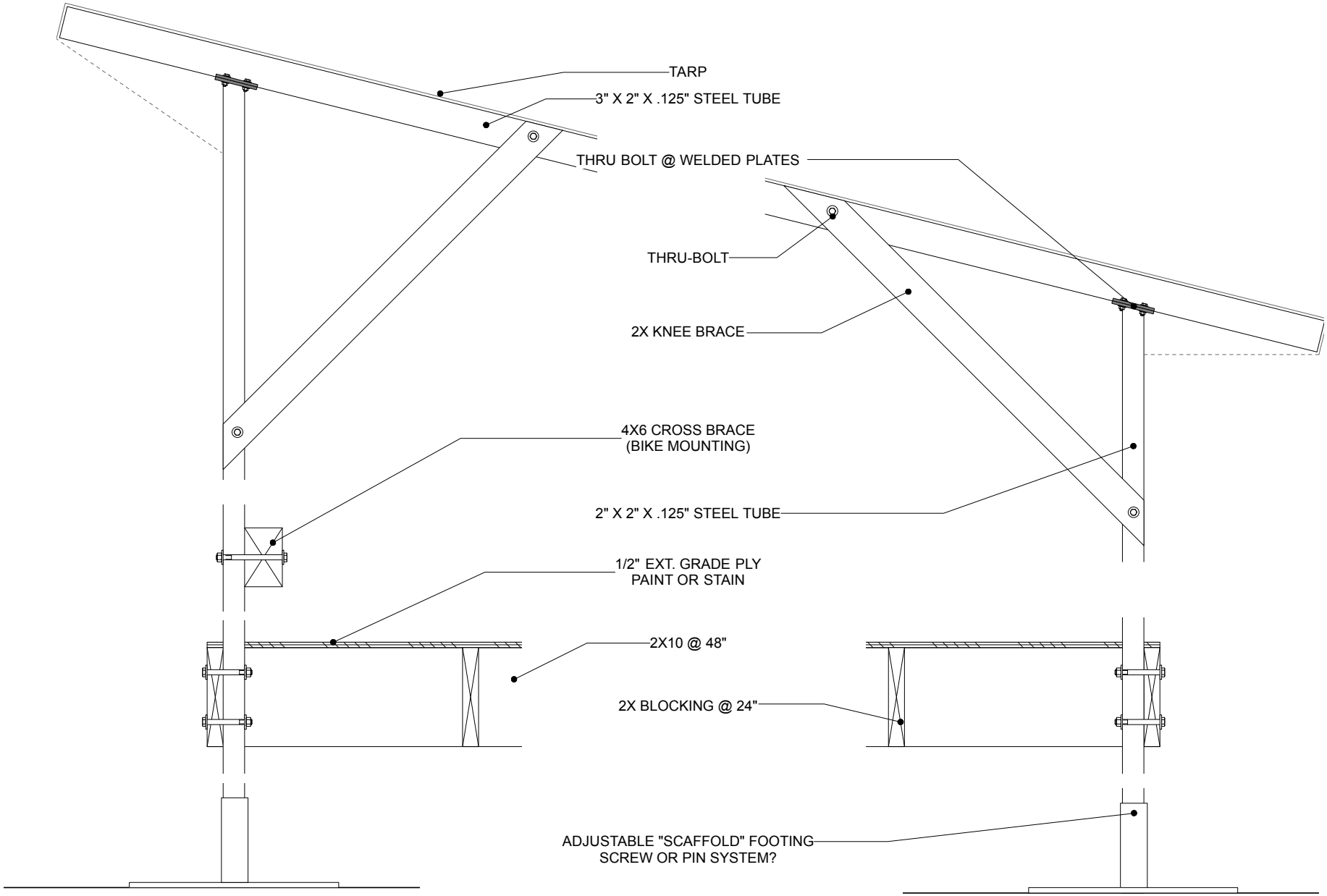
*storage / outdoor work area on deck*



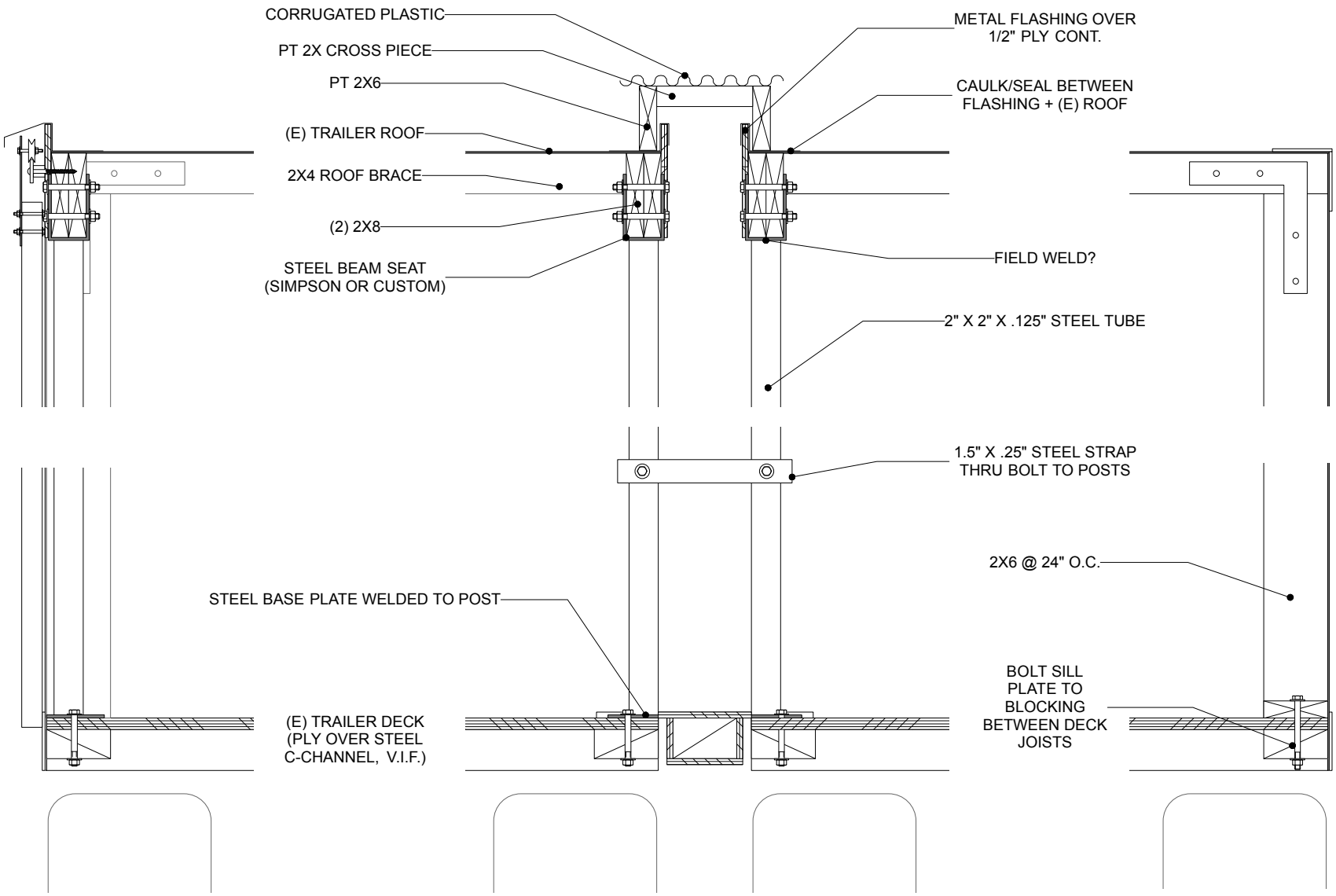


*simulation in context*

## Detail Drawings




*deck structure*




*trailer structure*

## Material Cost Estimate

| Material | Number of Units | Unit Cost | Total Cost |
|---|---|---|---|
| Wood | | | |
| 4x8' 3/4" Sheets of Plywood | 25 | $30.00 | $750.00 |
| Hem Fir | | | |
| 16' 2x12s | 20 | $15.00 | $300.00 |
| 20' 2x12s | 20 | $20.00 | $400.00 |
| 20' 2x6s | 20 | $10.00 | $200.00 |
| 8' 2x4s | 7 | $2.50 | $17.50 |
| 1' 2x2s (one 10' 2x4) | 20 | $3.50 | $70 |
| Doug Fir | | | |
| 16' 4x6s | 8 | $26.00 | $208.00 |
| 20' 4x6s | 6 | $29.00 | $174.00 |
| 8' 4x6s | 3 | $13.00 | $39.00 |
| 8' 6x6s | 9 | $21.00 | $189.00 |
| Metal | | | |
| Square Tube | | | |
| 18'6" | 10 | $40.00 /6 ft or $120.00 | $1,200.00 |
| 16'10" | 2 | $120.00 | $240.00 |
| 14'6" | 9 | $100.00 | $900.00 |
| 7'6" | 7 | $45.00 | $315.00 |
| 4'6" | 3 | $40.00 | $120.00 |
| 2'6" | 3 | $13.00 | $39.00 |
| Flashing | 120 sqft | $17.00 /50 yards | $17.00 |
| Diamond Plate Decking | 224 sqft | $3.50 /sqft | $784.00 |
| Chain Link | 900 sqft (3 rolls) | $89.00 /6'x50' | $267.00 |
| Clear/Translucent Plastic (roof seam) | 40 linear ft (10 units) | $15.00 /2'x4' | $150.00 |
| Clear/Translucent Plastic (doors) | 384 sqft (10 units) | $30.00 /4'x4' | $720.00 |
| Transparent Polyester Sheeting | 22 sheets | $76.00 /8'x4' x 1/8" | $1,672.00 |
| 10' PVC Tube | 15 | $14.00 | $210.00 |
| Hooks | 60 | $5.00 | $300.00 |
| Truck Tarp | 740 sqft | $240.00 | $240.00 |

**Grand Total: $9,521.50**

As of June, 2009, Recycle-a-Bike and The Steel Yard are negotiating their organizational relationship, including, among other considerations, what the rent cost would be for Recycle-a-Bike to operate with this proposed structure located on the Steel Yard site. Recycle-a-Bike is also looking into rent options in pre-built facilities at alternate locations.

During this design process, Recycle-a-Bike's proposed location on the site became somewhat uncertain. Therefore, it was designed without firm site constraints. In the case that Recycle-a-Bike remains on the Steel Yard site, this facility would need to be adjusted for the orientation and size of the concrete pad that is designated for it. Also, this team would need to assemble construction documents. Then, Recycle-a-Bike would initiate a fundraising campaign to hire a project manager and purchase materials. The construction process would also involve recruitment of volunteers to build, bartering for materials, and some adjustment of the design based on the material that becomes available.

## Faculty Advisors

**Yu Morishita** graduated from the Rhode Island School of Design with a B'Arch, where he received the award for best degree project. He then completed a Master's in Design Studies at the Harvard Graduate School of Design. He worked with 3six0 architects in Providence on schematic design for the Brown University Central Heating Plant and design development for Shepherd of the Valley United Methodist Church North Chapel in Hope, RI, among other projects. Prior experience includes work with HB LLC in Providence on a design/build renovation on an Eastside residence addition and design/build on a pool house in Walpole, MA.

**Erik Nelson**, co-owner of structural engineering firm, Structures Workshop, has 11 years of structural engineering experience, over 100 successfully completed buildings and a Master's in Structural Engineering from the Massachusetts Institute of Technology. He teaches part-time in the architecture department at the Rhode Island School of Design and the engineering department at Brown University.

## Students

**Mike Eng** completed his B.F.A. in Industrial Design at the Rhode Island School of Design in 2009. He also has a B.S. in Psychology from Cal Poly, San Luis Obispo. Mike has been closely involved with developing Recycle-a-Bike since 2007. He initiated the project and coordinated with the client throughout the process.

**Nick Buehrens** is a Master's of Architecture student at Rhode Island School of Design. Prior to attending RISD, Nick worked as a designer and project manager at DSA Architects in Berkeley, CA for several years. While at DSA, he collaborated on a number of progressive projects, including the LEED-plantinum rehabilation of a historic home, a net-zero energy strawbale house, and prototype, prefabricated affordable housing for low-income communities in the Bay Area. He played a key role in the design of a bike and pedestrian oriented commercial development in North Berkeley, during which he worked closely with local municipal agencies, transit authorities, public safety officals and private clients. Before joining DSA, Nick worked as an intern at Michael Collins, Architects, in Colorado Springs. Nick received his undergraduate degree from the Colorado College in Colorado Springs, CO, where he studied art, architecture and environmental science. He graduated with honors in 2005.

**Marty Cline** is a Master's of Architecture student at Rhode Island School of Design. He has a Bachelor's Degree in Interdisciplinary Visual Art from the University of Washington. He has worked for several years as a freelance illustrator and prepress editor for the advertising industry.