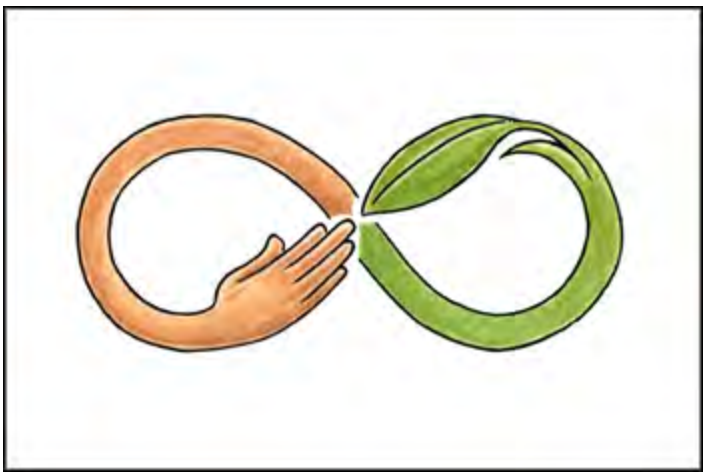

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Temple Community Garden Group #6

January 31, 2015

Group members
Catherine Bergeron, Physics with teaching
Molly Mattes, Geography and Urban Studies
Stephanie Haller, Architecture & Historic Preservation
Sean Kennedy, Architecture
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Our building for Temple Community Gardens is designed with the idea that function, environmental consciousness and community involvement can wonderfully coexist in one enticing tiny house. The design incorporates every item that TCG put on their wish list:

- a mini greenhouse to start seedlings
- a composting toilet
- solar power system
- space for 10-15 people at a meeting
- storage space

We aimed to create a space to accommodate the existing programs as well as envisioned program expansion. As Temple has a quickly expanding reach into the surrounding community, we thought it was important to think of how the garden can appeal to a wide array of people, beyond Temple club members. The partnerships TCG has already fostered with Duckery Elementary, Project H.O.M.E.'s Kairo's House, and Penrose Playground are an important part of the garden. Adding an indoor meeting area that is comfortable year round and has amenities such as a toilet, handwashing station, an entrance ramp, lights, and power for running a projector, will make the garden more appealing to both young and old members of the community. We envisioned expanding programs to include educational tours and information sessions, as well as social and activist events. The site design we proposed is intended to draw people into the garden, and to create a space for a multitude of groups to use in ways beyond gardening.

Space is maximized in the 120sq ft building by aiming to "go vertical." The multi-level design that allows access to the rooftop greenhouse does not impede on sitting area and even allows standard headroom below the mezzanine level. The vertical building philosophy aims to reduce the impact on the environment; for example, the building's run-off is nearly negated by incorporating a green roof.

To make the building comfortable in all seasons the design regulates temperature with a large south facing window aimed at the winter sun, insulated walls, and an insulating green roof. Passive heating is also used in the hand washing station. To meet technological expectations of today's meetings and events, a photovoltaic power system is included in the design. This system is designed around the expectations that phones will be charged, occasional computers will be plugged in, and a projector system can be installed. More details of the environmentally conscious design elements are discussed in the sustainability section of this document.

We made garden entrances at two locations: the corner of Diamond St and Carlisle St, and the northwest corner of the site via Carlisle St. We believe the main access to our building is from the corner of Diamond St and Carlisle St, which is why we created a meandering path of recycled material, through the newly situated flower beds. The main access is across the street from the Sonia Sanchez garden. Near the main entrance there will be some similar plants to those in the Sonia Sanchez garden, and perhaps a bench that compliments the mural, to increase the cohesion between the two gardens.

Transporting the building To take the most advantage of seasonal conditions, the location and angle we selected for the building site was chosen based on a SketchUp model of sun patterns on the summer and winter solstices. Since the surrounding buildings might change (such as the empty lot to the east being developed in the next five years), the building is intended to be easily moved or rotated. To relocate or swivel the building within the property, the building can be detached from the concrete footings. To relocate it elsewhere, new concrete footings would need to be poured. For more substantial moves, the building is within highway code for moving on a flatbed truck.

Cost analysis

The total cost of the building is estimated to be around $6000. This estimate includes a brand new photovoltaic system and a composting toilet. There are some materials which are not added into this price because there are plans to up-source them for free or very low cost; these include wood for side panelling and the interior floor, and glass for the greenhouse roof. Labour costs for building the structure have not been calculated; the construction method of using SIPS is simple and can be done by volunteers (possibly in conjunction with YouthBuild, as noted in the programming section.) The more specialized aspects of the construction, such as piecing together glass panes for the greenhouse, installing the photovoltaic system and doing the wiring, and artfully laying reclaimed floor boards, will require people with experience. To find experts (or motivated novices) willing to volunteer their labour, the pool of local artists will be tapped, from Tyler, RAIR, and other local art collectives such as Making it!, Philly Woodworks, NextFab, The Department of Making and Doing, and The Hacktory.

Photovoltaic System

The photovoltaic system includes a solar panel, mount, energy storage medium (rechargeable lead-acid batteries), solar controller, inverter (DC to AC conversion), cabling and fuses. The system is off-grid and allows for the usage of any household appliance requiring less than 500W of power. It is capable of powering interior and exterior lighting, hot water for tea and coffee, a projector for screenings and phone charging (10 or more phones a day). It is over-designed to prevent fire hazard and to accommodate increased electrical loading.

The total cost of the solar power system is estimated at $2280. The cost breakdown is as follows:

- 1x LG 270W Solar Panel (LG270S1C-A3) = $300
- 7x 12V, 100 Ah Lead-Acid Rechargeable Batteries = $1400
- 1x Solar Controller = $100
- 1x Inverter = $100
- Other costs, including unforeseen costs = $380

The photovoltaic system is designed to recommended specifications given by the City of Philadelphia, such as setting at an angle of 34º, >6 hours of sunlight per day and faces due South. No zoning permit is required for rooftop mounted solar panels according to Philadelphia Code, Title 14, Chapter 14-600, Section 7.

Walls, floor and roof

The buildings walls, and possibly the floor are designed to be build with structurally insulated panels (SIPS). These panels offer insulation benefits, are easy to build with, and " help conserve forest resources, because they produce almost no waste" (http://www.motherearthnews.com/diy/structural-insulated-panels-zm0z11zphe.aspx). The cost of 4.5" SIPS for the walls, and floor of the main part of the building is between $1500 to $2200. The exact cost depends on the source of SIPS and what dimension panels are available. A rough estimate made using prices from http://www.acmepanel.com/sip-prices.asp breaks down as follows:

- two 8X10 walls, made from (4) 4X10 panels= $680
- two 8X12 walls, made from (4) 4X12 panels=$820
- slanted section of the roof: about $230
- 10X12 floor, made from (3) 4X10 panels=$680

To build the greenhouse walls and roof (which are not glass) with SIPS would be about $400.

- Using 2 panels of 4X12, at $200 each=$400

Exterior and interior wall coverings are reclaimed wood, which can be pieced together based on availability. To further cut down the materials cost, the floor could be built with reclaimed wood (instead of SIPS). A possible design element that would look nice, and save money, is having a local craftsperson volunteer to shape a floor board mosiac. The exact design would be up to the craftsperson, but possible themes (such as African Art inspired, or quilt pattern inspired, etc.) could be suggested by TCG and other users of the space. RAIR is a possible source for the wood/floorboards/shingles. Other places to look for this material include asking a local floor installer such as Catherine's neighbor, or at de-construction zones in the city and nearby. Provenance and The ReStore are local businesses that specialize in collecting usable material as buildings are de-constructed, and both should be approached for donations or help sourcing material.

Doors, windows and glass for greenhouse

The door is a re-used door, which should not be difficult to find. Alternatively, a new door could cost over $200. Windows on the building will also be sourced from reclaimed options. Glass for the greenhouse (60 sq.ft) could be bought by the square foot, for an estimated cost of $600. More options should be considered, including using windows that others have discarded. We would like to consider cutting reclaimed window glass to fit frames which are custom built from metal scraps. This would introduce interesting design elements as well as cut the cost. A nice example of reclaimed glass fit into custom welded steel frames can be seen on a tiny house in West Philadelphia at 40th and Fairmount Ave.

Foundation

The building has 24 posts which attach with steel connectors to poured concrete footings. These are designed to unbolt from the footings for moving purposes. Material costs for the foundation are estimated to be $650, broken down as follows:

- (24) 6X6 pressure treated posts, about 2ft in length each: cut from (6) 8ft 6X6's which are about $23 each (from HomeDepot)= about $140
- enough concrete for (24) post holes that are 1ft diameter by 3ft deep, as calculated using an online post hole calculator requires ninety 90lb bags of concrete= $340
- steel hardware to attach the posts to the concrete are expected to cost around $7-$10 each, for a total of about $170

Composting System

The toilet would consist of a plastic 5-gallon bucket with a toilet seat attached to the top. The bucket would be enclosed on all sides by plywood, and one side would open, allowing the bucket to be removed. The composting bins are cylindrical and their dimensions would be 5 ft. in diameter and 3 ft. high for optimal use and maintenance. The bin is suggested to o be constructed from corrugated galvanized roofing panels and also polycarbonate plastic. An estimated cost of both of the systems would be $350.

Marketing plan which should appeal to potential funding sources

What

The TCG Club is looking to revitalize their current gardens by adding a TIny House design onto their current garden that would serve as a meeting space, extra storage space, and a greenhouse space for any new seedlings. Our design focuses on being communal and accommodating, while also stressing importance in sustainability by incorporating many sustainable aspects such as solar heating, a green roof/ greenhouse hybrid design, and two separate composting systems for food waste and human waste.

Who

- TCG members
- Temple Students
- North Philadelphia Community (including special programs for the youth of the community)

Where

The location of the garden is on the corner of Carlisle Street and Diamond Street. The site is on the North Side of Temple University's main campus.

Why

Benefits of this community garden

- Promotes sustainable living and building
- Acts as an excellent opportunity for Temple University and the North Philadelphia community to collaborate
- Provides a nutritious food source for participants and their families
- Provides community space for club meetings, as well as events (poetry slams, movie showings, BBQ, etc.)

- Gives back to the community by planting trees and other vegetation, which improves air conditions, as well as adding aesthetic value to the area.
- The space allows for a variety of community programs and afterschool programs.
- Building includes ramp for easy access for bikes, strollers, wheelchairs, and any loading and unloading.

How

- Fundraising! Holding money-raising events such as car washes, bake sales, or an annual garden feast can also raise awareness of the project and the garden, while also sparking interest and getting more people involved.
- Donations and sponsorships of the garden can raise awareness of the garden and it's outreach. An example would be having the trees donated by someone or another organization.
- Create a Kickstarter online, and invite people to donate to the construction fund.
- Opting for recycled, upcycled, and reclaimed materials if often times cheaper, and it cuts down on manufacturing waste. Check to see where you can possibly get these materials such as rairphilly.org

Programming Plan

One of the main uses for the building, as requested by TCG, is to accommodate 10-15 members for garden meetings. Providing a space that is passively heated will extend the lively season of the garden; whereas it is a now a dormant place during the winter, a comfortable meeting area could be enjoyed by TCG, as well as other community groups, year round. For larger events during the summer, the building's west wall has a 4ft section which opens and folds away, effectively expanding the building into an indoor/outdoor gathering space. The goal is to encourage movement between the garden and the indoor space, and to expand capacity for larger meetings. In the interior space, there are designated seating spaces along the perimeter, which also function as cabinet storage units. In the winter, when the wall is closed, the small building has a cozy feel, but in the summer it can transform to a more active environment.

Currently TCG has programs with youth from Penrose Playground, Youth for Change and Duckery Elementary school and adults from Project HOME's Kairo house. By adding an indoor space to the garden, youth activities can expand beyond gardening. The homework help that TCG offered at Penrose Playground could be offered on the garden site in the new building. Other nearby youth organizations to collaborate with include Treehouse Books and Teens4Good.

Partnering with YouthBuild, an alternative high school that focuses developing vital job skills (particularly construction and green-energy related!) and performing community service, could be a mutually beneficial arrangement. Students at YouthBuild are former high school drop-outs who could benefit from forming alliances and mentoring relationships with Temple Community Garden members. The TCG could certainly benefit from the construction skills and people-power that YouthBuild brings to their projects.

To compliment the food production aspect of gardening, healthy cooking demonstrations and community feasts can be held in the new building. Tanks for potable water can be installed inside the building (such as behind the ladder), which will increase the comfort of volunteers and make cooking demonstrations possible. A small marine-style gas burner stove can be added to the building, and a grill and/or a cobb oven can be added to the exterior. An important addition to the garden, when it comes to expanding food-centered events, is the hand washing station which uses passively heated, filtered water from the rain collecting system.

The buildings green aspects, such as the rain collection and solar power system, could be incorporated into information sessions about sustainable designs, and about living with a smaller footprint. Curriculum for these sessions can be geared toward various audiences, including elementary students through high school, university students, and non-student adults. For example, young students can learn about ecology by exploring the green roof and doing simple soil tests or making measurements of the rainwater catchment system, while engineering students from Temple University could visit the building to study the solar energy generating system.

Programming options are enhanced by the solar power system, which is designed to handle up to 500W at a given time. This power capacity enables some electric “luxuries” which will help TCG expand programming. For example, running a projector for several hours will be possible with this photovoltaic system. Offering monthly movie nights could get a wide range of community members visiting the garden. Other social or educational events that would be enhanced by outdoor lighting, the projector and the ability to plug in other devices include spoken word events, music events, and community feasts. During the summer when the west wall is opened and the building is transformed into an indoor/outdoor space, larger gatherings can be accommodated.

Sustainable Aspects of the Design

The Sun

The sun and its angle was a large consideration as to where the tiny house should be placed on the site. Optimal sun access in the winter is towards the southern end of the site and in the summer, in there is a lack of shadow on the northern side of the site. We decided to compromise and place the house in the center, more towards the east because it is both an inviting space, as one can see it from the street but is still encouraged to walk through the site, but it also considers the use of passive heating and lighting to the largest degree.

Photovoltaic System

The photovoltaic system generates usable 120V AC electrical power from solar radiation. Instead of being connected to the grid and potentially use environmentally damaging methods, solar power

allows the building to sustain its own electric loading needs. The solar panel will be mounted on the roof, where it does not take up more space than necessary.

Heating

The cooling load is 2200 BTU/h and the heating load is 4700 BTU/h. These are very minimal loads, and can be easily overcome with an efficient heat pump by using the photovoltaic system of electricity.

Composting

A possible location that would be suitable for the composting area would be near the north side of the garden. Since the composting would be primarily used in the summer, the system would get the most solar heat from this position. The food compost system is much smaller and can be placed anywhere on the plot. The toilet section would be located in a small separate structure.

There are five primary factors that are necessary to insure that the composting toilet is safe and clean.They are nitrogen (which comes from the feces and urine), carbon (which comes from the cover materials sawdust and straw), oxygen (which is provided by turning and stirring the compost as a part of maintenance), temperature (in order for the compost to decompose, it needs to be kept between 70-100 degrees F.), and moisture (waste water). Putting a black plastic cover weighed down by rocks on top of the compost bin will maintain a proper temperature, while also keeping moisture locked in and deterring insects from entering and laying eggs. The bin should have a bottom layer that separates the bin from the earth to avoid any possible contamination of water or soil.

It's design would be low-cost, simple to construct, and easy to maintain. The cover materials provide the necessary carbon for the decomposing process, eliminate unnecessary moisture (and smell!), and add to the aesthetic and comfortability of using the compost toilet. For more information on the designs and materials, refer to the links below:

For food waste composting system
http://www.potholesandpantyhose.com/2011/10/diy-spinning-composter/
For compost toilet system
http://www.omick.net/composting_toilets/composting_toilets.htm

There were no specific laws found against this design , and similar designs have already been created and used. For example:
http://www.greensgrow.org/urban-farm/composting-toilet/

Trees

We included the planting of trees in our design plan for a number of reasons. First, trees help combat pollution by improving air quality. Trees also add a nice aesthetic to the site, making the area more inviting to the public. Putting the trees along the South side of the garden will act as a natural barrier, separating the garden from the bustle of Diamond Street. Trees chosen should be indigenous to Philadelphia, and their height should be taken into consideration. The trees will provide shade, but the design wouldn't want too much sunlight blocked by the trees. Fruit trees would be a good option because they would also add to the edible portions of the garden.

Greenhouse/Green Roof

There was an executive decision as to how the greenhouse and green roof could become a hybrid. With the sawtooth roof as a main design feature on the south facade, this allows for sun access to both the greenhouse and the green roof slightly to the north. Those affiliated with the gardening can access the green roof by climbing a ladder on the interior that leads to a mezzanine platform. This utilizes vertical space because the meeting space is located in seats below the standing platform, located 4 feet above. Also, light penetrates through the sawtooth design which can then heat the interior meeting space.

Rainwater Collection

In our plan we discussed the possibility of including a water collection system that would collect rainwater off the roofs of at least of the one of the buildings. Optimally, we could use all three, but this would involve adding design features such as some sort of slanted roof onto the trailer since it is currently flat. The water collected would be stored in a barrel. The water could be filtered for hand washing, drinking, and for use in the gardens and composting systems. We also talked about the possibility of heating the water with passive solar power by painting the collection barrel black.

Conclusion

Our design is based on sustainability and community involvement, and meets the wishes of TCG. We aimed to do this on a small budget, and incorporated up-cycled materials whenever possible. We believe our design would enhance the use of the garden by both TCG members, Temple University and the surrounding North Philadelphia community.

JAMES S. WHITE
RESIDENCE HALL

CARLISLE

BROAD

DIAMOND

BEREAN
CHURCH

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W
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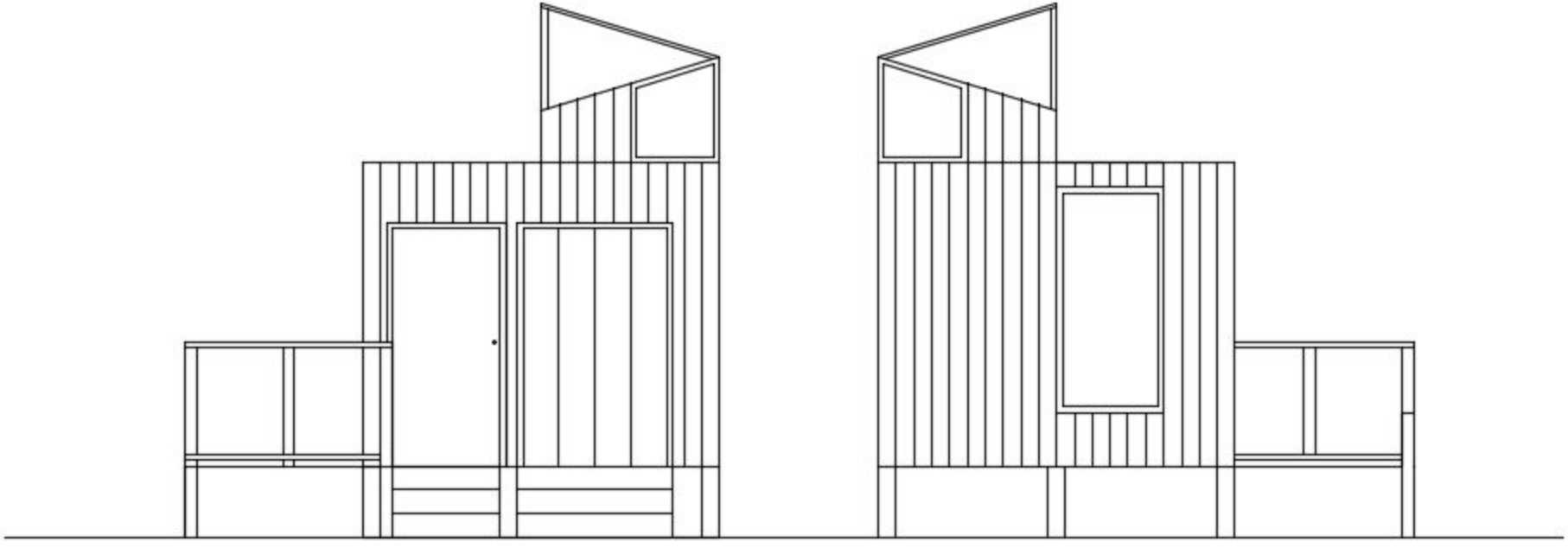

WEST ELEVATION
NTS

EAST ELEVATION
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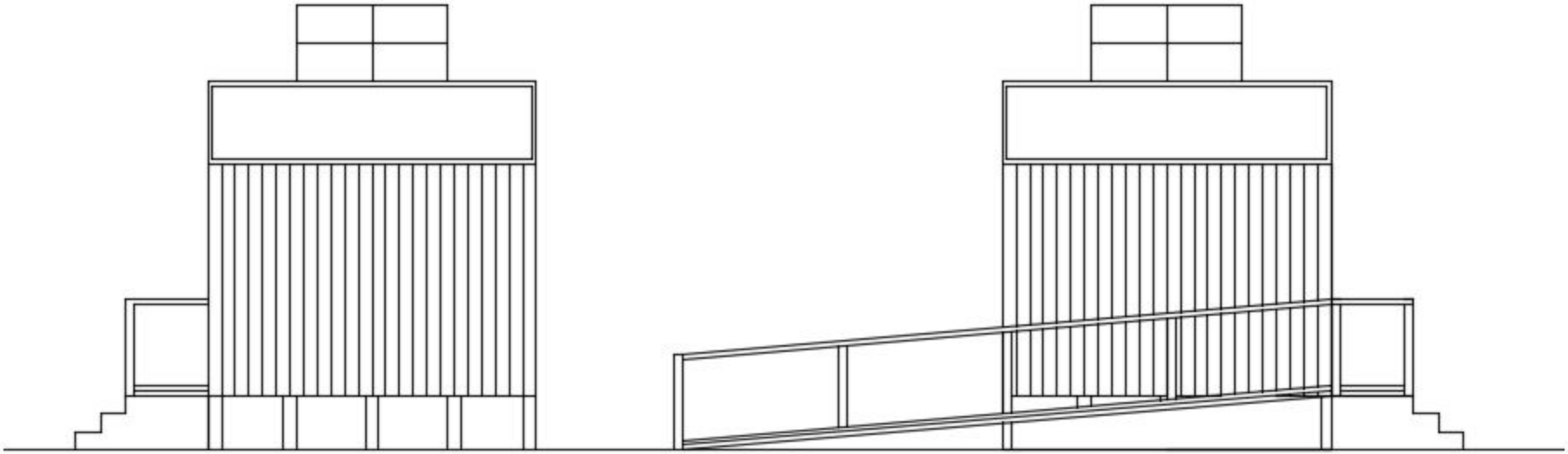

SOUTH ELEVATION
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NORTH ELEVATION
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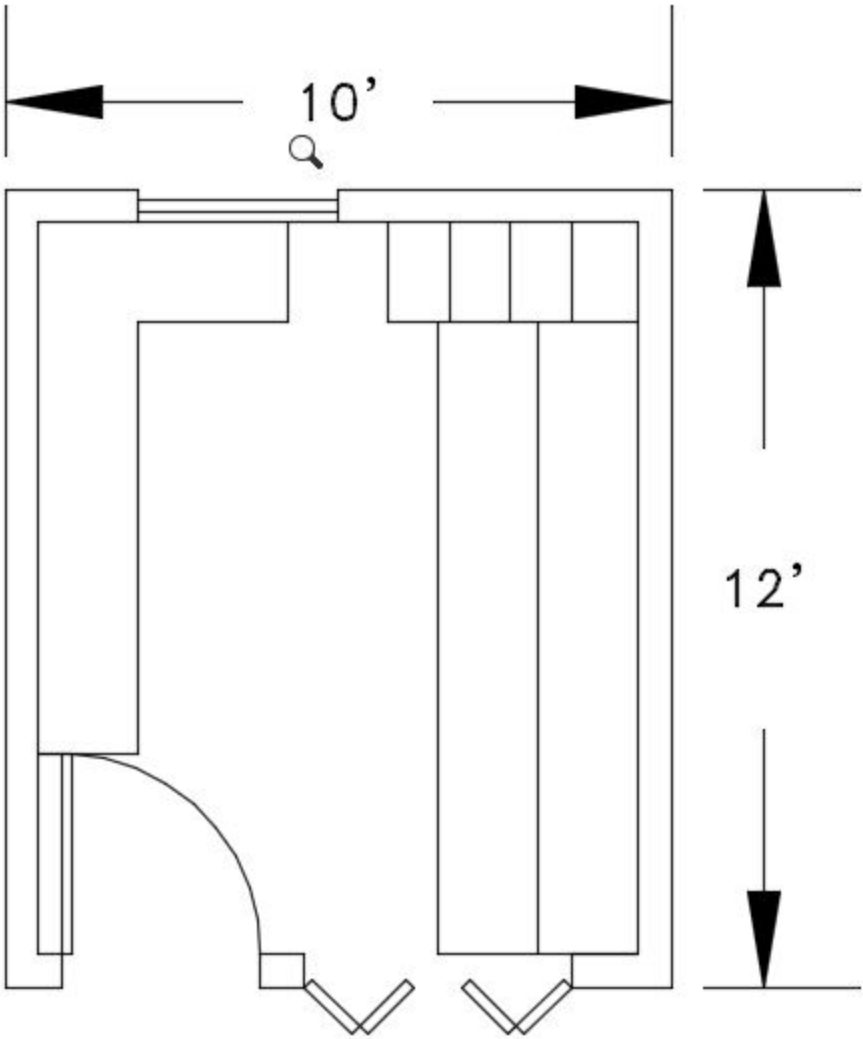

FLOOR PLAN
NTS