

STUDENT DESIGN CHARRETTE

SUSTAINABLE TINY HOUSE DESIGN
FOR TEMPLE

Competition Objective:

design a sustainable tiny house that will
be sited at Temple Community
Gardens located at Broad
and Diamond.

SATURDAY, JANUARY 31st, 9AM-5PM
Architecture Room 104

SUBMITTED BY THE TEAM OF:

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TABLE OF CONTENTS

1. DESIGN NARRATIVE..... 1
 1.1 Design Approach 1
2. SITE PLAN 2
 2.1 Access Requirements 2
 2.2 Existing Site Features 2
3. SITE RENDERINGS..... 3
 3.1 Views..... 4
 3.1.1. Floor Plan 4
 3.1.2. Elevation Views 5
 3.1.3. Wall Section 6
 3.2 Sustainable Building Component..... 6
4. STRUCTURE RELOCATION 7
5. BUILDING COST ESTIMATE 7
5. MARKETING PLAN 8
7. PROGRAMMING PLAN 8
8. CLOSING REMARKS 9

1. DESIGN NARRATIVE

1.1 Design Approach

Temple Community Garden's (TCG) site at Diamond and Carlisle Street promotes an appreciation for nature and sustainability in an urban setting. This is demonstrated by their vegetable and flower gardens. This tiny house further promotes these ideals. Our project is principally designed with the idea of *sustainability* in mind. Fitting the standards of TCG, as well as benefit the surrounding North Philadelphia neighborhood, our project broadcast sustainability. The effect the planned house will have for both Temple University and the city has been considered at each stage in design.

For this design, *sustainability* means:

1. Effective and efficient use of space.
2. Multiple uses of fixtures in the house.
3. Recycled/easy to procure items being the main materials used to construct the house.
4. Portability of the house. This gives TCG a house it can repurpose many times.

These criteria have produced a design that is compliant with the criteria set by Temple's Office of Sustainability, as well as fully responsive to TCG's requests for design.

1.2 Selected Design

Safety is the paramount consideration in the design.

Considerations for the house are in order of importance:

1. Structural Considerations

The house structure is based on a steel "shipping container" design. A shipping container 12'x8'9.5' will constitute the main area of the structure. This will be 96 sf. A secondary shipping container 8'x3'x9.5' will occupy 24 sf. This secondary area has been designed to be responsive to the composting toilet needs addressed by TCG. This will use up maximum allowed 120 sf for the house.

Any housing structure TCG uses will have to exist under various weather conditions including rain, snow, and wind. It will also have to be stable and well supported on the site. The advantage of the shipping container is that it can be reasonably expected to withstand these loads, and it is already stiff and strong. So long as the site is level, there is no appreciable threat to the safety and stability of the structure.

2. Functional Considerations

The shipping container will have double doors on one end. This is standard for shipping containers, and will be considered the entrance to the house.

Responding to TCG's need for a meeting and demonstration space, the idea of conserving standing room and minimizing fixed structures has guided the interior design. Along one length of the wall will be desktop surfaces. These desktops are attached to the wall, and have collapsible supports.

This allows to desktops to hang against the wall when not in use, and makes efficient use of the 8 ft. width.

Responding to TCG's request for a mini greenhouse to start seedlings, attached to the eastward wall of the house will be a collapsible (accordion-style) greenhouse. It rotates 90 degrees about a hinge located south east corner of the house. This allows TCG to position their greenhouse for maximum exposure the sunlight. When not in use during the winter, it can be collapsed to protect it from the elements and conserve open space on site.

A south yet slightly eastward oriented house allows for a passive solar concept for both heating and cooling the building. Cool air will be pulled through a solar chimney. In the summer, cool air is circulated in while hot air is forced out of the top. In the winter, cool air is pulled through the unit and circulated back into the space to sufficiently heat it. Also, we'll insulate the building to keep heat in or out depending of the time of year.

Furthermore, both the main and Sonia Sanchez gardens are in close proximity, yet there are no bathrooms. So we will utilize a compostable toilet. We'll even input renewable energy to power the necessary components.

Other considerations include a homemade moveable solar cooker. We'd like to install a rain catcher for watering plants. We'll repurposed solar panel cells and solder them together as an inexpensive alternative to costly new panels. A stationary bike or treadmill can be utilized to produce free energy, as well as windmills. We can make homemade batteries from cigarette butts for efficient energy storage (See Minzae Lee, 2014 Nanotechnology: <http://iopscience.iop.org/0957-4484/25/34/345601>).

3. Aesthetic Considerations

Openness of space has been emphasized by members of TCG. IN response, our design incorporates a patio space, as well as windows. It is positioned southward and slightly east so multiple sides are viewable from the street. The inside's form and function are adequately proportional.

2. SITE PLAN

2.1 Access Requirements

The planned house has no special access requirements; it is as accessible from the street as any other part of the garden is. There are presently no plans for handicap accessibility, but it is feasible that a ramp system be installed in front of the door space.

2.2 Existing Site Features

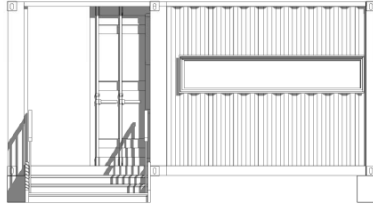
Our planned orientation of the house has it looking out upon the gardening plots that are already existing on the site. The patio design emphasizes the use of the house as a place to take in a whole view of the garden.

3. SITE RENDERINGS

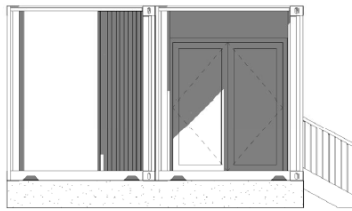


3.1 Views

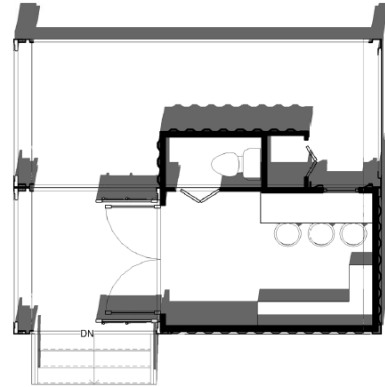
3.1.1. Floor Plan



① st elevation
1/4" = 1'-0"



② st elevation2
1/4" = 1'-0"

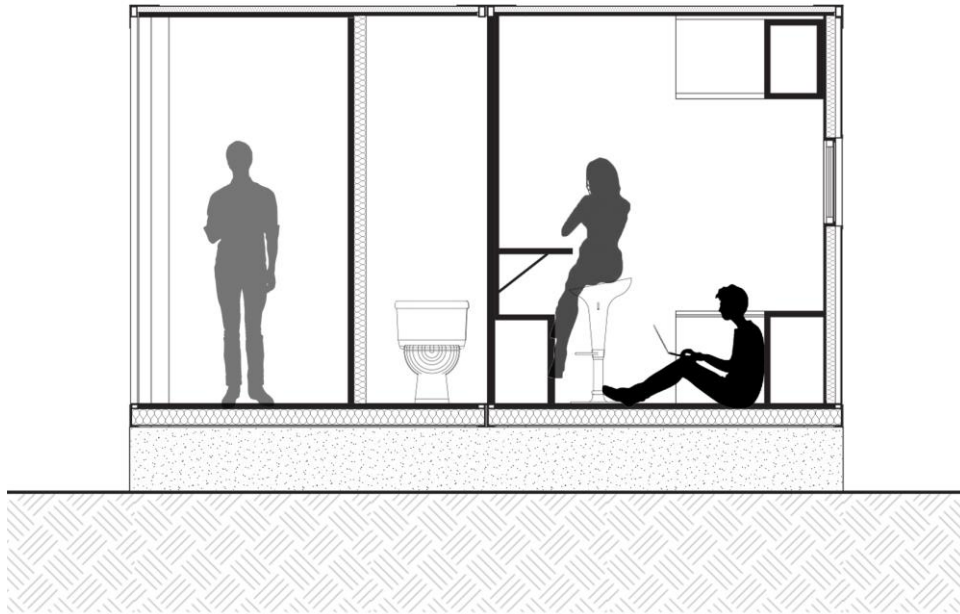


③ FLOOR PLAN
1/4" = 1'-0"

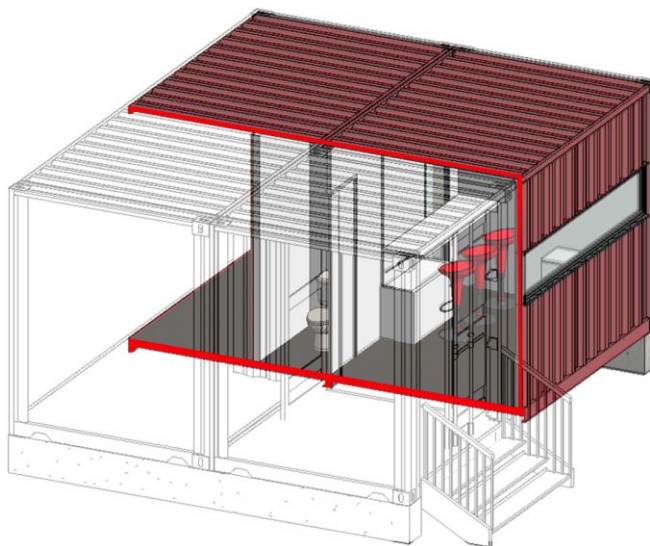
3.1.2. Elevation Views



3.1.3. Wall Section



3.2 Sustainable Building Component



4. STRUCTURE RELOCATION

Given that the structure is a shipping container, basic trucking will be sufficient to transport it, and there are no foreseeable reasons for damage to the structure occurring during or after transport. The components of the structure (hanging desktops, windows) will be connected securely, and there is no appreciable risk of their being damaged. The compact nature of the structure allows it to simply be loaded onto a truck, driven to a new location, and placed on the site. Even the greenhouse will be latched on for ease of transportability. Given a level site, there are no foreseeable problems in placing the structure in a new location.

Though the structure is being made for TCG, various components like the composting toilet, and collapsible greenhouse can be reasonably repurposed for other uses. The structure is an asset going forward, and will have very little to no maintenance costs associated with it through its lifetime.

5. BUILDING COST ESTIMATE

The costs of building can be offset by donations, or utilization of recycled/scrapped goods. Shipping container designer is advantageous here, because returning empty shipping containers to their original source is more costly than their actual worth. Subsequently, many industrial areas have surplus containers, which they either scrap, or sell of cheaply. Given the industrial resources in Philadelphia, this is a feasible resource to obtain. General research points to a price range as low as \$800 - \$1,800 for shipping containers (if they being bought). Searching terms like “shipping container homes” or “shipping container construction” will yield relevant information.

Tentatively Cost Breakdown (Amounts estimated conservatively):

Item	Components	Estimated Cost
Shipping Container	Single Unit	Free/Donated or \$800-\$1800
Composting Toilet	Single Unit	\$1000
Greenhouse	Collapsible metal frame, plastic	\$75
Desktop System	Surface, hanging system, supports	\$75
Benches/Chairs	Single Unit (Optional)	Free/Donated
Windows	Screens, Track Channel, Pane	\$150
Insulation	Rigid Foam Board	\$12 per 32 sf

Repurposed Solar Panels	For an off-grid panel	\$200
Bike/ treadmill generator	Magnetic conductor and wires	\$50
Windmill	Conductor, metal & bags	\$50
Solar Chimney	Glass, black paint, pvc pipe	Free
-	-	Conservative Cost: \$2500

Again, given that this is for a student run organization like TCG, and that it benefits a Philadelphia neighborhood, there is reason to believe that many goods will be found reused, or donated. The main component of the design, the shipping container, can most likely be found at an inexpensive price. The initial costs at the beginning will be offset by savings from not having to insure against structural damage or risk over time.

5. MARKETING PLAN

Many firms look to fund environmental projects for promotional purposes. In building projects, industries are adapting to the new LEED certification that are being put in place. Many large construction companies like Intech and Turner (Turner recently completed construction on the new SERC building on Temple’s campus) are emphasizing LEED Certified projects. In the Philadelphia region, many of the companies are looking to innovate and appeal to government regulations. The house for TCG would give companies like these easy ways to attach themselves to both the city and Temple University.

The City of Philadelphia’s 2014 Greenworks progress report identifies 14 Targets that it sets goals on. These target goals include reductions in energy consumption, greenhouse gas emissions, diverting solid waste from landfills, and providing walkable access to park and recreation resources for Philadelphians. TCG’s meeting house fits multiple goals on this list. Philadelphia’s involvement in this project advertises their willingness to work towards its own target goals. It is particularly valuable in a part of the city that does not have an abundance of greenspaces.

Environmental investments market themselves and look great to customers in the local community. This house is a symbol that leads to educate the community about environmental awareness.

Community involvement murals on the tiny house further educate and inspire our community. We can add said sponsors’ logos to show their support. We’ll promote the project as an upcycled facility that improves the environment. The efficient use of renewable energy sources cuts cost. In addition, typical health and safety concerns with average buildings are combatted by our design.

With this in mind, hopefully the global business leaders like Unilever, Procter and Gamble, Coca-Cola and Google will show interest in our project. We can seek donations for solar panels, windows, and other building materials. Collectively, all of this should lead to a good plan to fund and collect the necessary building materials. b

7. PROGRAMMING PLAN

Members of TCG have been direct in their wish for a space that “can be modified” throughout the life of the house. Meeting these conditions, the tiny house is functionally set up as a multi-purpose space. The standing desk space can be utilized for school work or planting seedlings, however, it’s collapsible. Underneath is storage that doubles as seating. The space can be used to teach youth from Penn Rose elementary school. Furthermore, the eastward wall will double as a white board and projection board. The tiny house will also allow TCG to have a space to host guests who are visiting the garden.

8. CLOSING REMARKS

The basis of design for this tiny house is ease of constructability, simplicity of use, and ability to repurpose for any future needs. It is desirable that the structure TCG inherits require as little maintenance as possible throughout its life, and that above all it is safe.

The “shipping container” design is being presented because it is repeatedly and successfully used as an innovative solution to creating livable and workable spaces, in both the first and the developing worlds. It maximizes use of space, minimizes use of resources, and a completed structure will be something that both Temple University and North Philadelphia can advertise. This design is successful in various environments, and accommodates various purposes. Our input has been to implement it for TCG at the corner of Diamond and Carlisle Sts, and fit it for their goals going forward.

