

**Arts & Engineering**  
**T3-2014-2015**  
***Disaster Relief/Emergency Shelter Project***  
***Presentation: May 20-22***

### **Description of the Problem**

History has shown us that in times of disaster the lack of basic human needs compounds already desperate situations. Food, shelter, clothing, and medical attention must be quickly accessible to victims, survivors, and rescue personnel in order to prevent further injury or loss of life.

Currently there is a trend sweeping the globe that centers on creating housing from shipping containers. Shipping containers are designed for ease of transport and handling, built to withstand rough treatment, and manufactured to securely stack together. This project is intended at meeting the need for providing quick, safe, and sustainable shelter in times of crisis.

Students will be designing and engineering emergency housing pods from shipping containers. The goal is to encourage students to creatively design a multi-use living structure that is transportable, versatile and addresses the need for emergency shelter.

There are a set of requirements that each dwelling must address. There are also a set of givens that each student will operate under.

### **SketchUp Container Design Requirements**

You will design three container housing structures: Three separate designs.

1 – 40' container with kitchen area, bathroom area, and sleeping area that sleeps up to 6 (single family dwelling) meant for

1 – 40' container with kitchen area, bathroom area, and sleeping area that sleeps up to 6 (multi family dwelling) that interlocks with another container,

1 – 20' container with an additional bathroom area that interlocks with another container that sleeps up to 6 (multi family dwelling)

Every container must contain 1 Egress window in the living area. All doorways must be standard 6'4" x 3' with a 1 1/2" fire rated door. All interior walls will be standard 3 1/2" thick using metal studs, at 16" on center, which when finished will be 4" thick.

All windows will need an exterior cover to protect the windows while being transported. This cover may be attached mechanically, or removable. When set up, this cover may be used as protection from reoccurring natural events, a security feature, or act as an awning.

### **Kitchen Requirements**

Each kitchen must include a microwave, stove, oven, refrigerator, and *sink*.

*Sink Specs:* The sink will operate off gravity feed. Water will be provided in the form of 55 gallon drum of provided purified water. Grey water drainage will require containment, also in the form of a 55 gallon drum for collection. You will need to account for secure storage of these drums in your design.

You should also make provisions for storage of food (a pantry), drawers for utensils, and cupboard space for pots and pans.

## **Bathroom Requirements**

All Bathrooms will be ADA compliant. Each bathroom must contain 1 non-egress window intended for ventilation. All bathrooms will use a composting toilet. All Bathrooms will include a sink. This sink will also operate off gravity feed. Water will be provided by the same 55 gallon drum of provided purified water. Grey water drainage will require containment in the same 55 gallon drum for collection.

You should also make provisions for storage of bathroom toiletries and necessities.

## **Sleeping \ Living room Requirements**

Space not dedicated to kitchen or bathroom needs to be multi-purpose. You need to consider furnishings that are dual purpose. For example, seating that converts to sleeping, tables or beds that fold away when not in use to increase space. There needs to be area and furnishings that can be used for dining as well as seating. Storage will also be a consideration. If the disaster is long term rather than short term, residents will need a place for clothing and storage of personal items.

## **Givens**

In order to concentrate on design aspects of the living environment, certain aspects of everyday living will be provided. Often times in crisis situations rescue efforts provide services for segments of the population. The givens are things that are provided for you. There will be containers provided that have been converted to shower and laundry facilities. There is a common power generation unit that allows units to simply plug in to get electricity. A combination heating and cooling unit will be installed in each container. There is a standard sealing and locking mechanism that will be used to secure units together. All containers will be placed on a bed of packed crushed gravel which will act as a foundation to create a secure footing, as well as adequate drainage. All mattresses will be twin – XL 39" x 80".

## **All Containers have**

Been cleaned, and sanitized, all seams and corners have been waterproofed. A 2" closed cell insulation product with 1/16" PVC non-structural top layer has been installed to all walls and ceilings. A structural 2" flooring product of closed cell insulation with textured PVC high density flooring installed over the floor. This means that all interior dimensions will be 4" smaller than the exterior dimensions. There are 1 1/2" vertical structural attachment points at 16" on center from the front wall and ceilings. Horizontal conduit for electrical runs around the perimeter walls at 4' on center from the floor.

## **Container attachment**

Containers may be joined side to side, in an L shape, or stacked. The conjoined opening of containers will be 8' x 8'. If the containers are stacked, you will need to take into account the need for standard stairs. Building code for Standard stairs are, 8 1/2" maximum rise and 10" standard run, with a width of 3'.

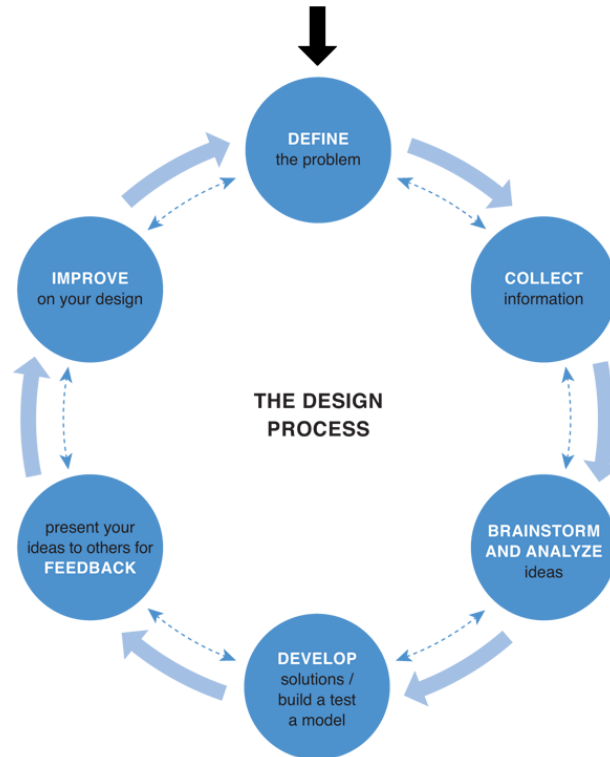
## **Modeling Requirements**

Using your SketchUp design as a guide, each student will construct 3 foam core scale models of your Emergency Container Shelters. One model will be the 40' single family unit displayed on its own. The other two will be constructed individually and attached together to show how you have created an interlocking multi-family living unit.

## **Special Considerations**

You may wish to consider exterior spaces as an extension of the interior living structure. Overhanging stacking of structures can create sheltered exterior living areas

## Emergency Shipping Container Project Design Portfolio



<http://www.discoverdesign.org/design/process>

Along with creating a 3D model of your Disaster Relief/Emergency housing solution, you must provide a design portfolio which documents your process. In class, we have discussed many of these aspects of the needs of disaster victims and we will continue to do so through this process. However, you will need to do some research to solidify your ideas.

Your Design Portfolio will be due on May 20<sup>th</sup> and should be used to help enhance your presentation and substantiate the choices that you made in your design.

### Define the Problem

You can't find a solution, until you can spell out what the problem is. Write a 2 paragraph explanation of the current challenges with disaster relief/emergency housing for disaster victims in the United States.

### Collect Information

Once the problem is defined, architects will spend time gathering information to help them understand the needs of the community. For this project, your given community are the disaster victims who have lost their homes and their personal property. Research the needs of the victims to help identify what they need. Use the givens in the previous section to also help inform the problem-you have certain constraints and requirements for your design that you will have to work with.

It's also valuable to collect information on the natural environment- in this scenario, the disaster relief housing is to serve individuals in regions of the United States that are susceptible to disaster. The disaster relief/emergency housing must be able to withstand these vulnerabilities.

Write 3-4 paragraphs explaining what you have found to be the needs of the individuals, communities and how the disaster relief/emergency housing should serve those needs.

## **Brainstorm/Analyze**

Document your ideas (in the form of sketches and notes) so that you can work through finding a solution to the problem. Please explain the documentation you are providing in 2-3 sentences.

## **Develop Solutions**

At this stage in the design process, architects will create drawings with specific solutions to be shown to the client. Schematic drawings, as these are typically called, help illustrate the big ideas and space requirements of the project.

Provide your solution design to meet the needs of the affected individuals. Be sure to provide an explanation of your solution in no less than 1 paragraph.

## **Feedback**

No solution is perfect the first time around, so it's critical that the architects continue the discussion with the client to receive feedback. You will discuss your design with your teachers and fellow students to evaluate your decisions and choices. In narrative form (2-4 paragraphs), document these conversations and identify what feedback you found valuable and why.

## **Improve**

With feedback in hand, the architects will go back and continue to revise and improve the final solution. Go back and revise your ideas. In narrative form (2-4 paragraphs), document the changes that you have made and how they provide a more productive solution for the disaster relief/emergency shelter.

## **Build It**

The precise details of the building will be determined over several months while the firm is developing a set of construction drawings and specifications - called construction documents - which will be part of the legal contract between the architect and client. Document these construction documents in your design portfolio.

### **Design Portfolio format requirements:**

- ✓ Text: Times New Roman 12 point font, single spaced
- ✓ 1" Margins (top, bottom, left, right)
- ✓ Cover Page-you can play with the font and font size, please include a graphic that is relevant to the project
- ✓ Table of Contents-be sure to include your documentation in your table of contents as subheadings
- ✓ Pages should be paginated (indicate the sequence of pages by placing numbers on each page)
- ✓ For each section, create a new page with the heading of the section in the middle of the page
- ✓ Narrative is free of grammatical and spelling errors
- ✓ Documentation-sketch, etc. are free of erroneous marks
- ✓ You may use other graphics to enhance your portfolio-however, be careful to only choose ones that are directly pertinent to the topic
- ✓ Portfolio folders will be provided