

## MSDI: Preliminary Test Plan

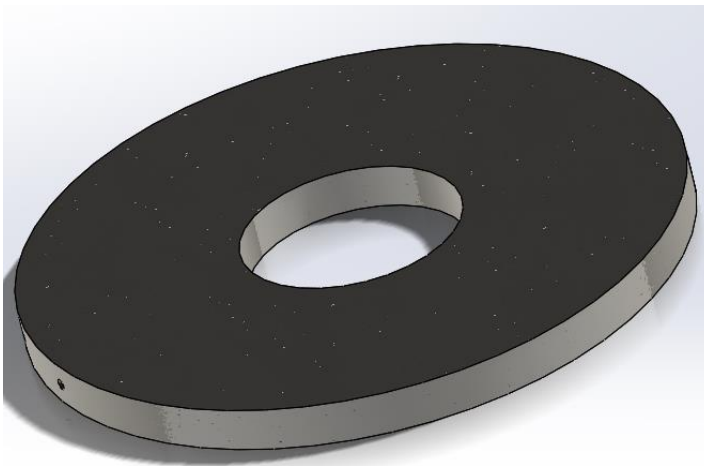
### 1. Introduction and Overview:

**1.1 Project Background:** This project is a continuation P13414: Portable Multi-use Shelter focusing mainly on the base rather than the entire arborloo and shelter. This project will design, build, and test two different arborloo geometries, one being a circular slab and the other being a dome shape.

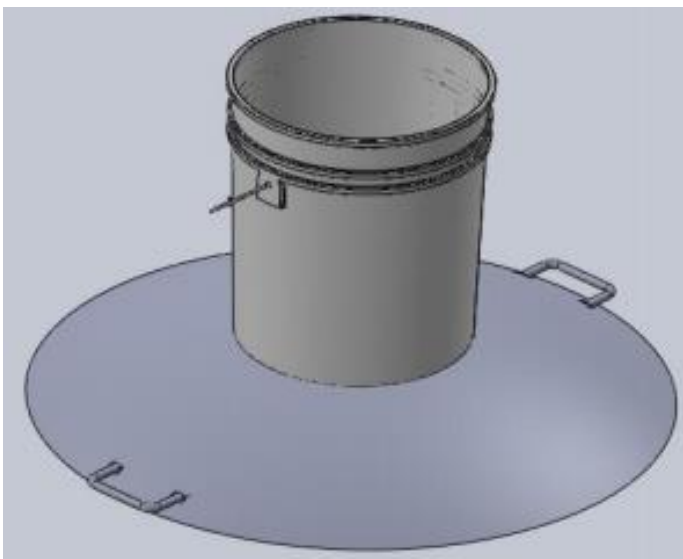
**1.2 Project Overview:** Each geometry will be tested in four main categories: strength/ safety, hole size, surveys, and molds. Within each of these four main test categories are multiple tests relating to the category title. The geometries performance will be evaluated based on the failure criteria and expected results.

### 2. Geometries Being Tested

#### 2.1 Circular Slab



#### 2.2 Dome



### 3. Approval: Team, Guide, Sponsor

#### 3.1 Approved By (initial):

Team Members: Victoria Snell \_\_\_\_\_  
 Joe Omilanowicz \_\_\_\_\_  
 Evan Burley \_\_\_\_\_  
 Anthony Deleo \_\_\_\_\_  
 Mac Keehfus \_\_\_\_\_

Guide: Sarah Brownell \_\_\_\_\_

Sponsor: Dr. Brian Thorn \_\_\_\_\_

### 4. Test Strategy

#### 4.1 Product Specifications and Pass/Fail Criteria

Rqmt. #	Engr. Requirement (metric)	Customer Req	Unit of Measure	Marginal Value	Ideal Value	Pass/Fail Criteria
S1	Purchase Cost for base	1	\$	25	25	Fails if purchase cost >\$25
S2	Load it can support (7 days)	3	lbs	270	450	Fails if load < 270 lbs
S3	Hole diameter it covers	2	in	18	20	Fails if clearance between outer edge of concrete base and diameter of plywood hole < 2"
S4	Squat hole widest point	3	in	9	10	Passes if diameter is between 9"-11"
S5	Static coefficient of friction against ground	3	-	0.5	0.6	Use scale to measure force it takes to move
S6	Tripping hazards	3	qty	0	0	N/A
S7	Time to assemble	5	hours	2	1	Fails if assembly time > 2 hours
S8	Hand tools needed to assemble	1,5	qty	3	0	Fails if tools needed quantity > 3
S9	Weight of heaviest assembled piece	4,5	lbs	100	80	Fails if weight of heaviest piece is > 100 lbs
S10	People needed to move heaviest assembled piece	5	qty	2	1	Fails if number of people > 2
S11	90% of Users find easy to clean	4,5	survey	90%	100%	Passes if within ± 5% of 90%
S12	Lifecycle	1,8	years	TBD	TBD	TBD
S13	90% of Users find comfortable	6	survey	90%	100%	Passes if within ± 5% of 90%
S14	90% of Users find visually appealing	7	survey	90%	100%	Passes if within ± 5% of 90%
S15	Pieces for available upgrade	9	qty	2	3	N/A

Customer Requirements	
1	Affordable
2	Covers Hole
3	Safe to Use
4	Moveable
5	Simple to Setup
6	Comfortable
7	"Modern" Aesthetics
8	Servicability
9	Allows Financing in Parts

## 4.2 Required Test Equipment

- Concrete base
- Tape measure
- Shovel
- Stopwatch
- Survey
- Scale
- Set of weights
- 5 gallon bucket
- Molds
- Trowel

## 4.2 Phases of Testing (4 Categories)

### 1. Strength/ Safety Test

- a. Weight of heaviest assembled piece [lbs]
  - i. Place base on scale and weigh
- b. Number of people needed to move heaviest assembled piece [qty]
  - i. Team members pick up and carry over a distance, simple observation
- c. Load the base can support [lbs]
  - i. Simulate base being over a hole with bricks supporting the outside and gradually increase the weight in increments to tell at what weight the base failed
- d. Lifecycle [years]
  - i. SimaPro (software)
  - ii. Learning how to use software
- e. Tripping Hazards [qty]
  - i. Visual inspection according to playground standard

### 2. Hole Size Test

- a. Diameter of hole arborloo covers [in]
  - i. Holes with varying diameters (18"-24") in sheets of plywood
  - ii. Lay concrete base over top of holes in plywood and make concentric
  - iii. Measure from edge of base to outer diameter of hole in plywood
    1. Need minimal distance from circle cutout to base edge
- b. Squat hole widest point [in]
  - i. Measure hole diameter after base is made and determine if between 9"-11"
  - ii. Each time concrete base is made, measure the hole diameter and record them, take an average after x amount

**3. Survey Test**

- a. Easy to clean [%]
  - i. Simple survey of questions
- b. Comfort [%]
  - i. Simple survey of questions
- c. Visually appealing [%]
  - i. Simple survey of questions

**4. Mold Test**

- a. Time to assemble [hrs]
  - i. Assume they have mold made and all materials including tools to begin mixing
  - ii. Stopwatch to time how long it takes to mix the concrete as well as lay up the mold
- b. Hand tools needed to assemble [qty]
  - i. Try attempting with just hands first
  - ii. For convenience, use trowel, etc.
- c. Pieces for upgradability [qty]
  - i. Seat- Can it support weight?- repeat load the base can support test, but with weight being placed on seat
  - ii. Seat cover- Does it catch rain? Are there gaps between the cover and arborloo?

-MSD II Plans are covered later under Preliminary MSDII Schedule on Edge

**P14416 P3 Arborloo Concrete Base Development  
Test Plan Template**

Date Completed: \_\_\_\_\_

Performed By: \_\_\_\_\_

**Summary:** This section includes what you are going to verify and how. Very briefly states your procedure.

**Specifications Tested** (engineering requirements to be tested with marginal value)

Engr. Spec. #	Specification (description)	Unit of Measure	Marginal Value
ES1			
ES2			

**Test Equipment** (check off list for equipment to be used)

Check off	Equipment Description

**Revision History** (any edits can be documented here)

Revision	Description	Date
1	Created Document	12/05/13

**Sections** (Tests relating to engineering specs, if multiple specs, can have multiple parts to the test category)

- Part I:**
- Part II:**
- Part III:**

**Test Name Goes Here**

Date Completed: \_\_\_\_\_

Performed By: \_\_\_\_\_

**Part I Procedure:** (check off list to make sure each step is followed correctly and nothing is skipped)

- \_\_\_ 1.
- \_\_\_ 2.
- \_\_\_ 3.
- \_\_\_ 4.

**Summary of Data** (data can be recorded as well as observations)


**Comments:**

**Sign off on section completion before continuing:** \_\_\_\_\_

(person completing test signs off)

**Test Name Goes Here**

Date Completed: \_\_\_\_\_

Performed By: \_\_\_\_\_

**Part 2 Procedure:**

\_\_\_ 1.

\_\_\_ 2.

\_\_\_ 3.

\_\_\_ 4.

**Summary of Data**


**Comments:**

**Sign off on section completion before continuing:** \_\_\_\_\_