

UBC Farm Chicken Shelter

Zach Bailey

Aleksandra Pawlowski

Hady Abou Jaoude

Di Hao Guo (Derek)

James Hosford

Andrew Burgin

Julian Cheung

University of British Columbia

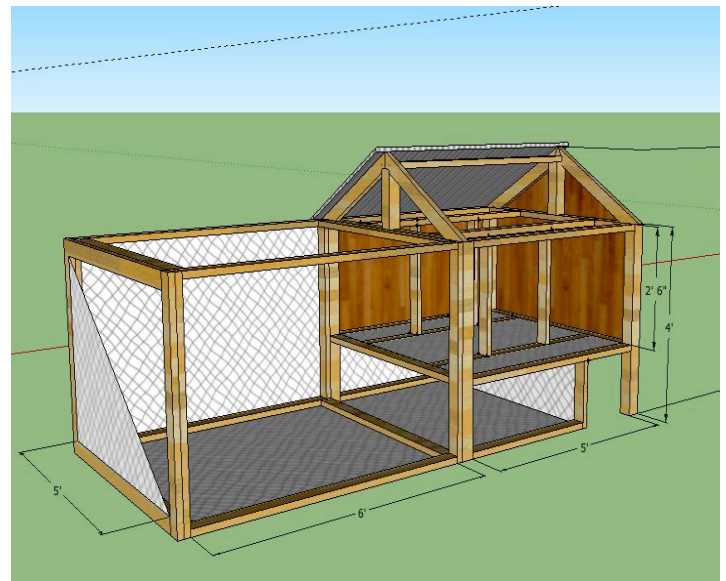
CIVL 201

December, 2010

Disclaimer: "UBC SEEDS provides students with the opportunity to share the findings of their studies, as well as their opinions, conclusions and recommendations with the UBC community. The reader should bear in mind that this is a student project/report and is not an official document of UBC. Furthermore readers should bear in mind that these reports may not reflect the current status of activities at UBC. We urge you to contact the research persons mentioned in a report or the SEEDS Coordinator about the current status of the subject matter of a project/report".

+

Chicken Shelter



+

UBC CSL | CIVL 201

December 2010

Zac Bailey
Aleksandra Pawlowski
Hady Abou Jaoude
Di Hao Guo (Derek)
James Hosford
Andrew Burgin
Julian Cheung

Executive Summary

UBC Farm is currently in need of a moveable chicken coop that is intended to house 12 chickens. The chicken coop is to provide shelter, a place to lay eggs, and a small area to graze for the chickens. A seven-person UBC Civil Engineering (CSL) team has been asked to design and construct a chicken coop that, in addition to being moveable, would take on a dollhouse-like design.

The size, durability, and materials used for the coop must meet the requirements stated by the client. In order for the chicken coop to be certified organic, there are certain size and material criterion that must be conformed to. The approximate size of the chicken coop is to be 55 square feet, where 25 square feet are allotted for the indoor portion, while the remaining space, including that below the raised coop, will make up the run. The estimated cost of the project is \$340.33. In designing this project, size constraints were considered in great deal. As it is intended to be moveable as well as easily accessible, the final design had to be both small and light, while still adhering to Organic Standards.

This report provides detailed designs and explanations of all aspects of the chicken coop to be built for UBC Farm. Dates for build have been selected and the client has seen and approved the recommended coop design. Construction of the shelter is currently scheduled for January of 2011 with materials ordered from manufactures and collected from the Farm.

Table of Contents

Table of Contents.....	iii
List of Tables	vi
1.0 Introduction	1
2.0 Background	2
2.1 UBC Farm	2
2.2 Chicken Coop	2
3.0 Scope Statement.....	4
4.0 Project Definition	5
4.1 Objectives.....	5
4.2 Constraints	7
4.2.1 Time	7
4.2.2 Size Specifications	7
4.2.3 Experience.....	7
4.2.4 Materials	8
4.2.5 Budget.....	8
4.2.6 Mobility	8
4.2.7 Durability.....	8
4.2.8 Accessibility.....	9
4.3 Stakeholders.....	9
4.3.1 UBC Farm	9
4.3.2 UBC Civil Department	9
4.3.3 UBC Community.....	9
4.3.4 CSL Group.....	10
5.0 Project Design	11

5.1 Exterior Design	11
5.1.1 Frame	11
5.1.2 Roof Structure	11
5.1.3 Wheels	12
5.1.4 Walls.....	12
5.1.5 Ramp	12
5.1.6 Lower section	12
5.1.7 Run	13
5.2 Interior Design.....	13
5.2.1 Flooring	13
5.2.2 Perch	13
5.2.3 Nesting and Sand Boxes.....	14
5.2.4 The Door.....	14
6.0 Activities and Schedule	15
6.1 Term One	15
6.1.1 Design of the Coop.....	15
6.1.2 Communication.....	15
6.1.3 Collaboration of the Group.....	15
6.2 Term Two	17
6.2.1 Final Detailing of Design.....	17
6.2.2 Attainment of Materials	17
6.2.3 Coordination with Client.....	17
6.2.4 Construction.....	18
7.0 Roles and Responsibilities.....	19
7.1 The Organization.....	19

7.2 The Team.....	19
7.3 Team Members.....	19
8.0 Cost Analysis	21
9.0 Risk Assessment.....	22
9.1 Personal Safety.....	22
9.2 Chicken Safety.....	22
9.3 Risk of Distraction	22
9.4 Risk of Incompletion	23
9.5 Risk of Reputation.....	23
10.0 Conclusion.....	24
Appendix A.....	25
Appendix B.....	27
Appendix C.....	37

List of Tables

Table 1: Schedule of Semester One.....	16
Table 2: Schedule of Semester Two.....	18
Table 3: Cost Analysis.....	21

1.0 Introduction

This report provides an outline and design for the mobile chicken shelter proposed to Ms. Natalie Yuen of the UBC Farm. Ms. Yuen has requested a group of civil engineering students from The University of British Columbia to design and construct a mobile chicken shelter that satisfies Organic Standards and is capable of housing 12 chickens.

This report provides a concise background of the UBC Farm, an expanded definition of the chicken coop, and all comprehensive designs created by the group of the mobile chicken shelter. The body of this report describes scheduled activities relating to the design and construction of the shelter, along with the roles and responsibilities of each group member. The end of this report examines all tools and materials needed, along with the respective cost of the project, and a detailed risk assessment.

2.0 Background

2.1 UBC Farm

The University of British Columbia Farm (UBC Farm) is located on the southern region of campus. It covers an area of 24 hectares, and is the only working land farm in Vancouver. It also has the novelty of being the only farm on a university campus in Canada. The Farm is led by students, and is available for all staff, faculty, and the local community to learn about the very important connection between food, land, and community.

The Farm was first established in the main part of campus on West Mall. The University expanded to allow for an increasing student population, and so the farm was moved further south towards mid campus. It was not until the mid 1970s that the Farm was moved to its current location. During that time period the Farm served as a research center for the departments of Forest Sciences, Botany, and Plant Science. In 2000, students from the Faculty of Agricultural Sciences pushed for a more diverse farm in opposition to the University, which had designated the land as a reserve for future housing.

The UBC Farm's highest objective is to turn forest land and existing land into a centre for sustainable agriculture, forestry and food systems. Students are to be engaged and involved in the creation and maintenance of relevant on-farm programs, activities, and events. Ultimately, the farm will link with the local community by running various programs and activities on the land.

2.2 Chicken Coop

A chicken shelter, also known as a chicken coop, is a small wooden structure used to house chickens. The shelter provides access to food and water, areas where they can lay their eggs, and most importantly, protection from predators such as foxes and hawks. In addition, chicken coops incorporate perches where the birds can sleep, have good ventilation, and include a protected outdoor area called

the run, where the chickens can roam freely and hunt for insects. A typical chicken shelter consists of:
perches, the house, and the run.

3.0 Scope Statement

This project will span two semesters under the courses CIVL 201 and CIVL 202 within the faculty of Civil Engineering at the University of British Columbia. The project started in October and is to be completed by February 2011. The goal of this project is to design a chicken shelter that not only meets Organic Standards but also encloses the chickens in a comfortable square footage through an enclosed shelter and a removable mesh run. These enclosures protect them from water penetration and predators that may prey on the chickens themselves or their eggs.

The group has developed a formal report to deliver to the client about the design process. The report takes into consideration the suggestions made by the client, and also includes the construction schedule. The client originally asked for a cattle shelter that housed three cows in a rigid structure. After further thought they decided a chicken shelter would be more valuable to the farm, and as a result the group quickly adapted to the new parameters and began the design process for the chicken shelter.

The main idea behind the chicken shelter is similar to that of a dollhouse with hinged walls for easy interior access and cleaning purposes. The floor consists of mesh to create a clean up free floor. The chicken manure will sift through the floor and act as a fertilizer for the grass below. The shelter is also made mobile by four wheels attached to the back of the shelter frame. It can easily be moved by a single person by lifting and dragging the front of the shelter. The mobility of the shelter gives the chickens an opportunity to peck various areas around the farm and fertilize the grass below the shelter through the mesh floor. The shelter will have a nesting box in one side and a dirt bath in the other. These features are easily accessible by the hinged “dollhouse” doors. The design also portrays a ramp that folds up into a door to enclose the chickens at night. The chickens will have raised perches to sleep on roughly 1.5’ off the ground so they can freely move below the perches. The shelter features a tin material roof to protect the chicken from the heavy rain and snowfall in the Vancouver area.

4.0 Project Definition

Through the design process, three main aspects stand out to define the project. Numerous objectives have been set by the group itself, along with the UBC Farm and the Civil 201 administration, and will be met by the conclusion of this project. Coupled with the objectives are various constraints and restrictions to which the group will have to accommodate to successfully meet the objectives. These constraints vary from individual skills and abilities to set design standards to financing of the project. Thirdly, the outcome of this project will affect a number of individuals and organizations. These stakeholders will benefit from a successful build and will suffer negative repercussions if this project fails to meet the set objectives.

4.1 Objectives

- **Construct a stable chicken shelter**

The shelter must be structurally sound. It must be able to support the weight of all chickens.

- **Ensure Structure is sealed to keep it weather resistant**

The shelter must have essential proofing materials applied where necessary on the structure to ensure that rain water and snow does not enter. The structure's walls and roofing must be free from outside leaks.

- **Provide a secure protection from predators**

The shelter must be constructed with proper materials that prevent predators from entering the shelter. Chicken wire must be securely fastened around and above the run to provide a secure area free from the threat of predators.

- **Access to food and water**

Food and water must be easily available to all chickens within the shelter. Also, the food and water must be easily accessible to farm workers to restock.

- **Meet Organic Standards**

In the interest of sustainability, the chicken coop will be designed with numerous Organic Standards in mind. This includes a minimum indoor and outdoor area to accommodate the expected 12 chickens. To add, the floor will be made of mesh to allow chicken waste to fall through onto the ground to keep sanitation at an appropriate level.

- **Provide perches for sleeping**

The client has requested that wooden perches be installed into the coop at a raised level off the coop floor. The perches are integral parts of the coop structure as they allow the chickens a place to rest and sleep. The perches will be elongated wooden dowels that span the width of the coop structure, with the design calling for a total of two perches.

- **Include proper run**

The main purpose of the run is to allow the chickens a place to strut around and to eat and drink. The run is the outside portion of the coop and will be designed to be detachable from the coop structure. The run is an objective due to its size and its multipurpose functionality; not only does it keep chickens in and allows them to walk around, it also repels predators.

- **Make coop mobile**

The client has specifically requested that the chicken coop be easily mobile. As such, allowing for mobility in the design is an important objective. To accomplish this, wheels will be fitted to the rear posts of the structure and the run will be detachable. However, due to the size of the coop structure, it will not be easy for one person to move the entire structure on his/her own. It is recommended that a minimum of two people be present during the moving process.

4.2 Constraints

4.2.1 Time

Due to the structure of this project, time is a rigid constraint with deadlines and timelines that must be followed. The group has been given until November 22nd to design and plan for the construction of a chicken coop, with a presentation about the design choices to be given to Dr. Nesbit, a panel of experts and the primary client on December 2nd. Within Term 1, numerous deadlines have been set by the group for varying sections of the project. For instance, because of a scheduled meeting with the client on October 28th to discuss conceptual designs, these designs needed to be finished and drafted by that time. Also, a short time of only three days has been allotted for the physical building of the chicken coop at the UBC Farm in Term 2.

4.2.2 Size Specifications

To comply with Organic Standards, the chicken coop structure and run need to be of a minimum size. To house the expected 12 chickens, the interior of the coop must have a minimum floor space of twenty-one square feet, [two square metres] and a minimum height of three feet to allow the chickens to easily walk around and have adequate space to perch. The exterior run must have a minimum surface area of thirty-two square feet [three square metres], which can include the area underneath the coop structure, and a minimum height of one and a half feet to allow space for the chickens to walk around.

4.2.3 Experience

Of the seven people of the group, only two members have relevant experience with respect to construction projects. As a result, five group members have little to no experience working with construction tools, the construction process, or working with building materials. This will pose difficulties during the construction process, and will affect the overall quality and level of complexity of the project.

4.2.4 Materials

Due to certain client demands, the materials chosen for the structure need to be carefully chosen to comply with these requests. For instance, the client has requested that the entire structure be mobile, so a lightweight material must compose most of the structure. As a result, it has been decided to use wood as the primary material. The roof needs to be durable, resistant to rainwater and insusceptible to rotting, so the decision has been made to use corrugated metal. The flooring of the coop must have voids to allow dirt and waste to drop through to the ground but consistent enough to allow the chickens to safely walk around. The walls of the run must be light and repel predators in addition keeping chickens inside, so chicken wire is a strong candidate.

To pursue the idea of sustainability, both the client and the Civil 201 class are encouraging the use of recycled materials for the project. Due to this limitation, recycled materials will need to be salvaged and used as much as possible for construction. This will also help stay on budget.

4.2.5 Budget

The UBC Farm and the Civil 201 class have pledged a maximum of \$350 for the purpose of constructing the chicken coop. However, the client at the UBC Farm has warned that if the \$350 ceiling is too low they can provide some financial assistance.

4.2.6 Mobility

Both the chicken coop and the run are required to possess an adequate degree of mobility. To accomplish this, wheels need to be incorporated into the design. Also, the entire structure needs to be light enough to allow for two people to move it without unreasonable difficult, so the run must detach from the coop to allow further mobility.

4.2.7 Durability

The chicken coop and run are required to be utilized over a long period of time. As such, the structure must be built sturdily to achieve this objective. Also, the structure must resist weathering to a point,

and steps during construction must be made to ensure the availability of the structure to be recycled for a new purpose later in its life.

4.2.8 Accessibility

The main structure of the coop is required to be built in such a way that allows it to be easily accessible to clean the inside. As such, the sides of the coop must be able to be opened up in a way similar to that of a dollhouse. The main purpose of this constraint is to allow for easy cleaning and maintenance of the coop interior. Appropriate design choices must be made to accommodate this requirement, as simple cleaning of the interior is a specific request from the client.

4.3 Stakeholders

4.3.1 UBC Farm

The UBC Farm is the primary client for this Community Service Learning Project. The project deliverables are described by the UBC Farm according to their specifications, constraints and requirements. At the end of the construction process, the finished chicken coop will be handed over to the UBC Farm for immediate use.

4.3.2 UBC Civil Department

Based upon the performance and behaviour of the group, the Civil Engineering Department will be reflected in the same light. If the project goes awry, this could affect the Civil Department in a detrimental way. Likewise, a strong project will increase the credibility of the Civil Department.

4.3.3 UBC Community

Similar to the Civil Department, the final outcome of this Community Service Learning project will contribute, either positively or negatively, to the overall public view of UBC and its internal cooperation and interactions. Additionally, the outcome of this project could affect how easily and confidently different factions of UBC interact with each other in the future.

4.3.4 CSL Group

This project directly influences the lives of those involved in the design and construction of this project.

The outcome of this project directly affects the academic standing of each group member involved.

Also, this project requires a large amount of time to be spent working on the technical aspects, such as design drawings, build time and various other features. The overall success of this project relies on the ability of the group members to work together and easily communicate ideas, concerns and suggestions to one another.

5.0 Project Design

5.1 Exterior Design

The main design of the shelter follows a concept similar to a doll house. The housing unit encloses a 5x5 ft. base, which meets the minimum requirements set by the Organic Standards for 12 chickens. The primary construction materials include various sizes of recycled wood and chicken mesh. The proportions of the wood used will be mainly 2x4 and 4x4 pieces. Other materials that will be utilized include a number of door hinges and latches, along with various types of metals such as corrugated steel sheets.

5.1.1 Frame

The frame of the shelter is considered to be one of the backbone structures when designing and implementing construction. The frame will primarily consist of lumber pillars, with the four respective corners composed of 4x4 ft wood pillars. The four pillars have to withstand the entire weight of the housing unit and so it is crucial to place a lot of importance to prevent the structure from collapsing. The lumber pillars are 2x4 ft and elongate 5 feet in length for easier construction purposes. Figure 1.1 (see Appendix A) shows a complete and detailed frame design which is expected to be similar to the constructed frame.

5.1.2 Roof Structure

The roof structure is composed of two triangular wood frames that are coated by corrugated steel sheets. Since the corrugated steel sheets are light and tough, it will act as an insulator when placed on the wood and will prevent any effects of weather. When viewed from the horizontal plane, the two triangular wood frames will be 6 ft in width and 3.5 ft in length which will be inclined at an acute angle of 30°. The roof structure includes an overhang as shown in Figure 1.1.

5.1.3 Wheels

The wheels are fastened onto the structure to formulate a mobile shelter. Each pillar contains a pair of wheels which are assembled at an elevation parallel to the run (see Figure 2.6). In the resting state, the weight of the housing unit will prevent the structure from moving. To transform the structure from the resting state to the active state, a force must be applied to tilt the housing unit until the legs of the structure are no longer in contact with the ground. This causes the wheels to initiate contact with the ground and thus allows the wheels to rotate. As a result, this action will cause the structure to move. In addition, since there are no axles running across the wheels, the structure will be easier to rotate clockwise or counter-clockwise.

5.1.4 Walls

This structure contains four walls which are primarily composed of plywood. The walls are held in place by bolt locks of various diameters and a number of door hinges in contact with the base (see Figures 2.7, 2.9). This conceptual design will allow the walls to fully open, allowing for easier access for cleaning purposes. The front wall of the structure is the only wall that will not open, and so it will be kept in place by a number of galvanized nails.

5.1.5 Ramp

The ramp is integrated in the structure to aid the chickens moving in and out of the structure. In order to close the door to the housing unit, the ramp is hinged to the structure and is connected to a metal cable that will help facilitate the user to open or close the door.

5.1.6 Lower section

The lower section of the structure contains a hollow rectangular vertical cross section that is surrounded by recycled wood. In order to prevent the chickens from leaving the parameters, chicken mesh will enclose the hollow section of the rectangle and the entire lower section as well (see Figure 1.1). This feature increases the run area and so chickens can move about in a safe environment. In addition, a

second set of pillars will be utilized to increase the support of the chicken mesh and will prevent the wheels from interacting with the chicken mesh.

5.1.7 Run

The run, placed on the facade of the structure, allows the chickens to move about outside. The run portrays a rectangular shape, which contains dimensions of 4'x6'x5' (depth, width, height). The run space is 6'x5', not including the open space underneath the housing unit as shown in Figure 1.1. It is attached to the run by a number of latches that help facilitate the attachment and removal of the run from the housing unit.

5.2 Interior Design

The interior design of this structure incorporates many features which have to be satisfied by the Organic Standards. Features include the flooring, the perch, the run and the door, along with the nesting and sand boxes. These features are added in order to create an adequate environment for the chickens to live in.

5.2.1 Flooring

The flooring is principally composed of chicken mesh across the entire 5'x5' floor. This feature will permit chicken waste to fall through the floor to the ground and nourish the plantations underneath the housing unit. The interior is designed to have a large open space area in order to allow features such as perches, sand and nesting boxes. The large open area allows easy cleaning and relocation of features if necessary.

5.2.2 Perch

The perch's main function is to accommodate the chickens when they sleep. Two cylinders of 2 inch diameter will run horizontally across the interior pillars. These perches are at a height of 1.5 ft above the flooring and contain a 1.5 ft headspace. Each perch has a width of 3 ft to accommodate at least 6 chickens each.

5.2.3 Nesting and Sand Boxes

The nesting and sand boxes are placed into the design to allow the chickens to execute their necessary daily activities such as nesting. The boxes are mainly composed of plywood and are positioned on both sides of the house as shown in the Figure 1.1. The dimensions of the boxes are 1'x1'.5'x1.5' (depth, width, height).

5.2.4 The Door

The door is placed on the face of the housing unit which is held in place by hinges and latches. Moreover, the door is four feet high in order to compensate for a person to enter the run for maintenance. For simplicity reasons, the doorframe will match the frame at the end of the run with a dimension of 4 feet height and 5 feet wide (refer to Figure 1.2).

6.0 Activities and Schedule

The following section lists all tasks completed by the group and the associated timeframe.

This section is divided into two parts: Term One and Term Two.

6.1 Term One

In the first term, the project was done through CIVL 201. This term involved the design process of the project. The design process included technical creation of designs, meeting with the client, and establishing responsibilities within the group.

6.1.1 Design of the Coop

Originally, the project was intended to be a cattle shelter, but was changed to be a chicken coop. Once the project was defined, the first step of the design included identifying the objectives. The second step involved coming up with three different conceptual designs. In the third step, all designs were evaluated based on how well they adhered to the given specifications. In the final step, the best design was chosen.

6.1.2 Communication

For the project, communication was established between the group, the mentor, and the client at UBC Farm. The group arranged meetings with Haydar Sabti, the mentor, to receive advice on the project and to answer any questions the group had. Meetings with Natalie Yuen of UBC Farm were conducted to discuss all specifications of the project and to present conceptual designs. Communication between group members was done through emails and in person meetings to discuss all aspects of the project.

6.1.3 Collaboration of the Group

The group worked as a whole to come up with all designs of the project and the schedule of meetings. Each member was given certain roles and responsibilities associated with design and communication as well as different sections of the report to be written.

Table 1: Term One Schedule

Date	People Involved	Purpose
September 30, 2010	Group	-Preliminary discussion about the project -Designation of roles and responsibilities of each group member - Brainstorm of potential designs
October 5, 2010	Group and Mentor	-Asked general questions about project -Were informed that project had been changed from cow shelter to chicken shelter -Given contact information of client
October 7, 2010	Group	-Discussion of meeting times -Rough sketches of conceptual designs
October 12, 2010	Client and Group	-First meeting with client -Discussion of all specifications to be met, preferences of client
October 14, 2010	Group	-Design sketches -Upload of designs to Google SketchUp and AutoCAD
October 21, 2010	Group	-Conceptual design touch-ups on Google SketchUp
October 25, 2010	Group Leader and Mentor	-Conceptual designs were presented -Discussed benefits and drawbacks of the design, mentor recommended use of recycled materials for sustainability reasons
October 28, 2010	Group	-Group choice of final design -Wheel options discussed -Discussion of potential build dates -Delegation of report sections to members, scope statement
October 28, 2010	Client and Group	-Second meeting with client -Presentation of all designs -Selection of final design
November 2, 2010	Group Leader and Mentor	-Presented how group plans to integrate recycled material, or Green Material, into design process
November 11,	Group	-Report Write Up

2010		
November 16, 2010	Group	-Final editing of the report
November 16,2010	Group Leader and Mentor	-Discussed great relationship with client -Obtained advice on how to approach some sections of the report
November 22, 2010	Group	-Submission of Report
December 2, 2010	Group and Panel	-Presentation of report

6.2 Term Two

In term two, the project will be done through CIVL 202. The second term will involve implementation of the final design. Before construction of the coop begins, final detailing to the design will be completed and all necessary materials and tools will be collected.

6.2.1 Final Detailing of Design

Before building of the project can begin, a final review of the design will be done. A review of all the necessary materials will be completed as well as an analysis of the space where the coop is to be built. The group will also discuss the steps of building the chicken coop, including a schedule of each day of construction.

6.2.2 Attainment of Materials

Once a detailed list of all materials is finalised, the materials will be ordered. The group will also claim any spare materials UBC Farm has to offer. The tools needed for construction will also be provided by UBC Farm.

6.2.3 Coordination with Client

At the beginning of term two, the group will meet with the client to make final agreements on the construction dates of the project. For building the project, the group will request access to the Farm and to the truck provided by the Civil Engineering Department.

6.2.4 Construction

Construction of the chicken coop will happen over a three day span. Each group member will be assigned a section of the build. The construction will involve both stationary and moveable sections. If any more time is needed to complete the build, an agreement will be made with the client.

Table 2: Term Two Schedule

Date	People Involved	Purpose
January 6, 2011	Client and Group	-Agreement of building dates
January 11, 2011	Group	-Attainment of all tools and materials for build
January 15, 2011	Group	-Day one of construction
January 16, 2011	Group	-Day two of construction
January 22, 2011	Group	-Day three of construction

7.0 Roles and Responsibilities

7.1 The Organization

In the first term, the UBC Farm was responsible for providing a contact to the team that could specify the description and purpose of the project. Basic information and requirements regarding the building's design and layout were stated by the contact during scheduled client meetings. A finalized design of the building was chosen by the contact. The UBC Farm was also responsible for providing an available time for the actual construction of the building in second term.

In the second term, the contact will continue providing assistances and suggestions for the project while the UBC Farm will provide access to the farm and essential hardware tools for the construction.

7.2 The Team

In the first term, the team was responsible for meeting with the client, UBC Farm, and providing the deliverables and research of all aspects of the project. Four conceptual designs (see Appendix C) were made during team meetings for the client to choose from and a scheduled construction period was decided among team members. The team was also responsible for adhering to all the detail requirements made by the client into the final design while also meeting all other constraints.

In the second term, the team will be responsible for purchasing all required materials within a given budget, and finishing the construction of the building within a scheduled time slot.

7.3 Team Members

Different roles were assigned to each team member within the group. Hady was elected to be the leader of the team, who is responsible for contacting the client and the mentor. Zac and Andrew were responsible for drawing the initial conceptual designs for the building, while Julian was responsible for composing the detailed final design on the computer. Meeting times and meeting minutes were made by Alex weekly to ensure the team was on schedule. In addition to this, she completed the final edit of

the report. Solutions to the problems encountered in the design were researched by Derek and James to make sure the final design was without fault. All team members were responsible for attending all the regular team meetings, as well as the construction of the building.

8.0 Cost Analysis

Table 3: List of Materials and Prices

Framing					
Size (cross section)	Quantity	Length	Total Length	Price/ ft or item	Cost
2" x 4"	28	6	168	0.37	62.16
4" x 4"	6	4	24	1.35	32.4
2" x 6"	4	5	20	0.53	10.6
4' x 8' (plywood)	4			15	60
				Total Cost	165.16
Accessories					
Item	Quantity			Price/ Item or kg	Cost
Wheels	4			12.99	51.96
Hinges for Opening walls	2			20	40
Latches for removable run	4			4	16
Galvanized Nails	1			6.99	6.99
Outdoor Deck Screws	1			15.99	15.99
Axels for Wheels	1			4	4
Tar Paper	1			17.34	17.34
Pulley for Coop Door	1			5	5
Cable for Pulley	1			5	5
Hinges for Door	1			12.89	12.89
				Total Cost	175.17
				Overall Cost	340.33
				Budget	350

Note: Treated wood is roughly an additional 30% on top of cost of framing lumber cost. The group has also asked for donations for supplies from local large construction companies. This cost is not including the materials supplied from UBC Farm because the group has not been able to reach the client to set up an appointment to reserve supplies. They have however, informed the group that they have roofing material and chicken wire available for use.

9.0 Risk Assessment

9.1 Personal Safety

Safety is a priority during construction. There are many hazards included with the use of power tools and handling construction materials. The group will use necessary safety equipment including CSA approved boots, gloves, safety glasses, ear plugs/ muffs, and all guards possible for saws. There are many other possible risks as well, such as tripping over unorganized materials or deep lacerations from sharp tin roofing materials.

9.2 Chicken Safety

The group is designing a chicken shelter to enhance the safety of the chickens and mitigate the threat of losing chickens to wild predators. Predators including bears, raccoons and coyotes are attracted to the chickens and their eggs. The rigidity of the shelter must be taken into consideration to keep predators out of sleeping areas and nesting boxes during hours when the coop is not supervised. The group has also designed a door to keep the chickens inside the coop when farm employees cannot oversee the predator's location. There is a fenced run that keeps the chickens enclosed in an area, is large enough to meet Organic Standards, keeps chickens in a safe range, and keeps sneaky unexpected predators out during the day.

9.3 Risk of Distraction

There are many more minor risks (less detrimental than personal safety) included with this project. Incorporated in this project is the risk of lowering grade point averages. This is a fairly large-scale project for engineering students to take on with a very busy schedule. One has to be sure to finish other assignments and stay on top of studying, not getting carried away with devoting all free time into the CSL project.

9.4 Risk of Incompletion

There is a risk with leaving a project incomplete because if left unfinished by the original design team it could pose confusion or difficulties for the next team continuing the construction/ design. However, the formal report and design must be as clear and easy to follow as possible in case of unexpected delays or obstacles. In the case of an emergency another group should be able to finish the project given the written report. Clearly, an unfinished project is not valuable to the client because it provides no functional purpose. Everything possible must be done to make sure this project is completed.

9.5 Risk of Reputation

Another large risk that is integrated with this small-scale engineering project is the reputation of our faculty, alumni, fellow students and professors. The group is working to build a relationship with the client, with the ultimate goal of building a functional structure of their desire. The group must carry out this task in a responsible, ethical, and professional manner to maintain the highly regarded reputation UBC engineers currently hold in the community and around the world.

10.0 Conclusion

The detailed design illustrated within Appendix A and Appendix B is a complete and effective replica of the mobile chicken shelter. Nevertheless, the specifications on the design are subject to change with respect to the circumstances faced when implementing the construction.

This group's primary objective is to build the design represented in the appendices in the most cost effective and professional manner, keeping in mind the client's recommendations and the principles set by the Organic Standards. Furthermore, the group has considered other features to add to the design that might influence the overall product, such as the principle of sustainability.

The design explained in Section 5.0 might not be preeminent in terms of aesthetics and the overall design. It has to be noted that initially our task was to build a cow shelter and after further investigation from the client, the task had been changed to a chicken shelter. The time constraint that was placed on the team during the design process did pressure the design. However, thanks to the co-operation of Ms. Yuen, the team was able to generate a number of distinct and working designs. The design chosen by the client was put into further investigation by the group in terms of cost and structural analysis.

The design is expected to begin execution on January 6th 2011, and is anticipated to be completed before the end of February 2011.

In conclusion, the team is eager about implementing the design and achieving outstanding construction results. Moreover, the design will be put into continuous supplementary research in order to achieve a paramount end result. Therefore, the design outlined in the body is subject to minor changes depending on the outcome of the team's further research. The CSL team is open to any further recommendations from Dr. Nesbit and Ms. Yuen.

Appendix A



Figure 1.1

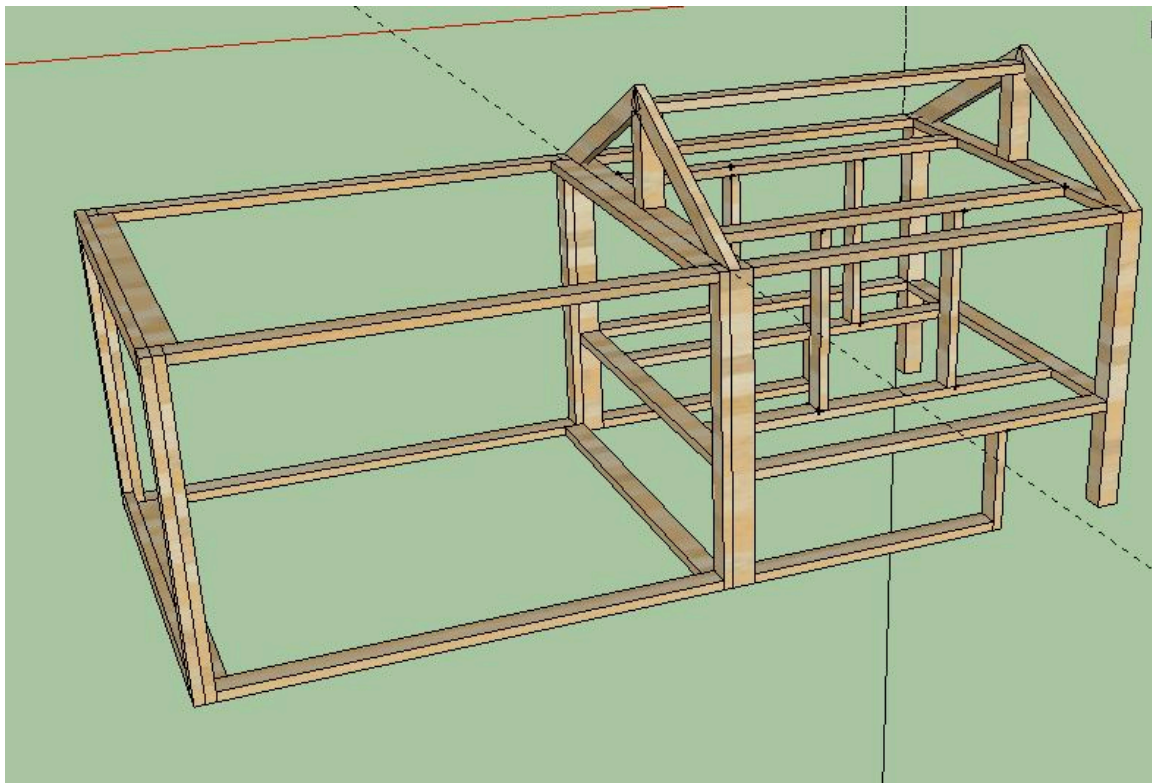


Figure 1.2

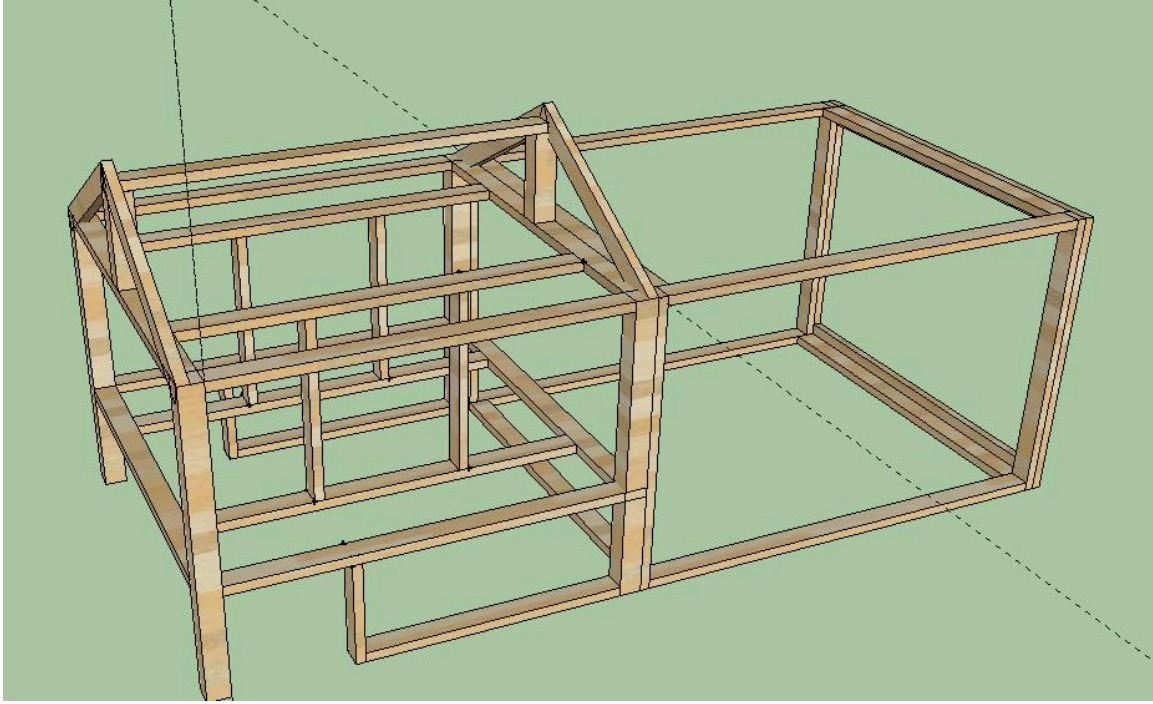


Figure 1.3

Appendix B

**all dimensions given in feet*

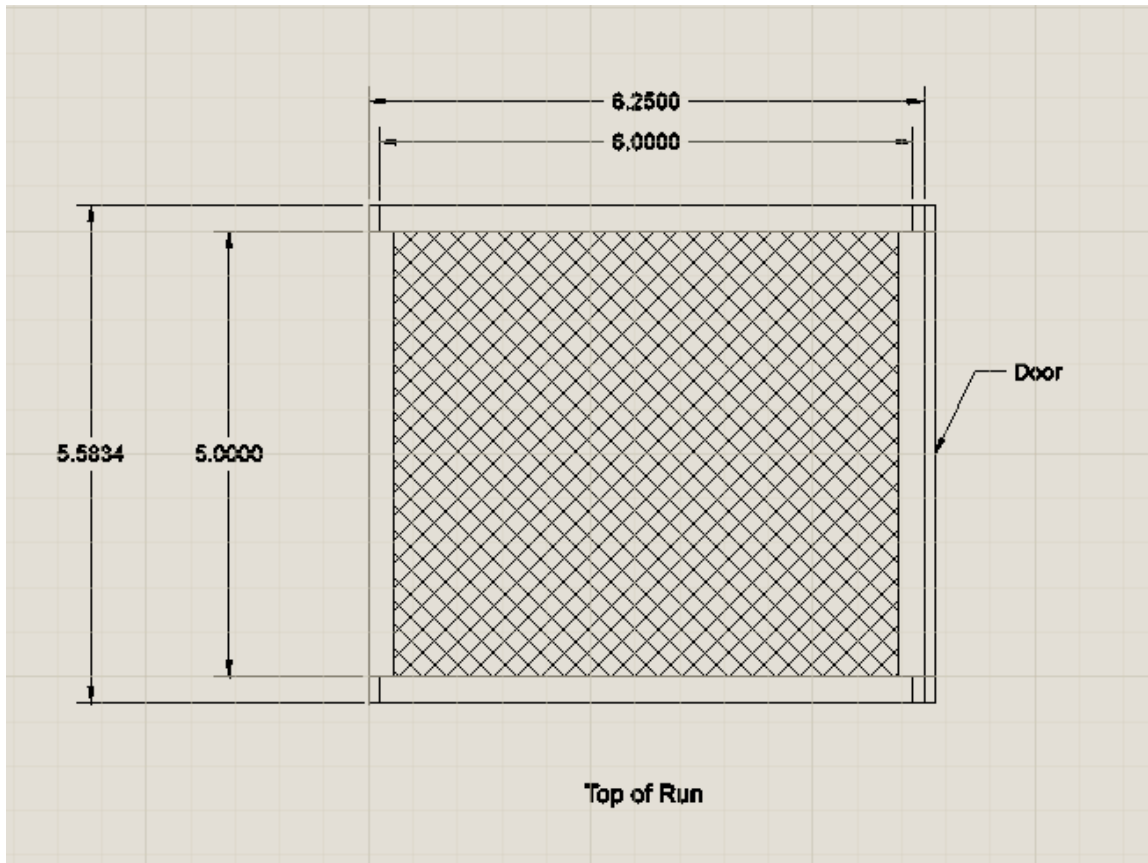


Figure 2.1

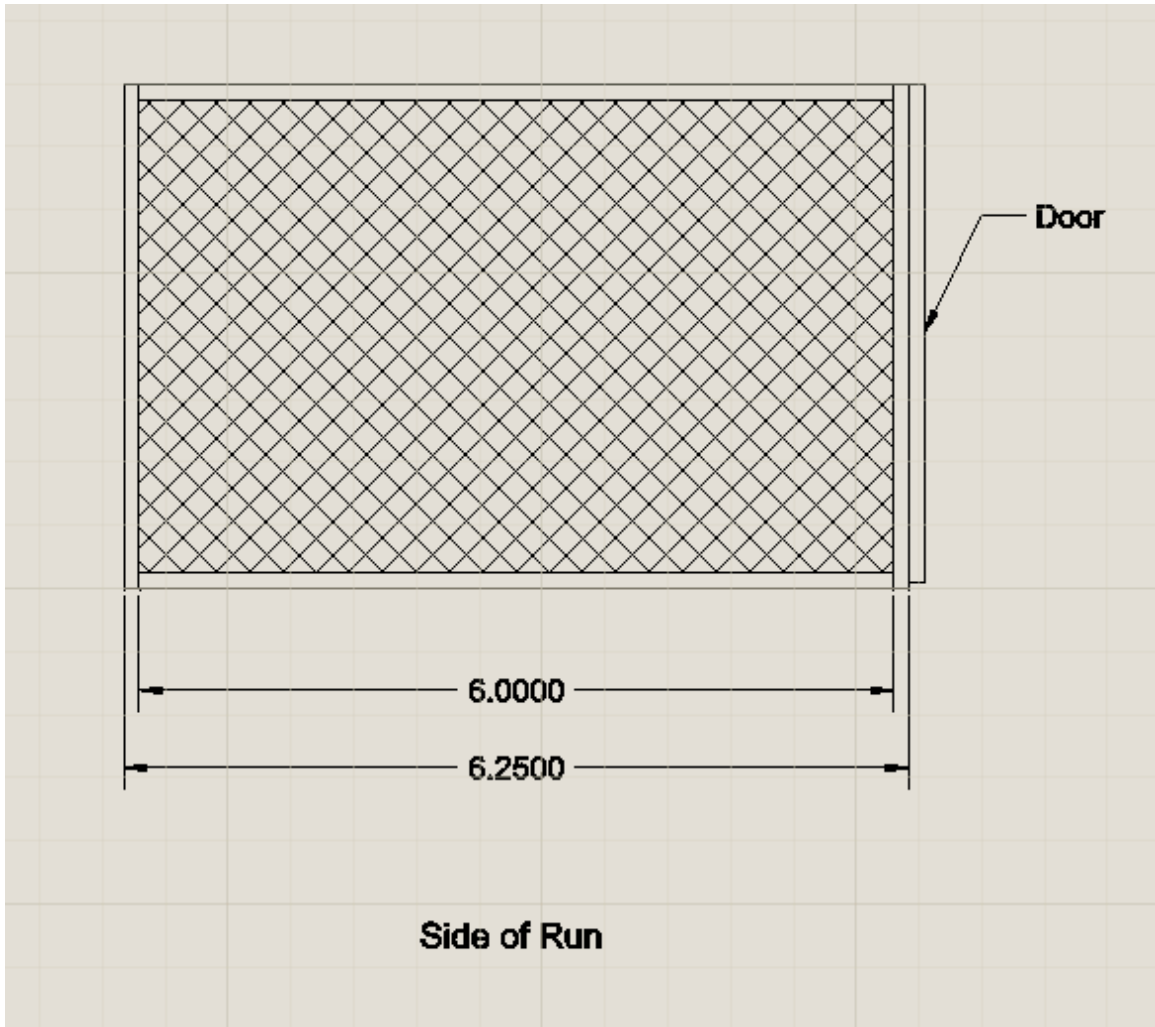


Figure 2.2

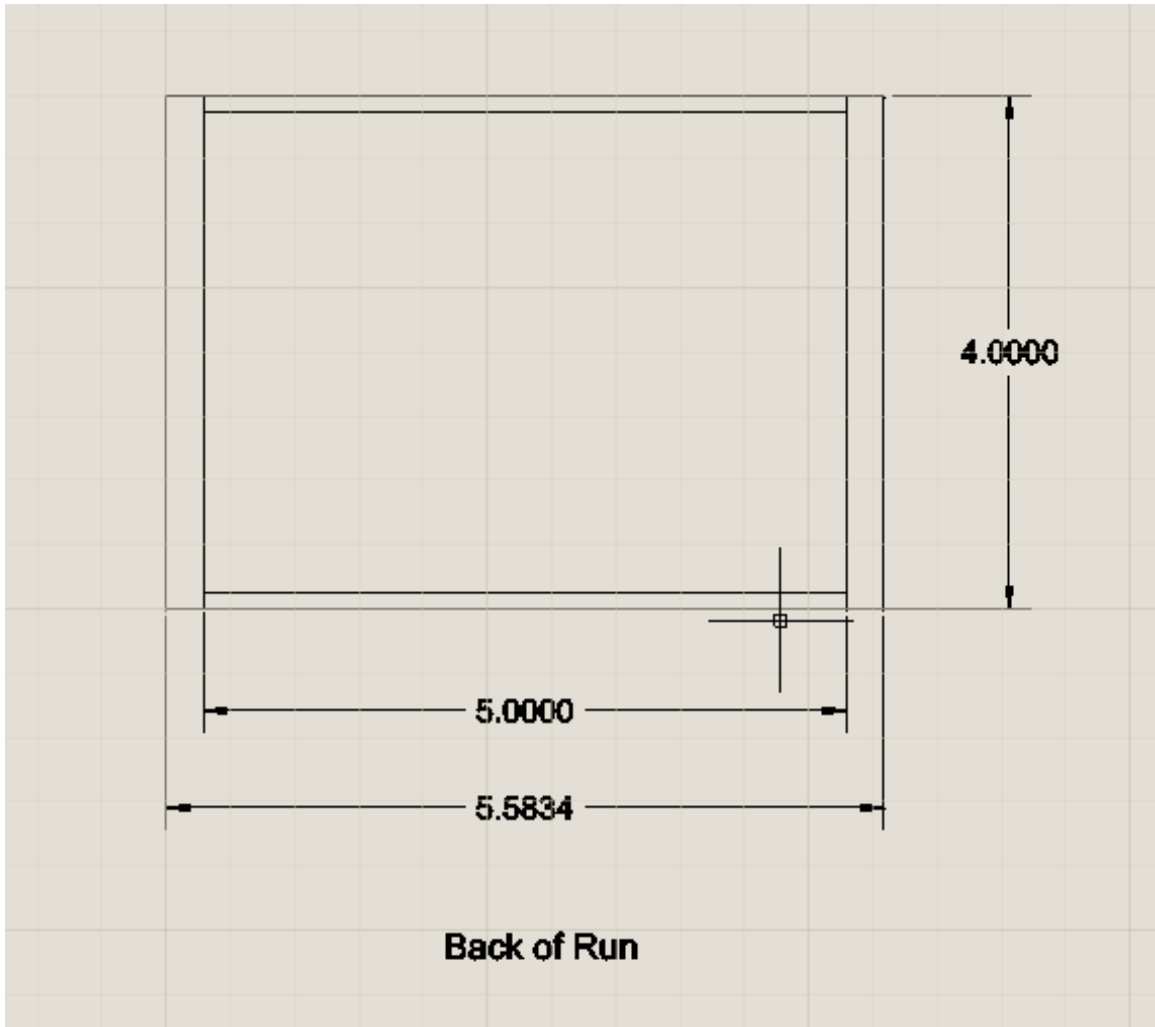


Figure 2.3

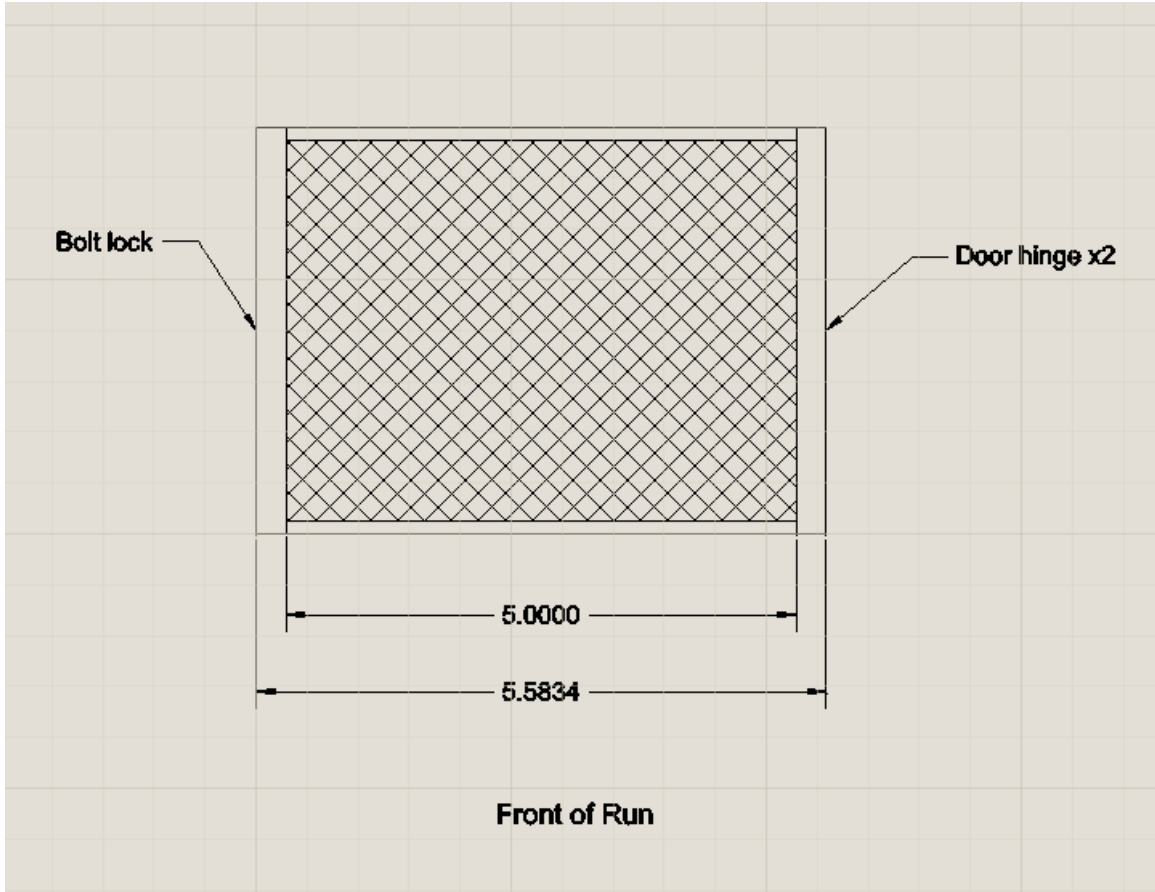


Figure 2.4

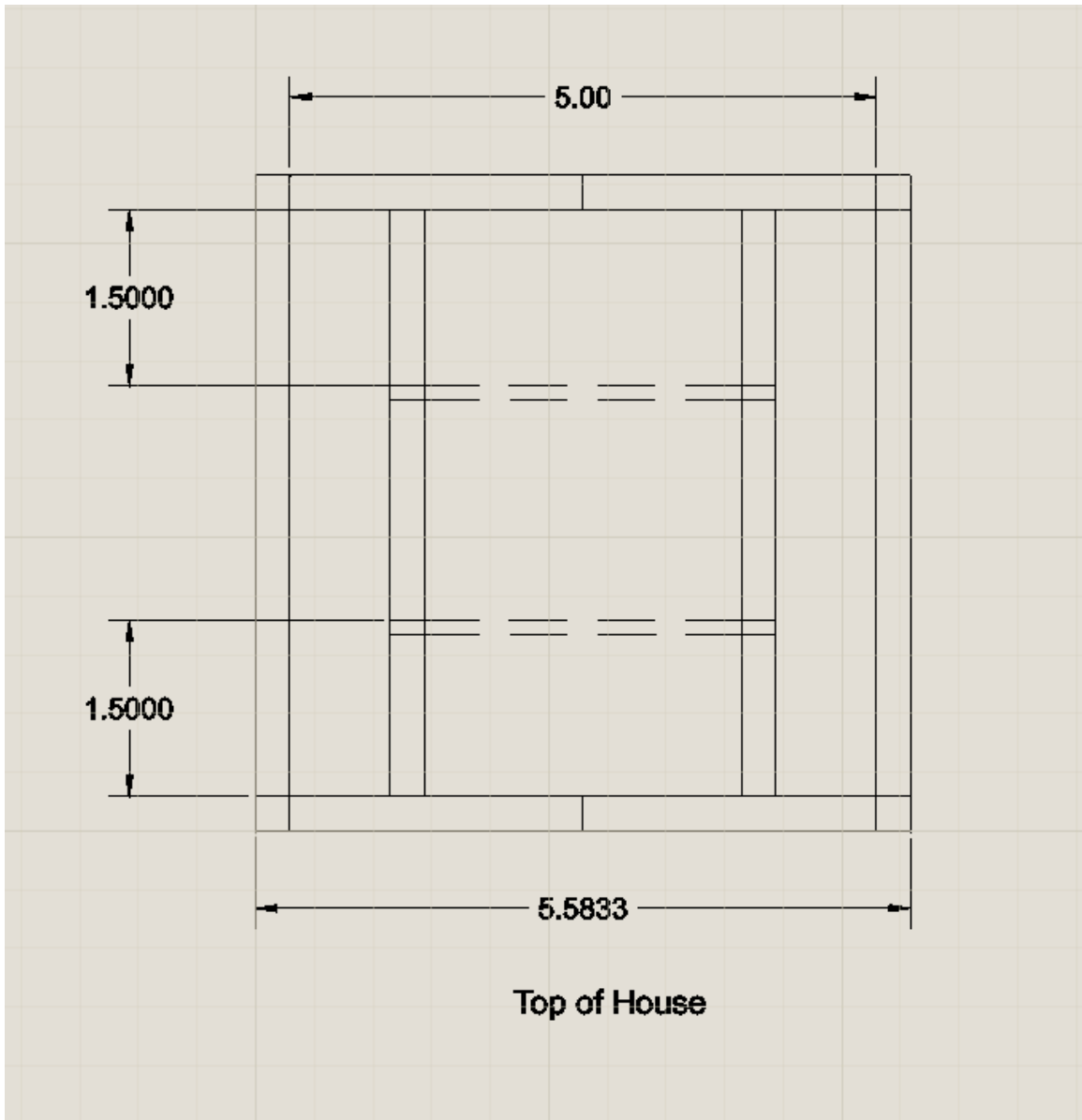


Figure 2.5

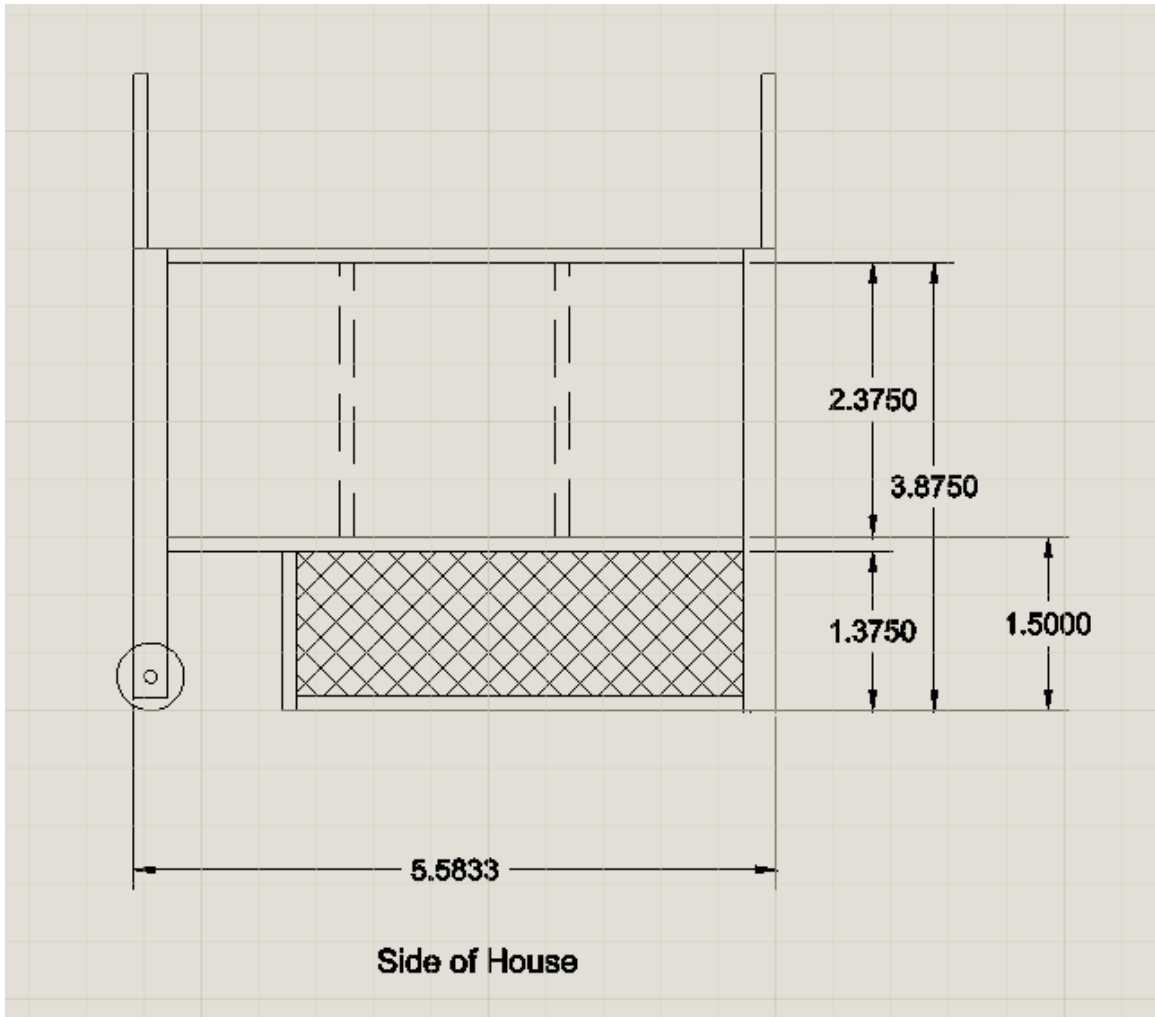


Figure 2.6

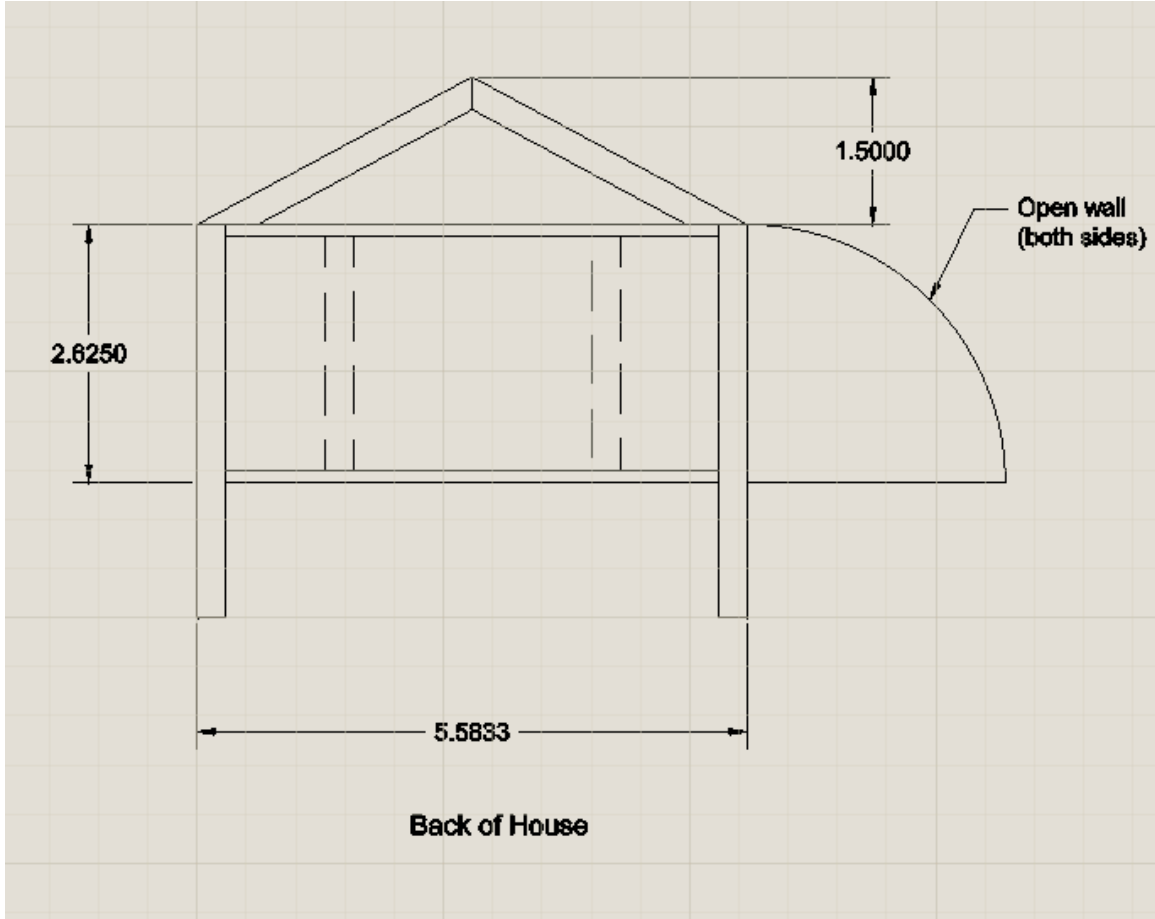


Figure 2.7

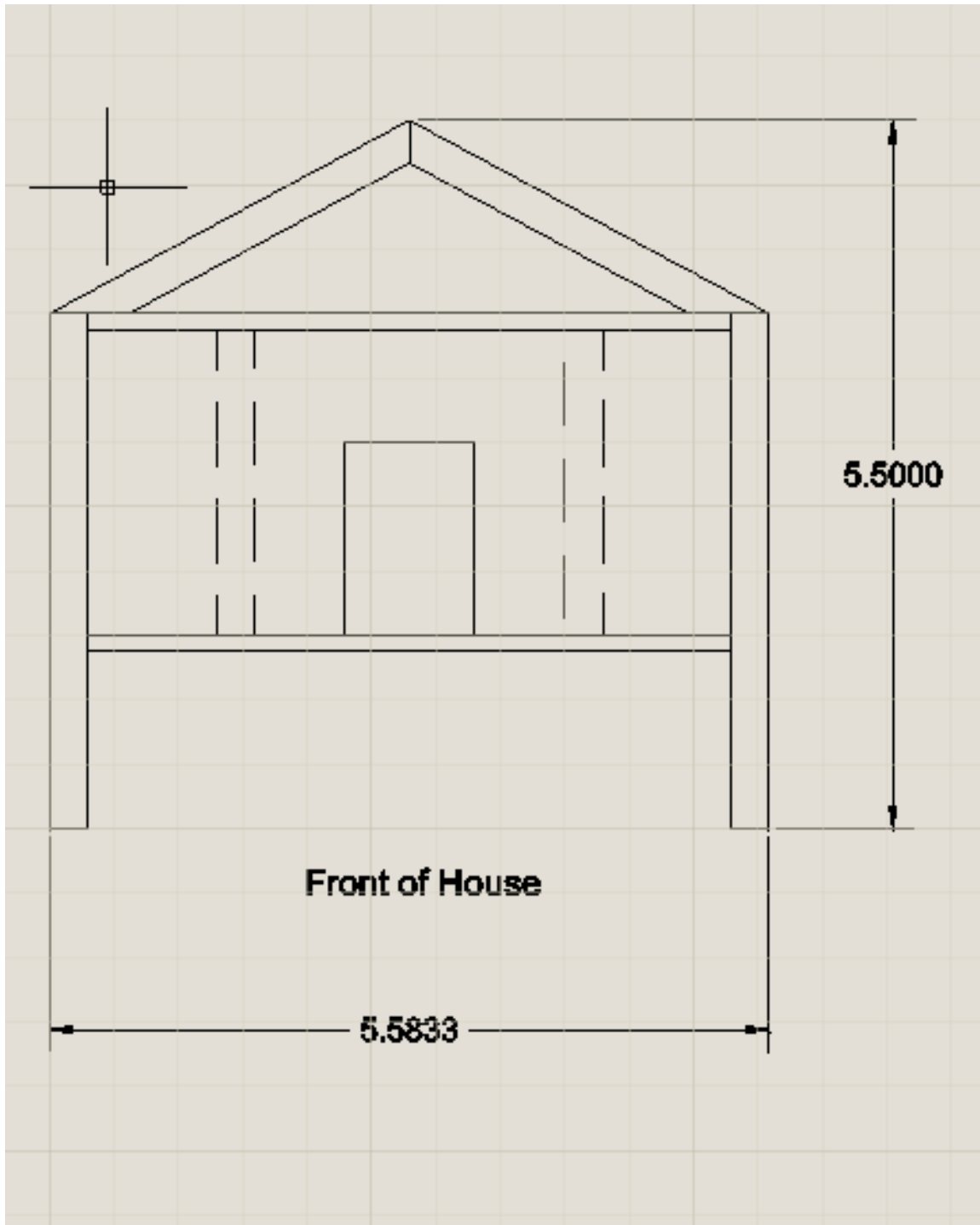


Figure 2.8

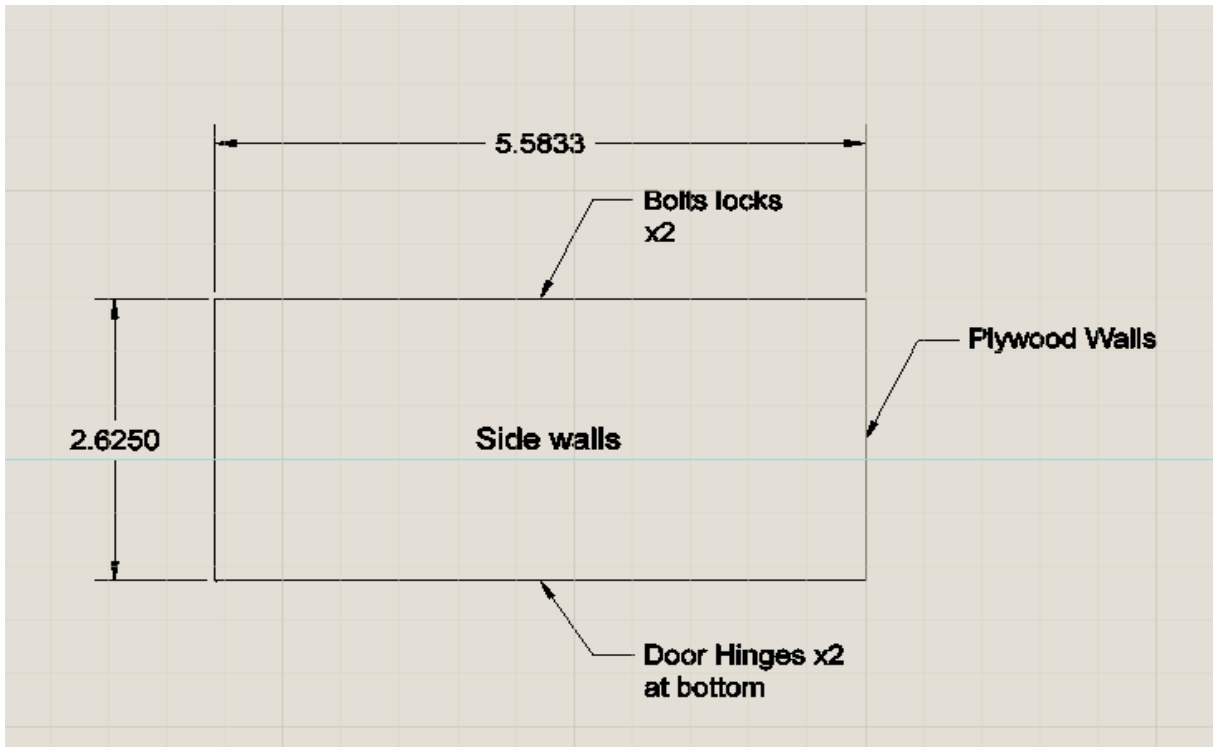


Figure 2.9

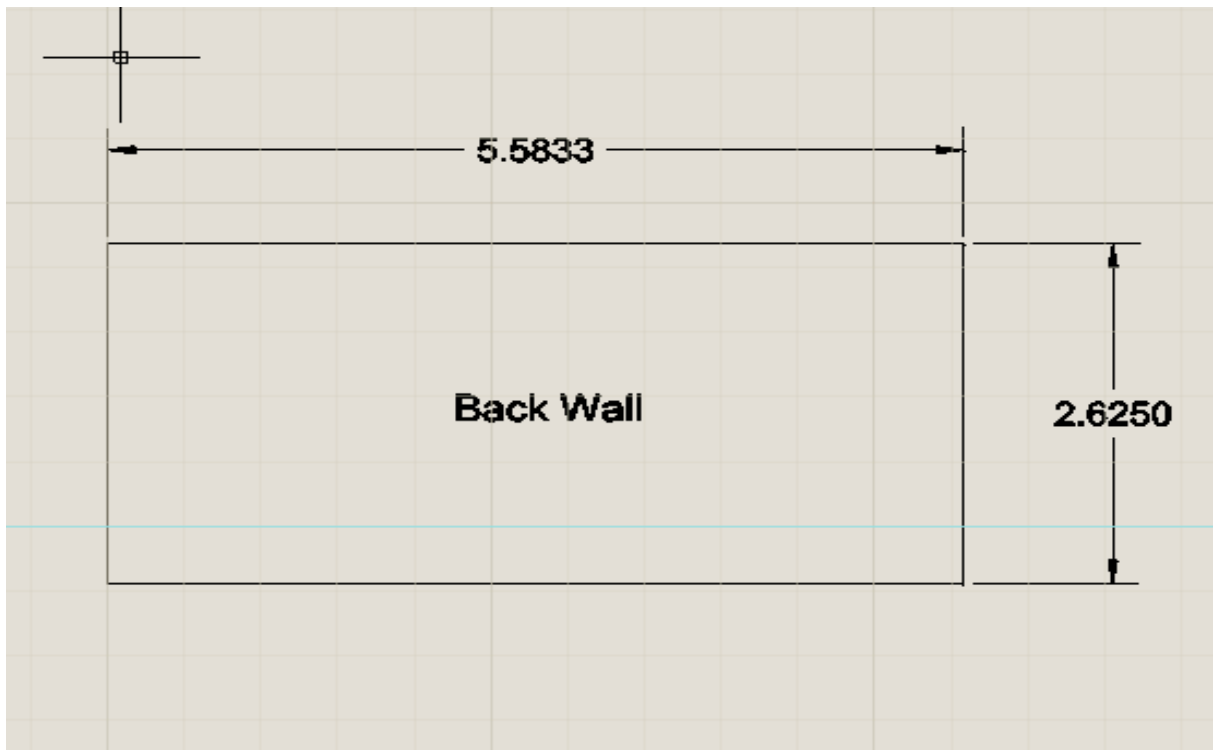


Figure 2.10

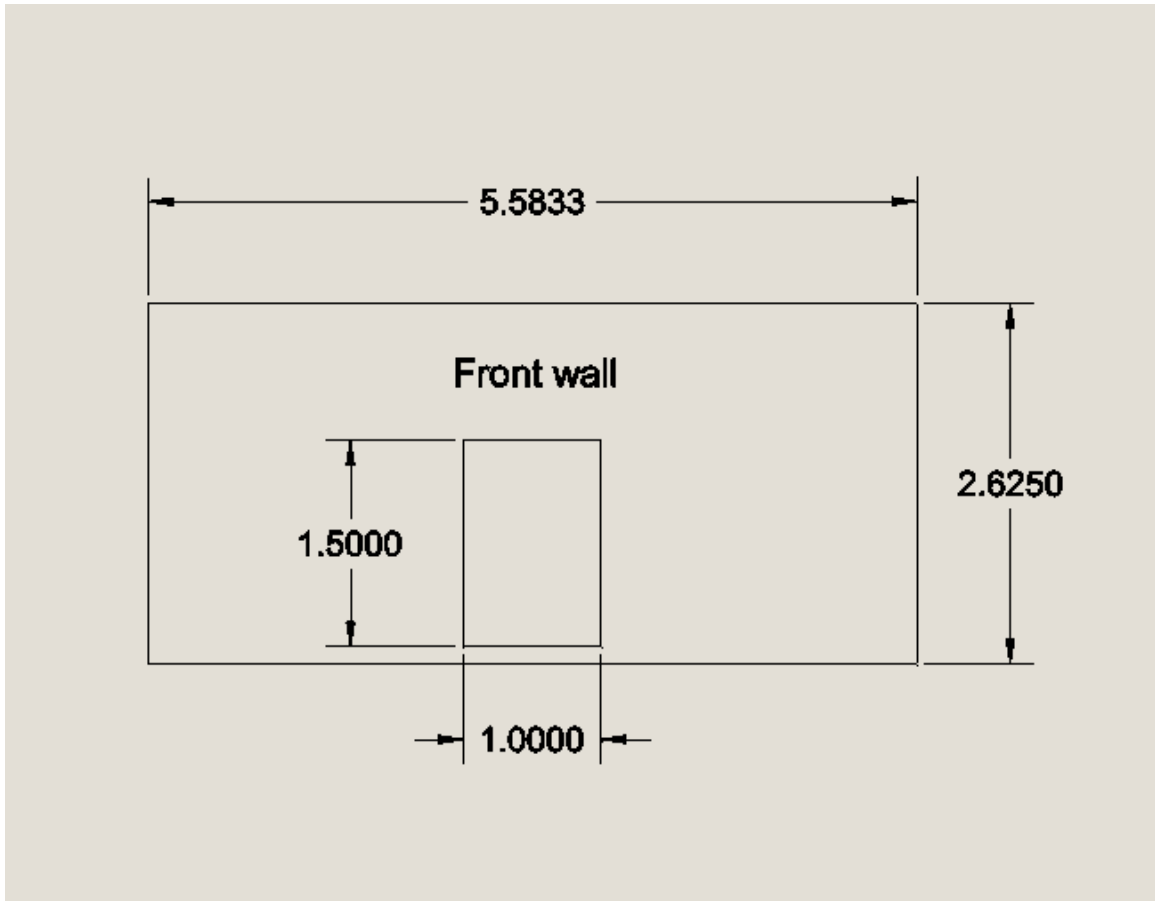


Figure 2.11

Appendix C

CSL CHICKEN COOP

DESIGN 1

ANDREW BURGIN

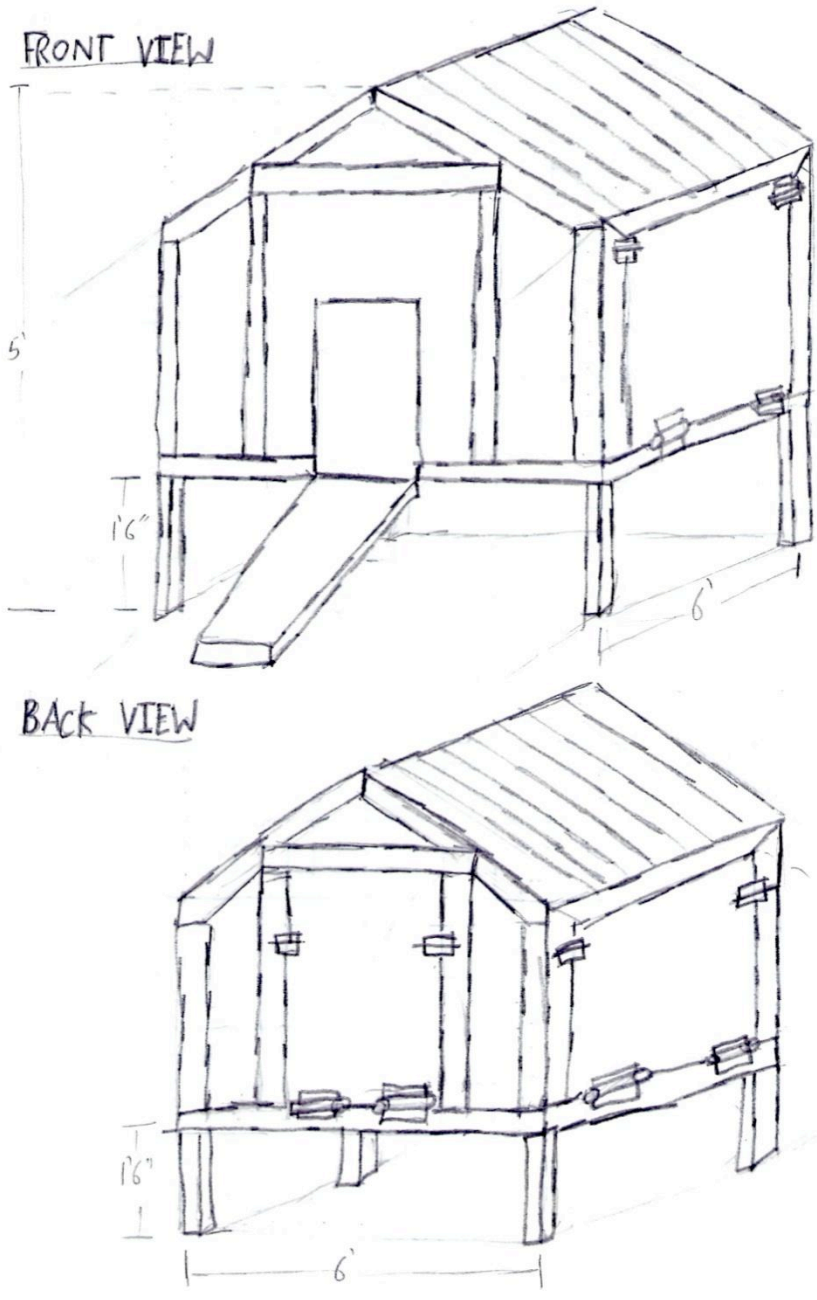
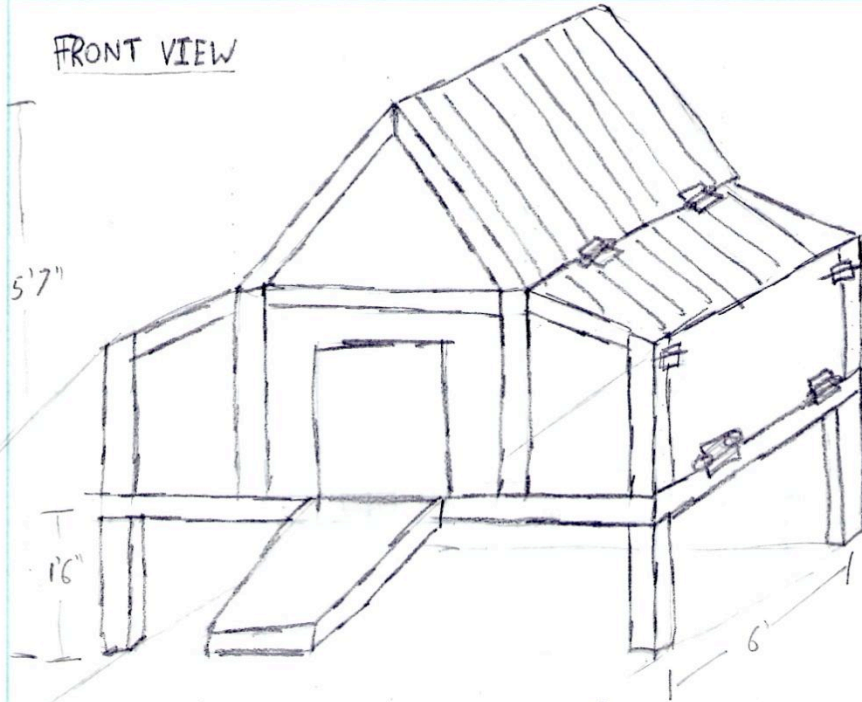


Figure 3.1

FRONT VIEW



BACK VIEW

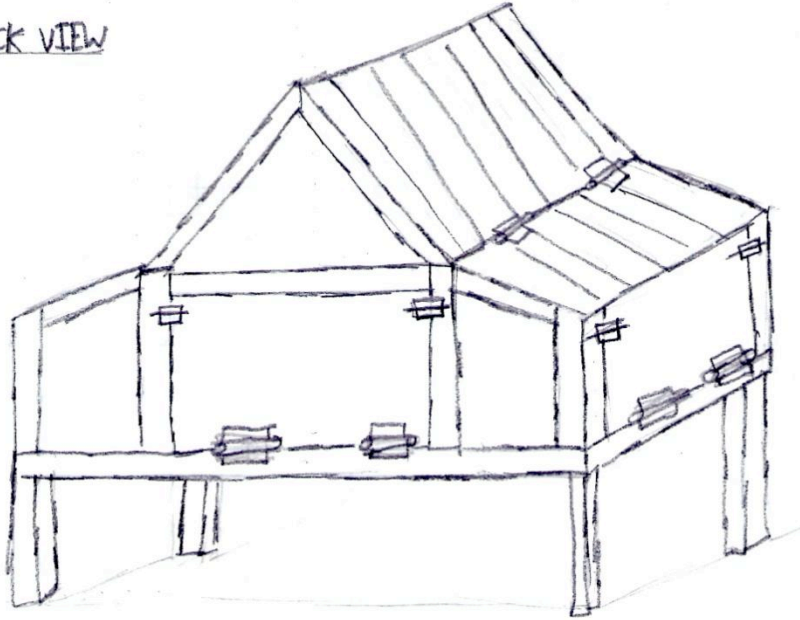


Figure 3.2

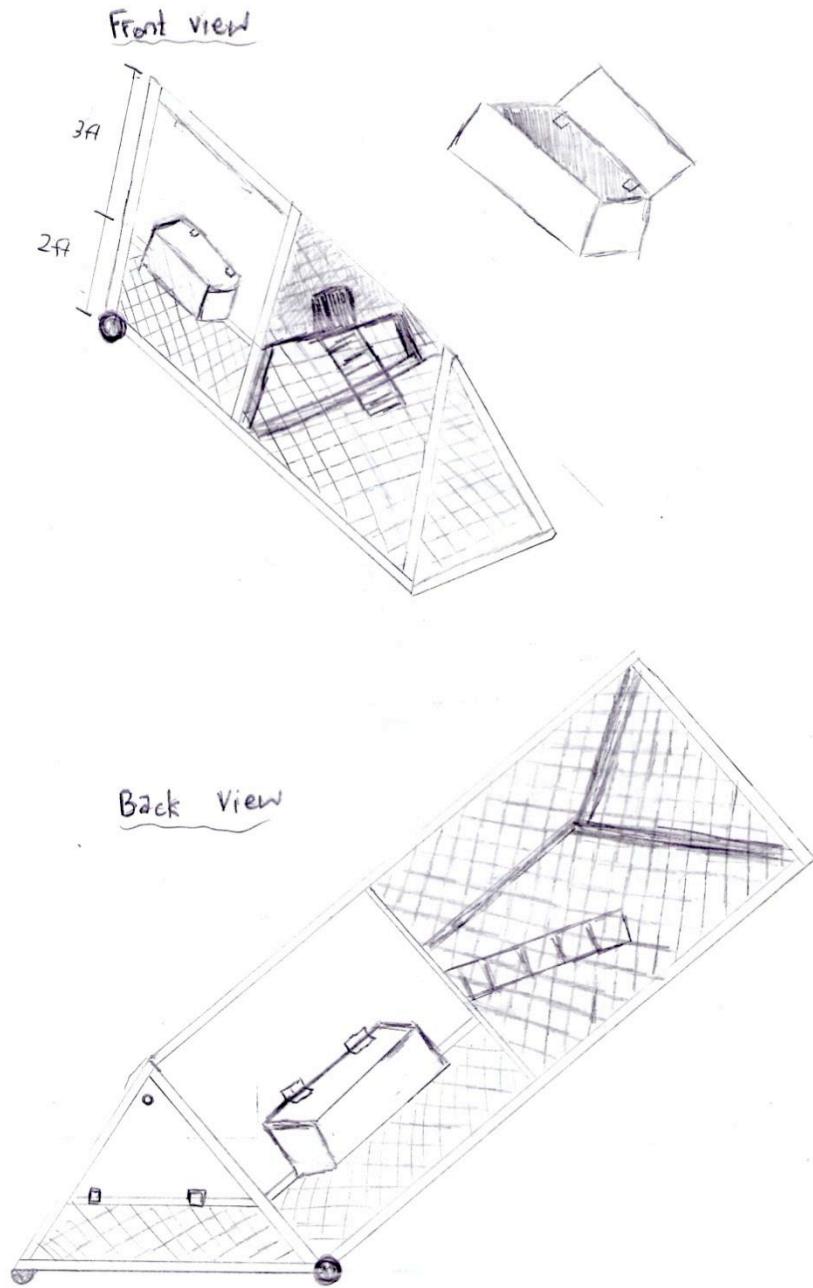
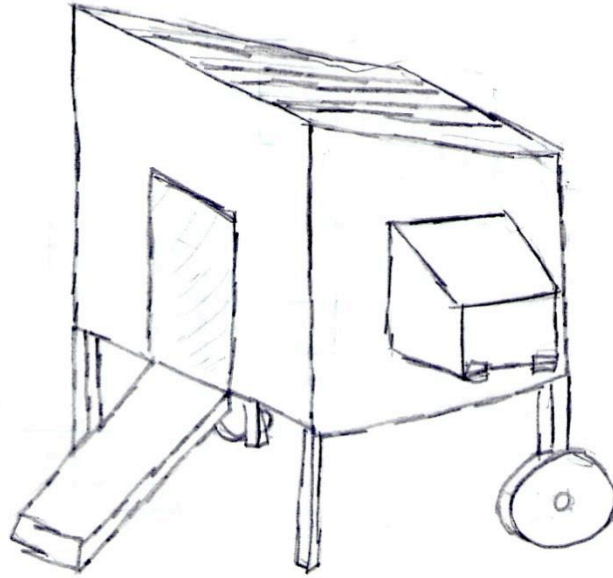


Figure 3.3

FRONT VIEW



BACK VIEW

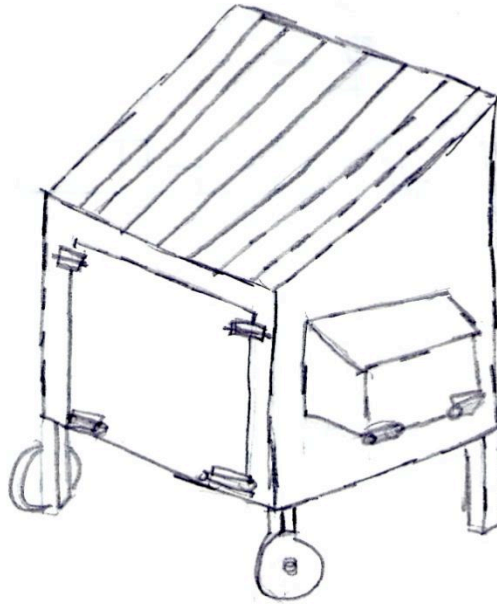


Figure 3.4