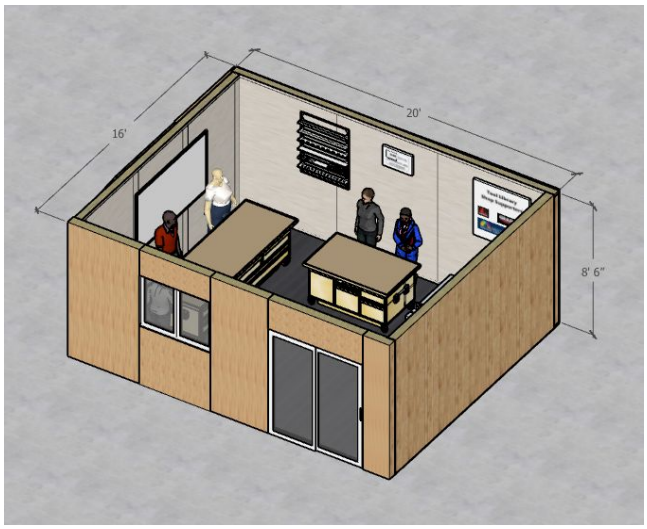
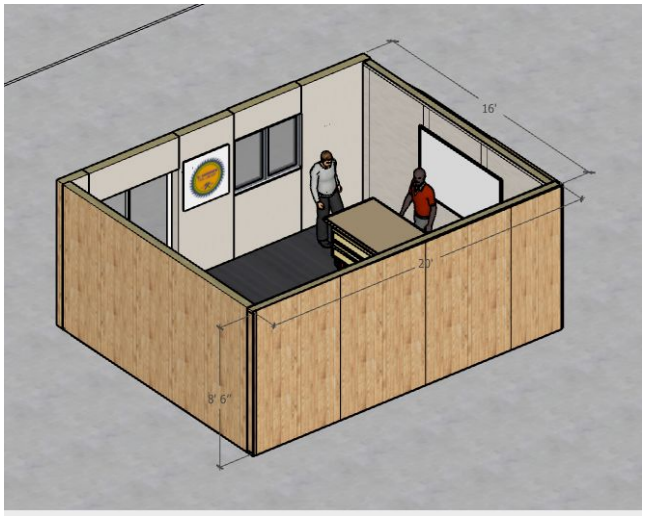
The Shop @ E. Warren Tool Library

Construction Manual

1. What we're building





The ceiling is omitted here in order to see inside the shop.

2. The 3 P's, Learning Objectives, Expectations

The People

Joshua Arntson, Andrew Iannaccone, Kim Canty, Latisha Johnson, Raymond Humphries, Tom O'Brien, Charon Nogues, Mark Rutherford, Erin Butler

The Product

- Portable space. It can be disassembled, moved to another location, or stored.
- Designed for workshops and open hours for members to work on individual projects.
- Designed for streaming video of workshops and library activities.

The Process

- Library members construct the shop.
- All team members bring their skills and time to the project. If we think like engineers during the construction phase, we will design and make a better product.
- Team meeting agendas
    - Follow Martha's rules of order
    - Have meetings at the beginning (looking forward) and end (debriefing) of work days
    - Beginning of the day meeting agenda
        - Workshop yoga, the work for today, what we learned yesterday, new ideas to consider incorporating, new agenda items for next time
    - End of the day agenda
        - Workshop yoga, what we got accomplished and learned today

- The process generates equity for all team members. Equity can be defined as the things that team members receive for participation in the project. This can include:
    - Knowledge, skills, and confidence in building the shop
    - Knowledge and skills learned/howned from being part of a well functioning team
    - The possibility of becoming a team leader on future projects.

Learning Objectives

- Proficiency with tools used in the shop construction
- Proficiency in measurement and geometry skills
- Efficient communication with Build Team members about the project

Build Team Expectations

- Attendance and participating in all agreed on Build Meetings

3. Safety and confidence in the work-place

We want members to develop habits around best practices in safety and use of tools.

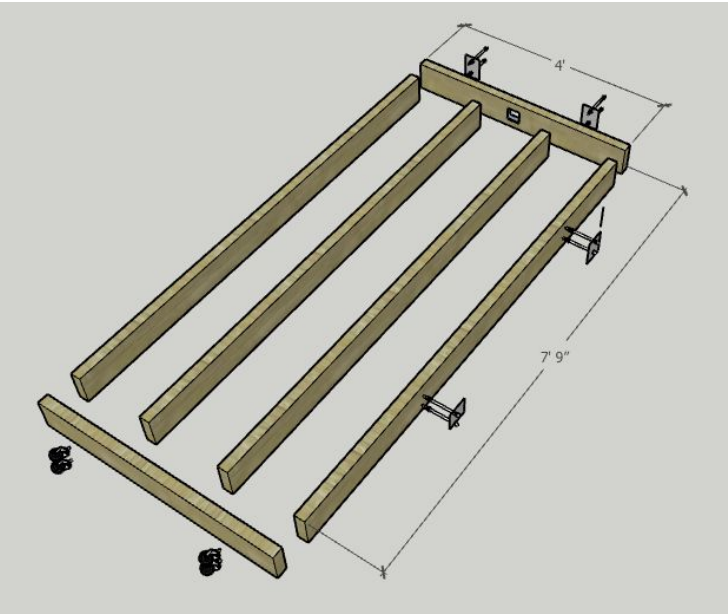
4. Steps in Rough Construction

4a. Floor sections

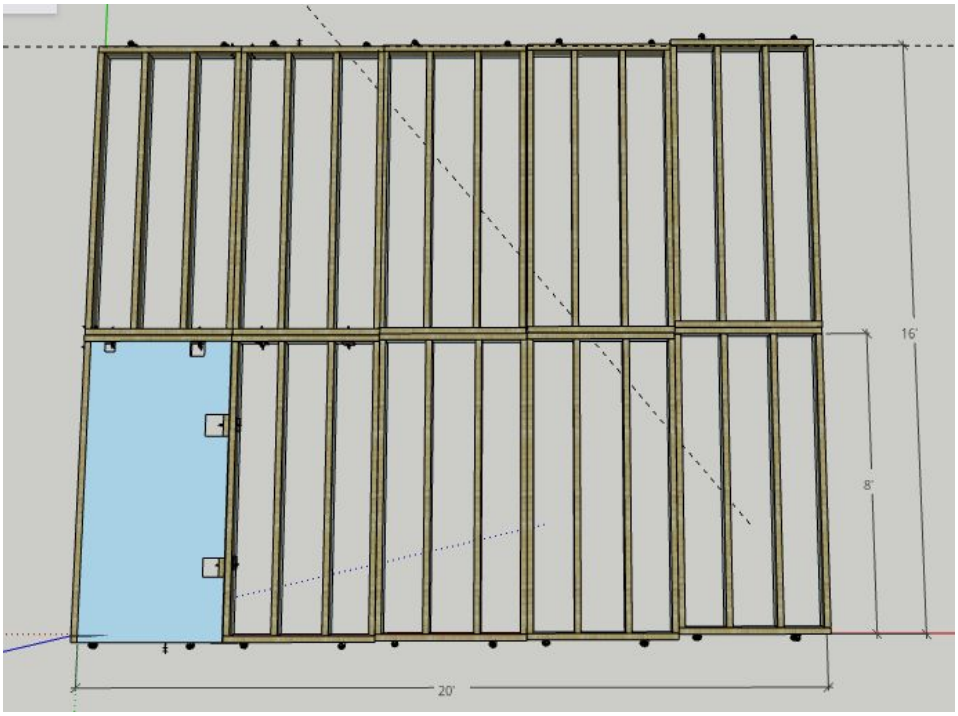
1. Each floor section weighs about 180lbs.
2. The floor sections take up about 20ft^2 when stored.
3. A hoist will be constructed to help move sections into place.
4. Leveling the concrete floor so that the shop's weight is equally distributed across the foundation needs to be worked out in detail.
5. The casters are mounted to the structure permanently.
6. Carriage bolts hold structure together tightly. Use one for every bracket.
    a. For floor sections that attach in the interior, a cut-out space can be made in the floor so carriage bolts can be installed. ⅜" steel plates cover the cut outs, providing adequate strength for the cover

<u>One floor section</u>

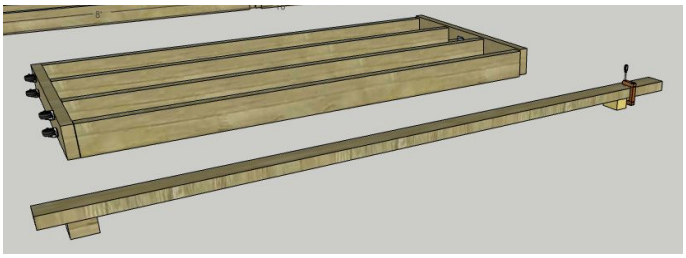
Use one carriage bolt per bracket instead of two seen in the pictures.

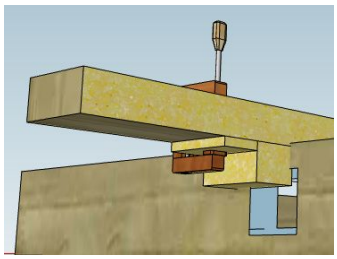


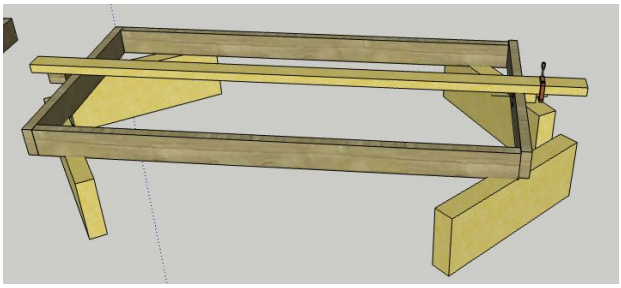
Fully constructed floor sections



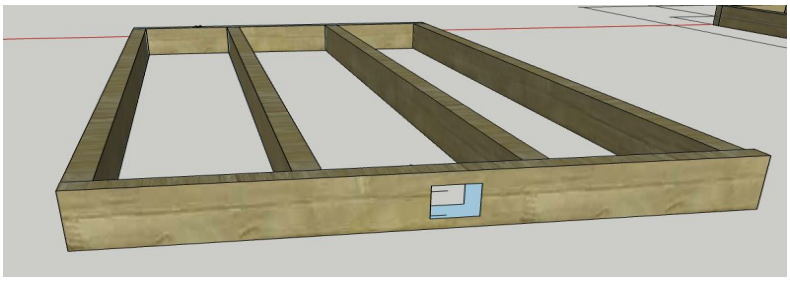
Close ups of jig built to hold the floor structure together initially. This can be used to secure the perimeter before installing hardware. The 1.5' high risers may help in construction.







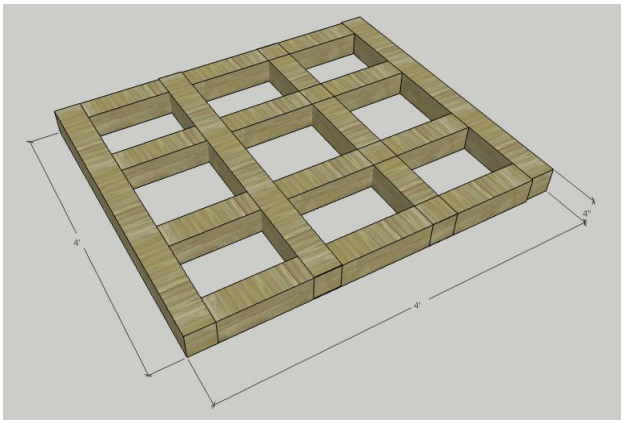
Close up of one floor section showing a cut out for hook to be used with hoist.



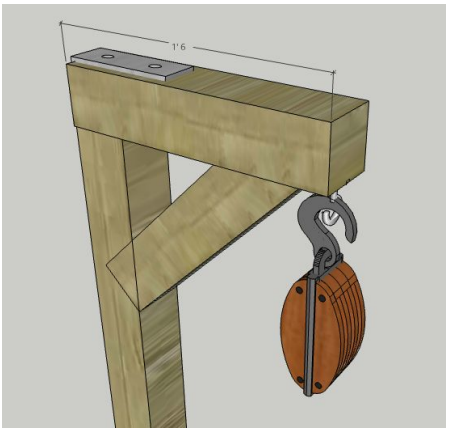
Hoist

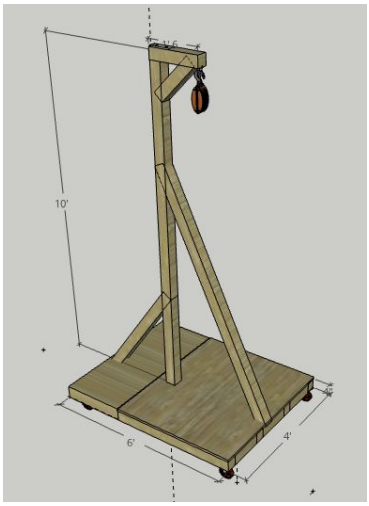
The modified design has a base of 4x6’

Base



Pulley





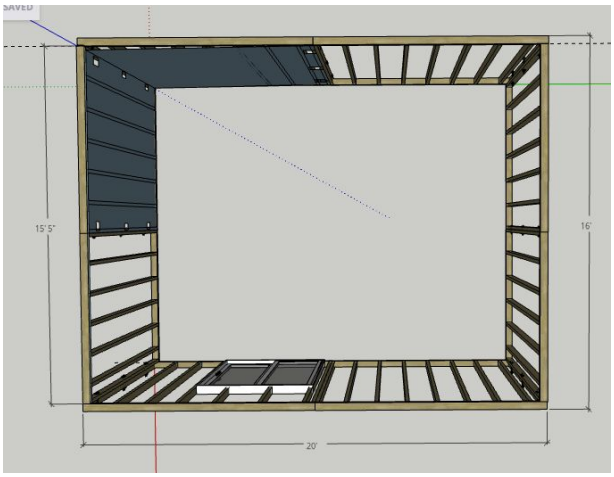
4b. Wall sections

1. 16 ft long walls:
    a. Two 8 ft sections make for a 16 ft wall.
    b. These walls sit inside the 20 ft wall, so the entire wall is really 15’ 5”. One section is 8ft in length and the second one is 7’ 7” in length. The walls sit on top of the floor sections.
    c. Use one carriage bolt per bracket.
    d. The ceiling joists run parallel to this wall and sit on top of the 20 ft wall.
    e. Wall height is 8’ 6”
    f. The extra 1’ 6” cut from the 10’ lumber is used in internal wall braces
2. 20 ft long walls
    a. Two 10ft sections make for a 20 ft wall

    How do we attach casters? Can I make it so that they are permanent? We can drill holes for casters and attach them for dismantle and storage. How do we install permanent eye bolts for use with hoist?

<u>One wall section</u>

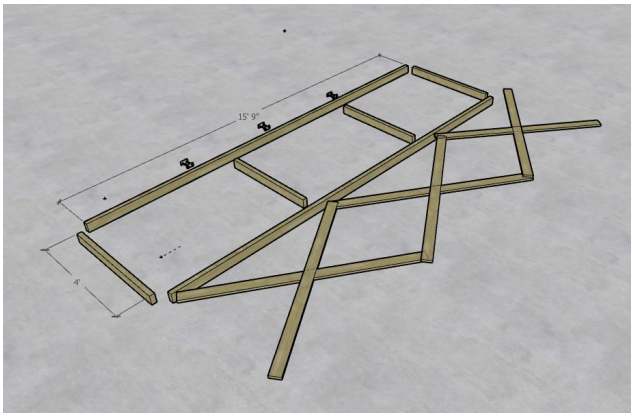
<u>Fully constructed wall sections</u>



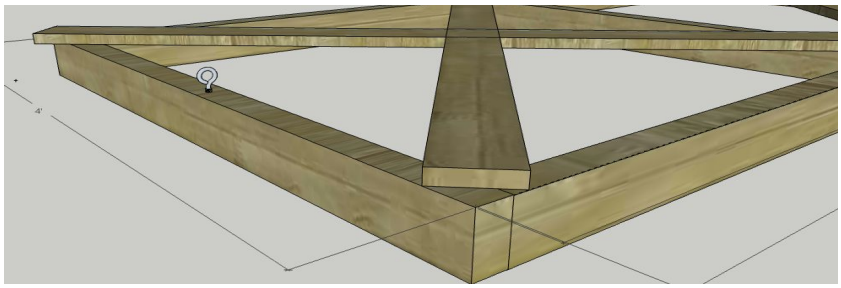
4c. Ceiling Sections

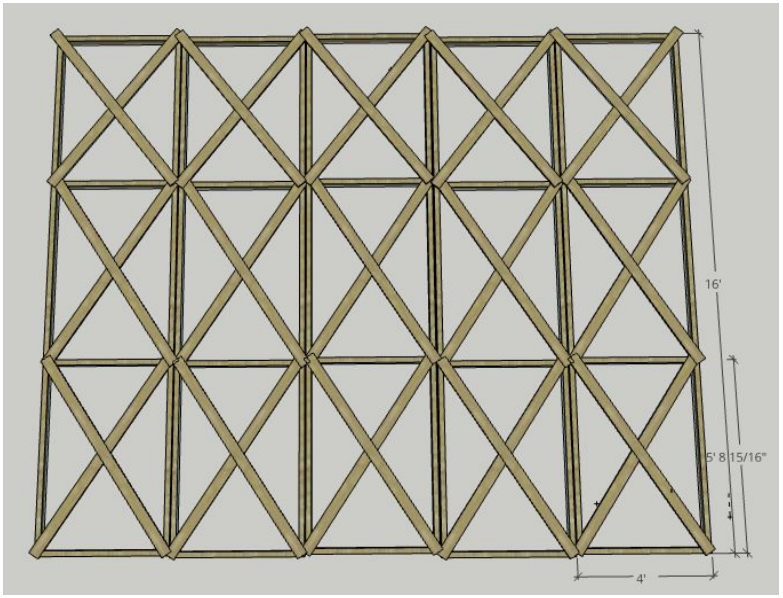
1. Use 2x4x16 for the rafters.
2. Use 2x1x16 cross member support on the outside of the ceiling.
3. Use 2in foam board insulation to reduce weight of ceiling.
4. The ceiling inside covering has to have cut outs for the carriage bolts

<u>One ceiling section</u>



<u>Eyebolt to be used with hoist.</u>





5. Insulation

Floor sections

- 1.5” depth XPS R 7.5

Walls

- Blown in insulation

Ceiling

- 1.5” depth XPS R 7.5

6. Drywall and ceiling wall

Floor sections

- OSB subfloor for the interior
- Thin plywood for the exterior

Walls

- Drywall for the interior. Using drywall is problematic as the structure can be disambeled. During disassembly and storage the drywall, especially the edges will become damaged. We could put gorilla tape on the edges to prevent damage.
- Plywood for the exterior gives structural support. They may need a 2x1x4 cross member support.

Ceiling

- Thin plywood for both interior and exterior

7. Shop Workstations, Storage, and Interior Design

Storage

- Four cabinets measuring 2’ x 1.5’ x 3’ (LxWxH) will be mounted at the top of the walls and in the corners. These give a total volume of 36 ft^3, which is comparable to two standard size dressers.

Design

- Desk that functions as a front desk for the library and as a drafting table. This needs lots of storage compartments.
- Side table or small desk that holds the equipment needed for broadcasting.
- Wall mounts for cameras
- Wall mounted lighting for filming

Timeline, Agendas, Goals, and Expectations

Some terms

Build Meetings: two hour meetings where members construct the shop
Build Team: the total number of members constructing the shop
Construct Team: two members working together

The timeline

This proposed timeline incorporates some assumptions about building time for different components. The time it takes to build each component in the shop can be used as a goal. We can evaluate our performance toward making the goals and set new goals.

The timeline is based on four members attending the Build Meetings, which last two hours. The Build Team of four is divided into two smaller teams with two people each. These are called Construct Teams. If we expand our Build Team then the timeline can be modified.

Agendas for Build Meetings

Item	Description	Time (min)
1	Discuss the days work, safety, team building,...	10
2	Build time	90
3	Clean up and discuss the day	20
	Total	**120 min**

Daily time goal for one Construct Team:
floor section build time

Step	Description	Time (min)
1	Cut one 8’ joist	5
2	Layout perimeter	10
3	Secure pieces	15
4	Install interior joists	15
5	Install assembly hardware	10
6	Install insulation and OSB	20
	Total	**75 min**

Daily assembly goal for one construct team: number of floor sections constructed in one Build Meeting.

Time to construct one section	Build time in meeting	Goal (floor sections constructed per day)
75 min	90 min	90/75 = 1.2 ≈ 1.25

Timeline for the build = 2 months

Weeks	1st meeting of the week	2nd meeting of the week
1 1/11	Discuss the project	CT1 = 1.25 floor sections CT2 = 1.25 floors
2	CT1 = 1.25 floors Total floors completed = 5 CT2 = 1.25 floors	CT1 = 1.25 floors CT2 = 1.25 floors
3	CT1 = 1.25 floors ***Floors finished*** CT2 = 1.25 floors	CT1 = 1.25 wall sections CT2 = 1.25 walls
4	CT1 = 1.25 walls Total walls = 5 CT2 = 1.25 walls	CT1 = 1.25 walls CT2 = 1.25 walls
5	CT1 = 1.25 walls Total walls = 10 CT2 = 1.25 walls	CT1 = **1.5 walls** CT2 = **1.5 walls**
6	CT1 = **1.5 walls** ***Walls finished*** CT2 = **1.5 walls**	CT1 = 0.6 ceiling sections CT2 = 0.6 ceilings
7	CT1 = 0.6 ceilings Total ceilings = 2.5 CT2 = 0.6 ceilings	CT1 = 0.6 ceilings CT2 = 0.6 ceilings
8	CT1 = 0.6 ceilings ***Ceiling finished*** CT2 = 0.6 ceilings	Shop assembly
9	Shop assembly ***Assembly finished***	