TAUBMAN COLLEGE
ARCHITECTURE & URBAN PLANNING
UNIVERSITY OF MICHIGAN

Arch314
STRUCTURES I

Fall 2025
Recitation

FACULTY: Prof. Peter von Bülow
Mohsen Vatandoost

Welcome to the Recitation session on 10/24

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Office hours:

Room 3128
Wed: 11:30 – 12:30
Mon, Fri: 11:30 - 12:00

Please feel free to ask questions.

Welcome to the Recitation session on 10/24

Outline:

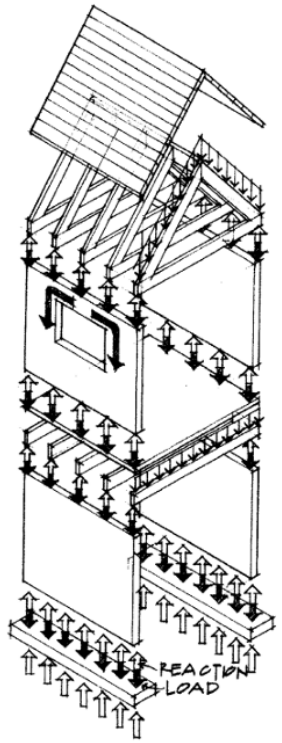
- Quick **Recap** of the week
- Provide the solution for the assignment **(Homework 9)**
- Answering students' questions
- Lab: **Lateral Stability**
- **Bridge_1** project (providing detailed feedbacks + Comments + free discussion + Q&A)

Please feel free to ask questions.

Recap of the week

Load Paths

Gravity loads trace from top down to their resolution at the foundation.



Load Paths

Floor Loads

Dead Load

weight of structure

Live Load

occupancy load

Member Hierarchy

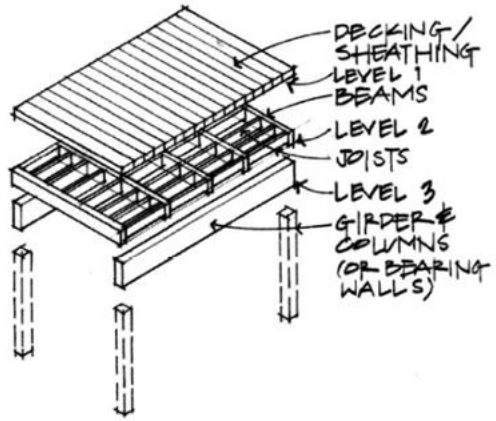
Flooring spans between joists

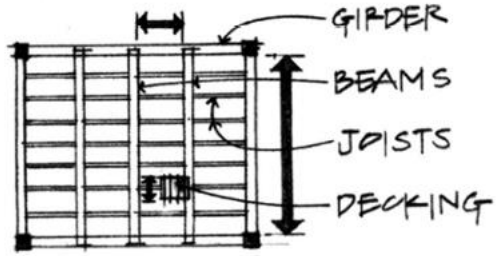
Joists span between beams

Beams span between girders

Girders span between columns

Columns carry load to ground





Recap of the week

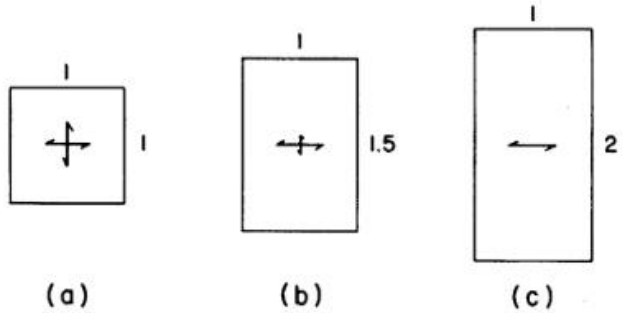
Load Paths

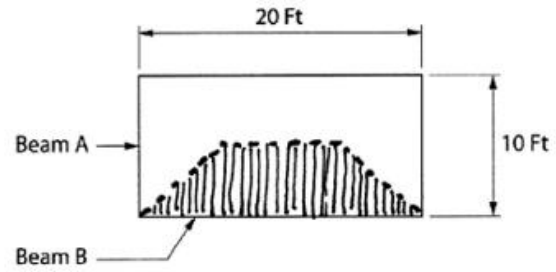
Floor Slabs

Concrete slabs span in the direction of the steel reinforcement.

One-way slabs should span the shortest direction.

Two-way slabs span in both directions. Aspect ratios should be square or less than 2:1. The load path divides at 45° from corner.





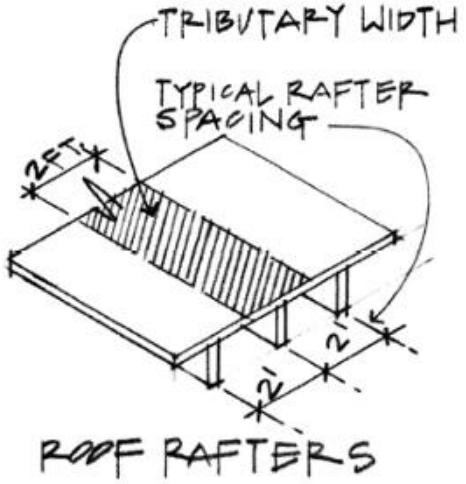
two-way slab tributary area of beam B

two-way waffle slab

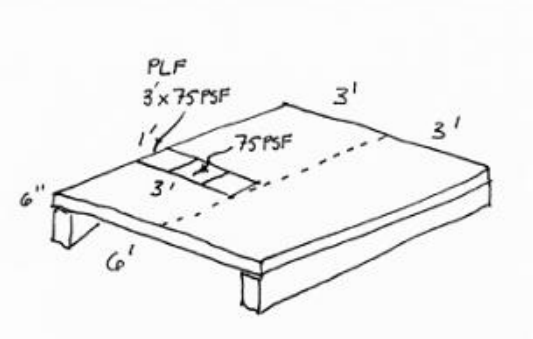
Recap of the week

Tributary Area

The **tributary area** is an area used to determine the load on a member.



Each member has a tributary area that can be used to find the total load on that member.



Provide the solution for the assignment – **HW9**

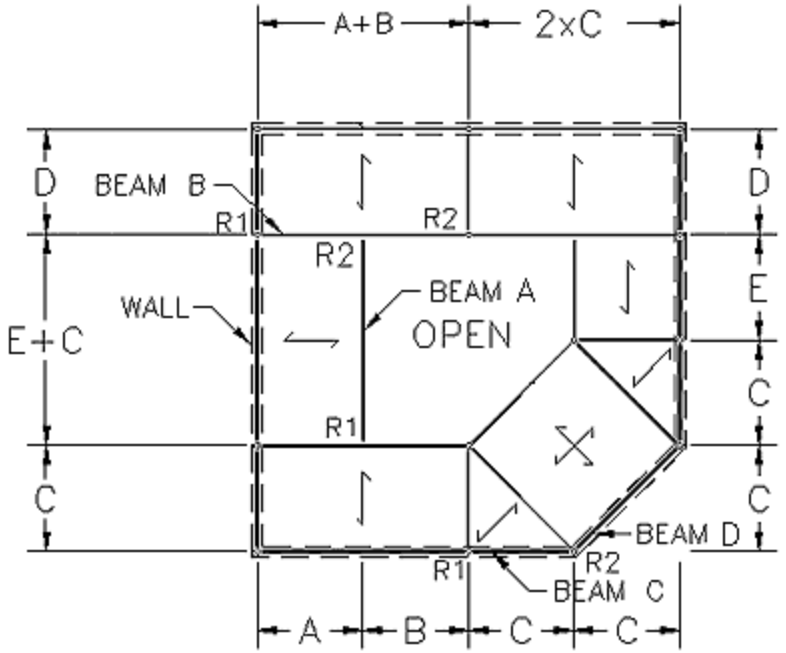
- **Problem:**

10. Floor Systems

For each beam, A through G, determine the loading from the floor, the wall and from other beam reactions. Then, calculate the end reactions for each beam.

DATASET: 1 -2- -3-

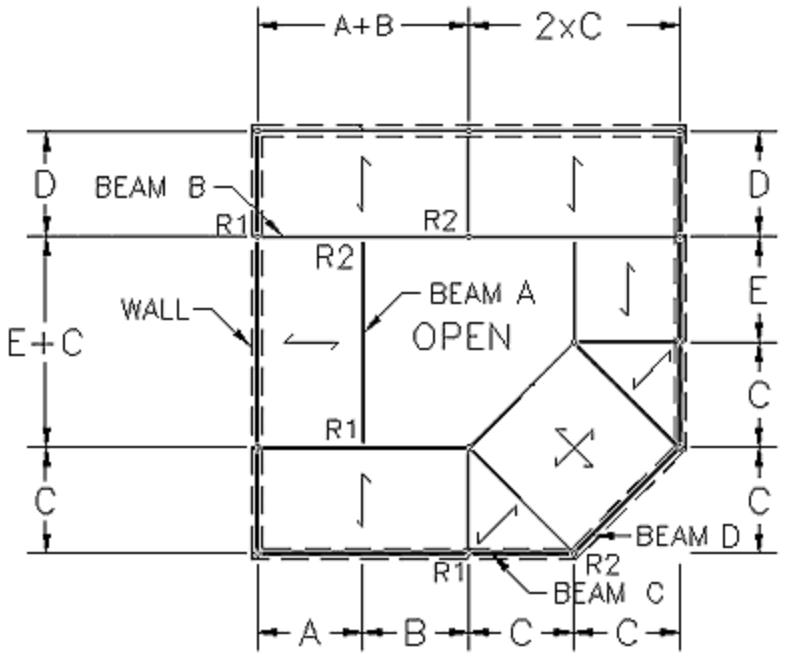
Span A	11 FT
Span B	10 FT
Span C	17 FT
Span D	14 FT
Span E	18 FT
Dead load of wall	912 PLF
Dead load of floor	48 PSF
Live load on floor	60 PSF



Provide the solution for the assignment – **HW9**

- **Problem:**

#	Question	Your Response	
1	Full uniform load on Beam A		PLF
2	End reaction R1 on Beam A		LBS
3	End reaction R2 on Beam A		LBS
4	Full uniform load on Beam B		PLF
5	Point load on Beam B		LBS
6	End reaction R1 on Beam B		LBS
7	End reaction R2 on Beam B		LBS
8	Full uniform load on Beam C		PLF
9	Peak value of triangular load on Beam C		PLF
10	End reaction R1 on Beam C		LBS
11	End reaction R2 on Beam C		LBS
12	Full uniform load on Beam D		PLF
13	Peak value of triangular load on Beam D		PLF
14	End reaction R1 on Beam D		LBS
15	End reaction R2 on Beam D		LBS



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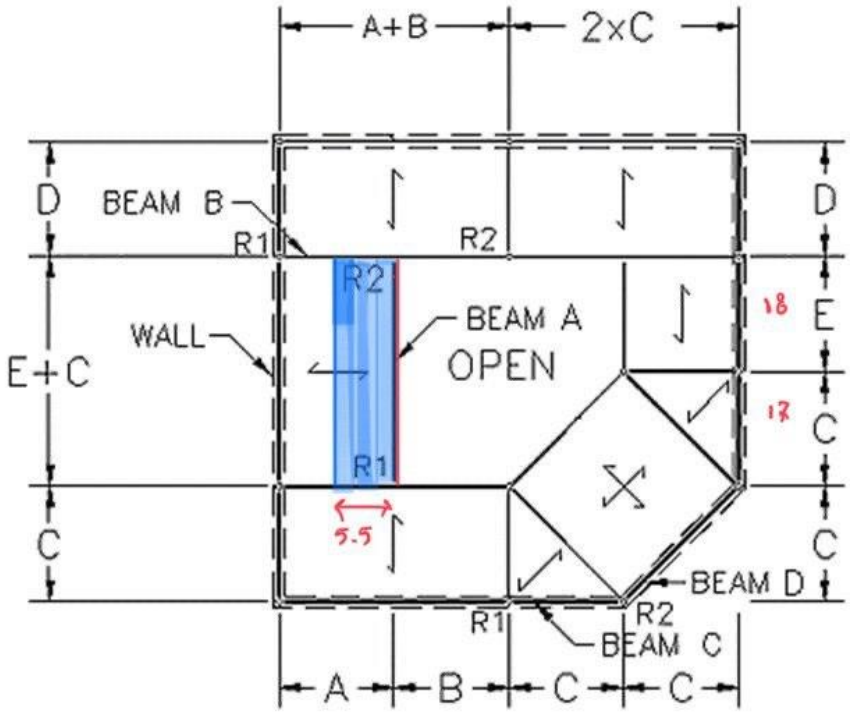


Floor Dead load:

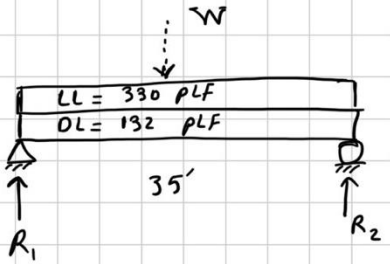
$48_{PSF} \times \frac{A}{2} Ft = 264 \ PLF$ (per linear foot)

+

Floor Live load:

$60_{PSF} \times \frac{A}{2} Ft = 330 \ PLF$

$594 \ PLF$ (1)



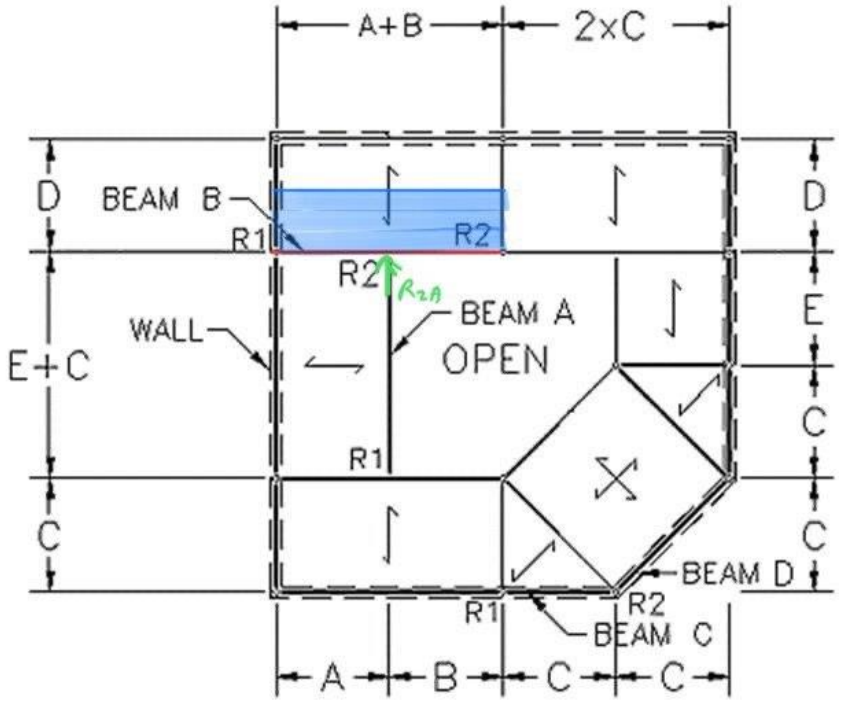
$W = (w) l = 594 \ PLF \times 35' = 20790 \ LBS$

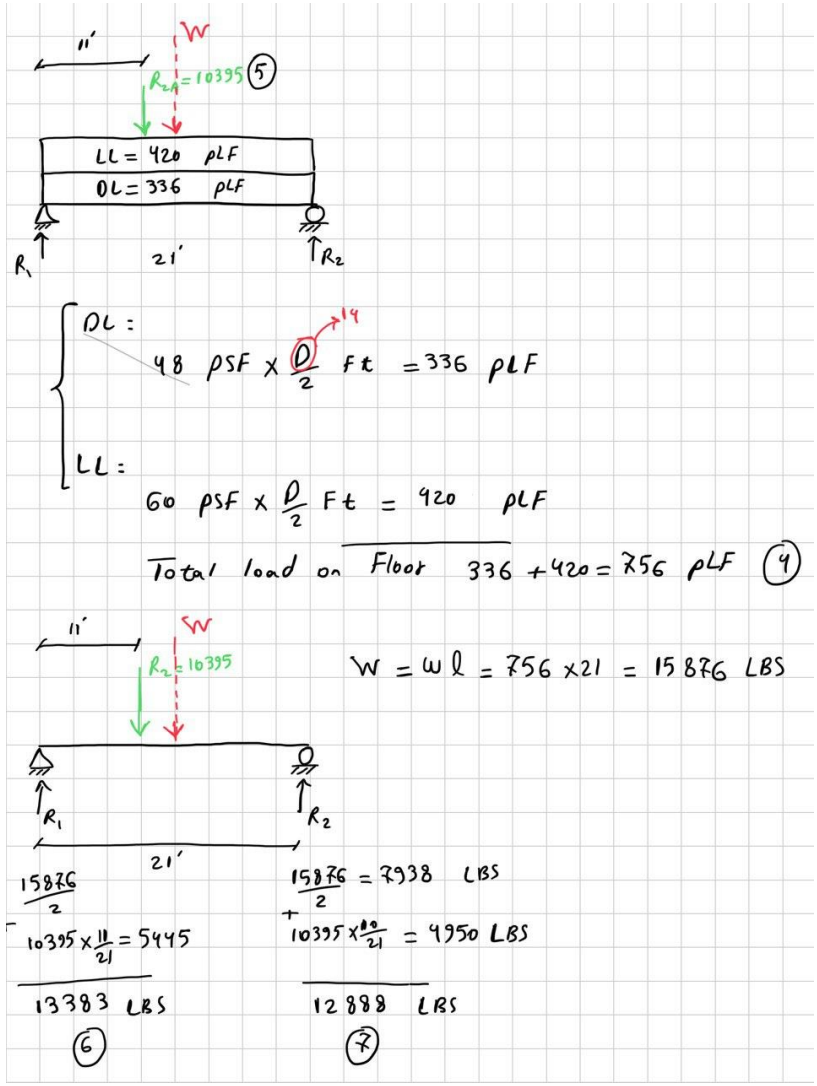
$330 + 264$

$R_1 = R_2 = \frac{20790}{2} = 10395 \ LBS$

(2), (3)

Provide the solution for the assignment – **HW9**





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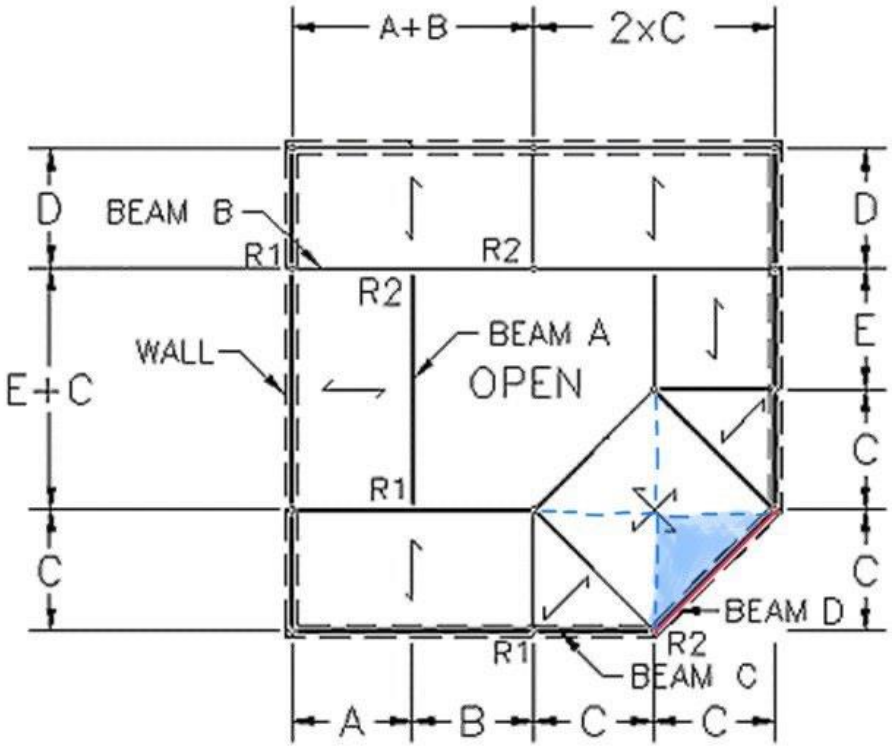
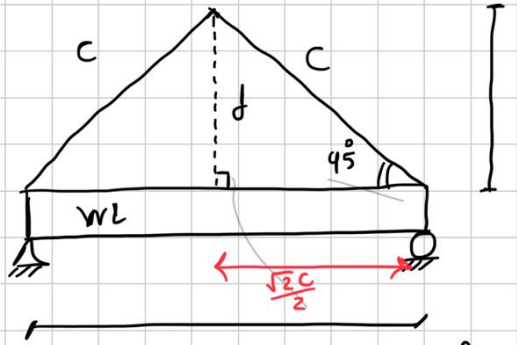


uniform load = wall load = 912 plf (12)



$L = \sqrt{2}\,C = 24.04$ ft

$\sin 45° = \frac{d}{C} \rightarrow d = \frac{C\sqrt{2}}{2}$

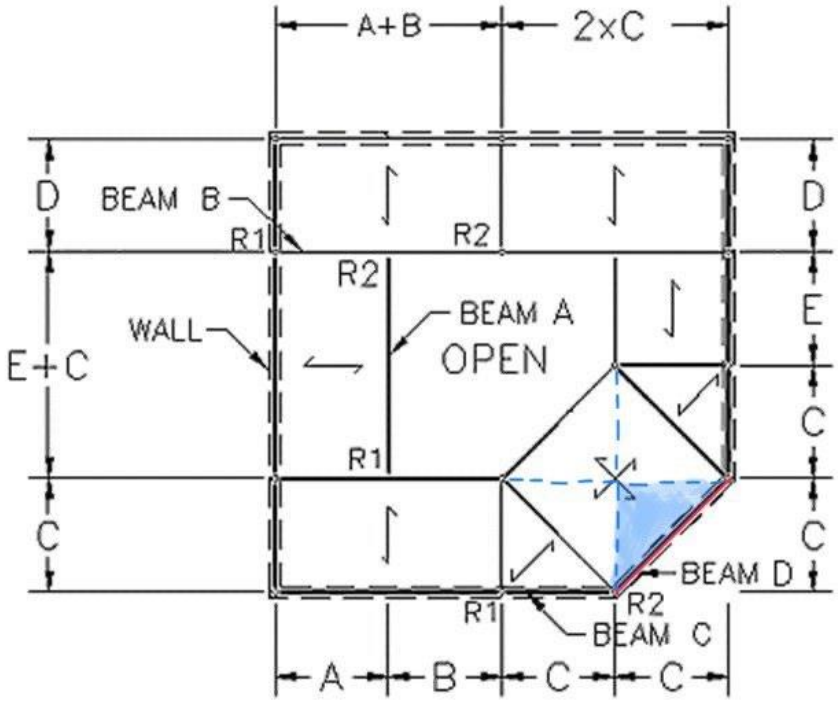
$\rightarrow d = \frac{17 \times \sqrt{2}}{2} = 12.02$

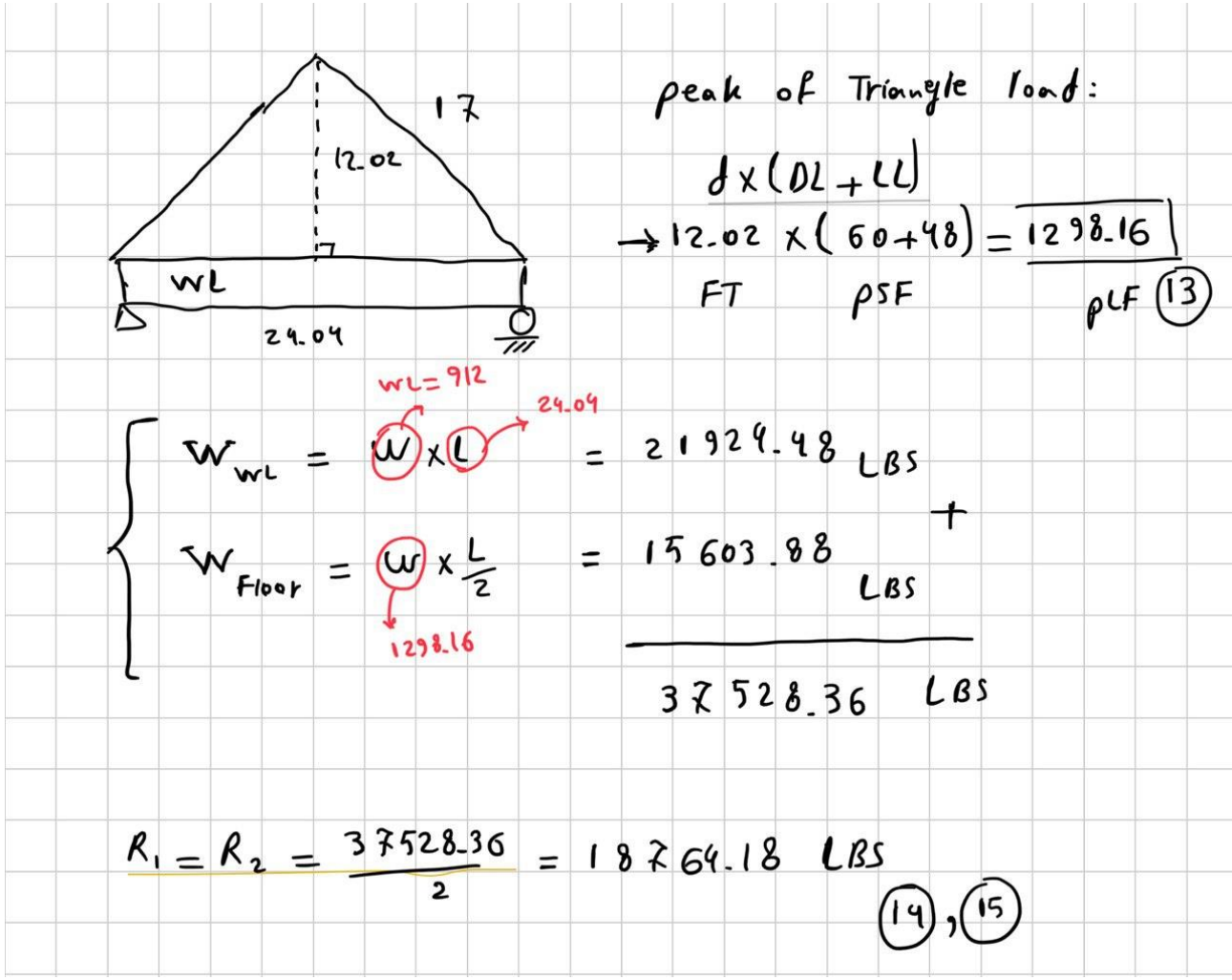
or:

$tg\,45° = \frac{d}{\frac{\sqrt{2}C}{2}} \rightarrow d = \frac{\sqrt{2}C}{2}$

Triangle Area : $d \times \sqrt{2}\,C \times \frac{1}{2}$

Provide the solution for the assignment – **HW9**





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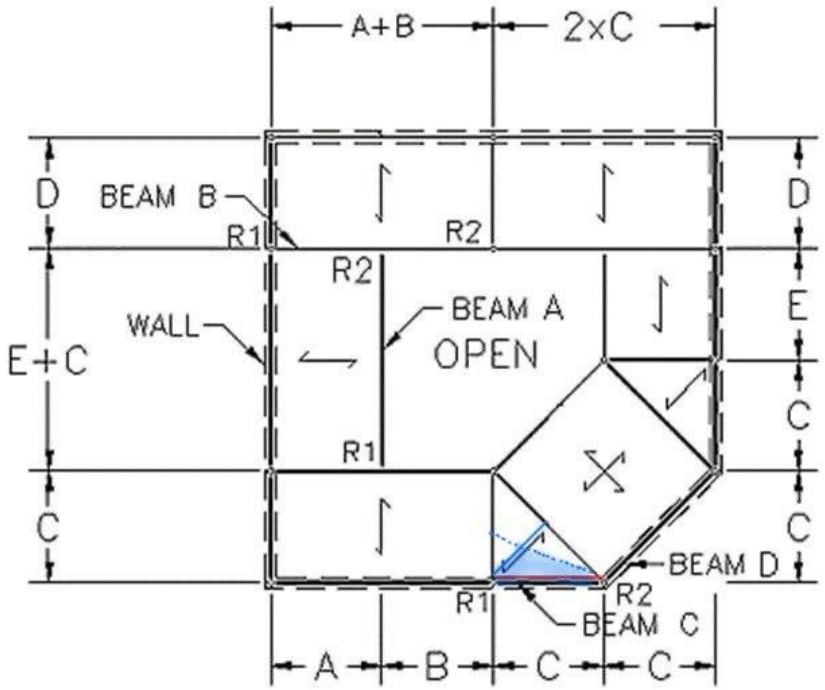

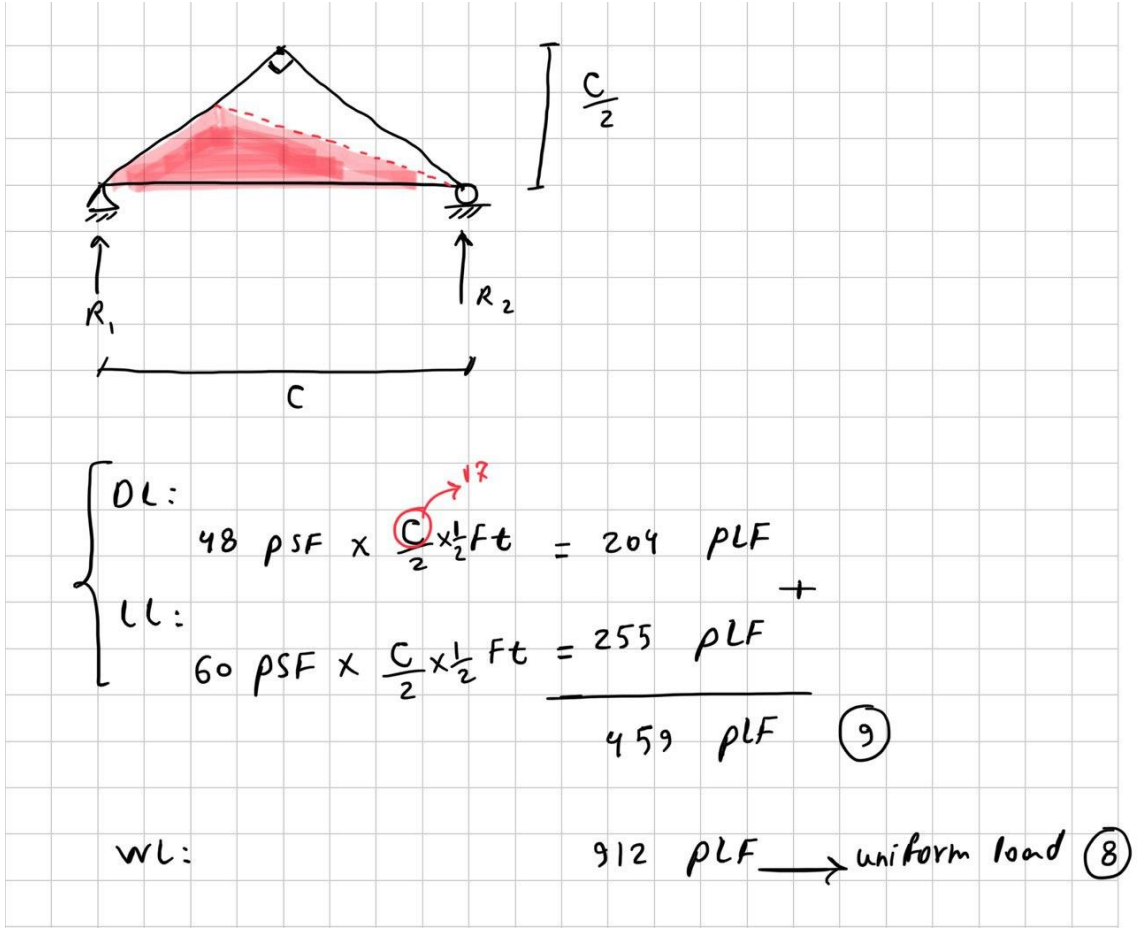

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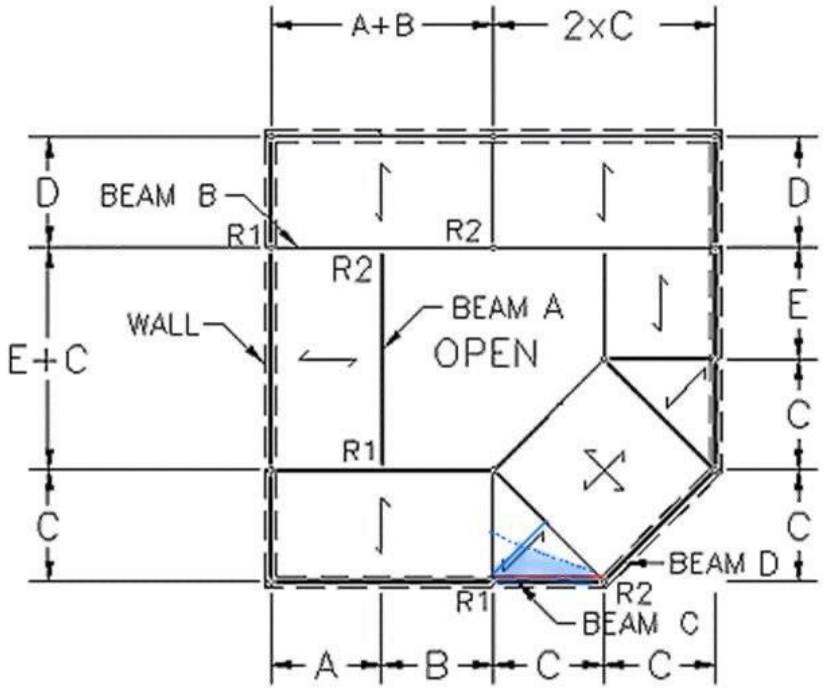

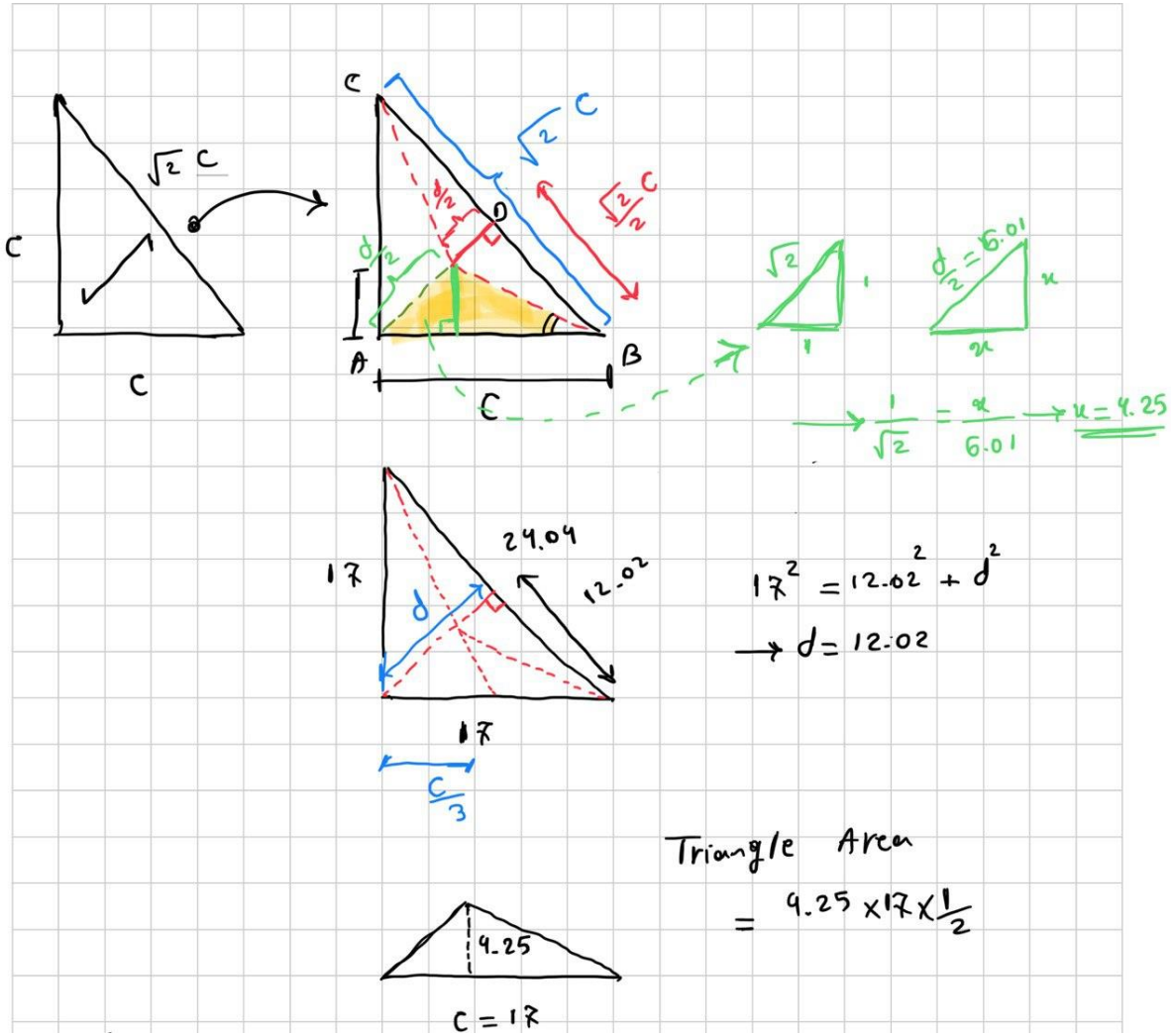

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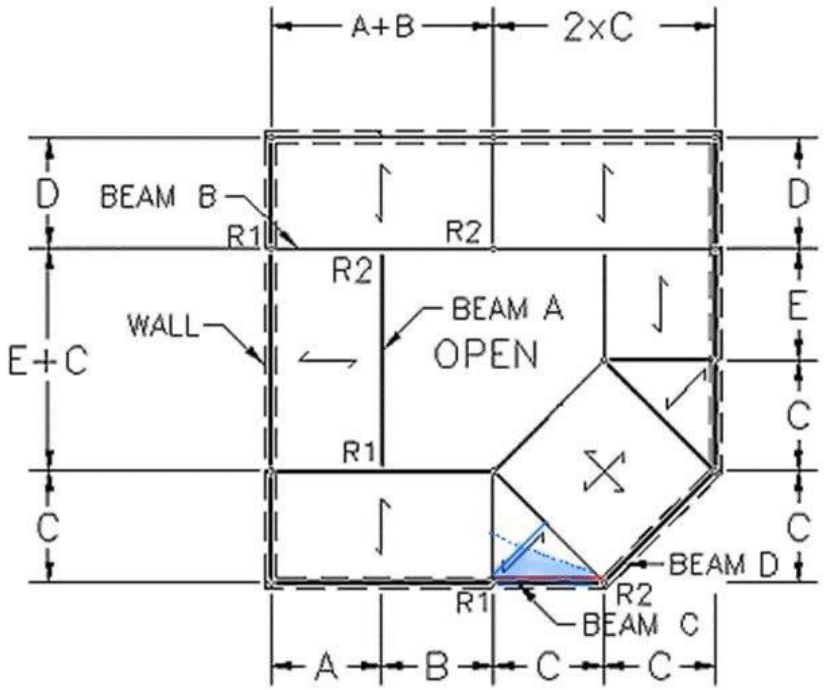
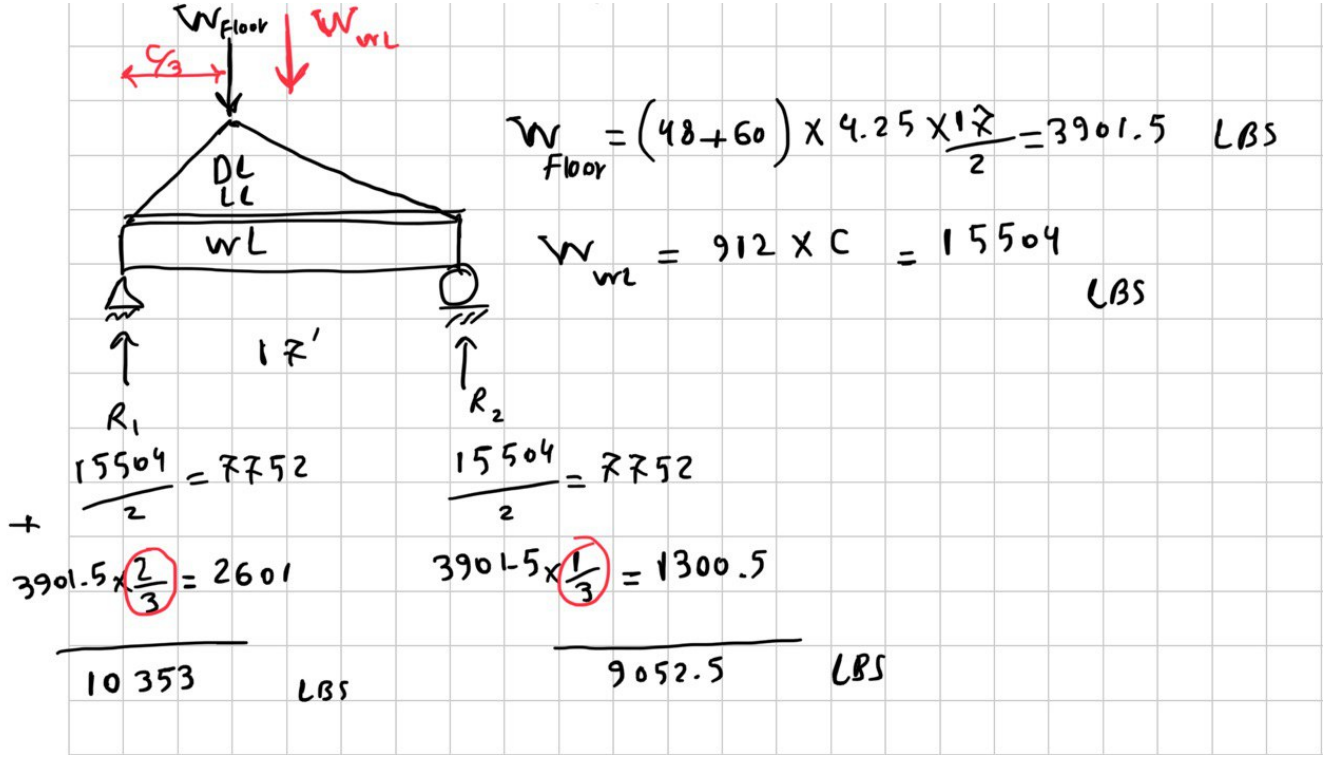




Lab: Lateral Stability

Description

This project investigates stable arrangements of structural walls against lateral loading.

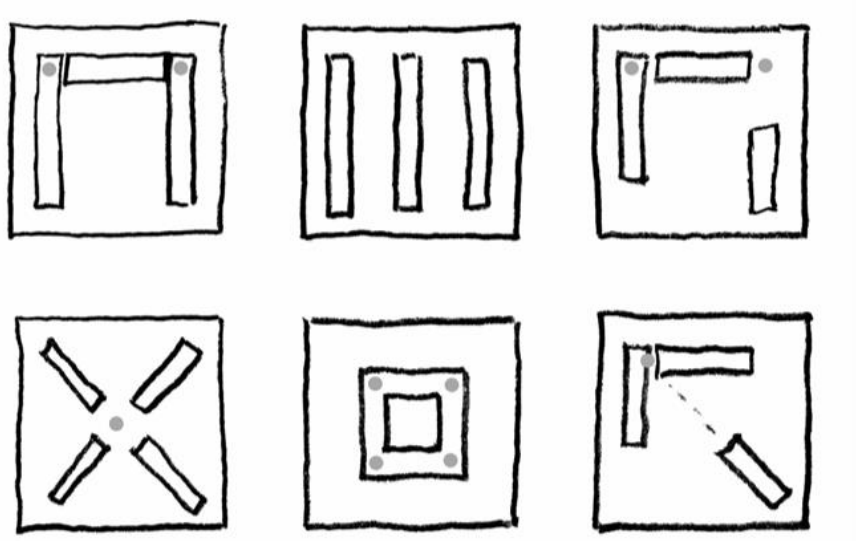
Goals

To observe the effects of lateral loading
To investigate the criteria of stable wall patters
To develop stable arrangements of shear walls based on the 2 point rule

Lab: Lateral Stability

Procedure

1. Arrange the small wood walls on the foam core base to support the MDF slab.
2. Make each of the six arrangements.
3. Apply lateral and torsional accelerations to the base and note the effects on the assembly. Mark on the diagrams below which fail and which remain stable.
4. Make your own stable and unstable arrangement.
5. Sketch the arrangements below and mark the intersection points.



Bridge Project

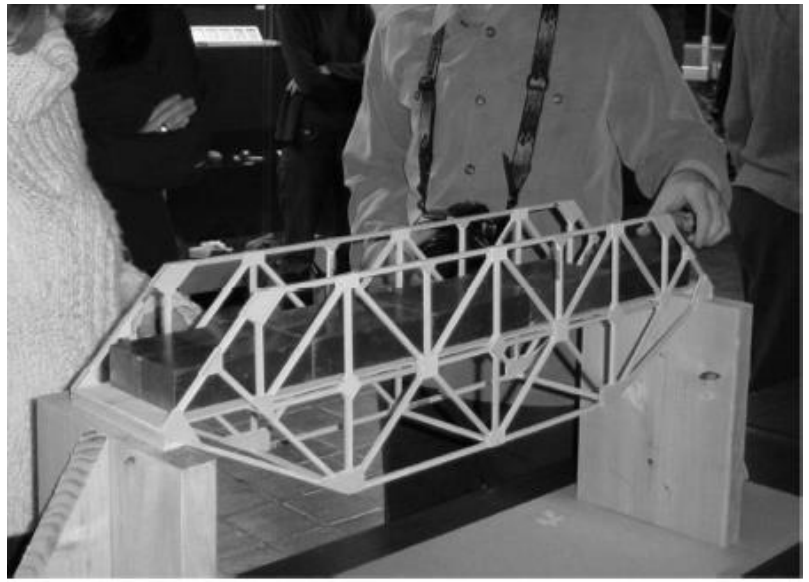
FEEDBACKS +

Evaluations + Comments

Answering Questions

Span=160 ft (scaled = 30 in)
Max. Depth = 53 ft (10 in)
Max. Deck = 8 in (1/8 in thick)

Max Weight = 68k (4 oz)
Material = wood + glue



Bridge Project

- Have creativity!
- Refine your initial design
- Iteration to upgrade your design
- Pay attention to the Tally sheet requirements.
  (We Don’t want you to lose points!)
- A long-continuous member is allowed.
- Deck required to be designed flat
- Look at the examples provided in the course website

Thank you.

Any question?

Please feel free to ask questions.

Contact: Mohsenv@umich.edu