

Agricultural Technology and Mechanical Systems Career Development Event 2013

Team Activity: Roof Layout

Event Format

A. Equipment Provided:

1. One sharpened No. 2 pencil.
2. Calculator – participants will be allowed to provide their own.
3. Scratch paper for problem solving.

B. Team Activity

The team activity evaluates the ability of team members to work together to use decision-making and problem analysis skills while applying and concepts taught in construction (specifically roofing).

1. Members of a team work together cooperatively to complete this section.
2. Sixty (60) minutes are allowed for completion of the team activity. At the end of the activity, each team submits the completed document to be scored.
3. The team activity involves the use of construction skills and the resource information.
4. The team activity has a maximum value of 400 points per team and is only included in the team score
5. All team members must be involved in the team activity to receive credit. If a team has two or less participants no credit will be allowed in the team portion of the event.

Directions:

Work as a group to complete parts A,B, and C. Organize yourselves in order to properly address all sections. While you are working you will be evaluated by an observer on your ability to work as a team. You have 1 hour to compile your answers in either a Microsoft Word or Excel Document. Your document must include a cover page, description of activity, description of roles, tables (Part C), and correct formatting.

Scenario:

You have decided to quit working for your egotistical boss and start your own dairy operation! Luckily your grandfather is senile and has agreed to sign over his lease to you in return for a weekly sponge bath.

Congratulations, you have just inherited 2,000 acres! Sadly, your grandpa destroyed all of the storage barns and you are left with nothing. You decide to start off with a small storage shed to get your feet wet.

The storage shed will be used to support the processing of dairy products. The foundation and frame work is finished. Now what remains is the roof layout.

First you must convert pitch to slope: Roof slopes are expressed in 2 ways, (a) pitch and (b) slope (rise per foot of run). Rise per foot of run is what is needed to lay out a rafter and figure its length. When pitch is given, you first need to convert to rise per foot of run. An easy formula to follow is:

$$\text{Rise} = \text{Pitch} \times 2 \times 12$$

Examples: 1/2 pitch, rise = $1/2 \times 24 = 12$ inches

and 1/4 pitch, rise = $1/4 \times 24 = 6$ inches

Slope then would be 12/12 (rise/run)

and 6/12

Part A

You wish to order roofing material for a small storage shed with a 1/4 pitch that is 10 feet wide. You want to allow for an overhang of 1 foot on each side. What is the slope?

What length is the rafter including overhang? (Hint: the rise number determines the length of rafter from rafter table on the square).

The length of the truss rafter is L, the roof span R, P is pitch, and The formula using the pitch is: $L = V + (R/2)\sqrt{1+P^2}$

What board length should be ordered, based in standard lumber sizes?

Another term for rafter is _____.

Part B

Your barn is finished and now you wish to build a building with a 26 foot span with a 1/3 pitch and an 18 inch overhang on each side.

What length rafter will you need? Will a 16 foot 2 x 10 be long enough?

You want to attach a lean-to shed roof to the previous barn. The span is 12 feet, the slope is 4/12 and the overhang is 18 inches.

What length of rafter do you need?

What is the rise/run for each of the following pitches?

$$1/8=$$

$$1/6=$$

$$1/4=$$

$$1/3=$$

$$1/2=$$

Part C

Before purchasing your trusses, you must decide if it would be more beneficial to purchase steel or wooden trusses. Create a table comparing the advantages and disadvantages of steel and wood trusses. Lastly, as a team, in a word document present your reasoning by explaining which type of truss you would use. (Hint: Factors may include climate, cost, and efficiency).