Wheelchair Ramp Design Project
ENGR 210

Background: For this project you can work in teams if you wish. Each team is tasked with designing a wheelchair ramp at a local residence for a community agency, Interlink. Each team will be responsible for designing the ramp so it is accessible from the door shown in the picture below and will hold the necessary loads.

Deliverables: Submit a report detailing structural analysis for the ramp along with any assumptions and load estimations. Include neat, legible drawings detailing your design and structural analysis ensuring any required building codes are met as well as any Americans with Disabilities Act requirements.

Project site:
Address: 1132 Linden DRIVE, Lewiston. Please note the address is Linden DRIVE, NOT Linden Avenue. Linden Drive is a dead end street. Go to Bryden Ave, East to 12th St (across Thain), North on 12th and then West on Linden Drive - 1st street north of 12th St. Owner: Ray Rosch; cell phone: (208) 791-5062.

Requirements: The final technical report with design drawings and statics analysis will be due December 1.

The final technical report will need to include an introduction, explanation of the design and assumptions, a cost estimate for materials (not labor), preliminary drawings, a static analysis of the structure, and a conclusion discussing the final product, benefits of the design, and any limits when using the ramp.

Design considerations:
Justify your weight load – don't use "seems like" or "should hold" use concrete examples…for instance, figure out what an average person weighs and then think about how many average persons might be using the ramp at any one time, figure out how much a wheelchair weighs (don't' guess, use the internet and find some numbers) and add all these together. Estimate conservatively so you know what the high end of your design can hold.

Use what we've been doing in class: F = 0 figure out what load the wood will hold using the wood manual. Make sure you use the wood manual – it has the strength of wood and you DEFINITELY need that information for your static analysis.

Figure out how deep you need to sink your posts that support the ramp – use moments to find the point where they equal zero. When you sink a post in the ground the support reaction is the same as a fixed support. Figure out what forces from the ramp deck and handrails will be applied to the posts and sum those moments.

Use the modules of rupture to figure out how long your spans can be without breaking the wood. The formula is what you will find in a mechanics of materials class but you can start using it now. The modulus of rupture can be found in the wood manual and you input the size of your beam. Here's the formula:

$$R = \frac{3Pa}{bd^2}$$

Where:
P = maximum applied load in pounds
R = modulus of rupture (pounds per square inch, psi)
a = distance between line of fracture and nearest support (inches)
b = average width of specimen (inches)
d = average depth of specimen (inches)

solve for "a" to find the longest length before rupture – you don't want any spans greater than this number.