**Wheelchair Ramp Design Project**

ENGR 210

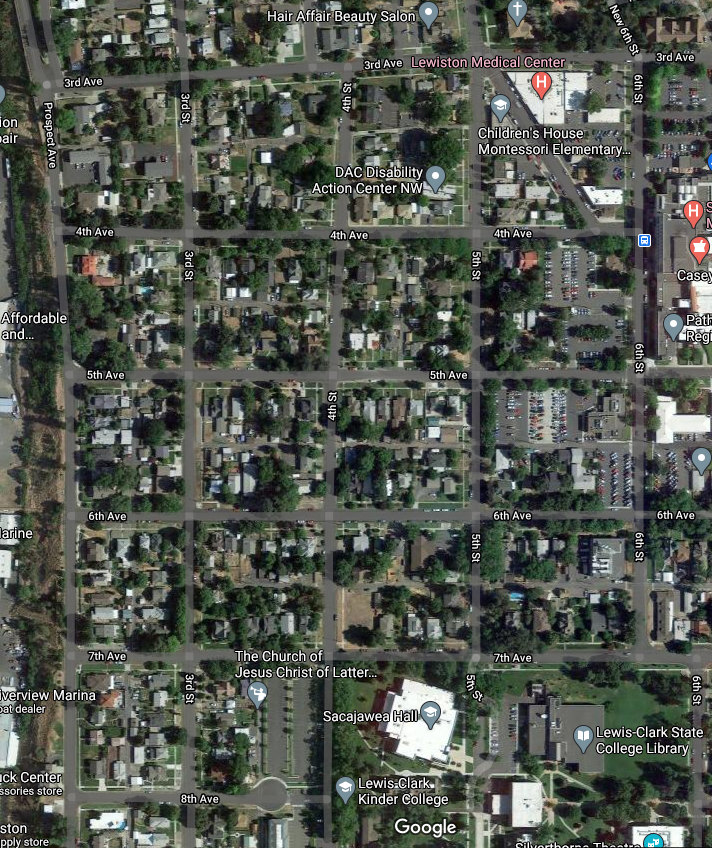
Final report due Thursday Dec 16

**Background:** For this project you can work in teams of two if you wish. Each team is tasked with designing a wheelchair ramp at a local residence for a community agency, Interlink Volunteers. Each team will be responsible for designing the ramp so it is accessible from the door to the gravel driveway.

**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 making sure the design meets Americans with Disabilities Act requirements.

**Project site:**

Address:  311 3rd St, Lewiston. Owner:  Keegan & Karen Schmidt



**Requirements:** The final technical report with design drawings and statics analysis will be due **December 16**

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 and 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 to 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:

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.

Plywood info:

Check to make sure your plywood won’t sag too much between supports. Here are some sites for plywood span information:

<http://www.pacificwoodlaminates.com/img/PDFs/APA/APA_LoadSpanTables.pdf> (use Table 2, ¾ inch plywood, deflection – L/180 – to find PSF (pounds per square foot) typical values)

<http://www.pfsteco.com/techtips/pdf/tt_plywooddesigncapacities>

handy calculator for calculating sag: <http://www.woodbin.com/calcs/sagulator.htm>;

use this to figure the deflection for your plywood spans. Use 0.20 inches/foot as your limit for sag. This corresponds most closely to the L/180 category on the pacificwoodlaminates.com website table 2. Check this value to the L/180 (for example, if your span is 24 inches, then L = 24 and L/180 = 24/180=0.133 which becomes more than 0.2 per foot when you multiply it by the span of 24 inches or 2 feet 🡪 0.133 x 2 ft = 0.266)