BME Design-Fall 2025 - GRACE NEUVILLE Complete Notebook

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Sara Mlodik

on

Dec 10, 2025 @09:04 PM CST

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SIERRA LOOSEN - Sep 19, 2025, 12:03 PM CDT

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GRACE NEUVILLE - Sep 07, 2025, 1:33 PM CDT

Course Number:

BME Design 200/300

Project Name:

Gait Trainer with Treadmill

Short Name:

Gait Trainer

Project description/problem statement:

A woman with a significant mobility impairment and seizure disorder requires support while walking due to seizure risk and poor postural strength. She has a pacer gait trainer which has allowed her to resume walking outdoors; however, it is unsafe to use in winter. It is crucial for her to be able to use the gait trainer, otherwise she may suffer from muscle deconditioning and mental health problems from a lack of walking. The solution is to design a device that will allow her to use her gait trainer on a treadmill to give her the opportunity to walk long distances while being stuck inside. The device will need to wheel the gait trainer onto the treadmill and then lock/secure the wheels in position so it can't fall off the side while she's walking. It will need to be easy for staff to use, lightweight, and be able to fold up as to not take up too much floor space when not in use.

About the client:

Name: Mrs. Amanda Pajerski

Occupational therapist

Sara Mlodik - Sep 15, 2025, 5:54 AM CDT

Title: First Client Meeting

Date: 9/10/25

Content by: Sierra

Present: Step Masters team

Goals: Complete the first client meeting

Content:

The attached document has individual meeting notes from our first client meeting (below and attached are the links that the client shared):

https://www.rifton.com/education-center/videos/pacer-treadmill-base-demo

https://www.rifton.com/products/pacer-gait-trainers/pacer-gait-trainer-k640

Here is a overall summary:

Client Information and Communication

- · Nadine has a brain condition that impacts walking, often has seizures
- Lives upstairs with her brother; sisters are guardians. Family should be included in communication
- Afternoon visits only (Nadine not a morning person). Meetings scheduled:
 - Zoom: Sept 17, 4:15 PM
 - In-person: Sept 24, ~4:15 PM, 4417 Bellgrove Ln, Madison, WI 53704

Issues with 2024 Design

- Uses C-clamps, which are heavy, hard to maneuver, and unstable. Must be attached/detached every use
- Heavy and cumbersome; cannot fold with treadmill
- No side rails, track lips only ~½ inch (too short)

Design Preferences

- Preferably permanent and foldable or detachable but lightweight and easy to move (with handles?)
- Avoid C-clamps
- Guard rails minimum 1 inch (preferably 1–2 inches)
- · Accommodate 8-inch gait trainer wheels
- Weight support:
 - Nadine ~150–175 lbs
 - o Gait trainer ~15-20 lbs
 - ∘ Staff (~150 lbs) may also need to step on ramp in emergencies
- · Avoid wood (too heavy, splinters). Aluminum or other lighter, durable material
- Ideally design should also fit new treadmill models in the future.
- Foldable for storage against wall. Easy to maneuver in small spaces
- Budget: \$500 approved, higher possible with family discussion

Conclusions/action items:

The team will use this information to begin brainstorming preliminary designs. At the team meeting on Friday, the team will assign sections of the PDS to complete individually. The team will also continue doing research on various aspects of the project.

SIERRA LOOSEN - Sep 12, 2025, 11:45 AM CDT

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9_10_2025_Client_Meeting_Questions.pdf (4.7 MB)

Sara Mlodik - Sep 15, 2025, 5:35 AM CDT



Download

pacer_dimensions.pdf (468 kB)

Sara Mlodik - Sep 18, 2025, 9:36 PM CDT

Title: Second client meeting with family

Date: 9/17/25

Content by: Sierra and Sara (Meeting Notes Summary)

Present: Step masters

Goals: Meet with Mrs. Pajerski (the therapist) and Nadine's family to gather more info about what they are looking for in

our final prototype

Content:

We were able to ask some more questions we had to the occupational therapist. We confirmed from last year's documentation that Nadine uses the treadmill and gait trainer for 10-15 minutes at a time, multiple times a week. Unfortunately, the family was unable to join our meeting, but an email will be sent to them to get more details about what they're looking for.

Meeting Notes Summary:

- Information about Nadine and her care:
 - Nadine always has 1 nurse with her at all times and one caregiver
 - There is very little staff turnover
 - Nadine has a side to side gait pattern
- Information about treadmill usage
 - The treadmill with the gait trainer is used up to 15 minutes, multiple times a week
 - Caregivers guide the gait trainer as Nadine walks
 - Will guide Nadine up the ramp to the platforms
 - Wheels on the gait trainer can be locked to not swivel side to side
 - o Can ensure the gait trainer moves straight forward and backward
 - Side rails need to be on the sides of the ramp and platforms: Ideally 1.5-2"
- Next week in-person visit:
 - o It may be a possibility to take the treadmill to work on to help with exact measurements
 - Bring measurement supplies (tape measure, ruler, etc) to the in person visit
 - Bring/wear masks
- Ideas:
 - Make rails that have a gap slightly larger than the width of the wheel so that it can only move forward and backward
 - Have the gap be wider at the base of the ramp and gradually get narrower towards the top to make it easy to get on but stable while walking

Conclusions/action items:

We will wait to hear back from the family about the specifications that they are looking for. We are planning on going to the house next week to look at the treadmill in person and take measurements. The team will use the information that

was gathered so far to completed our PDS.



Sara Mlodik - Sep 25, 2025, 6:53 AM CDT

Title: Third Client Meeting (In-Person)

Date: 9/24/2025

Content by: Sara Mlodik

Present: Step Masters

Goals: Talk to the family, take measurements, and discuss designs with the family, nurses, and our team

Content:

We went to the patient's house where we took measurements: the treadmill in its folded and unfolded state and measured how the gait trainer aligns with the front and the edges of the treadmill. We showed and discussed our designs with the family and the nurses. They gave input such as: it may be possible to leave the treadmill down and have the tracks permanently attached, the most important thing is that the tracks are stable and it is easy to set up, and the ramp will need to be very compacted to allow space in their home.

Conclusions/action items: Use our measurements and feedback from the family to choose the best design from the design matrix

Sara Mlodik - Oct 13, 2025, 5:22 PM CDT

Title: Fourth Client Meeting (In-Person)

Date: 10/13/2025

Content by: Sara Mlodik

Present: Sierra, Julia, Katie, Sara

Goals: Discuss our meeting with fabrication, talk about new design ideas, talk about space available

Content:

- · Meeting was with Lee, Nicole, and Amanda
- Talked about the two design routes: pre-fabricated or ramp with flat portions
- The angle does not have to be super small since with assistance she can easily get up non ADA approved inclines
- The treadmill can be put in the corner where the bookshelf was, so the treadmill can stay unfolded with semi-permanent tracks
- One family member is concerned with bowing at the bottom portion of the treadmill before the first set of legs
- Does not need to be wider at the base of the ramp than at the top, that may take up too much space in storage
- Pacer is 32" wide
- Family is fine with mixed materials
- Make sure that people will not hurt themselves when moving the parts that need to be compacted
 - Make sure small individuals will easily be able to set up the ramp
- Open to premade ramp if we find that it is the best option (foldable or easy to move)
- · Main family concerns:
 - Easy to put together
 - Easy to switch to a new treadmill
 - Lightweight
 - o Able to move slightly left or right if treadmill needs to be adjusted
 - Be able to fold/compact the ramp

Conclusions/action items:

GRACE NEUVILLE - Sep 12, 2025, 1:04 PM CDT

Title: First Advisor Meeting

Date: 9/12/2025

Content by: Grace

Present: Step Masters Team

Goals: Discuss our client meeting and first progress report with our advisor. Discuss next week's goals such as completing the PDS.

Content:

- · need to morph problem statement into more quantitative
 - needs to hold this much weight
 - how heavy is heavy
 - needs to fold/compact
- notebook check next week: research, citations, etc.
- aluminum: strong and lightweight, use solidworks to do force testing
- · can contract it out to other companies to machine it
- · Jessie helps with prototyping
- · device is pressure fits onto the treadmill, attachment mediators to easily attach ramp onto it
 - o potentially drill into treadmill if family wants
- · upload cad file of treadmill into solidworks

Conclusions/action items:

Adjust the problem statement to include more quantitative information. Make sure notebook is ready for the first notebook check next week. Continue doing research and work on PDS.

Julia Shefchik - Sep 21, 2025, 1:39 PM CDT

Title: Advisor Meeting 2

Date: 09/19/2025 **Content by:** Julia

Present: Step Masters Team

Goals: Review what we have done this week and discuss what needs to happen going forward

Content:

- · define what is "folding up"
- · next week looking for one or two design ideas in notebook
- · figure out how to get design of treadmill in solid works to do testing
 - o include important dimensions to consider
- · ask Professor Puccinelli where to store treadmill
 - o potentially in the green room
 - o could see how similar the treadmill in the teaching lab is
- · design something to attach to something need that object
- · expected to have a demo at the end of the project
 - interesting aspect is how you attach the device to the treadmill
- · design in solid works, assign material properties, and figure out how thick it needs to be
- · are dimensions needed for design matrix
 - potentially different design matrix for mode of action
 - securing, how to fold
- show preliminary final design during presentation

Conclusions/action items:

The team will need to begin to make decisions on how to fold up the ramp to allow for storage. This can be brainstormed and reflected in our designs and then decided upon in the design matrix with input from the family once we meet with them on Wednesday.

SIERRA LOOSEN - Sep 26, 2025, 1:00 PM CDT

Title: Advisor Meeting 3

Date: 9/25/25

Content by: Sierra

Present: Sierra, Grace, Sara, Katie

Goals: Discuss the previous weeks progress and plans for the upcoming week with Dr. Ashton

Content:

- We discussed our designs and the design matrix with Dr. Ashton
- We thoroughly explained how each design would work and discussed the pros and cons are each
- We discussed possible methods of fabrication, and Dr. Ashton brought up the idea of using an adjustable piece that screws and becomes longer or shorter to adjust the height of the ramp to different treadmills, which we had already been researching
- We explained that we will likely take aspects/features from each design to combine into one design
- Preliminary presentations are next week Friday, October 3rd
- Prelim reports are due Wednesday, October 10th

Conclusions/action items:

We will prepare for preliminary presentations that are next week Friday. We will also begin writing our preliminary report. We are waiting to hear back from the family with feedback to finalize our design.



Julia Shefchik - Oct 10, 2025, 1:04 PM CDT

Title: Advisor Meeting 4

Date: 10/10/25

Content by: Julia

Present: Grace, Sara, Katie, Julia

Goals: Discuss fabrication plans and prototype moving forward

Content:

- · talked about meeting with design staff
 - · explained why each method did not work the way it did
 - no telescoping
- · talked about ramp length
 - where will the ramp go?
- · suggested to fabricate our side rails first
 - keep thinking about the ramp discussion
- · suggests making model in SolidWorks and test it
 - o by next week have a model finished
 - o adjust as you go to figure out properties of design
 - thickness of the aluminum that comprises the ramp
 - o needs to prove it will not break or buckle with the materials that we have
 - o set the load in SolidWorks to be her plus the gait trainer
- · can look into purchasing a prefabricated track and make modifications to it
 - funding emails should go to Dr. Puccinelli
- · patent concerns can use their system but we cannot sell it
 - o for college project concerns we are fine
- · for the show and tell have the SolidWorks model done that shows our design will not fail
- · timeline concerns? we are on track
 - o still in the same ballpark of design
 - matter of executing now

Conclusions/action items:

Come up with a new preliminary design to talk with our clients about. Make a list of questions to ask the client in relation to our project. Make a SolidWorks model and do testing on our design. Order materials within the next 1-2 weeks to ensure materials get here on time and in enough supply to mess up once or twice. November to fabricate.

SIERRA LOOSEN - Oct 17, 2025, 12:55 PM CDT

Title: Advisor Meeting 5

Date: 10/17/25

Content by: Sierra

Present: Julia, Katie, Sierra, Grace

Goals: Discuss the progress our team has made this week

Content:

- · We discussed our current design with Dr. Ashton
- · Showed him our SolidWorks modeling of the side tracks and the load testing we did
 - we will look into how we can do the testing with two different materials, making the top of the side tracks wooden and the legs to be stainless steel to make the load testing more accurate
 - we should look into how to merge the bodies together in SolidWorks to make each individual piece its own material
 - there is also a way to make nailed pieces of wood represented in SolidWorks
- We explained that we are still waiting for a response about how to order our materials if we are using the BME department funding
- · We should use the client's funding first, and then use the department's funding

Conclusions/action items:

We will update our SolidWorks to more accurately represent the loading patterns based on the materials we plan to use. We hope to have materials ordered within the next few days. We will also be meeting with fabrication staff in the D+I Labs to make sure our design is sound.

SIERRA LOOSEN - Oct 24, 2025, 12:45 PM CDT

Title: Advisor Meeting 6

Date: 10/24/25

Content by: Sierra

Present: Sierra, Grace, Katelynn, Sara

Goals: Update Dr. Ashton on our progress

Content:

- We updated him that we changed the legs in the design to be more sturdy and prevent changes in height underneath the side track
- We updated him that we have purchased our wood, and are now waiting for our ramp and adjustable legs to arrive
- The fabrication plan for the side tracks will be done over the weekend so that hopefully we can start on that fabrication by next week

Conclusions/action items:

We will hopefully begin fabrication early next week. Grace and Sara are going to work on SolidWorks to do force testing of our side tracks on the treadmill. The team will prepare for show and tell that is next Friday.

Julia Shefchik - Nov 14, 2025, 1:00 PM CST

Title: Advisor Meeting 7

Date: 11/14/25

Content by: Julia

Present: Sierra, Grace, Katie, Julia

Goals: Update Dr. Ashton on our progress from the past weeks

Content:

- · recapped testing at the house
- · shared plans to attach straps across treadmill
 - o front and back
 - o concern force from outside causing a rotational torque versus something from the bottom
 - tightening not secured in the right position
 - o attach to treadmill is c clamps not space for that on the tracks, family and caregivers also did not like that from last year
 - have two more pieces that the bottom of the legs fit into that immobilize the legs
 - · connected in the back with the ramp could add in screws/pegs to immobilize the back further by using the ramp
 - band underneath or across seems to introduce unfavorable torques
- · asked about model
 - does the model make sense
 - if you put a lot of weight something should break
 - o not just the scenario you are doing but how much weight it can hold
 - o not sure if it will make sense to do that
 - stability is based on the industrial ramp and the treadmill
 - shared results of model
 - can you put in a distributed load versus a point force
 - should be able to define the material and add in properties
 - change to pine wood
 - see if can stop making super warped

Conclusions/action items:

Adjust the SolidWorks ramp

SIERRA LOOSEN - Nov 21, 2025, 12:48 PM CST

Title: Advisor Meeting 8

Date: 11/21/25

Content by: Sierra

Present: Sierra, Grace, Julia, Katie

Goals: Update Dr. Ashton on our project, get advice for the final presentation and report

Content:

- · We showed Dr. Ashton our final design
- Grace showed Dr. Ashton the updated SolidWorks testing to prove that our design is safe
- Dr. Ashton wants us to do a few more calculations to prove that the safety factor is 25
- · For easy of use testing
 - have multiple people do the testing and have them do multiple trials each
 - o see if there is a statistical significance between people or if everyone is around the same values
- · Do displacement testing again
 - redo this testing with the tape on the ground to see if the bars increase stability or affect how much the side tracks are moving on the ground
 - o report all the values from both rounds of this testing

Conclusions/action items:

We feel we are in a good spot with our final prototype. We plan to go to the house the week after Thanksgiving to finalize the test and make sure the prototype fits. We are beginning to split up the final report and final poster to work on it over break.

SIERRA LOOSEN - Sep 12, 2025, 12:29 PM CDT

Title: Weekly Team Meeting

Date: 9/12/25

Content by: Sierra

Present: Step Masters

Goals: Discuss what needs to be achieved in the upcoming week and prepare for our advisor meeting

Content:

- The team discussed how we will split the PDS into individual parts to work on
- · Also discussed the training throughout the curriculum requirements that were brought up at the BSAC meeting
- · Prepared to discuss what we did this past week with Dr. Ashton in our advisor meeting following this meeting
- Discussed research that we've found so far including types of foldable ramps, possible materials to make the ramp out of (plastic, polymers), dimensions of safe ramps

Conclusions/action items:

The PDS is due by Thursday September 18 at midnight. We will all try to have more research by next week as well to contribute to the PDS. We also are planning on meeting with the family in the upcoming weeks to get more info about what they would like. We are going to continue look at what the team from last fall did to get a better idea of how we can improve our design from theirs.



9/19/25 Weekly Team Meeting - Design Brainstorming

SIERRA LOOSEN - Sep 19, 2025, 1:44 PM CDT

Title: Weekly Team Meeting - Design Brainstorming

Date: 9/19/25

Content by: Sierra

Present: Sierra, Julia, Katie, Grace

Goals: Share individual design ideas to determine what will go on our design matrix

Content:

- general consensus is that we want to use aluminum (got confirmation from the family that this is ok)
- the family had mentioned that the belt of the treadmill could stay down, and the ramp could fold onto the belt of the treadmill
- We thought about creating narrow rail tracks to force the wheel of the gait trainer to stay straight, but we want to ask the family if that would be safe since Nadine's gait sometimes goes side to side
- We also discussed looking at the treadmill that is in the teaching lab in ECB to see if it is similar to Nadine's treadmill, we could possibly use it during our prototyping process to fit our device for dimensions
- We all shared our design ideas and will narrow down our designs for the design matrix

Conclusions/action items:

The team will need to further discuss ideas to narrow down ideas for the design matrix. Next week, the team will travel to Nadine's house to look at the treadmill and take further measurements to refine our prototype. We also will look at making a treadmill in SolidWorks to be able to make our prototype in SolidWorks and test different materials and loading patterns. The team will meet on Sunday to begin working on design matrix criteria

Sara Mlodik - Sep 21, 2025, 2:53 PM CDT

Title: Design Ideas Team Meeting

Date: 9/21/25

Content by: Sara

Present: Step Masters

Goals: Collaborate on our design ideas and begin constructing the design matrix

Content:

- · Action Items:
 - Talked out our designs
 - Brainstormed improvements
 - Created design matrix categories
 - Started design slides
- Ideas
 - Sara: Aluminum ramp that folds onto the treadmill and has hinges to it can fold onto itself
 - Grace: Detachable ramp with prop-up legs and a handle to help move
 - Julia: Telescoping ramp would make it adjustable to other treadmills, goes all the way around the treadmill
 - Sierra: Permanent rails made out of wood with detachable and/or foldable aluminum treadmill
 - Katie: No inner track, just an outer track that is just wide enough for gait trainer
- Things to consider:
 - Design
 - Would we have a shell that goes all the way around the treadmill or just side railings?
 - Could we use prop-up legs for the ramp and make it detachable?
 - Materials
 - Would be make the permanent parts out of wood or aluminum?
 - Safety
 - Would we need an inside rail if we made the outside rail tailored to the width of the gait trainer?
 - How would we fill the gap between the ramp and the treadmill/railings?
 - For the aluminum railings on the side of the ramp, how thick will me make the railings (fold up the aluminum, fold up the aluminum then fold over a second time?

Conclusions/action items:

- Start our sections of the design matrix
- · Work on slides
- Continue brainstorming design ideas and things to consider

10/1/25 Final Design Brainstorming Session

SIERRA LOOSEN - Oct 01, 2025, 5:38 PM CDT

Title: Final Design Brainstorming Session

Date: 10/1/25

Content by: Sierra

Present: Step Masters

Goals: Finalize design for preliminary presentations and prepare for preliminary presentations

Content:

- the team brainstormed how we can combine the three preliminary designs to come up with a final design
- we were able to come up with a final design to present at preliminary presentations on Friday
- the team finished planning for the final presentation on Friday and made plans to meet on Friday morning to practice for the presentation
- · we also discussed how we will divide the preliminary report due next Wednesday

Conclusions/action items:

The team was able to finalize the design we will present as our design to be prototyped for the preliminary presentation. We will meet on Friday morning to practice for the presentation. We will begin working on the preliminary report which is due next Wednesday.

Sara Mlodik - Oct 09, 2025, 2:00 PM CDT

Title: Fabrication Meeting with Fabrication Staff

Date: 10/7/2025

Content by: Grace

Present: Grace, Julia, Sara

Goals: Meet with Mike in the design lab to discuss fabrication plans for our device.

Content:

- He does not believe that the drawer sliding mechanism will work, especially if the ramp sections are tapered
- He does not know an easy way to do the telescoping mechanism
- Some options we discussed for telescoping mechanism:
 - 1. Place slots in the ramp sections, the sections can slide on top of each other in these slots
 - 2. Could have a channel on the side walls of the ramp and a ball pin to lock the position on the channel in place (like a peg into a peg board)
- For the tracks, there are aluminum channels which would be pre-made in the U shape
- Aluminum (0.5 inch thick, $2ft \times 4ft$) = \$900
- He believes our best bet is to use nesting wood blocks that can slide out
- Could potentially do a hinge mechanism that folds under, could have wheels to help navigate the folding, then have a latch to hook the two sections together

Conclusions/action items:

Research less expensive material besides aluminum. Brainstorm a new design that will be feasible to fabricate. Meet with advisor and discuss these alternative options. Meet with client to update them on the design.

10/10/25 Weekly Team Meeting - Design Alternatives

GRACE NEUVILLE - Oct 13, 2025, 1:18 PM CDT

Title: Weekly Team Meeting

Date: 10/10/25

Content by: Grace

Present: Grace, Julia, Katie, Sara (no Sierra)

Goals: Discuss the brainstormed design alternatives since the fabrication meeting with Mike.

Content:

- We are leaning towards purchasing a premanufactured ramp
- This would ensure stability and make the fabrication process easier
- We are going to set up a meeting with the client and family to discuss our alternate options
- · We hope to create a CAD model next week to begin load testing to determine material suitability

Conclusions/action items:

Grace and Sierra will meet to create the CAD model. The team will discuss material suitability and order materials. The team will meet with the client and family to finalize the ramp portion design.

GRACE NEUVILLE - Oct 15, 2025, 4:52 PM CDT

Title: Alternative Design Team Meeting

Date: 10/15/2025

Content by: Grace

Present: team

Goals: Finalize our design.

Content:

3-part system. The ramp will be a 36 in wide premanufactured ramp with wheels underneath. The ramp will be wheeled onto the tracks when not in use. There will be a flat portion and the ramp will rest on this portion.

Conclusions/action items:

Create solid works model of design and conduct load testing.



10/20/2025 Design Adjustments Team Meeting

GRACE NEUVILLE - Oct 20, 2025, 5:48 PM CDT

Title: Design Adjustments Team Meeting

Date: 10/20/2025

Content by: Grace

Present: Team

Goals: After meeting with Mike, fabrication staff, come up with adjustments to our original final design.

Content:

- We are going to move forward with the wheels being under the ramp
- We are going to add a rubber covering to the bottom of the ramp to prevent scratching
- · We are going to change the adjustable legs to more stable ones suggested by Mike
- We are going to get rid of the flat portion after realizing it is not necessary
- We will extend the sidetracks to support the ramp instead of the flat portion

Conclusions/action items:

Begin ordering materials.

SIERRA LOOSEN - Oct 22, 2025, 5:13 PM CDT

Title: Purchasing Lumbar

Date: 10/22/25

Content by: Sierra

Present: StepMasters

Goals: Go to Home Depot to purchase wood needed for the side tracks

Content:

The team was able to go to Home Depot and purchase the appropriate wood needed to fabricate our side tracks. This included 2 quantity of 2x10x8 wood to be the portion of the side tracks that will support the gait trainer wheels, and 2 quantity of 1x5x6 wood, which we will cut up to be the 4 side walls attached to the side tracks.

Conclusions/action items:

The team now has the desired wood to fabricate the side tracks. We are also in the process of purchasing the legs to be used to support the side tracks. A fabrication plan will be written to detail the process of how we will make the side track portion.

GRACE NEUVILLE - Oct 24, 2025, 12:54 PM CDT

Title: Weekly Team Meeting

Date: 10/24/2025
Content by: Grace

Present: Grace, Sierra, Katie, Sara

Goals: Go over goals for next week including fabrication plans, SolidWorks, and show and tell.

Content:

- Julia and Sierra will finish fabrication plans over the weekend
- Sent out clarification email to Dr. Puccinelli
- Looked into grippy mats to use so that the ramp will not scratch the flooring.

Conclusions/action items:

Update solidworks to get rid of the flat portion, conduct FEA with new adjustable legs. Finish fabrication plan. Prepare elevator pitch for show and tell.

SIERRA LOOSEN - Nov 14, 2025, 12:27 PM CST

Title: Team Meeting

Date: 11/14/2025

Content by: Sierra

Present: Sierra, Grace, Katie, Julia

Goals: Discuss testing from the previous week and discuss upcoming testing plans

Content:

- · discussed how testing at Nadine's house went
- planned out the final steps for fabrication
 - · attaching wheels to the ramp
 - o attaching handles to the ramp
 - figure out how to attach tracks to treadmill if we need to
- We decided we want to purchase D rings and a nylon strap with a buckle to attach the side tracks to the treadmill

Conclusions/action items:

We need to finish fabricating the prototype. This includes installing handles and wheels on the ramp. We also need to attach the rings which will allow the side tracks to attach to the treadmill via a nylon strap.

GRACE NEUVILLE - Nov 14, 2025, 12:25 PM CST

Title: Weekly Team Meeting

Date: 11/14/2025
Content by: Grace

Present: Team (minus Sara)

Goals: Finalize an attachment method between the sidetracks and discuss how testing went.

Content:

- nylon straps and button fasteners
- nylon straps and hooks
- water ski attachments
- D ring, ratcheting strap around the arms of the treadmill

Conclusions/action items:

The team chose the attachment method of using a D ring with a normal buckle strap around the arms of the treadmill.

Sara Mlodik - Oct 15, 2025, 5:22 PM CDT

Title: Measurements to Assist in Design Planning

Date: 9/18/2025

Content by: Sara Mlodik

Goals: Compile all known measurements to help in planning the design

Content:

Gait Trainer Base [1]

· Base dimensions chart is attached

Treadmill [2]

- T101-03 | TM659 | 2012 (Treadmill Folding)
- Horizon Fitness 2012
- Product Codes: TM659
- Treadmill parts list pdf is attached

Conclusions/action items: Switch the dimensions to metric in the treadmill measurements

References:

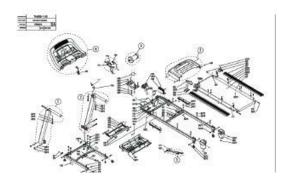
[1] Rifton, "Pacer Gait Trainer: Large (K640)," rifton.com, <a href="https://www.rifton.com/products/pacer-gait-trainers/pacer

(accessed Sep. 18, 2025).

[2] Horizon Fitness, "T101-03 | TM659 | 2012 (Treadmill - Folding)," parts.horizonfitness.com, https://parts.horizonfitness.com/product/detail/932

(accessed Sep. 18, 2025).

Sara Mlodik - Oct 15, 2025, 5:22 PM CDT



Download

resource.pdf (2 MB)

Sara Mlodik - Oct 15, 2025, 5:22 PM CDT

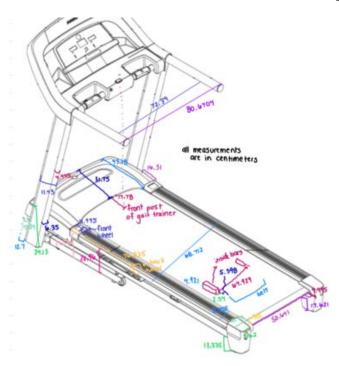
Item Dimensions (inches)	K640 Large Pacer		
Elbow height	32 – 47		
Floor to top of arm prompt	32 - 47		
Floor to top of MPS (not tilted)*	17 – 35		
Overall width	Standard base: 28 Utility base: 32		
Overall length	Standard base: 36 Utility base: 40½		
Frame height	28% - 38%		
Base height (without upper frame)	16.		
Frame weight (lbs)	Standard base: 15½ Utility base: 19¼ Standard upper: 9½ Dynamic upper: 13½		
Dynamic upper movement	Vertical: 2 Horizontal: 2		
Caster diameter	Standard base: 5½ Utility base front casters: 8 Utility base back wheels: 11½		
Maximum working load (b)	200		

^{*}This measurement is taken at the lowest frame and MPS height, and the highest frame and MPS height.

Download

Screenshot_2025-09-18_101841.png (102 kB)

Sara Mlodik - Oct 15, 2025, 5:22 PM CDT



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GRACE NEUVILLE - Sep 29, 2025, 12:03 PM CDT

Title: Design Matrix

Date: 9/25/2025

Content by: team

Present: team

Goals: After choosing 3 preliminary designs, create a design matrix to score the designs against specific criteria. The criteria should acknowledge the specifications of the client, and the weight of the criteria will reflect the importance of that specification.

Content:

Refer to document attached below.

Conclusions/action items:

The winning design is the suitcase ramp. This design scored highest in five of the six scoring criteria categories. The wheels on this design make the set up and take down easier as the device can be wheeled onto the treadmill. The handle also contributes to the ease of set up, making it easier to maneuver. The foldable legs underneath the ramp portion of the device provide added safety and stability to this design. Although the suitcase ramp design is the winner based on the design matrix, the proposed final design will likely combine elements from all three of the preliminary designs. Feedback from the family and caregivers will be gathered in order to inform the team on what the best elements of these designs are, so that they can be combined into a singular design.

GRACE NEUVILLE - Sep 29, 2025, 12:04 PM CDT

Storing Criteria

Safety (28%) - Safety is one of the most important criterio of the design, as it is important that the mor foces no risks of righty while using this device. The design should be able to hold the weight of the user and gain times without risk of collegings, which are sensing that the wheels of the gain trainer control of the olges, especially in one of a science occuring while the device is in sec. A higher score in this entegrey would indicate that the design office a safe way to wheel the gait trainer spa manp, and only be locked in place over the uses of the treadmill left.

Ease of Set Up (25%) - Aso that important factor in the design is the case of set up. The client mentioned that the previous prototype is very mody used. This is presently because it is difficult to sowe due to the lock of a handle, and it is also difficult to street to the two-facilit lesing the C-charge. The ratin post of this new design is to entere device that is soict to extrage at such to the tradeful so that it to re be not one foregraphy. Ease of set up is weighted at 25% because this is the main one error of the cleans. A high socre in this ontegory means the design presents as conier way to attach the device to the troublall that troud design be repeated, or presents a marked of paramately attaching the device to the troublall.

Weight of Bevice (19%)—Another contributing factor to be lock of use with the persions prototype is the weight of the device. The previous design was fabricated with wood, making it very betwy to never-arroad. The client has indicated they would prefer contecting nore lightweight than wood, especially if the device will need to be attached and naturated to the translatil repenting. The device should ideally weight ten than 21 kg if it will need to be needed in order to be trained on the translation. This ortegory is weighted at 19% because this is not be made and the device of the client. A higher score in this cost goty means the design presents a lightweight material that can be more oneshy moved around.

Compactability (15%)—The clients would prefer a design that takes up less squee than the previous postuppe. The design should be able to be folded onto the trendmill, or be completely removed from the trendmill and be compactly folded on the fiftee case yearing. The properties that the previous of the trendmill and be compactly folded on the fiftee cases when the importance of being plate for first in their living space. A higher severe in this case gave means the design can easily be folded into smaller dimensions to take up less space in the user's hone.

Ease of Pahrication (19%) - Ease of their atten considers how easy such design is able to be fabricated, technique the accordibility to materials and one of machining. It is only weighted at 10% because their is considerable accordion to material and resources for conting up with a period of historiates plan. A higher scene in this cate goty means the design can be easily fabricated using the resources a variable to the team.

Adjustability to Other Treadwills (9%) - The clients are hoping the design may be adjustable to the discretions of other treadmils in case the readwill were to malfunction. This category is only weighted or 5% because it is not for main concerns of the client. A higher score would include that the design can easily be attached to the characteries of a new treadwill.

Download

Step_Masters_Design_Matrix.pdf (1.64 MB)



SIERRA LOOSEN - Oct 02, 2025, 3:19 PM CDT

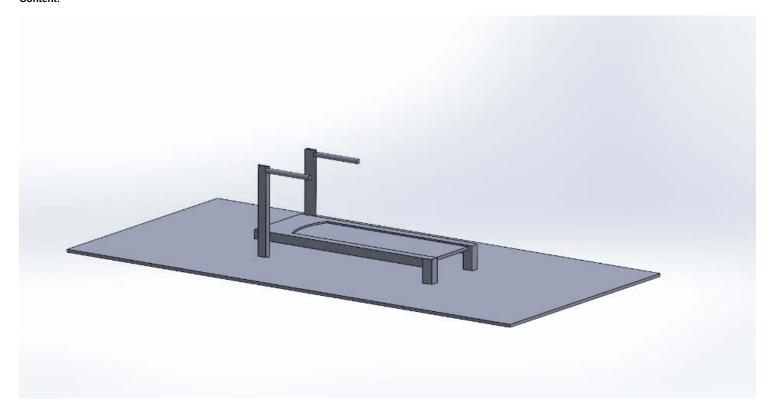
Title: Treadmill Solidworks Part

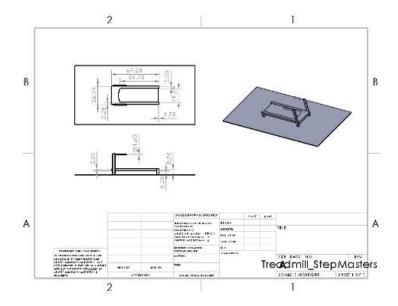
Date: 9/29/2025
Content by: Grace

Present: n/a

Goals: Create a 3D model of the treadmill in solidworks using the most relevant dimensions for our project.

Content:

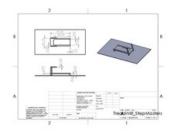




Conclusions/action items:

Use this part to show how our device will be attached to the treadmill. This will allow the clients and our peers to easily visualize how our part will fit to the treadmill. It will also ensure all dimensions work with the treadmill.

GRACE NEUVILLE - Sep 29, 2025, 4:00 PM CDT



Download

Treadmill_StepMasters_Drawing.JPG (74.2 kB)

Katelynn Johnson - Oct 17, 2025, 12:21 PM CDT

Title: Small Model

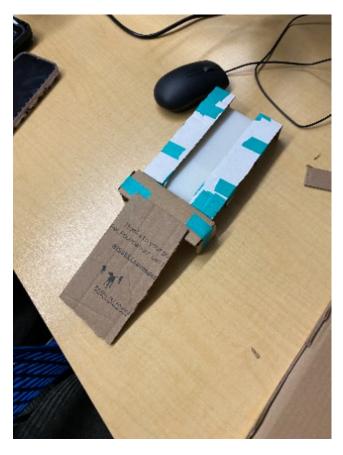
Date: 10/15/2025

Content by: Katelynn

Present: Sara, Sierra, Grace, Julia

Goals: To build a small model of our proposed design to visualize function and construction.

Content:



(See below for video of function)

Conclusions/action items:

Moving forward we will be developing a CAD model and begin outlining fabrication plans.

Katelynn Johnson - Oct 17, 2025, 12:20 PM CDT



Download

IMG_4259.MOV (11.1 MB)

SIERRA LOOSEN - Oct 17, 2025, 12:18 PM CDT

Title: Dimensions for Side Rails

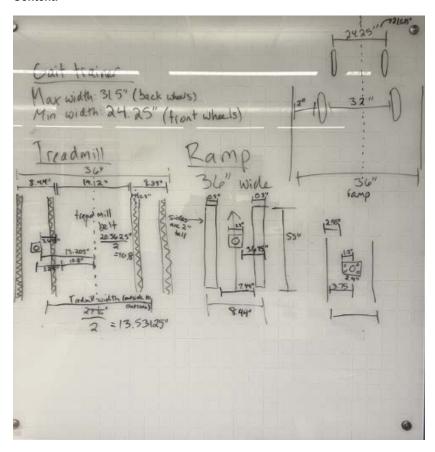
Date: 10/15/25

Content by: Sierra and Grace

Present: Sierra and Grace

Goals: Calculate dimensions needed for the side rails and create a SolidWorks model for stress testing

Content:



Conclusions/action items:

The picture above shows the calculations used for preliminary dimensions of the side tracks with adjustable legs. These dimensions are subject to change throughout the fabrication process. We calculated that the total width of the side tracks will be slightly wider than the width of the ramp so that the ramp can be wheeled across the tracks for storage.



Side Tracks SolidWorks Part 10/16/2025

GRACE NEUVILLE - Oct 16, 2025, 6:58 PM CDT

Title: Side Tracks SolidWorks Part

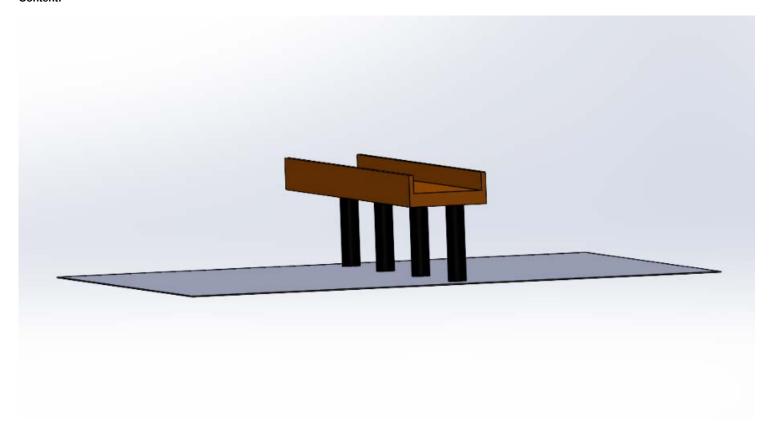
Date: 10/16/2025

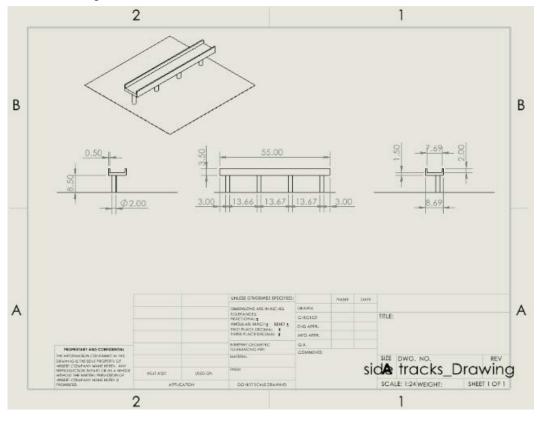
Content by: Grace

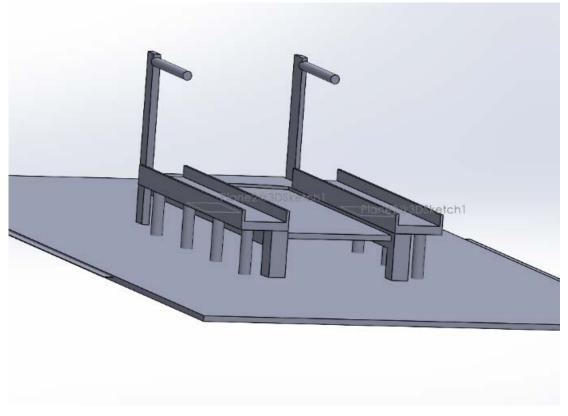
Present: Grace and Sierra

Goals: Create a SolidWorks part to represent the dimensions of the side tracks. Then use this part to perform FEA using Simulation XPress Wizard.

Content:







Conclusions/action items:

Conduct FEA using SolidWorks Simulation XPress Wizard and determine if the side tracks will be able to withstand the expected load.

Sara Mlodik - Oct 17, 2025, 9:32 AM CDT

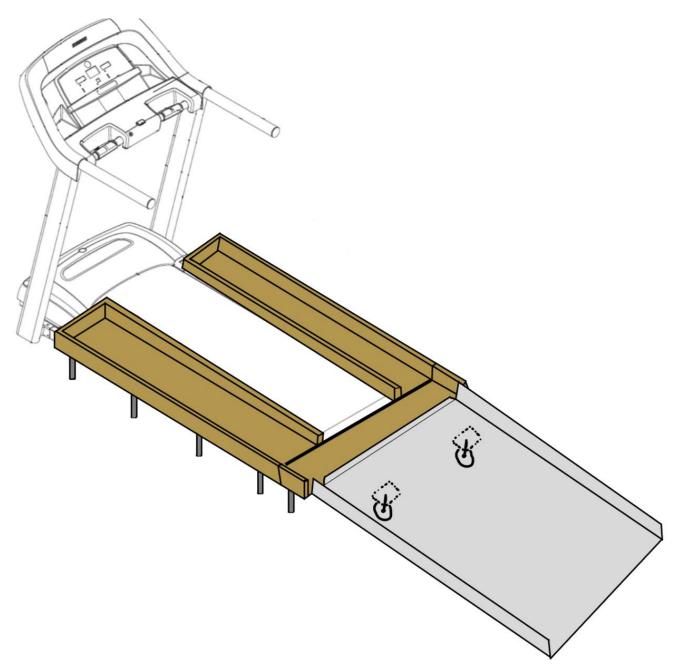
Title: Proposed Final Design Sketch

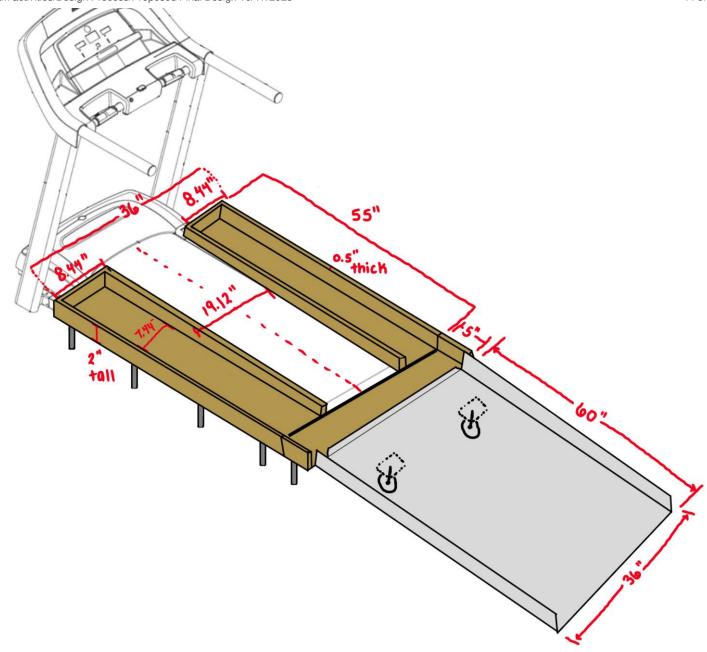
Date: 10/17/2025

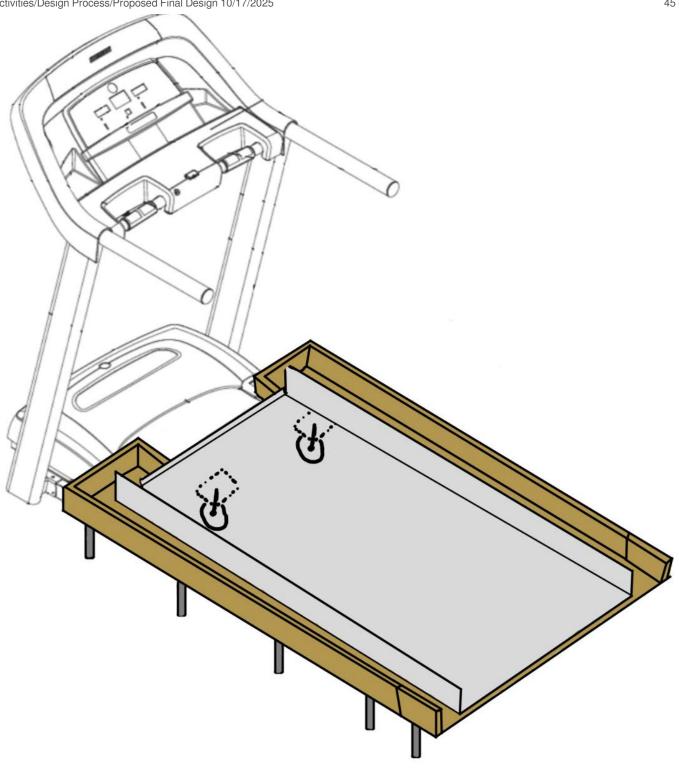
Content by: Sara Mlodik

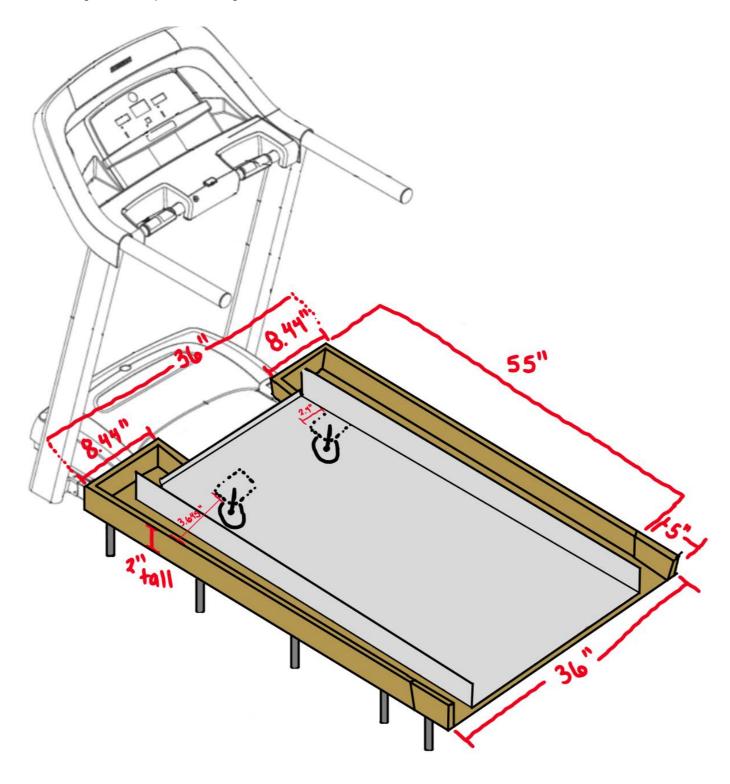
Goals: Make sketches of our final design

Content:









Conclusions/action items: Keep updating these designs if our dimensions or design is altered throughout the fabrication process

Julia Shefchik - Dec 08, 2025, 2:43 PM CST

Title: SolidWorks Legs

Date: 10/24/2025
Content by: Julia

Present: Julia

Goals: Create a SolidWorks model of the legs for use in testing

Content:



Conclusions/action items:

The file has been sent to the team, so they are able to combine this model with the model already created of the wood sidetracks. This will allow the team to get a more accurate value from our load testing.



SolidWorks Tracks and Legs 10/26/2025

Sara Mlodik - Oct 26, 2025, 6:17 PM CDT

Title: SolidWorks Tracks with Legs

Date: 10/26/2025

Content by: Sara

Present: Sara and Grace

Goals: Create a combined SolidWorks model of the legs and tracks

Content:



Conclusions/action items:

Create a Solidworks of both of tracks and complete Solidworks testing



SIERRA LOOSEN - Oct 30, 2025, 5:56 PM CDT

Title: SolidWorks Ramp

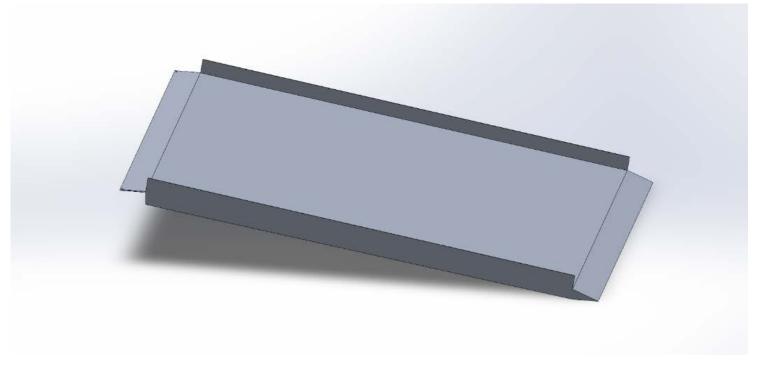
Date: 10/30/25

Content by: Sierra

Present: N/A

Goals: Model the pre-fabricated ramp in SolidWorks

Content:



(file located in google drive)

Conclusions/action items:

After modeling the ramp, all parts of the project should now be completed in SolidWorks. This will enable us to accurately do force/load testing to stimulate the forces our device will undergo in real life. This testing will also tell us if certain parts of the design won't be able to withstand the forces placed on them, which will cause us to redesign the device.

GRACE NEUVILLE - Nov 13, 2025, 4:08 PM CST

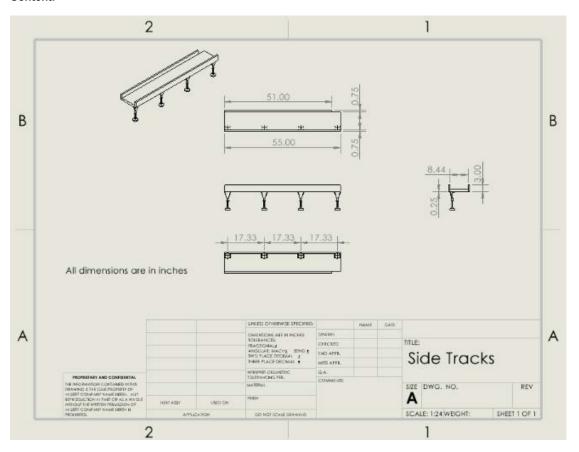
Title: Final Side Tracks

Date: 11/13/2025
Content by: Grace

Present: n/a

Goals: Create an updated model for our final side tracks.

Content:



Conclusions/action items:

This drawing shows the accurate dimensions of our final side track device. This will be put into the final report.



Materials and Expenses Spreadsheet

Katelynn Johnson - Dec 09, 2025, 8:19 AM CST

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Download

Gait_Walker_Final_Materials_and_Expense_Sheet_-_Google_Sheets.pdf (79.2 kB)



Katelynn Johnson - Dec 09, 2025, 8:21 AM CST

Budget Tracking

			xpense Trac	inci	
Expense Amount	Description	Approval Status	Date	Payment Method	Notes
\$329.99	Ramp	Purchased ▼	10/21	BME Department	Aluminum Ramp
\$66.59	Adjustable Legs	Purchased ▼	10/22	BME Department	Adjustable Height Legs
\$16.70	2x10 - 8ft Lumber	Purchased >	10/22	BME Department	Refunded by BME department LINK HERE
\$9.88	1x5 - 6ft Lumber	Purchased >	10/22	BME Department	Refunded by BME department LINK HERE
\$2.50	26 Wood Screws	Purchased ▼	10/27	DI@ ECB Budget	
\$39.06	1 x 4 x18 Aspen Lumber	Purchased ▼	11/2	BME Department	Refunded by BME department LINK HERE
\$22.74	2 Red Rigid Base Caster Wheels	Purchased ▼	11/5	BME Department	Refunded by BME department
\$11.59	4-pack Kayak Handles	Purchased ▼	11/12	BME Department	Refunded by BME department
\$9.99	Felt Furniture Pads	Purchased ▼	11/15	BME Department	Refunded by BME department
\$10.29	Hardware from Home Depot	Purchased ▼	11/15	BME Department	Refunded by BME department
\$8.80	Additional Hardware from DI Lab	Purchased ▼	11/17	DI@ ECB Budget	
\$5.03	Rubber End-caps (20 pack)	Purchased ▼	11/20	BME Department	Refunded by BME department
\$3.00	Additional Hardware from DI Lab	Purchased >	11/20	DI@ ECB Budget	
		•			
			Budget Tracke	г	
\$500.00	Initial budget	Approved ▼		By Request	Payment will be sorted when purchases are approved
\$50.00	Design Innovation Center @ Wendt	Approved ▼		By Request	To be used only at Wendt. Use Account Name: BMEDesign
TBD	BME Department Funding	Approved •	10/10	By Request	
	Total Budget:	\$550.00			
	Budget Remaining:	\$13.84			
	Budget Spent:	\$536.16			

Updated 12/09/2025 by Katelynn Johnson

Katelynn Johnson - Nov 25, 2025, 2:10 PM CST

Title: Amazon Return Update

Date: 11/25/2025
Content by: Katie

Content:

- After the 11/19 home visit, it was determined that the strap and carabiner system would no longer be used for increased stabilization of the side tracks. While the team supported this method, the client preferred a rigid, permanent attachment method.
- This mean that the D-Rings, Carabiner clips, and nylon straps were no longer required for the design and all items were returned to Amazon on 11/24/2025 (no return fee was charged).
 - See the purchase receipts folder for the return receipt.

Conclusions/action items:

Moving forward, I will be sending in the team's reimbursement request to the BME accounting department, and finalizing all budgeting and materials documentation in preparation for our final report.

Katelynn Johnson - Oct 16, 2025, 12:06 PM CDT

Title: Purchase Request Update

Date: 10/16/2025

Content by: Katelynn Johnson

Present: N/A

Goals:

- 1) To receive purchasing approval by 10/22 and order materials the same day approval is granted
- 2) To begin fabricating 10/24 with materials at DI @ ECB and DI @ Wendt along with any materials delivered at this time.

Content:

- Since the team's preliminary presentation, our final design has evolved into a design that combines a premanufactured ramp with custom-fabricated wooden side tracks.
- This project will be going over our initial budget, therefore BME funding is crucial for our team's success.
- We are ready to purchase a commercially available ramp, toggle latches, adjustable furniture legs, and wheels.
- · The team will also be looking into sourcing wood for our wooden side tracks.

Conclusions/action items:

Moving forward the team will need to source and request purchasing for wood for our side tracks. We also will seek to begin fabrication by the end of next week (10/24). Our design will also be reviewed by DI@ECB staff on 10/16 and Dr. Randolph Ashton on 10/17 to verify it's plausibility.

Katelynn Johnson - Oct 09, 2025, 4:17 PM CDT

Title: Funding Update

Date: 10/09/2025

Content by: Katelynn Johnson

Present: N/A

Goals: N/A

Content:

- This project is been accepted for funding through UW-Madison's BME department.
- All funding purchase requests should be promptly submitted to Dr. Randolph Ashton and Dr. Puccinelli.
- The team should also consider resources available at Wendt and ECB Design Innovation centers before sourcing materials externally.
- The team should be aware of materials available for free in the BME design closet.

Conclusions/action items:

Moving forward, the team should aim to submit funding requests as early as possible, and should take brief inventory of items available for free in the BME supply closet, and items available at a reduced cost through the Design Innovation Centers at ECB and Wendt.



10/22/2025 - SYP and Common Board Purchase Receipt

Katelynn Johnson - Oct 29, 2025, 2:29 PM CDT



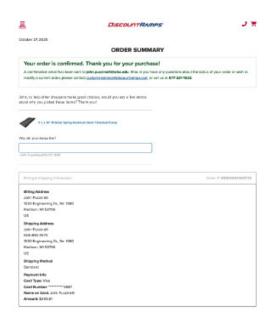
Download

10_22_Home_Depot_eReceipt.pdf (44.2 kB)



10/27/2025 - Ramp and Leg Support Receipts

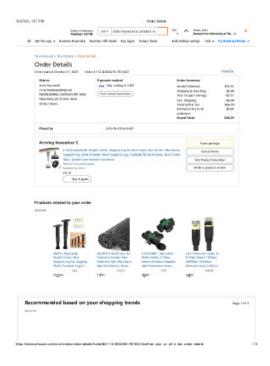
Katelynn Johnson - Oct 29, 2025, 2:30 PM CDT



Download

2025.10.27-Ramp-295.91.pdf (251 kB)

Katelynn Johnson - Oct 29, 2025, 2:30 PM CDT



Download

2025.10.27-Amazon-Legs-66.59.pdf (294 kB)



11/2/2025 - Aspen Wood and Gray 3" Wheels Purchase Receipt

Katelynn Johnson - Nov 12, 2025, 1:48 PM CST



Download

11.2.2025_Home_Depot_eReceipt.pdf (44.2 kB)

11/5/2025 - New Wheels Purchase Receipt

Katelynn Johnson - Nov 06, 2025, 1:14 PM CST



Download

11.5.2025_Home_Depot_Purchase_Receipt.pdf (849 kB)

Katelynn Johnson - Nov 06, 2025, 1:16 PM CST

Title: New Wheels Purchase Explanation

Date: 11/5/2025

Content by: Katie

Content:

These wheels were purchased after it was discovered that the base of previous wheels we purchased was slighly too small to be properly secured to the underside of our ramp due to the ramp's configuration.

Katelynn Johnson - Nov 12, 2025, 1:47 PM CST

Title: Return and Refund Receipt for Gray Wheels at Home Depot Details

Date: 11/5/2025

Content by: Katie

Content:

• Today Sierra went to Home Depot to return the gray wheels we purchased on 10/22.

 The new red wheels purchased were cheaper than the initial gray wheels, and therefore our team has \$5.07 of in-store credit remaining at Home Depot

Katelynn Johnson - Nov 06, 2025, 1:20 PM CST



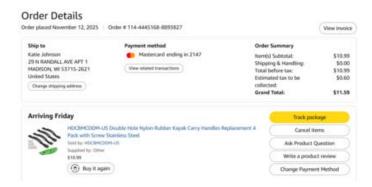
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11.5.2025_-_Home_Depot_Refund_and_Return_Receipt_for_Gray_Wheels.pdf (977 kB)



11/12/2025 - Kayak Handles Purchase Receipt

Katelynn Johnson - Nov 12, 2025, 3:48 PM CST



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Screenshot_2025-11-12_154644.png (131 kB)

11/15/2025 - Wheel and handle attachment hardware purchase receipt

Katelynn Johnson - Nov 15, 2025, 1:52 PM CST



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11.15.2025_Home_Depot_Receipt-_Order_Confirmation.pdf (228 kB)

Katelynn Johnson - Nov 15, 2025, 1:53 PM CST



Download

11.15.2025_Amazon_receipt.pdf (123 kB)



11/19/2025 - Additional Carabiners and D-Ring Purchase Receipt

Katelynn Johnson - Nov 19, 2025, 11:05 AM CST



Download

11.19.2025_Amazon_Order_Details.pdf (112 kB)



11/20/2025 - Rubber Endcaps purchase receipt

Katelynn Johnson - Nov 20, 2025, 12:24 PM CST



Download

11.20.2025_Amazon_Order_Details.pdf (83.9 kB)

11/24/2025 - Return Information for Straps, Carabiners, and D-Ring Hooks

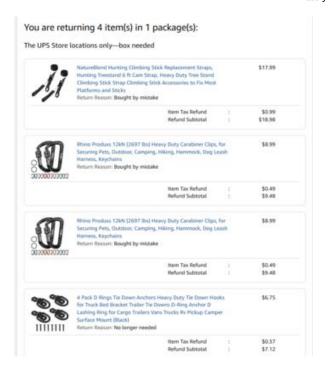
Katelynn Johnson - Nov 25, 2025, 2:15 PM CST

Refund summary	
Kerunu summary	
Refund subtotal for 4 items	\$45.06
Shipping (The UPS Store	\$0.00
locations only—box needed)	
Total estimated refund	\$45.06
\$45.06 will be added to your gift card b	palance

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Screenshot_2025-11-22_115643.png (17.3 kB)

Katelynn Johnson - Nov 25, 2025, 2:15 PM CST



Download

Screenshot_2025-11-22_115634.png (174 kB)



10/17/25 Fabrication Meeting with Mike

SIERRA LOOSEN - Oct 17, 2025, 2:07 PM CDT

Title: Fabrication Meeting with Mike

Date: 10/17/25

Content by: Sierra

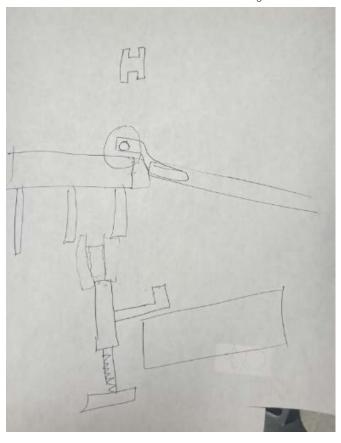
Present: Grace, Sierra, Katie, Julia, Mike (Pro Staff at ECB)

Goals: Discuss our refined design

Content:

- · Mike suggested looking into spring loaded wheels rather than the wheels we are currently looking into
 - or some other type of wheel that can pop in and out
 - o retractable wheels
- · he liked the idea of us using toggle latches to connect the parts together
- he really liked the rest of the ideas that we had for the overall design
- he brought up an idea of creating some way to attach the two side tracks at the front of the treadmill to prevent the side tracks from shifting around
- adjustable legs look in to legs with a screw feature to adjust the height up and down
 - o make wooden legs with adjustable feet
- use a 1x2 for the side walls of the side tracks
- potentially use 1/2 inch plywood for the side tracks
- t nuts
- he brought up the idea of eliminating the extra flat portion at the end of the ramp, make the side tracks longer, make the side wall slightly
 shorter in length on the inner portion of the side tracks so the flap of the ramp can rest there





Conclusions/action items:

Mike liked the overall design idea. However, he suggested we look into retractable wheels. He also suggest we redesign the legs of the side tracks to be made of wood, and have adjustable feet (as shown in the picture above).



10/25/25 Side Tracks Fabrication Protocol (first draft)

SIERRA LOOSEN - Oct 25, 2025, 2:59 PM CDT

Title: Side tracks fabrication protocol (first draft)

Date: 10/25/25

Content by: Sierra

Present: N/A

Goals: Write the fabrication protocol for the side tracks

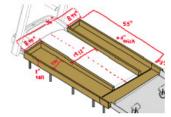
Content:

See attached

Conclusions/action items:

The first draft of the fabrication protocol has been written. This protocol is subject to change during the fabrication process if any issues arrive. The team will use this fabrication protocol next week to begin the fabrication process.

SIERRA LOOSEN - Oct 25, 2025, 2:58 PM CDT



- residure

 1. Measure and mark a line 55° fromthe and on each 2° n0°

 2. Cut describ 2° n5° is a length of 55° using the make raw

 3. Measure and mark is line on each 2° n0° in refer saw

 4. Using the table saw, cut each 2° n0° of the in ended in the previous step

 5. Bun each of these tables 1° not in plane to ensure a smooth 1° n0° in ensuring that

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 6. Mit the sooth on the purvious safely brough the priparte to active squared edges on

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 9. Cut-abort 1/5° at the appropriate largth using the miler saw. This step should would in one 15°05's place of wood.

 10. Buring the pieces from the previous step, runths wood through the planer until a feliciense of 25° than a thread 11. On each 10.5° str., measure and ment a fine on the 5° wide document 6.2° from the end.

Download

Side_Tracks_Fabrication_Protocol.pdf (1.11 MB)

SIERRA LOOSEN - Oct 29, 2025, 1:06 PM CDT

Title: 10/27/25 Side Tracks Fabrication

Date: 10/27/2025

Content by: Katelynn

Present: Team

Goals: 1) To cut down and plane stock to appropriate dimensions.

2) To use adjusted stock to construct the side track frame.

Content:

- Julia and Grace used the woodshop machines to cut and plane stock.
- The rest of the team provided measurement and advice for design execution, and assisted in drilling.
- · Successfully completed cutting and planeing
- Purchased 26 3" wood screws
 - swapped out for 2.5" screws to ensure screws weren't too long for the material

Conclusions/action items:

Moving forward the team will be joining the pieces to create the side track structure. We will also continue designing ramp attachment methods.

Sara Mlodik - Oct 31, 2025, 7:32 AM CDT

Title: Side Tracks Fabrication

Date: 10/29/2025

Content by: Katie

Present: Sierra, Grace, Julia, Katie

Goals: 1) To plane the side track walls

2) Equalize board thicknesses

3) Construct track frame

4) Begin finishing process on wood

Content:

- The team used the wood shop at the DI Lab @ ECB to finish planing our side track walls, and equalize board thickness.
- The team switched out the 3" screws with 2.75" wood screws due to side wall measurement changes
- After consulting with Eric, concerns about the strength of our side walls for our tracks were brought up. It was suggested that we replace
 our original side walls with hardwood at a side-by-side orientation to the base boards. It was also recommended that we glue the side
 walls in addition to using screws, and that screws should be drilled in either an upwards fashion, or side-ways fashion (depending on the
 strength of the material, orientation of the side walls, length of the screws).

Conclusions/action items:

Today our team finished planing the side track walls and equalizing the board thicknesses. Unfortunately after we completed with this we had a consult with Eric, one of the senior design lab staff, who recommended that we replace our current side wall material with a stronger hardwood, and that we also change the orientation/attachment of the side walls for increased strength and durability. Moving forward the team will be sourcing this new material, adjusting our CAD model, and sending in a new purchasing proposal to the BME department. The team aims to complete some of these next steps on Friday, 10/31.



11/3/25 Side Tracks Fabrication

SIERRA LOOSEN - Nov 04, 2025, 9:32 AM CST

Title: Side Tracks Fabrication

Date: 11/3/2025

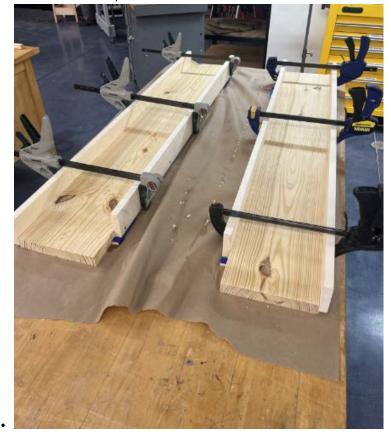
Content by: Grace

Present: Team

Goals: Cut the newly purchased aspen wood side walls to desired measurements. Attach the side walls to the side of the base board using screws.

Content:

- Grace cut the wood pieces on the miter saw to 51 and 55 inches.
- Sara cut the wood pieces to be 3 inches in width on table saw
- Purchased new screws to be the necessary length (1 1/4 in construction screws)
- Measured where the predrilled holes will be, 4 screws per board:
 - \circ 55 in length wood pieces: 0.5 in up from the base, 1 in inside the base, then every 17.67 in
 - \circ 51 in length wood pieces: 0.5 in up from the base, 1 in inside the base, then every 16.33 in
- Found appropriate bit to drill the holes (3/32 bit)
- Glued and clamped the side walls to the base
- · Inserted screws into pre-drilled holes



Conclusions/action items:

Let the glue dry for 24 hours and check on it after. Drill the adjustable legs to finish fabrication of the side tracks. Determine any finishing touches we want to do (sanding/staining)



11/4/25 Updated Side Tracks Fabrication Protocol

SIERRA LOOSEN - Nov 04, 2025, 10:01 AM CST

Title: Updated Side Tracks Fabrication Protocol

Date: 11/4/25

Content by: Sierra

Present: N/A

Goals: Update side tracks protoc0l with changes

Content:

See attached

Conclusions/action items:

The side tracks fabrication protocol has been updated with the changes that were made during the fabrication process. These changes included altering the dimensions of the side walls to be thicker so they can withstand more force. We also attached the side tracks on the sides of the thick base board, rather than on top of the board.

SIERRA LOOSEN - Nov 04, 2025, 10:02 AM CST

- Procedure

 1. Measure and mest a line 55° feetilite and an aach 2°×10°°

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- other.

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 15. Insert 125 to sees into each of the 16 peoplished not be to securely attach side web to the first base board.

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 17. Using "If secrees, drift all gates through the people field halds of the adjustable lag. This will enquire 32 of the 17 acrosses.

Download

Updated_Side_Tracks_Fabrication_Protocol.pdf (4.6 MB)

GRACE NEUVILLE - Nov 07, 2025, 4:22 PM CST

Title: Stained Side Tracks

Date: 11/7/25

Content by: Grace

Present: team

Goals: Sand and stain the side tracks for a professional finish.

Content:

The team used sand paper to sand any rough edges and excess wood glue. Then, the team stained the upper portion of the side tracks with a red Mahogony wood stain.

Conclusions/action items:

Finish sanding and staining the underside on Monday (11/10). Attach the adjustable legs. Determine fabrication plan for adhering the wheels to the ramp.



11/10/25 Finish Staining and Attaching Legs to Side Tracks

Sara Mlodik - Nov 11, 2025, 9:33 AM CST

Title: Finish Staining and Attaching Legs to Side Tracks

Date: 11/10/25

Content by: Sara

Present: Sara, Katie

Goals: Sand the excess wood glue, stain the bottom of the side tracks, and attach adjustable legs

Content:

Scrapers, electric sanders, and sand paper was used to remove excess wood glue and rough patches. Then the bottom of the tracks was stained with red Mahogony wood stain. Once dry, the adjustable legs were added by measuring the precise locations, pre-drilling holes, then drilling in the screws for each leg.

Conclusions/action items:

Test stability of the side tracks on the treadmill, fine-tune the height of the adjustable legs, and finalize wheel attachment methods at the home visit (11/11/2025)

Katelynn Johnson - Nov 11, 2025, 1:03 PM CST



Download

IMG_4509.HEIC (1.74 MB)

SIERRA LOOSEN - Nov 14, 2025, 4:27 PM CST

Title: Preliminary Wheel Attachment

Date: 11/14/25

Content by: Sierra

Present: Sierra, Grace, Julia, Katie

Goals: Begin the process of attaching wheels to the bottom of the ramp

Content:

- · Marked location where holes will be attached
- Drilled half of the holes on the bigger lips on the bottom of the ramp
- · determined that smaller bolts and smaller holes are necessary on the smaller lip
- Smaller bolts and washers need to be ordered since they weren't available at ECB

Conclusions/action items:

The team will finish installing the wheels early next week when we have the appropriate sized bolts and washers. We will also install the handles on the sides of the ramp. We are also ordering a felt pad to stick on the bottom lip of the ramp so it doesn't scratch their wood floors.

GRACE NEUVILLE - Dec 10, 2025, 2:07 PM CST

Title: Final Ramp Fabrication

Date: 11/17/25

Content by: Sierra, Grace

Present: Sierra, Grace, Katie, Sara Goals: Finish modifying the ramp

Content:

- We finished drilling the holes needed to attach the wheels to the bottom of the ramp, used a 0.201 in diameter drill bit for smaller holes
- · Found and bought the appropriate sized bolts, nuts, and washers to attach the wheels and handles to the ramp
 - The bolts used were #10-32 1-1/4 in L socket button head bolts for the smaller holes and corresponding nuts
 - The washers used for the smaller holes were #10 1/2 in
 - 1/4-20 1-1/4 in L socket button head bolts for the larger holes and corresponding nuts
 - #8-32 5/8 L phillips head bolts for the handles and corresponding nuts
 - #8 1/4 in washers for the handles
- Drilled holes in the side walls and attached four handles to the ramp, used a 0.77 in diameter drill bit for the handle holes
 - spaced so that each end of the handles were 9 inches apart, flush to the top of the ramp siding, beginning right as the slope of the siding flattens
- · Filed down the sharp corners to prevent them from poking into the gait trainer's wheels or hurting anyone



Conclusions/action items:

We were able to finish modifying the ramp. The side tracks and ramp will be taken to Nadine's house again this Wednesday to complete the final round of testing. We now just need to attach the D-rings to the side tracks in order to connect the side tracks to the upright posts of the treadmills with straps that were purchased.



11/20/25 Fabrication of Side Track Attachment Mechanism

SIERRA LOOSEN - Nov 20, 2025, 7:49 PM CST

Title: Fabrication of Side Track Attachment Mechanism

Date: 11/20/25

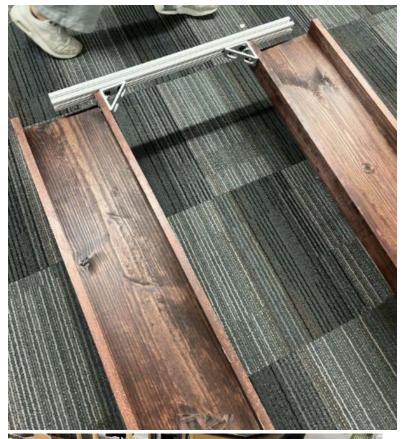
Content by: Sierra

Present: Sierra, Grace, Julia, Katie

Goals: Fabricate a mechanism to attach the two side tracks to each other

Content:

- We were able to utilize some of the scrap 80/20 aluminum and corresponding brackets that were found in the scrap room
- · We drilled holes through the inner side walls towards the front of the tracks and placed bolts through them to secure the brackets
- The long piece of 80/20 aluminum can then slide through the piece on the bracket to make the width of the side tracks adjustable, and when it is the appropriate width apart, the screws can be tightened to hold it in place
- A similar mechanism will be installed on the back side of the side tracks but will sit under the side tracks so that it won't interfere with the ramp
- Katie was able to attach the felt padding to the bottom of the ramp to hopefully prevent any scratches to the wood floors in Nadine's home





Conclusions/action items:

Tomorrow, the team will pre-drill the holes towards the back side of the side tracks to secure the brackets on that end. We will then make finishing touches to the prototype, which may include adding more stain to the areas of the wood that have gotten dinged up. The team will then complete a final fitting of the prototype to the treadmill at Nadine's home during the week after Thanksgiving break.

GRACE NEUVILLE - Oct 30, 2025, 5:13 PM CDT

Title: Side Tracks FEA SolidWorks Simulation XPress Wizard

Date: 10/16/2025

Content by: Grace

Present: Grace and Sierra

Goals: Create a protocol for running FEA SolidWorks Simulation XPress Wizard on the Side Tracks.

Content:

- 1. Open the Solidworks Side Tracks Part with the treadmill support added to the body.
- 2. Click on the Evaluate tab then open "Simulation XPress Analysis Wizard"
- 3. Input fixtures below the four legs and the treadmill support
- 4. Add a 1726.56 N load on the top face of the track to represent the maximum expected load (F=176kg*9.81m/s)
- 5. Choose a material for the entire body (this is a limitation because the true device will be mixed materials)
- 6. Run the simulation
- 7. Evaluate the results
- 8. Choose a different material if necessary

Conclusions/action items:

Follow this protocol and conduct FEA on the Side Tracks part to determine if it will be able to withstand the expected load.



Side Tracks Updated FEA Protocol - 10/30/2025

GRACE NEUVILLE - Dec 07, 2025, 1:44 PM CST

Title: Side Tracks Updated FEA Protocol

Date: 10/30/2025

Content by: Grace

Present: Grace

Goals: Write an updated protocol for FEA testing using Solidworks Simulation tool to be able to test the sidetracks with mixed materials.

Content:

Sidetracks as a whole:

- 1. Open the updated sidetracks Solidworks model
- 2. Open the add-on Simulation Tool
- 3. begin a new study
- 4. apply AISI 1020 Steel material to the adjustable legs and treadmill body
- 5. apply balsa wood material to the side walls and sidetrack body
- 6. apply fixtures to the bottoms of the legs and treadmill body
- 7. apply bonded connections:
 - 1. side walls main body
 - 2. main body legs
 - 3. main body treadmill body
- 8. apply load to main body (1736 N)
- 9. create mesh and run simulation
- 10. analyze the results

Sidewalls (version 1 - no bolts)

- 1. Open the updated sidetracks solidworks model
- 2. open the add-on simulation tool
- 3. begin a new study
- 4. apply balsa wood material to the side walls and sidetrack body
- 5. exclude legs and treadmill body from the study
- 6. apply fixture to the bottom of the sidetrack body
- 7. apply bonded connections:
 - 1. side wall main body
- 8. apply load to the side wall (868 N)
- 9. create mesh and run simulation
- 10. analyze the results

Sidewalls (version 1 - bolts)

- 1. Open the updated sidetracks with bolt holes SolidWorks model
- 2. open the add-on simulation tool
- 3. begin a new study
- 4. apply balsa wood material to the side walls and sidetrack body
- 5. exclude legs and treadmill body from the study
- 6. apply fixture to the bottom of the sidetrack body
- 7. apply bolt connectors at each hole
- 8. apply local interaction
 - 1. find contact surface of bolts between both wood planks
- 9. apply load to the side wall (868 N)
- 10. create mesh and run simulation

11. analyze the results

Sidewalls (version 2 - no bolts)

- 1. Open the updated sidetracks with new sidewalls SolidWorks model
- 2. open the add-on simulation tool
- 3. begin a new study
- 4. apply balsa wood material to the side walls and sidetrack body
- 5. exclude legs and treadmill body from the study
- 6. apply fixture to the bottom of the sidetrack body
- 7. apply bonded connections:
 - 1. side wall main body
 - 2. side wall side wall
- 8. apply load to the side wall (868 N)
- 9. create mesh and run simulation
- 10. analyze the results

Sidewalls (version 2 - no bolts)

- 1. Open the updated sidetracks with new sidewalls SolidWorks model
- 2. open the add-on simulation tool
- 3. begin a new study
- 4. apply balsa wood material to the side walls and sidetrack body
- 5. exclude legs and treadmill body from the study
- 6. apply fixture to the bottom of the sidetrack body
- 7. apply bolt connection to each hole
- 8. apply bonded connections:
 - 1. side wall side wall
- 9. apply local interaction
 - 1. find contact surface of bolts between side wall and main body
- 10. apply load to the side wall (868 N)
- 11. create mesh and run simulation
- 12. analyze the results

Conclusions/action items:

Perform this protocol in SolidWorks then analyze the results.

GRACE NEUVILLE - Nov 12, 2025, 11:04 AM CST

Title: Ease of Use Protocol

Date: 11/12/2025

Content by: Grace

Present: n/a

Goals: This test aims to determine the time it takes to set up and take down the device.

Content:

Materials:

Side tracks, ramp, Gait trainer, treadmill, stopwatch

Procedure (Set up):

- 1. Before recording perform 3 practice trials to become familiar with the set up process
- 2. Begin with ramp wheeled on top of the treadmill
- 3. Record the time it takes to wheel the ramp onto the treadmill
- 4. Repeat step 2-3 for a total of 3 trials

Procedure (Take down):

- 1. Before recording perform 3 practice trials to become familiar with the take down process
- 2. Record the time it takes to wheel the ramp off of the treadmill
- 3. Repeat step 2 for a total of 3 trials

Conclusions/action items:

Perform this test once fabrication is complete.

GRACE NEUVILLE - Nov 12, 2025, 11:06 AM CST

Title: Side Walls Protocol

Date: 11/12/2025

Content by: Grace

Present: n/a

Goals:

This test aims to determine the force needed for the gait trainer wheels to climb over the 2.54 cm side walls.

Content:

Materials:

Side tracks, ramp, gait trainer, treadmill, Phyphox app on smartphone, straps

Procedure:

- 1. Wheel gait trainer onto the side tracks
- 2. Open Phyphox acceleration with g tool
- 3. Strap phone onto the gait trainer
- 4. Press record
- 5. Attempt to push the gait trainer above the side walls
- 6. Stop recording once wheels climb over the walls
- 7. Repeat for 3 trials

Conclusions/action items:

Perform this test at the upcoming home visit to determine the stability of the side walls and to ensure the wheels of the gait trainer will not be able to climb over the walls.

GRACE NEUVILLE - Dec 07, 2025, 1:59 PM CST

Title: Stability Protocol

Date: 11/12/2025

Content by: Grace

Present: n/a

Goals: This test aims to determine the stability of the side tracks while the device is in use.

Content:

Materials:

Side tracks, ramp, gait trainer, treadmill, tape, timer

Procedure:

- 1. Wheel gait trainer onto the side tracks
- 2. Place tape at each corner of the side tracks and the ramp
- 3. Turn on the treadmill to speed 3 (the speed that it will be operated at?)
- 4. Set a 5 minute timer
- 5. Measure the displacement of the side tracks and ramp from the tape

Conclusions/action items:

Perform this procedure at the upcoming home visit. Analyze the results to determine if attachment methods of the side tracks to the treadmill are needed.



Coefficient of Friction Protocol 11/12/2025

GRACE NEUVILLE - Nov 12, 2025, 11:09 AM CST

Title: Coefficient of Friction Protocol

Date: 11/12/2025

Content by: Grace

Present: n/a

Goals: This test aims to determine the coefficient of friction of the ramp.

Content:

Materials:

Ramp, Gait trainer, Phyphox app on smartphone

Procedure:

- 1. Wheel gait trainer onto the ramp
- 2. Place phone with Phyphox inclination tool open
- 3. Lift ramp until the gait trainer begins to slide
- 4. Record angle
- 5. Repeat for 3 trials

Conclusions/action items:

Perform this test at the upcoming home visit. Analyze the results to ensure that it meets a minimum coefficient of friction of 0.5.

Final Version of Protocols for all Testings - 12/8/2025

GRACE NEUVILLE - Dec 08, 2025, 5:17 PM CST

Title: Final Version of Protocols for all Testings

Date: 12/8/2025
Content by: Grace

Present: n/a

Goals: Finalize protocols for the final report.

Content:

Seen in the appendix of the final report.

Solidworks FEA Simulation Testing

Procedure:

- 1. Open the updated sidetracks Solidworks model
- 2. Open the add-on Simulation Tool
- 3. begin a new study
- 4. apply AISI 1020 Steel material to the adjustable legs and treadmill body
- 5. apply pine wood material to the side walls and sidetrack body
- 6. apply fixtures to the bottoms of the legs and treadmill body
- 7. apply bonded connections:
 - 1. side walls main body
 - 2. main body legs
 - 3. main body treadmill body
- 8. apply load distribution to main body (1703 N)
- 9. create mesh and run simulation
- 10. analyze the results

Stability Testing

Materials:

Side tracks, ramp, gait trainer, treadmill, tape, timer

Procedure:

- 1. Place tape at each corner of the side tracks and the ramp
- 2. Begin operating conditions set up
 - 1. Caregivers wheel patient onto the ramp
 - 2. Turn on treadmill

- 3. Set a 30 second timer
- 4. Measure the displacement of the side tracks and ramp from the tape
- 5. Repeat steps 2-3 for the duration of the trial period
- 6. Conduct steps 1-5 again, but with the 80/20 horizontal bars in place
- 7. Analyze results between the different conditions

Ease of Use Testing

Materials:

Side tracks, ramp, Gait trainer, treadmill, stopwatch

Procedure (Set-up):

- 1. Before recording perform 3 practice trials to become familiar with the set up process
- 2. Begin with ramp wheeled on top of the treadmill
- 3. Record the time it takes to wheel the ramp into position at the end of the treadmill
- 4. Repeat step 2-3 for a total of 3 trials

Procedure (Storage):

- 1. Before recording perform 3 practice trials to become familiar with the take down process
- 2. Begin with the ramp at the end of the treadmill
- 3. Record the time it takes to wheel the ramp to on top of the treadmill (in storage position)
- 4. Repeat step 2-3 for a total of 3 trials

Conclusions/action items:

This protocol outlines the final procedures for all testing relevant to our project. Put this in the appendix of the final report.



Side Tracks FEA Results 10/16/2025

Sara Mlodik - Oct 23, 2025, 11:34 AM CDT

Title: Side Tracks FEA Results

Date: 10/16/2025

Content by: Grace

Present: n/a

Goals: Follow the protocol and conduct the Simulation XPress Wizard Analysis on the side tracks.

Content:

See attached PDF below.

Conclusions/action items:

Some limitations of the analysis include that the modeled body does not accurately reflect the final device, and the applied load was larger than what is realistically expected. The actual device will consist of mixed materials; however, due to the constraints of the Simulation Xpress Wizard, a single material, Balsa Wood, was used in the analysis. The four supporting legs will be made of stainless steel, and the solid body below the side tracks represents the treadmill. Additionally, the applied load of 1726.56 N was assumed to act on a single side, whereas in practice, the total load will be distributed across both side tracks and the treadmill, resulting in a lower effective load. The analysis yielded a minimum factor of safety of 112.274 and a maximum deformation of 2.4×10–2 mm, both indicating minimal concern regarding the device's ability to withstand the expected loading conditions.

GRACE NEUVILLE - Oct 16, 2025, 7:08 PM CDT



Download

side_tracks_MergedWizard-SimulationXpress_Study-1.pdf (850 kB)

Side Tracks Updated FEA Results - 10/30/2025

GRACE NEUVILLE - Oct 30, 2025, 5:32 PM CDT

Title: Side Tracks Updated FEA Results

Date: 10/30/2025

Content by: Grace

Present: Grace

Goals: Perform Side tracks Updated FEA Protocol and analyze the results.

Content:

See attached simulation reports.

Conclusions/action items:

Sidetracks as whole:

Some limitations of the analysis include the exclusion of screw connections, the use of balsa wood as the only available material option, and the application of a load greater than what would realistically occur. Although balsa was used to represent the wood in the side track assembly, it provides a conservative estimate, suggesting that the actual deformation would likely be even smaller than predicted. The four supporting legs and the solid body representing the treadmill were modeled using AISI 1020 stainless steel. The applied load of 1726.56 N was assumed to act on one side only; however, in practice, the total load will be distributed across both side tracks and the treadmill, resulting in a lower effective load. The analysis produced a minimum factor of safety of 46.84 and a maximum displacement of 1.56×10^{-2} mm, both indicating minimal concern regarding the device's ability to withstand the expected loading conditions

Side walls (version 1 - no bolts)

According to the simulation results, the side walls can withstand a load of 868 N. The maximum displacement is only 3.35×10^{-2} mm, indicating minimal concern for deformation. However, this analysis does not fully capture the behavior of the screw connections between the side wall and the base of the board

Side walls (version 1 - bolts)

The maximum deformation of the side wall would be 23.48 mm with a load of 868 N (half of the total maximum weight). This deformation is not acceptable and adjustments in the design will need to be made.

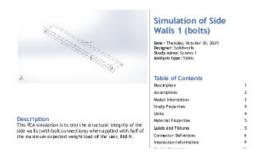
Side walls (version 2 - no bolts)

According to the simulation results, the side walls can withstand a load of 868 N, with a maximum displacement of only 9.35×10^{-2} mm, indicating minimal concern for deformation. However, this analysis does not fully account for the behavior of the screw connections between the side wall and the base of the board. When compared to a configuration where the side walls are screwed on top of the main board, this design demonstrates slightly less stability, with 6×10^{-2} mm more displacement

Side walls (version 2 - bolts)

Study failed to run this operation. Potential errors may be that the displacement is too large for the bolts to handle linearly.

GRACE NEUVILLE - Oct 30, 2025, 5:26 PM CDT





Download

Side_Walls_1_Bolts_.docx.pdf (1.09 MB)

GRACE NEUVILLE - Oct 30, 2025, 5:26 PM CDT



Download

Updated_Side_Tracks.docx.pdf (1.1 MB)

GRACE NEUVILLE - Oct 30, 2025, 5:26 PM CDT



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Side_Walls_1_No_bolts_.docx.pdf (1.05 MB)

GRACE NEUVILLE - Oct 30, 2025, 5:26 PM CDT



Download

Side_Walls_2_No_Bolts_.docx.pdf (787 kB)



Testing at Nadine's Home 11/12/2025

SIERRA LOOSEN - Nov 14, 2025, 12:19 PM CST

Title: Testing at Nadine's Home

Date: 11/12/25

Content by: Sierra

Present: Julia and Sierra

Goals: Complete preliminary testing/fitting of the device on the treadmill

Content:

We were able to ensure that the side tracks with adjustable legs work with the treadmill. We also then laid the ramp in the position that it will be used in to ensure that it worked well with the side tracks. We rolled the gait trainer on the treadmill to ensure the wheels do not hit the side walls when in use. We then completed the Stability protocol and coefficient of friction protocol and collected data. We are waiting to do the other forms of testing until we have the device fully fabricated, as we have yet to install the wheels and handles on the ramp. Nadine also went on the device in her gait trainer and everything remained stable and in place.





Conclusions/action items:

The preliminary testing went well and revealed that the side tracks are extremely durable and able to withstand the forces put on it. We also determined that the side tracks don't really move at all when in use even though they were physically attached to the treadmill. However, we are still looking for a way to attach the two side tracks to each other in the front so that they don't flex or rotate while the device is in use.

Side Tracks (2.0) FEA Results - 11/17/2025

GRACE NEUVILLE - Nov 17, 2025, 7:04 PM CST

Title: Side Tracks FEA Results (2.0)

Date: 11/17/2025

Content by: Grace

Present: n/a

Goals: Update FEA study to use pine wood as the material. Experiment with pressure as the applied load instead of force. Determine if deformation results can be less exaggerated.

Content:

Refer to attached pdf.

Conclusions/action items:

Some limitations of the analysis include that the modeled body does not accurately reflect the final device, and the applied load was larger than what is realistically expected. The treadmill support was simplified to a single material and a basic rectangular body. Additionally, the applied load of 1703 N was assumed to act on a single side, whereas in practice, the total load will be distributed across both side tracks and the treadmill, resulting in a lower effective load. The analysis yielded a minimum factor of safety of 25.68 and a maximum displacement of 1.371×10-2 mm, both indicating minimal concern regarding the device's ability to withstand the expected loading conditions.

- Pressure was the same as the force (solidworks does evenly distribute a single force over the area)
- · was able to get rid of the exaggeration of the deformation of the device (changed the results scale to 1 instead of 8000)
- · used online data for pine wood mechanical properties

GRACE NEUVILLE - Nov 17, 2025, 7:04 PM CST



Download

Study_Final-Static_1-2.pdf (1.2 MB)



Setup/Takedown at Nadine's Home 11/19/2025

Sara Mlodik - Nov 20, 2025, 11:46 AM CST

Title: Testing at Nadine's Home

Date: 11/19/25

Content by: Sara

Present: Grace, Sierra, Sara

Goals: Determine the time it takes to setup/takedown the ramp/platform assembly

Content:

Compacting ramp:

• 12.08

• 12.44

• 9.72

• Average: 11.413 seconds

Setting up ramp

• 15.97

• 16.61

• 14.64

• Average: 15.74 seconds

Conclusions/action items:

This revealed that the setup/take down is within our goals and the system will be easy for caregivers to use.



Final Testing at Nadine's Home 12/1/2025

Sara Mlodik - Dec 04, 2025, 8:36 AM CST

Title: Final Testing at Nadine's Home

Date: 12/1/2025

Content by: Sierra

Present: Sierra, Sara, Katie

Goals: Complete final testing and make sure no adjustments to prototype are needed

Content:

- We were able to complete more trials of the stability testing to ensure the side tracks were completely stable and the legs were not moving while in use
 - Nadine walked on the treadmill for 7 minutes and 30 seconds straight at speed 1.0 to 1.3 mph (the speed she normally
 uses it at), and the legs underneath the side tracks did not move at all
 - This shows that the horizontal bars add stability when the treadmill is in use, even though the side tracks are actually attached to the treadmill itself
- We also completed more rounds of the ease of use testing, which included setting up the ramp for use and putting the ramp in the storage position
 - these trials mostly consisted of two people working together to set it up and take it down
 - We did one set of trials with just Sara setting everything up and taking it down for storage, and it was able to still be done in
 a reasonable amount of time (under twenty seconds on average to either set up or store the device) which exceeds the
 PDS criteria of 5 minutes
 - the device was quicker to set up/take down with two people, but can still be done relatively easily with one person

Conclusions/action items:

The team is now done with fabrication and testing of the prototype. The team will prepare for the final presentation and working on the remaining final deliverables. We will also arrange a final meeting with the clients to drop off the prototype at their home.



GRACE NEUVILLE - Dec 08, 2025, 5:58 PM CST

Title: Stability Testing

Date: 12/8/2025

Content by: Grace

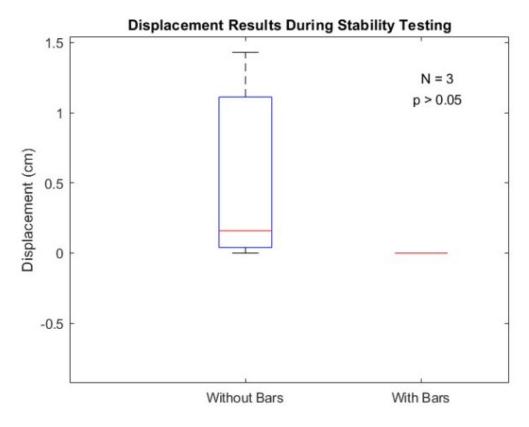
Present: n/a

Goals: Create MATLAB code to analyze the stability testing results.

Content:

hold off

```
Stability Testing BME 300
clear; clc; close all;
groupA = [1.43, 0.159, 0]; % without bars
groupB = [0, 0, 0]; % with bars
[h, p] = ttest(groupA, groupB);
meanB = mean(groupB);
meanA = mean(groupA);
figure;
hold on
boxplot([groupA'; groupB'], [ones(3,1); ones(3,1)*2]);
ylabel("Displacement (cm)");
xticklabels({'Without Bars', 'With Bars'});
yticks(-0.5:0.5:1.5);
text(2, 1.25, 'N = 3');
text(1.95, 1.1, 'p > 0.05');
title('Displacement Results During Stability Testing')
```



Conclusions/action items:

After performing a t-test between the groups, it was found that there was no statistical significant difference. However, because the displacement without the horizontal bars exceeded the displacement threshold, the horizontal bars can be concluded as necessary for maximum stability of the device. In order to provide more statistical evidence, additional testing should be performed in the future, with a larger sample size.

GRACE NEUVILLE - Dec 08, 2025, 6:04 PM CST

Title: Ease of Use Testing

Date: 12/8/2025

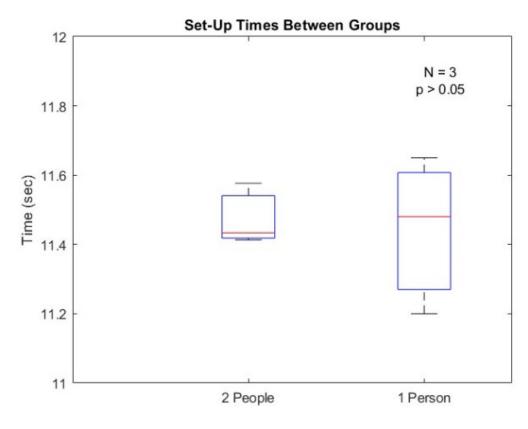
Content by: Grace

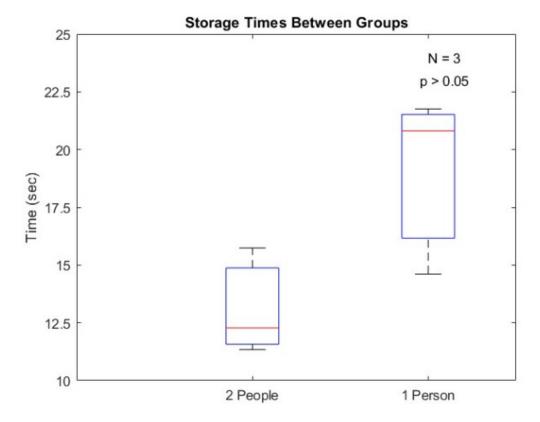
Present: n/a

Goals: Create MATLAB code to analyze the results from ease of use testing.

Content:

```
Ease of Use Testing BME 300
groupA = [12.08, 12.44, 9.72];
groupA2 = [15.97, 16.61, 14.64];
groupB = [12.89, 13.16, 8.68];
groupB2 = [11.59, 11.91, 13.33];
groupC = [12.61, 11.66, 10.03];
groupC2 = [11.56, 11.40, 11.06];
groupD = [11.48, 11.65, 11.20];
groupD2 = [20.81, 21.76, 14.61];
group = [mean(groupA), mean(groupB), mean(groupC)];
group2 = [mean(groupA2), mean(groupB2), mean(groupC2)];
mean_g = mean(group)
mean_g2 = mean(group2)
mean d = mean(groupD)
mean_d2 = mean(groupD2)
[h, p] = ttest(group, groupD);
[h2, p2] = ttest(group2, groupD2);
figure;
hold on
boxplot([group'; groupD'], [ones(3,1); ones(3,1)*2])
ylim([11 12]);
yticks(11:0.2:12)
xticklabels({'2 People','1 Person'});
text(2, 11.9, 'N = 3');
text(1.95, 11.85, 'p > 0.05');
ylabel('Time (sec)');
title('Set-Up Times Between Groups');
hold off
figure;
hold on
boxplot([group2'; groupD2'], [ones(3,1); ones(3,1)*2])
ylim([10 25]);
yticks(10:2.5:25);
xticklabels({'2 People', '1 Person'})
text(2, 24, 'N = 3')
text(1.95, 23, 'p > 0.05')
ylabel('Time (sec)');
title('Storage Times Between Groups');
hold off
```





Conclusions/action items:

The t-test concluded that there is no significant difference between the group sizes, indicating that the setting up and storage procedure can easily be done by one caregiver. Ultimately, reducing the steps needed to set-up and store away the device makes it easier and quicker to use whether it is done by one or two caregivers.

GRACE NEUVILLE - Sep 18, 2025, 3:08 PM CDT

Title: PDS Version 1

Date: 9/18/2025

Content by: team

Present: team

Goals: Combine all of the current design specifications highlighted by our client into one document. Support numerical values with credible research.

Content:

View pdf attached below.

Conclusions/action items:

Meet with our advisor to discuss PDS improvements. Continue to add to the PDS as new specifications arise. Begin working on designs and a design matrix that fits these specifications.

GRACE NEUVILLE - Sep 18, 2025, 3:08 PM CDT



Download

Step_Masters-PDS-version1.pdf (302 kB)

SIERRA LOOSEN - Oct 04, 2025, 4:47 PM CDT

Title: PDS Version 2

Date: 10/4/25

Content by: Sierra

Present: N/A

Goals: Update the first version of the PDS

Content:

The first version of the PDS was updated to include properly formatted and numbered citations, remove duplicate citations, and add in specific dimensions and weights.

Conclusions/action items:

The PDS will continue to be updated by the team throughout the semester. Once fabrication begins, the team will use the PDS as a reference to ensure the prototype is meeting the client's expectations. The team will also use the PDS once testing begins to ensure it can hold the expected amount of weight and still be operational.

SIERRA LOOSEN - Oct 04, 2025, 4:52 PM CDT



GAIT TRAINER WITH TREADMILL

Риплиния Распист Винич Бисличноск

Fall 2025 BME 200 300 Lab 302

Team Name: Step Masters

Team Merabers:

Gince Neuvill (Tens Leader) Sierra Lossen (BSAC) Julio Shekhik (Communicator) Katelyan Johnson (BPAG) Sara Mlodik (BWIG)

> Amando Pajerski Advisor: Dr. Randolph Ashton

18 September 2025

Download

Step_Masters-PDS-version2.pdf (301 kB)

GRACE NEUVILLE - Oct 09, 2025, 2:31 PM CDT

Title: Preliminary Report

Date: 10/9/2025

Content by: Grace

Present: n/a

Goals: Document our preliminary activities into a formal report. This report must include background information for the project, our design process so far, future testing and fabrication plans, as well as a discussion of important considerations.

Content:

see pdf below

Conclusions/action items:

Continue to add and make changes to this document throughout the design process. Share our preliminary report with our client and advisor to receive feedback.

GRACE NEUVILLE - Oct 09, 2025, 2:31 PM CDT



GAIT TRANER WITH TREADMILL

PRILATIVALY RIPORT

FEEL 2025 BME 2002-00 Lab 302

Truin Nature
Step Misters

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Sieth Loose (BSAC)
July Sheckia (Contractand BMC)
Step Misters

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Advisor.

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Download

Step_Masters-Preliminary_Report_.pdf (8.24 MB)

Julia Shefchik - Nov 07, 2025, 12:02 PM CST

Title: Show and Tell

Date: 10/31/2025

Content by: Julia Shefchik

Present: Grace, Sierra, Katie

Goals: Present our progress to the other teams and ask for feedback

Content:

The file attached to this entry is our notes and feedback from the other teams

Conclusions/action items:

The team received valuable feedback on attachment methods of the tracks to the treadmill, non-slip materials to use, and advice on fabrication of the treadmill. The team plans to move forward on fabricating the sidetracks while also looking to source materials to prevent scratching of the ramp on the floor and to attach the sidetracks to the treadmill. An idea that was brought up was somehow attaching the sidetracks to the bars at the top of the treadmill which is something the team had not previously considered.

Julia Shefchik - Nov 07, 2025, 11:58 AM CST

Elevetor pitch: • We have creating a device to allow a worran to use her gail trainer with her breadmill • We have modeled the entire design in Sold/Mode and have completed load testing to ensure all ports are storag enough • Last week we began februraging the side tracks and received the pre-fibricated ramp, we are still waiting for the adjustable legs to answe Guessifons we want to saik other groupe: 1. Whire trying to figure cut the best way to secure the side tracks to the treadmill in case, earth support is needed. Down these any times for an attachment method? 2. We are solding that a material to gut under the namp to prevent sociation gold the focc. We are training of infolders if in mans, to you have any begans. 3. We taked with staff in the stop about sorwing in the side walls, they felt the side walls execution to be storag enough, it stems and flower way we could do the side walls to make the storage cough, it stems and flower way we could do the side walls to make the staff of the first the staff of the staff of the side walls. Outsides ! Outsides ! • Adapt to side same on the treathall and secure it undermeath • Two statching is define part (water skil) • Sequence -clamps - like those seem in the woodshop • Something in the flow that arrange on the world ben in the final • Make better of wooden piece have material that reduces movement • Hooks that was the first arrange on the world ben in the final Costote 2: • Circley address raise, not slip while in use • What is gut undermeath what • Not the same it thinks • Note that an a staff or the world • Residue as the start was the same to • Note the same in the same • Make the side arranger or through the same of the same of

Download

Show_and_Tell_Notes.pdf (276 kB)

SIERRA LOOSEN - Dec 06, 2025, 11:08 AM CST

Title: Final Poster

Date: 12/6/25

Content by: Step Masters

Present: N/A

Goals: Present the project via the final poster

Content:

See attached

Conclusions/action items:

The final prototype was completed and tested. The information gathered throughout the semester was then compiled and presented at the final poster session. The design satisfies the client's and patient's needs.

SIERRA LOOSEN - Dec 06, 2025, 11:04 AM CST



Download

Final_Poster_-_Step_Masters.pdf (2.77 MB)

GRACE NEUVILLE - Sep 24, 2025, 12:10 PM CDT

Title: Gait Trainer Importance

Date: 9/24/2025

Content by: self

Present: n/a

Goals: Understand how gait trainers used with treadmills may affect physiological conditions.

Content:

- Robot-assisted gait training incorporates the use of an exoskeleton with a treadmill and a body weight support
- RAGT allows patients to undergo rehab in a tailored, repetitive manor and for therapists to quantitatively assess their performance
- The study aimed a assessing the effects of the assistance of a treadmill-based exoskeleton (Lokomat) on the biomechanics of 5 healthy participants
- walking with the lokomat mostly resembles free gait patterns with high gait speed and without body weight support

Citations:

[1] F. D. Tommaso, F. Tamburella, M. Lorusso, L. Gastaldi, M. Molinari, and N. L. Tagliamonte, "Biomechanics of Exoskeleton-Assisted Treadmill Walking," *PubMed*, pp. 1–6, Sep. 2023, doi: https://doi.org/10.1109/icorr58425.2023.10304685.

Conclusions/action items:

Gait trainers are important for rehabilitation and using them with a treadmill enables therapists to quantitatively assess their performance. The study was not broad enough to claim statistical significance, but it claims that gait patterns may not vary much between use of a RAGT and free gait.

GRACE NEUVILLE - Sep 24, 2025, 12:11 PM CDT

Biomechanics of Exoskeleton-Assisted Treadmill Walking

F. Di Tommuse^{1,7}, F. Tambuetlar², M. Lomsor², L. Gustakh², M. Molimari², N. L. Tagliamoric^{1,2}

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I. INTRODUCTION

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Download

Biomechanics_of_Exoskeleton-Assisted_Treadmill_Walking.pdf (1.59 MB)

GRACE NEUVILLE - Sep 17, 2025, 6:02 PM CDT

Title: Portable Ramp Types

Date: 9/8/2025

Content by: self

Present: self

Goals: Learn more about what kind of portable ramps are already on the market. Determine advantages and limitations of each in relation to our project.

Content:

There are 4 main types of portable ramps: telescopic, rollable, foldable, and scissors.

TELESCOPIC	ROLLABLE	FOLDABLE	SCISSORS
U.S. Patent No. 20,130,028,693 A1, 2013	U.S. Patent No. 7,958,586 B1, 2011	U.S. Patent No. 20,020,108,190 A1, 2002	Patent No. 20,110,072,596 A1, 2011
U.S. Patent No. US5813071 A, 1998	U.S. Patent No. 20,060,214,456 A1, 2006	U.S. Patent No. 20,090,300,860 A1, 2009	
U.S. Patent No. US5312149, 1994	U.S. Patent No. 6,643,878 B2, 2003	U.S. Patent No. 6,378,927 B1, 2002	
	Patent No. 20,020,088,065 A1, 2003		

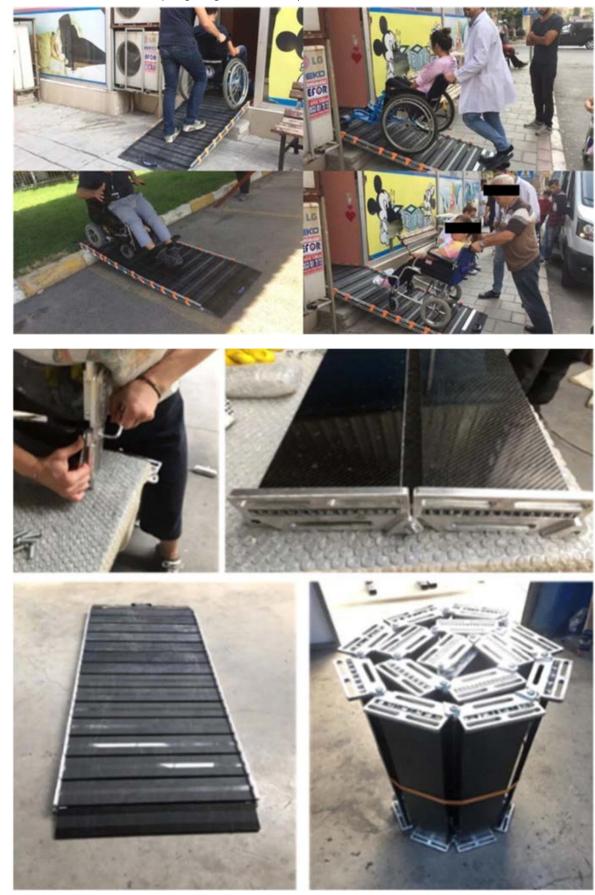
Telescopic portable ramps consist of hollow members that slide into and out of each other for use.

Rollable portable ramps consist of chain-linked members that rotate about a connection point.

Foldable portable ramps consist of hinged panels that deploy in a jack-knife fashion.

Scissor portable ramps consist of members that rotate about an axis to stretch and condense the members in a scissor fashion.

In this study, 8 wheelchair users with ages from 13-40 years old were interviewed. It was found that the most desirable features for them for a portable ramp were lightness, ease of deployment, transportation and installation, and compactness. During production of this study's improved design for a rollable ramp, they used the smallest enclosing circle algorithm. The ramp plates were made of aluminum honeycomb and carbon fiber sandwich composites to provide high load bearing capacity and lightness. For ease of transportation a handle was placed at the end of the ramp.



Citations:

[1] E. D. Kumtepe, A. N. Başoğlu, E. Corbacioglu, T. U. Daim, and A. Shaygan, "A smart mass customization design tool: a case study of a portable ramp for wheelchair users," *Health and Technology*, vol. 10, no. 3, pp. 723–737, Jan.

2020, doi: https://doi.org/10.1007/s12553-019-00400-w.

Conclusions/action items:

The rollable portable ramp seems to be the most compact, but the most complicated to fabricate. The foldable seems to be the easiest to fabricate, but not the most compact. The telescopic seems to be the most stable but may have bumps due to the different sections. The scissor ramp would not be ideal for this project due to the large holes (the gait trainer wheels may get stuck) and complex design. During next team meeting I will share these findings with my team and continue to discuss pros and cons of each type. I will begin brainstorming new ways to approach a portable ramp/ how these designs may be changed to fit our project.

GRACE NEUVILLE - Sep 08, 2025, 4:29 PM CDT



Download

s12553-019-00400-w.pdf (3.2 MB) A Case Study of a Portable Ramp for Wheelchair Users

GRACE NEUVILLE - Sep 17, 2025, 5:59 PM CDT

Title: Gait Trainer Market

Date: 9/17/2025
Content by: self

Present: N/A

Goals: Research what the current gait trainer market is to understand what the demand would be if this product were to be mass produced.

Content:

The gait trainer market is expected to grow significantly in the next 10 years due to an increasing elderly population, prevalence of mobility disorders, and need for rehabilitation devices

Citations:

[1] M. Faizullabhoy, "Gait Trainer Market Size - Regional Outlook, Application Potential, Price Trends, Competitive Market Share & Forecast, 2025 - 2034," Global Market Insights Inc., May 2025. https://www.gminsights.com/industry-analysis/gait-trainer-market (accessed Sep. 16, 2025).

Conclusions/action items:

Include this information in my section of the PDS. This will be put under Quantity. Due to the gait trainer market being high and increasing, it can be assumed that the product would need to be massed produced to meet high demands.

GRACE NEUVILLE - Sep 17, 2025, 6:04 PM CDT



Download

Gait_Trainer_Market_Size_Share_Statistics_Report_2025-2034.pdf (1.04 MB)

GRACE NEUVILLE - Sep 17, 2025, 1:26 PM CDT

Title: ADA Ramp Standards

Date: 9/7/2025

Content by: Self

Present: Self

Goals: Research ADA Standards on ramps to determine what limitations there are to what the dimensions of our ramp can be in order for it to be accessible and safe.

Content:

405.2

The maximum slope ratio can be 1:12. 1 unit of height per 12 units of length.

405.3

The maximum cross slope ratio is 1:48.

405.4

The run and landing surfaces must be firm, stable, and slip resistant.

405.5

The ramp must be 36 inches of width minimum.

405.6

The height of a ramp can be a maximum of 30 inches per run.

405.7

There must be level landings at the top and bottom of the ramp.

405.8

There must be handrails on both sides if the height is greater than 6 inches.

Citations:

[1]U.S. Access Board, "U.S. Access Board - Chapter 4: Ramps and Curb Ramps," www.access-board.gov. https://www.access-board.gov/ada/guides/chapter-4-ramps-and-curb-ramps/

Conclusions/action items:

Meet with our client to determine the dimensions of the treadmill. Ensure that the ramp will follow these standards while still being able to fit on the treadmill. Continue to do research on materials to ensure the ramp is stable, slip resistant, but still lightweight.

GRACE NEUVILLE - Sep 07, 2025, 2:27 PM CDT



Plamps and curb ramps are required along accessible routes to sper changes in level greater than 1%. Elevators and, under certain specified conditions, platform lifts, can be used as an alemanity. Portions of accessible routes with running slopes steeper than 5% also must be treated as ramps.

Clear Width (§405.5) 6" min. (batween loadin

Download

ADA_Ramps_Standards.pdf (2.08 MB)

Occupational Weightlifting Requirements 9/18/2025

GRACE NEUVILLE - Sep 18, 2025, 11:04 AM CDT

Title: Occupational Weightlifting Requirements (NIOSHA)

Date: 9/18/2025

Content by: self

Present: N/A

Goals: Research the typical job weightlifting requirement. This will suffice as our device's maximum weight as it is expected for the staff to be able to be able to lift this weight.

Content:

According to NIOSH lifting equation, 51 pounds (23 kg) is the maximum load. The equation can be adjusted based on different conditions: frequency of lifting, twisting of the back during lifting, the vertical distance the load is lifted, the distance of the load from the body, the distance moved while lifting, and how easy it is to hold onto the load.

Citations: [8] T. Galassi, "OSHA procedures for safe weight limits when manually lifting | Occupational Safety and Health Administration," *www.osha.gov*, May 04, 2015. https://www.osha.gov/laws-regs/standardinterpretations/2013-06-04-0

Conclusions/action items:

The device should not need to be frequently lifted (2 times a day), there should be minimal twisting of the back, the vertical distance is minimal, the distance of the load should be minimal -- however the caregiver wants to hold it, the distance moved will vary but should be minimal, and the device should have a handle to easily be held. With all of those conditions considered, the maximum weight should be 23 kg.

GRACE NEUVILLE - Sep 18, 2025, 11:04 AM CDT



NIOSH_Weightlifting_Requirements.pdf (146 kB)

GRACE NEUVILLE - Sep 17, 2025, 5:55 PM CDT

Title: Non-Slip Coating

Date: 9/17/2025

Content by: self

Present: N/A

Goals: Research non-slip coatings that we can use for the ramp to ensure traction in the gait trainer's wheels.

Content:

ResuGrip Non-Slip Floor Coatings by Sherwin Williams

- can be used on ramps
- · follows ADA guidelines
- can be applied over a primer on metal

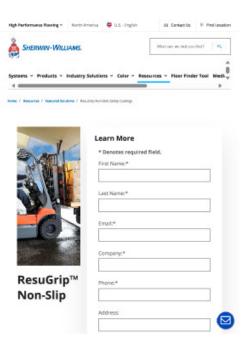
Citations:

[3]"ResuGrip Non-Skid Safety Coatings | Sherwin-Williams," Sherwin-williams.com, 2025. https://industrial.sherwin-williams.com/na/us/en/resin-flooring/resources/featured-resinous-floor-solutions/resugrip-non-slip-safety-coatings.html (accessed Sep. 16, 2025).

Conclusions/action items:

Discuss this non-slip floor coating with team and add it to the PDS as a factor to ensure the safety of the ramp.

GRACE NEUVILLE - Sep 17, 2025, 6:04 PM CDT



Download

ResuGrip_Non-Skid_Safety_Coatings___Sherwin-Williams.pdf (1.76 MB)

GRACE NEUVILLE - Nov 22, 2025, 8:18 PM CST

Title: Recommended Factor of Safety

Date: 11/22/2025

Content by: Grace

Present: n/a

Goals: Determine recommended factor of safeties for different applications to compare to the FoS results from FEA analysis of our side tracks.

Content:

FOS - Factors of Safety - Applications

Applications	Factor of Safety - FOS -
For use with highly reliable materials where loading and environmental conditions are not severe and where weight is an important consideration	1.3 - 1.5
For use with reliable materials where loading and environmental conditions are not severe	1.5 - 2
For use with ordinary materials where loading and environmental conditions are not severe	2 - 2.5
For use with less tried and for brittle materials where loading and environmental conditions are not severe	2.5 - 3
For use with materials where properties are not reliable and where loading and environmental	
conditions are not severe, or where reliable materials are used under difficult and environmental conditions	3 - 4

Conclusions/action items:

The recommended FoS range from 1.3-4 which is extremely lower than the results from FEA analysis (25.7). This means that with our application of our device, there is minimal to no concern about failure.

GRACE NEUVILLE - Nov 22, 2025, 8:23 PM CST

Factors of Safety - FOS

Factors of Safety - FOS - are important in engineering designs.

Factors of Safety - FOS - are a part of engineering design and can for structural engineering typically be expressed as:

FOS = F_M / F_{dire} (1)

where

FOS = Fout of Safety

Four = faiture load (N, b)

Example - Structural Steel Column in a Building

Due to bucking the faiture load of a steel column in a building is estimated to 10000 N.

With a safety factor FOS = 8 - the allowable load can be eathreised by searranging (1) to

Four = F_{dire} - FOS (15)

Four = (10000 N) / 5

= 2000 N

Download

GRACE NEUVILLE - Oct 06, 2025, 12:33 PM CDT

Title: Slip Testing

Date: 10/06/2025

Content by: self

Present: n/a

Goals: Determine testing methods for slip testing to ensure that our ramp surface will not cause slipping.

Content:

Determination of coefficient of friction:

Tribometer testing:

- · A walkway tribometer is a mechanical or electromechanical device
- · measures the frictional forces acting at the interaction of a walkway surface and a footwear material surface.
- · It determines the static coefficient of friction.

Human subject traction demand testing:

- · uses forceplates
- measures the vertical, lateral, and longitudinal walking forces applied to it by the human test subjects.
- these force measurements are used to calculate the traction required by that pedestrian.
- · RCOF, required COF, typically does not involve the pedestrian slipping

Human subject slip testing:

- In this testing, human test subjects walk along a slippery walkway.
- · In level walkway slip testing, a forceplate is often used to evaluate applied walkway forces at the point of slipping.
- · Ramped walkway slip testing is also done, in which a human test subject traverses a slippery ramp surface while the
- ramp angle is increased up to the point of slip and the friction measurement is derived from the ramp angle.

American National Standards Institute (ANSI) / American Society of Safety Engineers (ASSE) A1264.2 Provision of Slip Resistance on Walking/Working Surfaces:

- This standard suggests a slip resistance of 0.5, and states that
- traction testing shall be done using a tribometer that meets ASTM F2508 Standard Practice for Validation, Calibration, and Certification of Walkway Tribometers Using Reference Surfaces.

[1]

J. Leffler, "The Changing World of Slip-and-Fall Analysis." Accessed: Oct. 06, 2025.

Conclusions/action items:

Determine if tribometer testing is something that can be done/ if there is one available on campus. If not, create a testing protocol for simple determination of the coefficient of friction.

Session No. 550

The Changing World of Slip-and-Fall Analysis

John Lettler, PE, DFE FORCON International Atlanta, Georgia

Introduction

Pickerias fül in desions are frequently alleged to be reassed by a "slipport" well-way surface. Beilding onder, softly order, and accorded by segulations require adoptive todal may" slip accidental segulation of the surface of the

It is important to note that perfection slep-and-full tacidents may involve both forebook-obstrains adard to the polarities (randical conditions, medications, artifation, attentionnose, one) as well as curvisive demonsts of sted to the walloway continuous of functions, contaminants, themination, distractions, etc.).

Slip Events and the Shoe-Walkway Interaction

Types of Skip Events
There are two main types of pedestrian skip events that are routinely studied.

- Herds lig. This is deceased consents cause of a slip-related (id.). As the end of the swing phase
 of the order, or the landing had contain the solitone, the both olded forward. The
 solitone is declared to end to be a solitone of the both of the solitone of the both end to support in
 that of the both verifiel.
 The slip: A new lip occurs when the raining for a slip as grack off. A new lip sound sends in
 it is, there can be lay regards has donly how the both states of the cleaning lips.

Download

the-changing-world-of-slip-and-fall-analysis.pdf (179 kB)

GRACE NEUVILLE - Oct 06, 2025, 12:45 PM CDT

Title: Coefficient of Friction Determination

Date: 10/06/2025

Content by: self

Present: n/a

Goals: Learn how to find coefficient of friction.

Content:

Place the object on the track at one end and slowly lift that end to make a ramp. Record the angle, θ , at which the block just begins to slide. At this angle, the effective force of gravity acting down the ramp is just barely greater than the friction force preventing the block from beginning to slide. Incorporating the physics of friction with the geometry of the inclined plane gives a simple formula for the static coefficient of friction:

 μ _static = tan(θ)

[1] A. Balter, "How To Calculate The Coefficient Of Friction," *Sciencing*, Mar. 14, 2023. https://www.sciencing.com/calculate-coefficient-friction-5200551/

Conclusions/action items:

Use this procedure and formula to determine the static coefficient of friction of the ramp.

GRACE NEUVILLE - Oct 06, 2025, 12:45 PM CDT



Download

How_To_Calculate_The_Coefficient_Of_Friction.pdf (2.49 MB)

GRACE NEUVILLE - Sep 22, 2025, 5:01 PM CDT

Title: First Brainstormed Designs

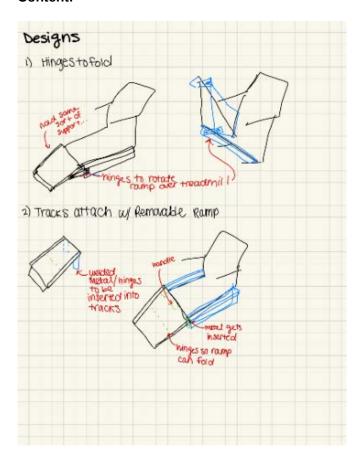
Date: 9/22/2025

Content by: self

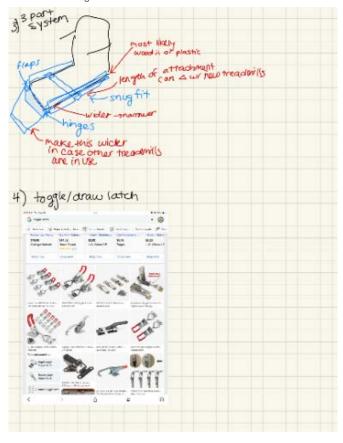
Present: n/a

Goals: Brainstorm different ideas for the project that fit the design specifications given by the client.

Content:



- 1) There is a hinge connecting the ramps and the tracks so the ramp can fold up onto the treadmill.
- 2) There are metal rectangles that can be inserted into the tracks. Then can be removed and the ramp can fold.



3) There is a support rectangle with hinges. Then a 3 part system to keep the tracks in place by a tight fit mechanism.

Conclusions/action items:

- 1) There needs to be more support under the ramp, the tracks may not be able to be folded up with the ramp.
- 2) The inserts may not provide enough support.
- 3) The system may be too bulky.

Meet with team and discuss our brainstorms. Continue thinking of design ideas.

GRACE NEUVILLE - Sep 22, 2025, 5:01 PM CDT

Title: Suitcase Ramp First Draft

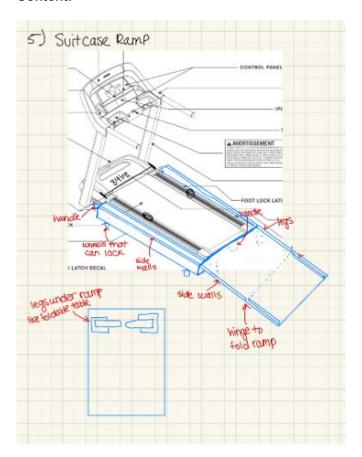
Date: 9/22/2025

Content by: self

Present: n/a

Goals: After meeting with the team, come up with a new design that improves stability of the device.

Content:



This design incorporates ideas of a foldable table and a suitcase. The ramp portion has hinges to fold, and a handle to transport it. There are foldable legs under for stability. The tracks are mobile through wheels that can lock when needed by the treadmill and then can unlocked when the tracks need to be wheeled to a corner.

Conclusions/action items:

Discuss with team at team meeting to decide if we want to move forward with this idea for the design matrix.

GRACE NEUVILLE - Sep 22, 2025, 5:05 PM CDT

Title: Suitcase Ramp Refined

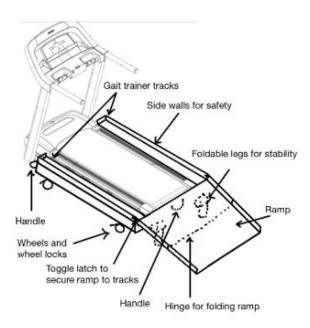
Date: 9/22/2025

Content by: self

Present: n/a

Goals: Refine the suitcase ramp design to be used for the design matrix.

Content:



Conclusions/action items:

Insert my design into the design matrix and rank it based on the criteria we chose. Begin working on the preliminary design presentation. Meet with team and client to discuss which design is the best based on preferences and design matrix.

GRACE NEUVILLE - Oct 09, 2025, 3:21 PM CDT

Title: Aluminum Hinge Ramp

Date: 10/9/2025
Content by: self

Present: n/a

Goals: Research aluminum options for our ramp that would be able to be fabricated at ECB lab.

Content:

Architectural Aluminum Sheets - Grainger Industrial Supply

						Nominal Size (WxL)
Thickness	Gauge	Thickness Tolerance	Width Tolerance	Mechanical Finish	Coating	24 in x 4 ft
0.05 in	16 ga	±0.0035 in	±0.062 in	#4	PVC	\$118.64

16 ga aluminum is able to be cut using 52" Grizzly Shear, sheet metal cutter in ECB

We would need two sheets of 24 in x 48 in

We would need to cut the length (width of our ramp) to be 32 in to match gait trainer dimensions.

The extra material could be used for aluminum channel ends. Would need to look into scraps for side guards as well as flat portion of the ramp.

The ramp would have a rise in 8 in and a run in 47.3 in which does not meet ADA guidelines of 1:12 slope ratio.

6061, American Standard, Aluminum U-Channel - 795LT0|1070_72_0 - Grainger

Aluminum channel: 6 ft (72 in) length, 5 in width, 0.19 in thick, 1 -3/4 in wall length

\$166.09

Look into other channel options, this is too long and expensive

Conclusions/action items:

Bring this idea to my team. May need to look into other options for the ramp. May need to order pre-existing ramp.

Ramp with Adjustable Legs 10/13/2025

GRACE NEUVILLE - Oct 13, 2025, 1:01 PM CDT

Title: Ramp with Adjustable Legs

Date: 10/13/2025
Content by: self

Present: n/a

Goals: Find a design alternative that can use a premanufactured aluminum ramp.

Content:

AlumiLite HD Folding Curb Ramp | alumiramp

Folding Curb Ramp | 32" Wide | Portable Ramp by Alumiramp



Figure 1. AlumiLite HD Folding Curb Ramp by AlumiRamp.

MODEL	SIZE	WEIGHT	WEIGHT CAPACITY
ACRHD3F	32" W x 3' L	26 lbs.	600 lbs.
ACRHD4F	32" W x 4' L	34 lbs.	600 lbs.
ACRHD5F	32" W x 5' L	42 lbs.	600 lbs.
ACRHD6F	32" W x 6' L	50 lbs.	600 lbs.

Table 1. Design specs for AlumiLite portable ramp.

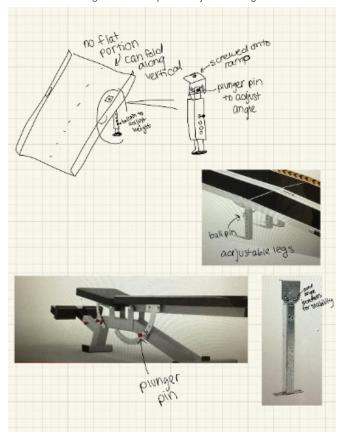


Figure 2. Ramp adjustable legs design. Adjustable Single Leg Support 15"-23"H for UNEX® Curved Conveyors. Bing Videos.

The adjustable legs will use 0.5 in hole increments and a ball pin to adjust the height.

A change in 0.5 in in height results in only a 0.5-degree angle change. Therefore, there needs to only be one angle increment that offers a little wiggle room (a small smiley face hole).

Then there will be another hole increment that allows the leg to fully collapse and fold.

Conclusions/action items:

For the 32" W x 5' L ramp: \$349.99, this ramp meets all specifications by being under 50 lbs. and holding a weight capacity of at least 176kg. Additionally, portable ramps often have greater slopes than ADA guidelines and usually fall within 1:8 to 1:6 which this ramp would.

If we choose to move forward with this design. We will look into materials needed and will order them this week.

GRACE NEUVILLE - Sep 24, 2025, 12:14 PM CDT



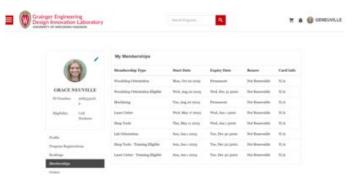
This certifies that Grace Neuville has completed training for the following course(s):				
Course	Assignment	Completi		
2023-24 HIPAA Privacy & Security Training	HIPAA Attestation	9/27/2024		
2024-2025 HIPAA Privacy & Security Training	2024-2025 HIPAA Privacy & Security Training	10/25/2024		
Blosefety Required Training	Blossfety Required Training Quiz 2024	9/3/2024		
Chemical Safety: The OSHA Lab Standard	Final Gutz	9/2/2024		
UW Human Subjects Protections Course	Basic/Rafresher Course - Human Subjects Research	10/22/2024		

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GRACE NEUVILLE - Oct 21, 2025, 11:24 AM CDT



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WoodshopTraining.png (202 kB)

GRACE NEUVILLE - Sep 10, 2025, 2:03 PM CDT

Title: Lecture 1

Date: 9/5/2016

Content by: self

Goals: Learn about tips and tricks for job searching.

Content:

Job Search Tips

- keep track of what you do ECS tracking sheet (policy and resource page, job tracker)
- need to make sure that the source is real actual company career page, handshake, linkedin
- applying is step 1 follow-up is required (2-3 weeks*)
 - find some sort of connection, can meet with a career advisor for them to help
- any experience is good experience does not need to be the perfect internship
- add objective statement to resume for career fair, not one you apply to the job

Resume Tips

- · it is like an abstract
- · ATS proofed resume
 - make quick changes to tailer your resume to the position look for code words that you can include that show up in the job description
 - make the design projects WITHOUT years or semesters what did you do? make it unique, put most relevant first
 - Jobs organization + location, position title + dates
 - MS Word is best
 - o skills programing and manufacturing skills can be on there if they are revelant

Cover Letter Tips

- · ALWAYS based on the job posting
- CUSTOM to each job
- · combine experiences into the cover letter
- 2-3 things you want them to know
- · clear and concise
- address to person
- recommended if it helps then yes put it in!
- Outline
 - intro who you are, what you are applying for, how you found it, A, B, why this employer/ closing statement

Career Fair Advice

• identify your purpose - internships, exploring, finding connections, find alumni

- biomechanical overlaps with mechanical engineering make a point to show how you are above and beyond the regular mechanical engineer
- research the employer
- develop your "value added" statement why you?

Industries related

- · biotech & life sciences
- design
- healthcare
- · medical devices
- · manufacturing
- pharmaceuticals

Conclusions/action items:

Cater your resume and cover letter to the job you are applying to. Make connections or follow up with someone in recruiting. Become prepared with a list of things that make you unique.

GRACE NEUVILLE - Sep 17, 2025, 2:03 PM CDT

Title: Grace Neuville

Date: 9/17/2025

Content by: self

Present: self

Goals: Learn more about leadership and qualities that make a good team.

Content:

Do you consider yourself a leader?

I would say yes, but I still have room for improvement. I want to gain more confidence in my abilities to be a leader. I feel that I am great at inclusivity, but I also want more confidence in myself.

What do you feel are important qualities of an effective leader?

- 1. inclusive
- 2. confident
- 3. approachable
- 4. flexible
- 5. determined
- 6. open-minded

Anatomy of a good leader:

- 1. Self-awareness: understand your strengths and weaknesses
- 2. Vision: provide direction
- 3. Transparent: clear processes and open to feedback
- 4. Communication: articulate goals
- 5. Decision-making: final decider
- 6. Empathy: able to understand and connect

Levels of leadership

- 1. personal- self- awareness and management, competency, goals
- 2. interpersonal- active listening, building trust, engaging
- 3. team- facilitate team interactions, support others'
- 4. organizational- "CEO" collaborate beyond individual teams, improve culture of entire group

Self-assessment tools can help you grow your self-awareness and awareness of others

- 1. CliftonStrengths- Gallup
- 2. Myers-Briggs (personality traits)
- 3. DiSC (behaviors)

Leadership Styles:

1. Power Model

- 1. "Someone has to take control", only certain people are born to lead, being in control is the most important thing, hierarchy, authority
- 2. Servant our model for our design project
 - 1. "It's not about me", being in service to others, sharing power, listening, understanding, empathetic, empowering
- 3. Authentic also my model for our design project
 - 1. "being my genuine self", building self esteem, emotional intelligence, creating authentic relationships, transparency, genuineness, honesty

4. Discussion:

- 1. Power: in my engineering EXPO club there is a hierarchy: Executive board -- Chairs -- Committee members, executive board gets final say
- 2. Servant and Authentic: all of my design projects have been this style of leadership, roles are shared amongst the group, and we build genuine relationships with one another. These are the type of leadership models I hope to follow this semester.

According to my Clifton Strengths I would be process-oriented, but I feel that I am also people-oriented. I love getting things done efficiently and am constantly productive. Also, I love making an inclusive environment because I know what it is like to not feel included.

Be sure to self-assess, observe and reflect, seek out feedback when figuring out how you want to lead.

Goal Setting:

1. I want to increase my confidence in decision-making. I will practice this skill by asking the team for their opinions and then giving my final thoughts. From there, the team can go into further discussions, but at the end, I will have the final decision say. Success would look like I am more confident in my ideas. Even if others disagree with my decisions and we have to veer in a different direction, I want to portray my decisions with confidence.

Conclusions/action items:

Continuously strive to accomplish my goal of increasing my confidence in decision-making. Continue to self-reflect on myself as a leader to be sure that the team dynamic is the best it can be.

GRACE NEUVILLE - Sep 24, 2025, 2:07 PM CDT

Title: Lecture 3 - Near Peer Mentoring

Date: 9/24/2025

Content by: self

Present: n/a

Goals: Learn more about what it takes to be a good mentor.

Content:

Why are you mentoring BME 200 students?

- It helps the mentees feel welcomed into the BME department now that they have met progression
- It helps us develop confidence, leadership, and communication skills
- Provides us with career development by working in teams with people with varying skill level
- We are more approachable for mentees and can share our experiences
- Mutual benefits (transferrable skills)

Transferable/portable skills

- leadership
- · communication
- active listening
- · study practices
- self-awareness
- interpersonal skills

General Benefits of Mentoring

- · increased self esteem
- · increased patience
- · foster personal growth

What does it mean to be a "good mentor"?

- delegating tasks/ doing the tasks with the mentees so they learn
- · encouraging them to ask questions
- creating a welcoming environment
- building trust, psychological safety, reliability, support/enthusiasm, being available, transparent, humanizing their challenges (be the coach), good listening

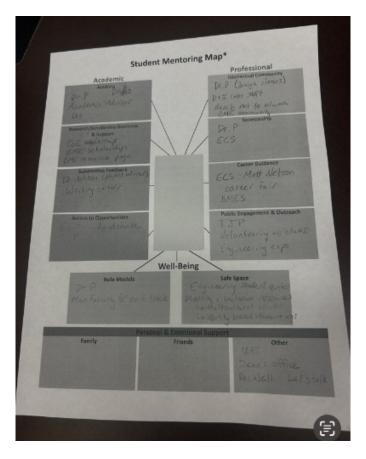
Listening effectively

- · get rid of distractions
- stop talking
- · act like you're interested

- · look at the other person get the main idea
- ask questions
- · check for understanding
- react to ideas, not to the person
- avoid hasty judgments

What do you wish you knew in BME 200?

- know that things won't go right the first time and that is ok
- the semester goes by quickly and really picks up pace at the end
- BME canvas page and BME track course selections



Conclusions/action items:

Implement these skills when meeting with my team. Make sure that if they have any questions, they feel that they can ask. Show our team the map.

GRACE NEUVILLE - Oct 01, 2025, 2:07 PM CDT

Title: Lecture 4

Date: 10/1/2025

Content by: self

Present: n/a

Goals: Learn more about sustainability in biomedical engineering.

Content:

Circular Economy:

When is recycling worth it and when is it not worth it?

Life cycle Assessment:

- gives a quantitative assessment of the environmental impacts of certain devices
- · without biases

Environmental payback period

- where two separate conditions are equal
- · metal: takes longer to manufacture, but is reusable
- plastic: easier to manufacture, but is not reusable
- how often do you need the device? is it easy to obtain the non-reusable ones?

Assess risk of infection and easiness to clean to determine if a device can be reused

How do we use these tools to engineer a more sustainable world?

Look at environmental and economic impacts.

Conclusions/action items:

Look at the environmental impact of our project. Be sure to only order the material amounts necessary for production. Do small prototyping before creating final design to be sure that the final design will work to reduce waste.

GRACE NEUVILLE - Oct 08, 2025, 2:02 PM CDT

Title: Lecture 5

Date: 10/8/2025

Content by: self

Present: n/a

Goals: Learn more about the patent process and how we could potentially apply them to our project.

Content:

Introduction to WARF, IP, Disclosing & Licensing

WARF: mission to protect designs created on campus

Technology transfer: help identify innovations that students are making and see if it can be applied to real world and new products

invention, invention disclosure, assessment, protection, marketing, licensing, financial return

Intellectual property:

- Four common types: patents (inventions/innovations), copyrights (inventions/innovations), trademarks (invention is in commerce), trade secrets
- other: biomaterials (tangible materials that may not reach patent), technique and know how (additional insights to implement technology commercially), data (research results)

Non-Patent IP:

- · copyrights: creative works (music, movies, software code, surveys) not time sensitive
- trademarks: names, marks, logos, dress (requires use in commerce, source-identifying function, protects consumers know what they are getting is real)
- trade secrets: value because they have secrets (recipes) used to protect anything of value

Patents:

- · property right, granted by a governmental agency
- Patent holder has the right to exclude others from making, using, selling, or importing the claimed invention
- Three different types of U.S. patents:
 - design (15-year term, limited to ornamental features)
 - plant (new variety, 20-year term, asexually reproducing, non-tuber)
 - utility

Utility (non-provisional) Patents:

- · new and useful process, machine, manufacture, or composition of matter
- · 20 years from filing
- often takes 2-5 years to issue after filing (patent examination)

- costs, on average, \$30K mostly attorneys' fees (WARF covers)
- ~90% of patents issued by USPTO are non-provisional utility patents

Requirements for patenting:

- 101 eligible, cannot be a product of nature, abstract idea, or natural phenomenon
- 102 novel, it must be new
- 103 non-obvious, it cannot be simple modification or combination of existing concepts
- 112 enabled and described, must provide enough detail to teach others how to make or us the invention

Disclosing an innovation to WARF

- · Disclosing:
 - o describe the innovation
 - identify its advantages and potential application
 - name contributors (inventors, authors)
 - provide funding and public disclosure details (disclosure needs to be within less than one year within filing patent)
- · Meeting with WARF:
 - o discuss the innovation in more detail
 - ask questions about WARF and patenting processes
 - discuss next steps

Assessing university inventions:

- IP Considerations:
 - type of IP protection
 - potential breadth and strength of IP protection (broader the better)
 - public disclosure (past and planned)
 - stage of development (sketch or fully refined prototype)
- Licensing Considerations:
 - applications (start-up company)
 - likelihood of identifying a commercial partner
 - likely return from licensing

Marketing and Licensing:

- Market analysis: market status, size and type, potential licensees
- License negotiation: types and terms, consideration (how much return would we be getting)
- Ongoing: technology development, enforcement, amendment, termination (create a development plan)

Value of Licensing:

- Benefits to the company:
 - reduced R&D costs
 - improved time to market
 - opportunity to enter new markets
 - new features and technologies provide revenue opportunities
- · Determining the value:
 - technology application
 - key selling points

- technology trends
- market size, trend, competition
- industry standards/historical deals

Al and intellectual property:

- Patents:
 - Al cannot invent, inventor = natural person, conception
 - Al can help you, but Al is not an inventor
 - global approach (not in South Africa)
- Copyright:
 - o original works of human authorship

Conclusions/action items:

Discuss with team if we are interested in disclosing our device to WARF. Determine if it is patent eligible/ non-obvious.

GRACE NEUVILLE - Oct 15, 2025, 2:09 PM CDT

Title: Lecture 6

Date: 10/15/2025 **Content by:** self

Present: n/a

Goals: Learn more about the legal side of engineering and intellectual property process.

Content:

Legal Career Paths for Engineers in IP:

- technical advisor (STEM degree): researching to see if the invention already exists, fun to see ground-breaking innovations, learn what technology is out there/what interests you
- patent agent (STEM degree + patent bar): can sign documents, have interviews, "mini lawyer"
- patent examiner (STEM degree + patent bar eventually): wants the smallest "fence", multiple small patents (makes them more money)
- patent attorney (Law degree +patent bar): can chose what clients you want large companies vs start-ups
- patent litigator (law degree): busy, evaluate loss in profits and damages
- · IP license attorney (law degree): negotiations
- tech transfer manager: (STEM degree): business side, determining what goes to market

Skills from Engineering to IP:

- research
- · analytical reasoning
- · technical writing: translate complex technical concepts into clear, precise language so it is easy for everyone to understand
- · communication
- · creativity: problem-solving in patents and creating competitive products
- collaboration
- · project management

Intellectual Property Ownership in the Biomedical Industry:

- · University: disclose before publishing, university usually owns IP, possible license opportunities
- Company: employer typically owns inventions, review employee agreements, know the scope of your employment
- Startup: you own IP, file early, use NDA before disclosing anything, document development, have a patent on file

Timing and Publication:

- · disclose internally first
- publishing before filing and offers for sale = lost patent rights abroad and possible loss of rights in the US (typically have a year after first publication)
- · posters or abstracts can count as public disclosures (school posters but still have 1 year grace period)
- · first to file system (not first to invent)

Legal and Ethical Duties of Engineers:

- Respect others' IP
- · keep invention notebooks, dates, information, says you are the inventor
- understand inventorship vs. authorship- authorship is for those who aided in invention but did not substantially contribute to the invention on the patent
- · maintain confidentiality agreements

What makes an invention patentable?

noveltv

- non-obviousness
- · utility -must work (do not need an actual prototype, just have an extensive fabrication process/plan)
- · enablement

What is a patent?

- creates a monopoly/stops others from making, using, selling or importing the invention
- Two types: utility patents (20 years) covers the works of the invention, design patents (15 years) covers the visual appearance

Parts of a patent:

- · weird language
- · components of the patent

can still be patentable even if you infringe another patent, addition of one new change but still could be within the fence of another patent Important to know what type of protection your invention needs to keep it safe.

Presenter: Anrea L. Arndt

aarndt@dickinson-wright.com

Conclusions/action items:

Having an engineering background is helpful in the legal side of innovations. Having creativity and problem-solving skills will set you apart in the patent world. Looking into pre-existing inventions will help you understand what changes could be made or what technology you want to work in.

GRACE NEUVILLE - Oct 22, 2025, 2:01 PM CDT

Title: Lecture 7

Date: 10/22/2025

Content by: Grace

Present: n/a

Goals: Learn more about the post-grad programs available and what are the requirements.

Content:

BME Advising Session Part II: Fall Post Graduate Planning

Use your undergraduate experience to "build a story"

- · research very important for post-degrees
- · gain experiences
- · figure out who you are and what you want

Do your homework

- · what does your ideal career look like?
- · connect with people who are already in your career
- · what steps does it take to get into your ideal career

Start thinking of 3 strong references who can write letters of recommendation

· give them ample time to write

Think about GRE and/or MCAT: study summer before senior year

Writing your story

- · don't do: Legos to engineer to cancer to BME, or a description of your resume
- forget that, how did you get to where you are
- What to do: say exactly what you want to do
 - Start with a thesis statement: your narrow experiences and how that applies to your broad interest specific to each position or place to which you apply
 - Personal statement

Masters, MS

- steppingstone/change directions/gain depth/expand credentials for future
 - Medical school
 - PhD programs
 - industry focused
 - o generally, one year
- · Rewrite your story: MD: need time to prep for MCAT or apply for Med schools; PhD: cannot find a foundering
- · makes you more desirable
- fill gaps in your resume
- · higher levels of skills
- · more experiences
- maturity
- · really powerful if you add in industry experience
- get paid a bit more (gap is about \$10,000)
- · can co-op during

MS options within BME

- research (1.5-2y yrs)
 - o continuing on for a PhD here
 - can be funded as RA/TA/PA (tuition remission and stipend)
 - o can co-op
 - thesis required (must have a lab PI identified and willing to support before applying ask them what projects are available
 and if they can sponsor your thesis)
- · accelerated programs (1 year)
 - · Funding (TA only) stipend only (no tuition remission \$1200/credit)
 - No co-op allowed co-ops are considered 1.5 years (internship is OK)
 - Accelerated Program (BME Masters):
 - coursework only
 - independent study/research is allowed (up to 3 credits per semester)
 - Biomedical Innovation, Design, and Entrepreneurship (BIDE):
 - project based project required (BME Design project continuity)
 - partnership with business school (can take 6-9 credits in the business school)

Applying online, pay fee and submit - Fall and spring start available:

- statement of purpose: why you want to pursue further education in BME
- research MS only: list the PI who plans to support you
- · deadline of 12/15
- need at least a 3.0 overall (automatically in)

Explore other Masters opportunities

- MEng (good for industry)
- · MS in global health
- · MS in other engineering dept. (usually takes longer)
- . MBA generally industry pays for credits or evening options (as you work your way up the ladder)

Doctoral, PhD

- · desire to be an independent researcher
- · write research grants
- · work in academia
- · lead projects in industry, startups, and consulting
- https://www.wisolve.org/

Do your homework:

- · network, follow your passion
- · build your resume/CV
- REU research is a must (Honors in Research- sum up work in a thesis and present in last semester) try to do research where you want to get your PhD
- · External funding NSF-GRFP
 - o due October ~15th, fall senior year
- Generally, >3.5 GPA and 75%tile in quantitative GRE

Pre-health requirements

- premed, check requirements early https://www.prehealth.wisc.edu/
- research is required, volunteer, shadow physicians, patient contact time, build relationships, use your design experiences, requirements vary by degree

Conclusions/action items:

I am interested in getting my MPO degree (masters of prosthetics-orthotics). UW Madison does not have this program available so I will look into which schools near Wisconsin do. I will determine what requirements are needed and ensure that I have a plan to fill all requirements. I also want to see how I can get into the UW Health OP clinic for volunteering and job shadowing.

GRACE NEUVILLE - Oct 29, 2025, 2:08 PM CDT

Title: Lecture 8

Date: 10/29/2025 **Content by:** self

Present: n/a

Goals: Learn more about medical device regulations and history of the FDA.

Content:

To regulate or not to regulate:

FDA determines risks, FDA approved (never completely safe, does not say materials are safe, just approved for certain uses)

- class I: low risk, exempt from the FDA (tongue depressor) or may need to do 510K pathway
- · class II: moderate:
 - 510K pathway (close to predicate) or De Novo 510K (no predicate, but can become a predicate) pathway
- · class III: high risk
 - · HDE (probable benefit outweighs risk) or PMA pathway (reasonable assurance of safety and efficacy)
- · General controls, special controls, and clinical data pathways

FDA did not regulate medical devices until 1976

Dalkon Shield complications lead to the creation of FDA

CDRH to oversee medical devices across different companies

Many failures and recalls of devices show the limitations and short comings of regulations.

Very early onset of Alzheimer's disease happened due to misfolded proteins from cadaveric pituitary-derived growth hormone - makes you wonder about regulations. Took 15 years to set. It is not feasible to do 15-year test before use.

Failure Mode and Effects Analysis: go through everything that could possibly happen and analyze the likelihood of it happening. Determine what component would cause this to happen.

Conclusions/action items:

There are different opinions in regard to FDA regulations, whether there are too many, not enough, or are unnecessary. There is ultimately no right answer.

GRACE NEUVILLE - Nov 05, 2025, 2:10 PM CST

Title: Lecture 9

Date: 11/5/2025

Content by: Grace

Present: n/a

Goals: Learn more about the structure of FDA, guiding product development, a "quality" manufacturing mindset, and about career opportunities.

Content:

FDA Structure

- Device (CDRH): PMA, 510(k), IDE
- Drug (CDER): NDA (new drug application), IND (human clinical trial)
- Biologic (CBER): BLA (biologics license application), IND (human clinical trial)

Advanced Therapeutics:

- · genome editing, gene delivery, cell therapy
- · considered CDER or CBER

FDA Framework:

- U.S. Laws
- · regulations (CFR Title 21)
- FDA guidance help structure clinical study, not law, more a guide to help
- · framework

361 Product

- · Homologous use: taken from the patient and put back into the patient
- · minimally manipulated
- same function (not necessarily same cell type)
- Example: take fat out and place it somewhere else for cosmetic purposes
- Don't require regulation, surgeon can use at their own discretion

351 Product

- · Biologic
- required for marketing and regulatory process
- indicated for a specific therapeutic use
- · maximally manipulated
- · different function
- marketing exclusivity for 12 years (if first in category)

Target Product Profile (TPP)

- good way to see if product is on the critical path (like a PDS)
- Core: information about the product, efficacy, safety, dose, route of administration, dose form
- Clinical Development Planning: clinical and regulatory pathways, timelines, risk, cost
- · CMC (qTPP: Quality TPP): product attributes, purity, biocompatibility, storage, container, compliance
- Patient identification, benefits, risks is it medical and commercially compelling?

How to use this TPP (use to answer these questions):

• will patients and prescribers want it? (key opinion leaders)

- · will regulators accept it? (discuss plans with regulatory agencies)
- will payers reimburse for it? (understand the evidence payers require)
- · why should I fund development? (investors)

Pathway to developing a 351-Regulated CGT

- · each step adds value for investors
- 1. non-GLP nonclinical studies and pilot tox studies
- 2. GLP Tox studies
- 3. CMC development
- 4. method (GMP) studies: manufacturing, shelf life, potency assays
- 5. phase I/II trial and phase III trial (clinical trials after IND submission)
- 6. prepare BLA submission (after TPP interact meeting, Pre-IND meeting, IND submission, EOP1/2 meeting, pre-BLA meeting)
- 7. ready to market

Quality Management:

- Quality management System: Asset management, equipment management, document management, audits & inspections, corrective & preventive actions, supplier management, training management, risk management
 - o system that documents policies, processes, internal rules, procedures, and other records to ensure consistent quality
- · Monitoring manufacturing at all different levels (looking for contamination)
- · machine, up and down stream processes, people, system, expansion, materials all effect quality

Numerous career options:

- · characterization and analytics
- · process development
- · gene delivery
- · manufacturing development

Conclusions/action items:

There are different classifications of therapeutic products (351 and 361). There are numerous steps before product can go to market: pre-clinical, manufacturability, clinical studies, and different regulatory steps with FDA. Quality is very important and there must be detailed documentation of all manufacturing processes.

GRACE NEUVILLE - Nov 07, 2025, 12:42 PM CST

Title: Tong Lecture

Date: 11/7/2025

Content by: self

Present: n/a

Goals: Learn more about the importance of engineers in healthcare systems.

Content:

Why Healthcare Needs More Engineers

Kristin Myers

Chapter #1

UW-Madison Biomedical Engineering - Medtronic - Harvard MBA - Skyline Ventures - Arboretum Ventures

Chapter #2

- · Combine EQ with IQ to multiply impact & reach
- · Aetna Chief of Staff, good business job
- · Unified Women's Healthcare

Chapter #3

- · Drive system-level impact through innovation & scale
- Hopscotch Health rural communities
- Blue Cross Blue Shield Association how do we make healthcare affordable and make patient care experiences better

Find what is important to you and take on those problems to make an impact.

Our healthcare system is broken:

- · Quadruple aim: improved provider experience, improved patient outcomes, improved patient experiences, lower cost of care
- We spend 5.3T and 18% of GDP
- We spend 2x than other countries
- and yet, fundamentally there are a lot of issues not good outcomes
- Challenges: misaligned incentives (fee for service), fragmented financing & regulation (federal, state, employer), data silos & legacy IT, inequities (10-15 yr gap between zip codes)

What if we build an integrated system to enable health and wellness for all?

- ensure care is delivered in the right place (telehealth for rural places)
- Engineers are well positioned to do it (design and systems thinking)
 - Aligned incentives and measurement: everyone rewarded for outcomes (not services), performance is transparent and known to all
 - · Human centered design
 - interoperable data infrastructure
 - · connected care delivery platforms
 - · simplified and automated infrastructure
- 1. Work hard & build range: take on the hardest projects, classes and experiences you can find. Effort and range are your foundation
- 2. Seek Diverse Exposure: explore different areas, gain perspective, learn how systems connect
- 3. Choose your people wisely: surround yourself with curious, driven, high-integrity people. They will shape who you become
- 4. Know your values & protect them: define what matters most (family/friends, health, career) and make decisions that align

5. Embrace Challenge & Keep Growing: run towards hard problems. Growth lives on the edge of discomfort - where big impact starts

Conclusions/action items:

Engineers are in the best position to improve healthcare systems. Work hard and expand your knowledge to find something you are passionate in and then tackle it.

GRACE NEUVILLE - Nov 12, 2025, 2:05 PM CST

Title: Lecture 11

Date: 11/12/2025

Content by: Grace

Present: n/a

Goals: Learn more about the purpose and process of the IRB.

Content:

IRB

Historical problems: experiments on vulnerable patients with numerous ethical problems.

Belmont report: 3 main principles: respect for persons/autonomy, beneficence, and justice

Purpose

- · protect rights and welfare of people enrolled in research
- · research cannot start until approved by IRB

Common Rule Criteria

- · risks: no unnecessary risks; unavoidable risks as low as possible
- · benefits: potential direct benefits to participants and scientific
- · risk/benefit ratio: ensure risks are reasonable in relation to the benefits
- · equitable selection of subjects
- informed consent: participants make an informed choice about taking part in research OR criteria for waiver of consent are met (example: using past medical records)
- privacy and confidentiality: adequate protections for participant privacy

Need to de-identify any identifiers by separating identifier from the subject's information.

There are different categories of research.

Non-exempt research:

- · surveys of children
- · analysis of identifiable samples
- · intervention with participants that goes beyond exempt category 3 (blood draws, blood pressure...)
- · administering drug
- device study

medical devices (anything that acts on the body to treat disease that is not a drug)

How to submit an IRB:

- · create a study in ARROW
- full review, health care records research, exemption
- amending an existing study, may submit change of protocol form in ARROW for any new or revised

IRB review process: administrative review - IRB pre-review - committee or non-committee review (may need to go to scientific review - working with cancer patients)

What happens after approval?

- begin your study
- · changes of protocol (must have approval of the change before implementing)

· progress reports

Conclusions/action items:

Research on campus needs IRB approval to ensure the welfare of the subjects. The IRB weighs risks versus benefits of the study to determine its approval.

GRACE NEUVILLE - Nov 19, 2025, 1:56 PM CST

Title: Lecture 12

Date: 11/19/2025

Content by: Grace

Present: n/a

Goals: Learn more about bringing medical devices to the market with high probability of success. Understand how NPD projects are managed and resourced.

Content:

How New Product Development Works in the Medical Device Industry: Russ Johnson, PhD

NPD

· highly regulated, very expensive, resource intense (lots of risks involved), competitive (speed-to-market is crucial)

Selecting and prioritizing projects (annually):

- strategy (how business will sustain itself over the next 3-5 years economy, political)
- portfolio review (define with product categories to develop, sustain, or eliminate)
- project review (select and prioritize projects to support over next 1-3 years)
- budgeting and resource allocation (allocate budget and resources)

Types of NPD (increasing risk and cost)

- 1. line extensions: additions to sizes and configurations
- 2. product improvements: based on market feedback
- 3. new-to-company: expanding portfolio
- 4. new-to-world: innovative and completely new (limit them to ~10%)

Stage-Gate Process (cloud-funnel-tunnel)

- · Stage 0: ideation
- Stage 1: exploration (focus ideas, seek costumers)
- · Stage 2: concept development (decide on concept)
- Stage 3: design development (make it work)
- Stage 4: design confirmation (very long, clinical testing, FDA submission)
- Stage 5: design transfer & commercialization (ensure is marketable and manufacturable)

Example: ORWell- reduce risks and make fluid collection simpler

- Stage 0:
 - case study
 - · talk to clinicians, ask questions
 - · saw exposure to biohazardous fluid and confusion
 - o customers liked it, but did not like the smell, did not get the container all clean
 - o created numerous sketches
- Stage 1:
 - o review ideas, separate into categories, reduce to 8-10 ideas
- Stage 2:
 - continue asking questions
 - $\circ\$ reduce to 1 leading concept
 - conduct comprehensive IP examination
 - o "go/no go" business decision
- Ctodo 3

- · move to functional prototype
- begin formal design control documentation (risk assessments)
- o design control: customer needs, specifications, history of design process, risk management
- Stage 4:
 - · conduct extensive verification and validation testing
 - finalize product component drawings/models
 - "Frozen design" only minor changes
 - submit regulatory documentation (FDA 510(k))
- Stage 5:
 - · complete any remaining testing
 - make final design changes
 - · ensure manufacturing feasibility
 - o create Instructions for Use (IFU)
 - finalize go-to-market strategy

Post Market Surveillance

- · monitor and document customer complaints
- · document sales

In the end ORwell was no longer marketable due to financial reasons and a similar product launch (Neptune 2)

Conclusions/action items:

Medical device development is expensive, complex, and needs numerous resources. Stage-gate is used to reduce risk and increase probability of success. Good analysis of the problem and product design + development is necessary.



11/19/2025 Injury and Mobility Devices

Julia Shefchik - Dec 08, 2025, 2:37 PM CST

Title: Injury and Mobility Devices

Date: 11/19/2025

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Learn about studied risks with mobility devices to assess if our design would be considered "safe"

Content:

- · some important considerations in this study gait belt, walker, ramp were all considered separately for injuries and risks
- · top injury pathways
 - critical component breakage
 - unintended movement
 - instability
 - o poor, uneven surface
 - · trip hazards
 - · design failure
- · statistics for injuries were reported in reviews as mentions
 - these were evaluated and named as "cases" in the article
- · the study concluded there were more injuries from gait trainers/walkers versus ramps
 - o important because we are not modifying the trainer we are modifying the ramp
- $[1\ \ \text{``Safety Concerns in Mobility-Assistive Products for Older Adults: Content Analysis of Online Reviews. EBSCO.'' Accessed: Nov.\ 20,\ 2025.$
-] [Online]. Available: https://research-ebsco-com.ezproxy.library.wisc.edu/c/x2n5kw/viewer/html/sefrg3xukj

Conclusions/action items:

The team should evaluate our prototype and ensure our prototype is free of any hazards. The team has mentioned adding a non-slip material to the bottom of the ramp which could help prevent slips and falls. In addition, the team should ensure any modifications made to the ramp are structurally sound as unintended movement and instability were some main injury pathways. The trip hazards and uneven surface have been accounted for when we planed the sidetracks and filed down sharp edges.

Julia Shefchik - Nov 20, 2025, 11:19 AM CST



large reside content analysis off those #0.8200 retained reviews by cooling them according to its jays 7(5) to be equity, potential life analysis, and may it jays 7(5) to be equity, and may it jays 7(5) to all papers potential princips of the confidence components between good or decorating in subsection of the experimental princips of the experiment o

Results: The content analysis provided a better understanding of the contents and conditions leading to user injury, as well as the severity of injuries associated with those mobility-analysis devices, letters understand-device critical controllers in these:

Download

EBSCO-FullText-11_20_2025.pdf (154 kB)

09/14/2025 Aluminum - Properties and Uses

Julia Shefchik - Sep 14, 2025, 4:25 PM CDT

Title: Aluminum - Properties and Uses

Date: 09/14/2025

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Learn more about the preferred material for this project.

Content:

The article describes some key aspects of aluminum such as weight and strength.

Weight:

"only about two and a half times heavier than water", "four times as light as silver and a little more than a quarter the weight of copper"

Strength:

"nearly as hard as iron", has great rigidity and tenacity"

Citation:

[] "ALUMINUM---ITS PROPERTIES AND USES," Scientific American, vol. 17, no. 19, pp. 292–292, 1867.

Conclusions/action items:

Since the client wants the ramp to be lighter for ease of use, aluminum seems like it would be a good material to consider. The material seems relatively light compared to other materials although the article did not mention in reference to wood which the previous ramp was made of. In addition, the article mentions that it is durable which is a necessity to be able to support the necessary weight.

Julia Shefchik - Sep 14, 2025, 4:35 PM CDT



ALUMINIUM—ITS PROPERTIES AND USES
Sources Scientific Assertion, Vol. 17, No. 19 (NOVEMBER 9, 1867), p. 202
Published by Scientific Assertion, a division of Nature Assertio, Inc.
Stable URL: https://www.jscco.org/stable/10.2307/26026166

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Download

09/14/2025 Aluminum Alloy Properties Chart

Julia Shefchik - Sep 17, 2025, 5:51 PM CDT

Title: Aluminum Alloy Properties Chart

Date: 09/14/2025

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Learn more about the specific properties of alloys to get a better understanding of the material we would like to use for our project.

Content:

Alloy	Temper	Ultimate Tensile Strength, ksi	Yield Strength, ksi	Elongation Nan ²	Brinell Hardness	Sheer Strength, ksi
	0	13	5	25	23	0
1100	H14	18	17	9	32	11
	H18	24	22	S	44	13
2011	13	35	43	n/n	95	12
	0	36	10	n/n	45	18
2017	TA.	62	40	0/0	105	-18
	1451	tw.	- 45	ava	4.5	18
	D	3F	11	20	47.	18
2624	13	70	50	18	100	41
	14, 1351	68	47	.20	120	41
	.0	16	63	80	78	11.
3003	H14	22	21	8	40	14
	HTD	29	21	4	35	16
4032	Hi	35	44,	0/0	120	48
	D	28	10	25	4/	18
5052	H82	44	78	217	6.0	20
	H58	4/	32	- 1	11	74
6013	18	40	62	11	180	36
6020	18	44	Ψ.	15	100	6/4
	0	18	8	25	10	12
6061	76.	45	.40	12	99	30
	3601	45	40	12	79	10
	0	В	7	n/a	25	10
6063	15	žī.	21	.12	60	17
	783	317	35	9	82	22
6262	19	38	-55	n/a	120	35
7068	79511	103	99	9	190	53
	0	33	15	12	60	22
7075	T0	.83	.73	11	190	40
	T651	83	73	11	190	48

Allay	Temper	Thermal Conductivity © 77° F (BTU/Te ² /in./hr.)	Electrical Conductivity (0 68° F (% of lot), Copper Standard)	Electrical Resistivity G SR* F (OhreCir. MIML)	Nominal Density (Brs./cs. in.)	
	0	1540	59	19	9.056 0.056 0.056	
1100	H14	1510	37	18		
	HIE	1510	£7	16		
2011	TS	9050	39	27	0.102	
2017	0	1340	50	21	8,101.0.181	
	34,					
	7451	830	34	31		
2024	0	1160	20	21	0.1	
	19	840	20	35	0.1	
	14.	840	20	35	0.1	
	1351	****				
3003	0	1340	59	21	0.000 0.000 0.000	
	1414	1100	at	35		
	HIG	1870	(40	36		
4092	76	960	15	13	0.007	
5052	0	960	.55	áll	1	
	H32	960	.55	33	0.067 0.097 0.097	
	HSE	980	35	33		
6013	TB	1140	1140 30		0.098	
6020	78	1190	46	11/4	0.098	
6061	0	3250	47	82		
	36.	1160	-6	24	0.000 0.000	
	7651	1160	45	24	0.091	
6063	0	1510	38	18		
	To	1450	35	19	0.067 0.087 0.097	
	183	1990	55	29		
6262	Т9	1190	41	34	0.095	
7068	76511	1/4	30	1/4	0.191	
7075	0	1/4	rela	9/4	0.181	
	Tei	900	25	àti	0.101	
	T651	900	33	31	0.101	

Citation:

[] "Alluminum Alloy Mechanical Engineering Properties." Accessed: Sep. 14, 2025. [Online]. Available: https://www.engineersedge.com/materials/aluminum-mechanical-properties.htm

Conclusions/action items:

The above chart includes relevant information on aluminum alloys which is a material the group is considering using for our project. It is important to use a lightweight material that can support our client and any other equipment. The lowest yield strength in ksi is 5, which means aluminum would be a good material choice.

Julia Shefchik - Sep 18, 2025, 9:34 PM CDT

Title: Treadmill Dimensions

Date: 09/17/2025

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Discover necessary measurements for the PDS

Content:

The T101 Horizon Treadmill has dimensions 70" x 34" x 55"

Link: What are Dimensions and Weight of Horizon Models? - Horizon Fitness

Citation: "What are Dimensions and Weight of Horizon Models?," Horizon Fitness, May 02, 2023.

https://support.horizonfitness.com/hc/en-us/articles/4402868626573-What-are-Dimensions-and-Weight-of-Horizon-Models.

[Accessed: Sep. 17, 2025]

Conclusions/action items:

The design for the ramp should be at least 34" since the client would like guard rails on the side of the ramp that continue up to the treadmill sides.

09/17/2025 Pacer Gait Trainer Weight

Julia Shefchik - Sep 18, 2025, 9:44 PM CDT

Title: Pacer Gait Trainer Weight

Date: 09/17/2025

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Find the weight of the gait trainer for the PDS

Content:

The client has the utility base option - 8.7 kg

The client has the dynamic upper option - 6.1 kg

Conclusions/action items:

The device created needs to support this weight in addition to the weight of the client.

Julia Shefchik - Sep 18, 2025, 9:36 PM CDT





Download

Rifton_Pacer_Gait_Trainer_Product_Manual.pdf (4.56 MB)



09/18/2025 Individual Preliminary Design Idea 1

Julia Shefchik - Sep 18, 2025, 10:49 PM CDT

Title: Individual Preliminary Design Idea 1

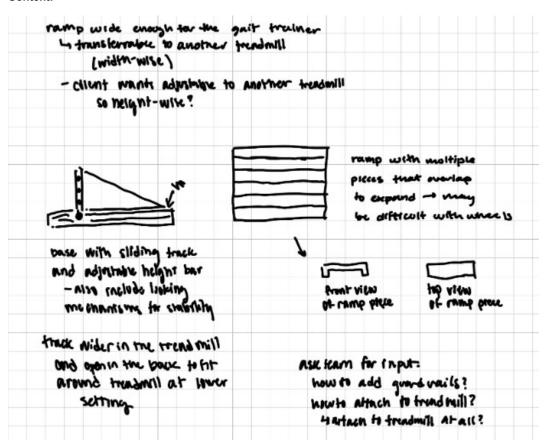
Date: 09/18/2025

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Design a preliminary idea to present to the team

Content:



Conclusions/action items:

This design solves the client's problem of wanting to be adjustable for other treadmills but may struggle to add rails to on the side. This design could also be clunky or pinch but could potentially be easily set up and taken down depending on what locking mechanism is used. Additionally, the ramp could be folded down all the way depending on final decisions for the ramp.

Julia Shefchik - Sep 25, 2025, 11:01 AM CDT

Title: Updated Preliminary Design

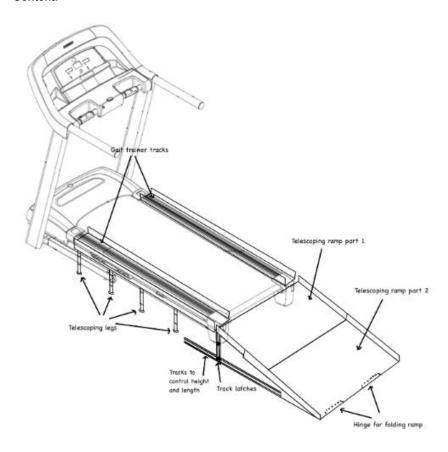
Date: 09/24/2025

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Take client and team advice to modify design

Content:



This design has tracks that are able to control the height and length of the ramp to be ADA compliant if the client would need to adjust to another treadmill with different dimensions in the future. The adjustment tracks are held in place by a screw clamp. There is a hinge at the bottom and the tracks are open to allow the ramp to fold fully flat. The gait trainer tracks are also removable and have telescoping legs that allow the height of them to be adjusted to other treadmills. The tracks are held onto the treadmill with toggle clamps.

Conclusions/action items:

The design has the adjustability features the client wants. Fabrication of these elements may be difficult and would require expert opinion. Aspects of this design can be combined with the other designs to eliminate some of the negatives of the design.

Julia Shefchik - Oct 30, 2025, 10:29 AM CDT

Title: New Folding Design Idea

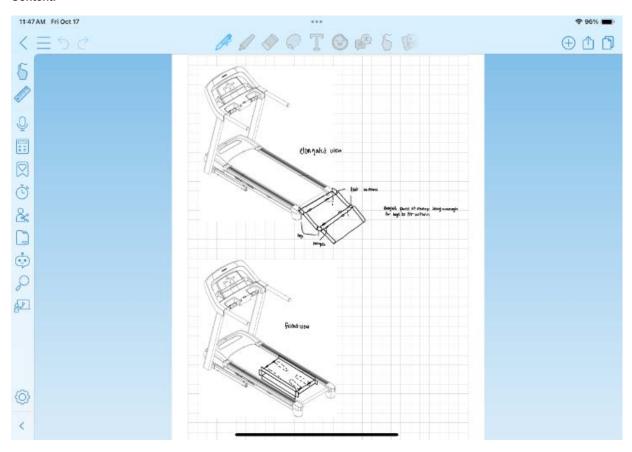
Date: 10/12/25

Content by: Julia

Present: Julia

Goals: Create new folding design

Content:



This design includes flat sections which allow for the height adjustable legs to be attached there. The ramp will still be attached with a toggle latch. With the use of hinges, the ramp will be able to be folded up into a box which may be more aesthetically pleasing for the client to have in their living room.

Conclusions/action items:

Share folding design with the team. Evaluate difficulties within the design. Refine the design to share with the client if the team decides to move forward with this design.

Julia Shefchik - Oct 30, 2025, 10:27 AM CDT

Title: Prefabricated Ramp Design

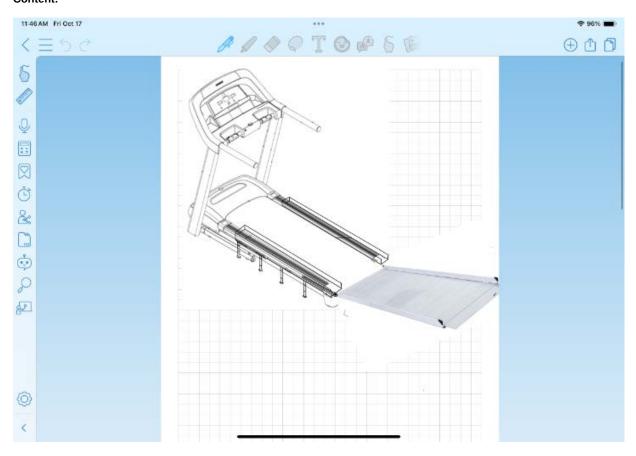
Date: 10/14/25

Content by: Julia

Present: Julia

Goals: Create a design with a prefabricated ramp

Content:



There will be a sliding mechanism made by the water jet that will attach to the sidetracks. In the sliding mechanism there will be a rotating pin that has a modification to attach to the ramp. This will allow the ramp to adjust the angle in reference to the floor and the sidetracks. This feature still follows the clients' request to be adjustable. Using this mechanism the ramp can slide backwards on the sidetracks and lean against the arms of the treadmill. This is not as compact as the other ideas, but would all be attached to the treadmill allowing for ease of use by the caregivers.

Conclusions/action items:

This design has a solution using a prefabricated option. This idea should be shared with the client and the team with opportunities for feedback and readjustment. The team liked this idea, and the client was okay with it, but there was an idea the team liked better. There are potentially fabrication issues with this idea.

09/18/2025 Chemical Safety Training

Julia Shefchik - Sep 18, 2025, 10:39 PM CDT

Title: Chemical Safety Training

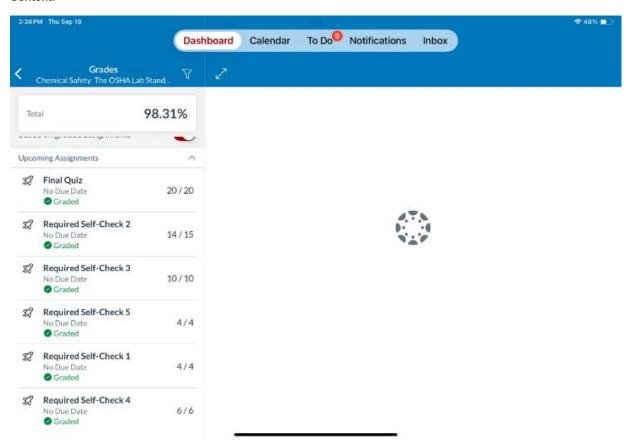
Date: 09/18/2025

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Complete required training

Content:



Conclusions/action items:

The required training for this course is complete.

Julia Shefchik - Sep 18, 2025, 10:36 PM CDT

Title: Biosafety Training

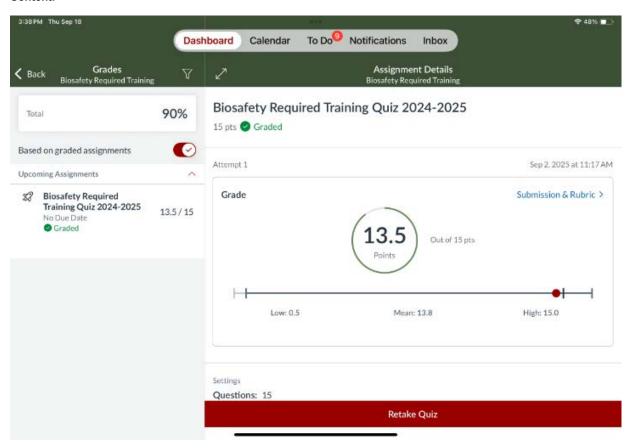
Date: 09/18/2025

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Complete required training

Content:



Conclusions/action items:

The required training for this course is complete.

10/30/25 Intro to Machining Training

Julia Shefchik - Dec 08, 2025, 2:31 PM CST

Title: Intro to Machining Training

Date: 10/30/25

Content by: Julia

Present: Julia

Goals: Finish Intro to Machining Training in the Grainger Desing Innovation Lab

Content:



Conclusions/action items:

Now that my Intro to Machining Training has been completed, I can help my team fabricate our prototype if we need to use those machines in the main shop. Additionally, I have fulfilled the requirements for training for BME 200.

Julia Shefchik - Oct 02, 2025, 9:44 AM CDT

Title: Contributions to Design Matrix

Date: 09/24/25

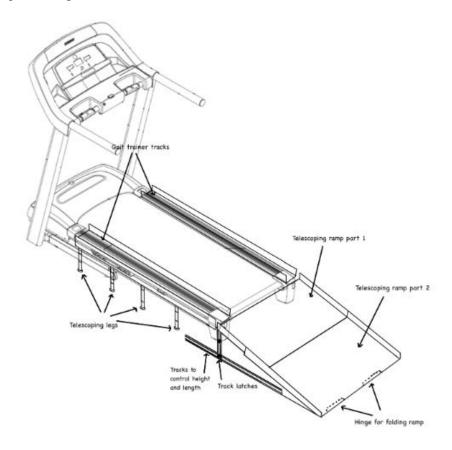
Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Add to my part of the design matrix

Content:

Design 1: Telescoping Ramp Full Image



This design has tracks that are able to control the height and length of the ramp to be ADA compliant if the client would need to adjust to another treadmill with different dimensions in the future. The adjustment tracks are held in place by a screw clamp. There is a hinge at the bottom and the tracks are open to allow the ramp to fold fully flat. The gait trainer tracks are also removable and have telescoping legs that allows the ramp height to be adjusted to other treadmills. The tracks are secured to the treadmill with toggle clamps.

Design Matrix Discussion

Safety - All three designs have similar mechanisms for securing the tracks to the treadmill and include supports underneath. Although they vary by specific design, safety-wise they are similar and provide the same effect with necessary locking and attachments. Design 1 has a safety concern with a bump created by the telescoping ramp that could potentially catch the gait trainer or cause the client to lose their balance.

Ease of Set Up - Each design has tracks that would need to be adjusted on and off the treadmill for each use. The addition of the ramp for each design also requires the attachments to be engaged for each use.

Weight of Device - The additional tracks for Design 1 would add more weight and would need to be able to securely hold the ramp in the desired position which would also add weight to the device. Design 3 would also need to have enough weight to the tracks to keep them stabilized on the floor. Design 3 was ranked the highest because the locking mechanisms on the wheels of the tracks would allow the tracks to be made of lightweight materials since the securing mechanism is built into the track.

Compactability - Design 1 was ranked the highest because of the ability to fold fully flat and shorten the legs on the tracks. Design 2 and 3 were tied, but for different reasons. For Design 2, the wheels would still have their height as that is unchangeable, but the ramp would still be able to fold up. Design 3 would be attached to the treadmill and fold on top, not allowing the treadmill itself to fold up but still reduce space the device would take up when not in use.

Ease of Fabrication - Design 1 and 3 were ranked lower because they require more elements to be fabricated. In Design 1, the track mechanism and telescoping aspect to allow the ramp to increase in length and height would require specific processes and mechanisms to ensure the adjustments could be made smoothly. Design 3 would need to have specific measurements to allow the ramp to rest compactly on the treadmill and not interfere with the tracks that would be on the side of the treadmill. Design 3 does not have any specific measurements required for compactability and the wheels and locking mechanism for the wheels would likely be purchased.

Adjustability to Other Treadmills - Design 1 is ranked the highest because of the ability for the design to be longer and taller to comply with ADA guidelines if the transition to another treadmill is needed. Design 2 and 3 could be adjustable to other treadmills because they are based off of the client's gait trainer, however, the height of each ramp is unable to be adjusted for other treadmills.

Cost - Design 1 would be the most expensive because of the extra materials required to fabricate the ramp. Design 3 would also be more expensive than Design 2 because of the additional hardware needed to fold the ramp up.

Conclusions/action items:

The team will still need to modify the design to incorporate elements the client likes. Input from the client will be coming which should help inform decisions on which prototype to move forward with.



09/26/25 Prep for Preliminary Presentation and Team Meeting

Julia Shefchik - Oct 02, 2025, 5:03 PM CDT

Title: Prep for Preliminary Presentation and Team Meeting

Date: 09/26/25

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Review advisor meeting notes and begin preparation for preliminary presentation

Content:

- · what are adjustable screws
- · any plans discussed for fabrication of telescoping design
- · aspects of design were discussed
- any specific order to present design matrix
- current plan: highlight greentalk mostly about chosen design

Conclusions/action items:

Talk with group to decide our preliminary design. Ask group if there is a specific way I should present the design matrix.



10/02/25 Preliminary Presentation Preparation

Julia Shefchik - Oct 02, 2025, 5:20 PM CDT

Title: Preliminary Presentation Preparation

Date: 10/02/25

Content by: Julia Shefchik

Present: Julia Shefchik

Goals: Prepare for presentation

Content:

- · explain criteria
 - · safety is the most important consideration our client presented to us which is why it is rated the highest
 - ease of set up is also important because it is one of the main reasons the previous ramp design does not work which goes
 hand in hand with the weight
 - the client would also like the device to be able to be compact for easy storage
 - o adjustability to other treadmills was another thing the client presented to us
 - o cost and ease of fabrication is also important to make sure our design is feasible and within the client's budget
- · explain scores
 - · due to the bump in the telescoping design, we thought that would pose more of a risk than the other two designs
 - · ease of set up was scored relatively the same since each has its own aspect to make it easier
 - weight of the device was scored highest for the suitcase ramp because of the rolling tracks which would make it easier to move
 - · each design is able to fold up and be removed or fold onto the treadmill which the client was okay with
 - design 1 and design 3 were scored lower for ease of fabrication because of the complicated track and telescoping system for design 1 and the increased folds in design 3
 - design 1 scored highest in adjustability to other treadmills because of the height adjustment of the tracks and length and height adjustments for the ramp
 - the second design scores the highest for cost because it has the least parts involved

Conclusions/action items:

This information should be summarized for the presentation. The highlight should be on the winning design to explain why it won, but also spend time on the explanation of the criteria.

Julia Shefchik - Oct 10, 2025, 1:11 PM CDT

Title: Preliminary Report Contributions

Date: 10/07/25

Content by: Julia
Present: Julia

Goals: Finish my section of progress report

Content:

Fabrication

Materials

The team will use a material that is lightweight and durable to hold the gait trainer, the user, and another caregiver if applicable. Following these guidelines the team will use 1.6 mm thick aluminum sheets for the ramp because its properties fulfill the requirements [11]. The lowest yield strength of available alloys is 5 ksi which is able to hold the combined weight of 173.6 kg [12]. The team selected aluminum channels for the sidetracks because their existing U-shaped design simplifies the fabrication process by eliminating the need to weld on side guards. The hinge on the design will also be aluminum for a more cohesive finish of the design. The adjustable legs that will be incorporated into the design are made out of cold rolled steel chosen for their durability [10].

Methods

The team will be using a Grizzly 52" sheet metal shear for cutting all pieces of aluminum. This machine was chosen for its capability of cutting through 1.6 mm thick aluminum sheets and its availability in the ECB lab. For the side rails, the team will use channel aluminum to form sturdy tracks. The team will need to cut a rectangle of aluminum material and then weld it onto the end of the tracks to prevent the gait trainer from rolling forward off the tracks. The adjustable legs will be added by drilling holes through the side tracks and screws will be added so they are flush with the top of the tracks and will not stick out.

For the ramp, the team will weld side guards to the sheet of aluminum to make each individual section. The tracks will be connected and telescoped together by attaching inner tracks on the side, similar to drawer tracks, by drilling holes and screwing the hardware to the pieces of the ramp. The team will also explore adding non-slip coverings to the top of the ramp and where the bottom of the ramp meets the ground for more stability.

The team will cut the flat portion of the ramp and weld the side guards on. This portion will attach to the telescoping portion of the ramp with a hinge. Connecting the ramp to the side rails will be achieved through toggle latches which will be attached by drilling holes into the side guards and screwed in using appropriate hardware.

Final Prototype

The final prototype will be fabricated using the above methods. The material and connections are subject to change if more suitable materials or methods arise following continued testing and research. After the team's meeting with fabrication staff, a final plan will be made and adjustments to the prototype may be needed. In addition, the team can explore and research materials that are non-slip to incorporate into the device.

Conclusions/action items:

Discuss with advisor new plans for prototype. Ask for fabrication help. Meet with Jesse (Katie from Dr. Puccinelli). Arrange meeting with clients.

Julia Shefchik - Oct 10, 2025, 1:41 PM CDT

Title: Design Meeting

Date: 10/07/25

Content by: Julia

Present: Julia, Grace, Sara

Goals: See if our design is feasible

Content:

- · not a fan of telescoping
 - o thinks it will be too unstable
 - o incremental holes with pins
 - heavy
 - o expensive
 - suggested using channel for side-rails
- make custom hinges for foldable
 - o on water jet
 - o why don't regular hinges work?
- proposed was separate wood blocks
 - attached through hinges
 - o last year's design
 - o no height or length adjustability

Conclusions/action items:

Discuss with advisor new plans for prototype. Ask for fabrication help. Meet with Jesse (Katie from Dr. Puccinelli). Arrange meeting with clients - meeting will be on Monday.

Julia Shefchik - Nov 07, 2025, 12:48 PM CST

Title: Tong Lecture

Date: 11/07/2025

Content by: Julia

Present: BME Department

Goals: Learn from Kristin Myers: Building a Career of Impact

Content:

- COO Blue Cross Blue Shield current, many prior experiences in upper-level positions, but also spent some time in design and process evaluation
- 3 chapters
 - foundation
 - learning skills, how to scope project, high achievement with a technical focus
 - o climb the growth curve
 - combine IQ and EQ
 - see diverse things and jump into uncomfortable situations
 - build and transform
 - system impact through innovation and scale
- Fundamentally healthcare needs to change
 - o address cost, physician ease, patient ease, patient outcomes
 - o spend 2X more than other "successful" countries
 - worse outcomes
 - there are underlying challenges
 - incentives, financing, data and IT, inequities zip code dictates longevity
- 5 things to keep in mind
 - · work hard and build range
 - work long and hard and get stuff done
 - seek diverse exposure
 - explore sectors, teams, geographies
 - learn connections
 - choose your people wisely
 - surround with curious, driven people
 - values protect them
 - define what matters most
 - embrace challenges and grow
 - stop chasing next achievement
 - more curiosity
 - take on hard things but embrace them
- effort and character compound over time
- energy flow, can only do so much

Conclusions/action items:

From this lecture, I learned to embrace challenges and things that can make you grow. Kristin contributes a lot of her success to putting herself in uncomfortable situations to get the chance to improve and learn new things. She also said this opened her up to other opportunities.



10/13/25 Client Meeting Questions and Notes

Julia Shefchik - Dec 08, 2025, 3:01 PM CST

Title: Client Meeting Questions and Notes

Date: 10/13/25

Content by: Julia

Present: Julia

Goals: Write questions for client meeting and take notes

Content:

Key Points:

- Per design consultation, telescoping ramp is not feasible
- · Current design:
 - Track:
 - Wood tracks, with telescoping legs, narrower tracks, taller track height, end of track guard
 - Ramp:
 - TBD

Questions:

Design Ideas

- · Modify prefab ramp
- Foldable with flat sections for adjustable legs (will fold into a box)

Materials

- · Tried to find aluminum channel
- · Okay with wood if it looks finished
- · Still will try to use aluminum for the ramp

Spacing

- How much space is there for a ramp behind a treadmill (How long can the ramp be?)
- Ideally the ramp would meet ADA specifications, but if it does not, what ratio/angle would you be comfortable with?

Meeting Notes:

- · Is fine with mixed media
 - Side tracks aren't so permanently down that we can't move the treadmill side to side
- Legs close to the bottom (want supports at the bottom)
 - · Concern for Lee

Conclusions/action items:

The client seemed to like the plans we presented to them. Key takeaways are that our sidetracks plan has been approved and they are okay with us modifying a prefabricated ramp which is a design the team will be further considering.

11/10/25 Individual Design Staff Consultation

Julia Shefchik - Dec 08, 2025, 2:48 PM CST

Title: Individual Design Staff Consultation

Date: 11/10/25

Content by: Julia

Present: Julia

Goals: Get advice on how to attach the wheels to the ramp

Content:

- · welding
 - o need to get piece of steel
 - o ramp is aluminum wheel plate is steel
 - o need same metals in order to weld
 - o process:
 - cut piece of aluminum
 - sand sharp edges of aluminum
 - drill holes with drill press
 - attach wheels to aluminum plate using nuts and bolts
 - weld aluminum plate to aluminum ramp
- · drill holes
 - use a hand drill
 - use metal table with magnetic drill press
 - for both methods use a drill bit that is slightly larger than the bolt size to allow for clearance

Conclusions/action items:

This information will be shared with the team, and a decision will be made regarding which method we will choose to use for the project. Based on my knowledge of my abilities and my team's abilities, I believe we will go with the handheld drill to attach the wheels to the ramp.

Julia Shefchik - Dec 08, 2025, 3:12 PM CST

Title: Sidetracks Attachment Method

Date: 11/14/25

Content by: Julia

Present: Julia

Goals: Find a way to further secure the sidetracks to the treadmill or the ramp

Content:

Client mentioned wanting to using ratcheting straps

Could attach ratcheting straps to sidetracks by using D-rings and drilling into the sidetracks

Straps could wrap around the bars in the front of the treadmill or could wrap across the front of the sidetracks and under the back of the sidetracks

Would not be able to adjust the straps if they go underneath the treadmill



link from Grainger: CONDOR, Fixed D-Ring, 1/4 in Dp, D-Ring Plate Anchor - 35KU73|35KU73 - Grainger



Q. More Images

link from Uline: Uline Hi-Vis Retractable Ratchet Tie-Downs - S-Hook, 1" x 10', 1,200 lb Capacity H-11663 - Uline

Conclusions/action items:

This proposed solution will be discussed with the team. After the team has decided which solution to use, the team will share with Dr. Ashton and will order materials. The team will confirm with the client first before ordering materials and making modifications.

Julia Shefchik - Dec 08, 2025, 3:19 PM CST

Title: Friction Testing

Date: 11/14/25

Content by: Julia

Present: Julia

Goals: Investigate how to accurately quantify friction

Content:

Client seemed skeptical about current method to deduce friction

App interface protocols suggested gave values that did not seem fully accurate/relevant

Friction testing can be done in SolidWorks

Analysis from client visit

- observations indicate coefficient of friction is sufficient
- ramp itself has a non-slip material on it
- qualitatively the family and caregivers say the ramp is sufficient

Conclusions/action items:

The team should either figure out a more accurate and understandable way to determine the coefficient of friction or determine more relevant testing for the project. The team already plans to do stability testing on the sidetracks which would be a more useful examination of the device's success of a machined element versus the part of the prototype that has been fabricated and already tested by a company.

Julia Shefchik - Dec 08, 2025, 3:28 PM CST

Title: Source Materials

Date: 11/14/25

Content by: Julia

Present: Julia

Goals: Find materials needed to finish fabrication

Content:

Intended bolts were truss head combo screws - unavailable in diameter and lengths needed

Match materials of nuts and bolts - bought combination packs to ensure, also so there is not an unnecessary amount of nuts

Different size holes to make sure maximum amount of material is attaching wheels to the ramp

Large hole nuts and bolts: Everbilt 1/4 in.-20 x 2-1/2 in. Combo Round Head Zinc Plated Machine Screw (3-Pack) 803521 - The Home Depot

Small hole nuts and bolts: Everbilt #10-24 x 2-1/2 in. Zinc Plated Combo Round Head Machine Screw (3-Pack) 830611 - The Home Depot

Washers for small holes: Everbilt 1/2 in. Zinc Flat Washer (30-Pack) 825221 - The Home Depot

Conclusions/action items:

These materials should be ordered to complete fabrication as soon as possible. The team will need to finish this fabrication next week to be able to have the prototype done to finish testing at the client house before Thanksgiving break.



9/13-9/19 Biology and Physiology Research Notes

Katelynn Johnson - Sep 19, 2025, 9:22 AM CDT

Title: 9/13-9/19 Research Notes: Biology and Physiology

Date: 9/19/2025

Content by: Katelynn Johnson

Present: Katelynn Johnson

Goals:

1) to research lifting guidelines in order to determine our ideal design weight

2) to research the client's current and desired Gait Trainer in order to better understand the situation and possible limitations of our design

Content:

(See attached PDF)

Conclusions/action items:

Moving forward I will be focusing on materials research, and expanding upon the research of my teammates. Once we attend a home visit with our client, I will be able to use the lifting equation to to estimate our ideal design weight, to make sure that it is compliant with OSHA guidlines, and easy for caregiving staff to use.

Katelynn Johnson - Sep 19, 2025, 9:23 AM CDT

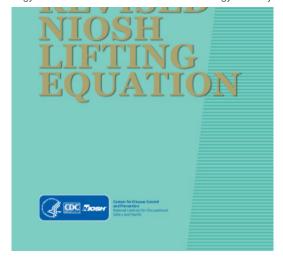


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9_13-9_19_Research_Notes__Biology_and_Physiology.pdf (975 kB)

Katelynn Johnson - Sep 19, 2025, 5:41 PM CDT





Download

cdc_110725_DS1.pdf (17.2 MB)



9/13-9/19 Competing Designs Research Notes

Katelynn Johnson - Sep 19, 2025, 9:25 AM CDT

Title: 9/13-9/19 Research Notes: Competing Designs

Date: 9/19/2025

Content by: Katelynn Johnson

Present: Katelynn Johnson

Goals:

1) to research lifting guidelines in order to determine our ideal design weight

2) to research the client's current and desired Gait Trainer in order to better understand the situation and possible limitations of our design

Content:

(See attached PDF)

Conclusions/action items:

Moving forward I will be focusing on materials research, and expanding upon the research of my teammates. Once we attend a home visit with our client, I intend to research lifting aides that would work best in the treadmill location.

Katelynn Johnson - Sep 19, 2025, 9:25 AM CDT



Download

9_13-9_19_Research_Notes__Competing_Designs.pdf (651 kB)

10/10/2025 - 10/13/2025 Commercially Available Ramps and Cost-Effective materials

Katelynn Johnson - Oct 16, 2025, 4:53 PM CDT

Title: Commercially Available Ramps

Date: 10/10-10/12

Content by: Katelynn Johnson

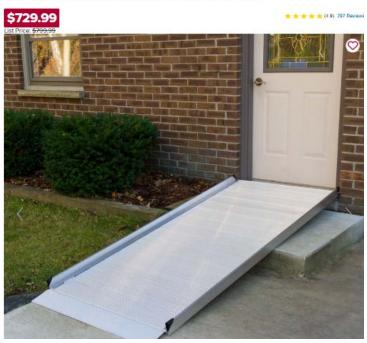
Present: Katelynn Johnson

Goals: To research and commercially available ramps that could 1) be used as inspiration for fabrication of our own ramp design or 2) be purchased and modified for our design.

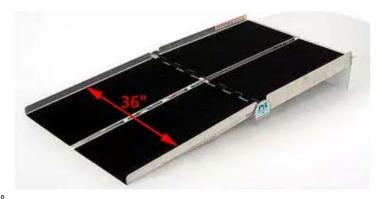
Content:

• 6' L - Silver Spring Aluminum Wheelchair Access Ramp

6' L - Silver Spring Aluminum Wheelchair Access Ramp



- Ramp measurements: 6' L x 36" W
- more width than desired, but good length
- $\circ~$ this ramp is long enough that we could shorten it as needed/alter for track attachments
- 850 lb weight capacity is generous
- $\circ~$ item weight of 52 lbs (a bit heavier than we would like)
- slip-resistant surface and self-adjusting ground transition plate
- the edge looks to be 2" tall -- perfect!
- https://www.discountramps.com/silver-spring-semi-permanent-wheelchair-ramp-handrails/p/SSG-06/
- Heavy-Duty Bariatric Wheelchair Ramp for Safe Access



- 5' x 36" option is \$739.00
 - weighs 50 lbs

- $\circ~$ side rails look a bit short about 1.5" high
- folds horizontally, which is perfect for our storage ideas
- connection plate on the end would be useful for attaching ramp to tracks
- 800 lb capacity is generous for use
- o comes in longer versions
- $\\ \circ \ \ \text{https://www.disabilitysystems.com/portable-ramps/bariatric/?srsltid=AfmBOoqhf7e2Dcap07zNWvcouJ5ey46qBJ5KROPvzdD45vdg_9feCmS3} \\$
- Freedom Folding Ramp (National Ramp)







- Well outside of budget -- very expensive
- · love the height of the "toe guards"
- · the pin-lock system is amazing
- · like how it disassembles
- the wheels for transport is amazing, but not needed in our design
- likely around the 50lb mark
- · handle is nice addition
- o 30" width -- too narrow for the gait walker
- · 800 lbs weight capacity
- https://homeaccess.nationalramp.com/our-ramps/three-fold-portable-aluminum-ramps/

Conclusions/action items:

Of the three commercially available ramps, the first two could be purchased and modified for our project. Even though the cost information for the third ramp is not available online, it can be assumed that this ramp is much too expensive to purchase for this project, especially considering that we would have to permanently alter it to attach to our tracks. Additionally this final design is not wide enough to accommodate the gait trainer. Out of the three ramps available, this third ramp has some great ideas for our own fabrication designs. I think that the pin-lock system is ingenious, and a very approachable way for our team to make the design compactible. Unfortunately, this design looks heavier than 25 lb (somewhere in the 40-50lbs range), so I don't know if us mimicking this design entirely is feasible, as the materials cost themselves are way outside of our budget. Moving forward, I will be considering these ramp designs for my new design proposal during the 10/13 group meeting.

Katelynn Johnson - Oct 16, 2025, 5:15 PM CDT

Title: Cost-Effective Material Research

Date: 10/12/2025 - 10/13/2025

Content by: Katelynn

Present: Katelynn

Goals: To investigate cost-effective materials for both the ramp and track system.

Content:

- Important note: These ideas are not just my brain child, since I have relatively little experience with the variety of materials available on the market, I talked with my dad about some ideas we could try.
- · From my meeting with my dad, he recommended I look into the following:
 - For the tracks: fiber glass resin over a wooden frame
 - · L-shaped aluminum ends instead of C-shaped tracks
 - 16 gauge (or thicker) C-shaped aluminum (running upwards) for increased load capacity
 - Heavy duty base (track system) with lightweight aluminum ramp
 - Pin-securement system for storage
- In researching these further, I determined that while it was more cost-effective than other materials, the DI Labs at Wendt and ECB do
 not have a good set up for working with resin. This solution would also require a lot confidence in the durability and effectiveness of the
 supplies purchased as the approach is very "all or nothing". Overall this idea wasn't pursued further.
- The L-shaped aluminum side rails for the tracks would be easier to implement, and likely would work better than the c-shaped tracks.

- There is a concern about cost with this option, as it comes to just under \$70 for two pieces of 5 foot 2" x 2" aluminum angle on Online metals.com
 - https://www.onlinemetals.com/en/buy/aluminum/2-x-2-x-0-062-aluminum-angle-6063-t52/pid/17858? variant=17858_72_0&gad_source=1&gad_campaignid=19615658788&gbraid=0AAAAADs4lv0w9tSnDLd7L wudaNJ9E85S8&gclid=CjwKCAjwr8LHBhBKEiwAy47uUgKe8WtyoiNWaol_mAdOURulAn25DwWXsIHZevI4jK9gMwtuQ2F_RoCQwwQAvD_BwE
- Would likely want 3"x3" aluminum angle for increased security and safety
 - https://www.onlinemetals.com/en/buy/aluminum/3-x-3-x-0-125-aluminum-angle-6063-t52-extruded-architectural/pid/19846?

variant=19846_24_0&gad_source=1&gad_campaignid=17426924309&gbraid=0AAAAADs4lv1A9YP_qNDpkbL0gGsUBf6Oy&gclid=CjwKCAjwr8LHBhBKEiwAy47uUhlopEblv2Lyvkeob8PVetyd3-k9gQNW0WVRXs8ma92WCw5UMhXenxoCILoQAvD_BwE

2" x 2" x 1/16" Aluminum Angle 6063-T52 -

Part #: 17858

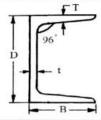






- C-channel is stronger than flat pieces of metal of the same thickness
 - this option would require us 1) purchasing c-channel from a vendor which could be expensive as it is a very specific ask or
 2) asking a local metals supplier to bend 16 gauge (or higher) aluminum for us for free/a reduced cost.
 - Some good information about the difference between U-channel and C-channel and their applications: https://eziil.com/u-channel-vs-c-channel/

Medium Weight Channels (IS 808: 1989)



Size	kg / mtr	Height D (mm)	Width B (mm)	t (mm)	T (mm)
ISMC 75	7.14	75	40	4.8	7.5
ISMC 100	9.56	100	50	5.0	7.7
ISMC 125	13.10	125	65	5.3	8.2
ISMC 125*	13.70	125	66	6.0	8.1
ISMC 150	16.80	150	75	5.7	9.0
ISMC 150*	17.70	150	76	6.5	9.0
ISMC 175	19.60	175	75	6.0	10.2
ISMC 175*	22.70	175	76	7.5	10.2
ISMC 200	22.30	200	75	6.2	11.4
ISMC 200*	24.30	200	76	7.5	11.4
ISMC 225	26.10	225	80	6.5	12.4
ISMC 225*	30.70	225	82	9.0	12.4
ISMC 250	30.60	250	80	7.2	14.1
ISMC 250*	34.20	250	82	9.0	14.1
ISMC 250*	38.10	250	83	11.0	14.1
ISMC 300	36.30	300	90	7.8	13.6
ISMC 300*	41.50	300	92	10.0	13.6
ISMC 300*	46.20	300	93	12.0	13.6
ISMC 350	42.70	350	100	8.3	13.5
ISMC 400	50.10	400	100	8.8	15.3

- The team is continuing forward with the heavy-duty base with lighter-weight ramp design
- The pin-securement inspiration in question can be found in the Commercially available ramps note page.

Conclusions/action items:

Moving forward, I will be bringing the L-shaped aluminum angles to my team's attention, as well as the plausibility of the c-shaped aluminum as opposed to flat sheet aluminum (in the case that we decide to move forward with fabricating our own ramp). I also will be monitoring the team's budget to see if we are able to fit the L-shaped aluminum in the budget as it might be easier to use the 3" angle instead of fabricating this angle out of wood (especially since the DI Lab at ECB is no longer selling wood.



10/14/2025 - 10/15/2025 Barrister Door Research

Katelynn Johnson - Oct 16, 2025, 5:22 PM CDT

Title: Barrister Door Research

Date: 10/14/2025 - 10/15/2025

Content by: Katelynn

Present: Katelynn

Goals: To investigate the construction, and function of barrister doors in order to assess their application for a ramp storage system.

Content:

- YouTube Video: "Making barrister door homemade hinges"
 - https://www.youtube.com/watch?v=yXaV-qg_iQc
 - used to analyze the construction of barrister doors
 - · Key visual:



Conclusions/action items:

Through my own experience with Barrister doors, and by analyzing the YouTube video above, I think that a barrister door storage system could be used in conjunction with a purchased commercially available ramp/a personally fabricated ramp. Some concerns I do have with this system includes how easily the materials of the system would work with each other (will friction make this system harder to operate). Moving forward I will be sketching a design that uses this system.



9/23/2025 Gait Trainer Locking Mechanism

Katelynn Johnson - Sep 26, 2025, 10:55 AM CDT

Title: Gait Trainer Locking Mechanism

Date: 9/23/2025 (Recorded on LabArchives on 9/25/2025)

Content by: Katelynn

Present: Katelynn

Goals: My goal in researching the Rifton Pacer Utility Base locking mechanism, was to determine if our proposed preliminary design ideas needed to be modified to better accommodate for the wheel locking mechanism. Additionally, I wanted to evaluate the mechanism in order to mindfully design a track system that allowed easy access for the caregivers to reach the locking mechanism.

Content:

- The Rifton Pacer Utility Base rear wheels have a diameter of 11.5"
- The wheel locking mechanism is 4" from the ground. Therefore, a recommended maximum wheel track height is 2.5" in order to allow for the best access.
 - This maximum wheel track height falls in-line with current preliminary designs that feature 1.5-2" track heights.
 - These measurements were determined from the Rifton Pacer Gait Trainer Product Manual, and verified during the team's in-person home visit on 9/24/2025.
 - [X] "Pacer Gait Trainer K620, K630, K640 & K650 Product Manual." Available: https://www.rifton.com/-/media/files/rifton/product-manuals/dynamic-pacer-pv58.pdf? rev=392c1249d4884b68b14519262b904bb0&hash=161FEF8206B67140CA84A9A244019C2F
- The wheels not only lock in place, but they are also able to lock and prevent lateral movement, while maintaining free longitudinal
 movement.
- https://www.rifton.com/education-center/videos/dynamic-pacer
 - this video above was used to evaluate the movement of the client's Gait Trainer prior to the home visit.
 - The wheels on the utility base gait trainer allow for greater leniency when designing the clearance between the track of the treadmill and the edge of the ramp. The main concern would be the client's ability to navigate the distance with the assistance of her caregivers.

Conclusions/action items:

Moving forward, our designs should maintain a track height of 2.5" or less in order to maintain easy-access to the wheel locks. For best access, the design should consider not featuring an interior track line, solely relying on a snug exterior track and the Gait Trainer's directional locking mechanism.

Katelynn Johnson - Sep 25, 2025, 11:38 PM CDT



BIESE-Gallhamby I

Download

921_Gait_Trainer_Lock_Mechanism.pdf (180 kB)

Katelynn Johnson - Sep 26, 2025, 9:36 AM CDT

Title: 9/24/2025 Home Visit

Date: Notes recorded 9/26/2025

Content by: Katelynn

Present: Katelynn, Sara, Sierra, Julia, Grace

Goals:

- 1) To introduce our team to the family and caregiving staff, and ask for their insight on our design options.
- 2) To take comprehensive measurements of the treadmill and the surrounding space.
- 3) To analyze how the family wants the gait trainer to interact with the treadmill, and how the current design functions.

Content:

Note: Team members collectively documented this trip, and these photos and measurements are only a small portion of the information we collected.

This home visit was incredibly helpful in gaining the family's and caregiving staff's input on the current design, and the improvements they would like to see. From our meeting, we determined that the family would be willing to have the treadmill permanently resting on the ground in the case that the wheel tracks are permanently/semi-permanently attached to the treadmill. Additionally, the family stated that their highest priority is the ease of use, and that storage is a secondary concern, as they have a storage space on the same level where they could keep the ramp while it was not in use. The caregiving staff highlighted their need for easy attachment methods, snug/more secure attachment, and a lightweight ramp.

After presenting the three designs we are including in our design matrix to the family, they expressed their open interest in all of them, and have no specific concerns at this time.

From the home visit we were able to take comprehensive measurements of the treadmill (see Sara's diagram for details). These will be incredibly important in the coming weeks as we prepare for our preliminary presentation, and the start of our fabrication stage. The caregiving staff also informed us that the current gap between the treadmill and ramp is not difficult for them to navigate with the client and her gait walker, and that they would have no concern with another design having the same distance between.

We discussed the possibility of taking the client's treadmill to UW-Madison with us in order to improve the accuracy of our measurements and design cohesiveness, and the family supported this idea. However, there is concern about transporting the treadmill as it does not fold completely flat, and a rampy would be recommended for moving it in and out of both the client's house, and the moving vehicle. At this time I have considered the possibility of renting a U-Haul Truck, and/or networking with friends and family to find a truck (or large enough vehicle) to easily transport the treadmill.

Conclusions/action items:

Moving forward we will be finalizing our design matrix, and begin composing our Preliminary Design Presentation. Personally, I will be focusing on getting the required BME 200 shop and saftey trainings. My goal is to finish the Canvas modules by October 1st at the latest (and sign up for the inperson trainings at that time). Overall I hope to be completed with the trainings by 10/24/2025. I am also interested in attending a Monday Woodshop Orientation and skills training at ECB. This is both out of personal and practical interest for the team. I feel that getting this training will help during the initial fabrication phases.

Katelynn Johnson - Sep 26, 2025, 9:16 AM CDT





Download

IMG_4194.jpg (2.78 MB) Side view of how the gait trainer should be positioned in relation to the treadmill to optimize available walking space for the client.

Katelynn Johnson - Sep 26, 2025, 9:17 AM CDT



Download

IMG_4196.jpg (2.58 MB) Secondary side view focusing on far up the track needs to support the gait trainer.

Katelynn Johnson - Sep 26, 2025, 9:17 AM CDT



Download

IMG_4197.jpg (2.45 MB) Secondary side view focusing on how the front support of the gait trainer interacts with the treadmill frame.

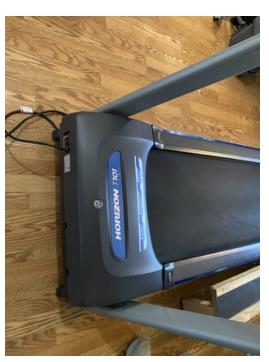
Katelynn Johnson - Sep 26, 2025, 9:18 AM CDT



<u>Download</u>

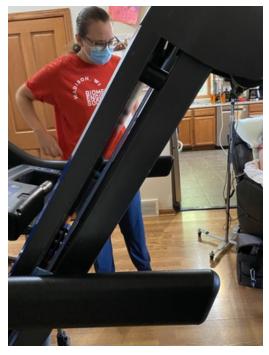
IMG_4199.jpg (3.13 MB) Front view of the treadmill shell.

Katelynn Johnson - Sep 26, 2025, 9:18 AM CDT



Download

IMG_4200.jpg (3 MB) Secondary front view of the treadmill shell.



Download

IMG_4201.jpg (2.63 MB) Side view of the treadmill in its inclined position. Specifically focusing on the clearance between the two sides of treadmill track and the surrounding frame.

Katelynn Johnson - Sep 19, 2025, 5:35 PM CDT

Title: Preliminary Design #1 Overview

Date: 9/19/2025

Content by: Katelynn Johnson

Present: Katelynn Johnson

Goals: To outline a preliminary design that fulfills all of our clients needs, and meets the majority of their design requests.

Content:

This preliminary design features a semi-permanent over-treadmill shell, with an attached two-piece removable ramp. Due to personal experience and familiarity, the designs are drawn up with wood material in mind, however they should be transferable an aluminum and plastic combination.

The over-treadmill shell rests just above the existing treadmill sideboards and functions as a side extension and wheel track for the client's gaitwalker. This shell is secured via snug fit and interlocking pegs, with the surrounding front board able to be be removed via a horizontal manual latch release system. This allows for easy installation and removal, and may allow this system to be re-used in the case that the current treadmill needs to be replaced.

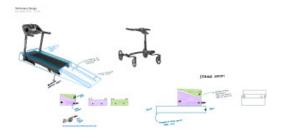
The light blue sketch is the two piece removable ramp that is highlighted in purple and green parts in the bottom half of the Preliminary Design PDF. While the previous design team had successful created a functional track and ramp system, the client was not satisfied with the user saftey, and found the set-up and take down to be impractical for everyday use. Additionally, they were dissatisfied with its storage abilities. Therefore this design was made with storage, and ease-of-use in mind. Additionally, the client's OT requested the wheel tracks to be about an inch higher than the previous design's (total of 1.5" - 2"). The purple half of the ramp is secured to the over-treadmill shell via an interlocking peg system and the horizontal manual latch release and latch plate featured at the bottom of the PDF. The green and purple halves of the ramp are attached in a similar manner. On the top surface of the ramp, guide track starts at the base, before narrowing to the width of the track over the treadmill.

For storage, the two-peice ramp disconnects from the shell and from each other by unlocking the latches and pulling the peg systems apart. The pruple part of the ramp is then placed directly on the treadmill guide track with the green part of the ramp stacked on top of it in the interlocking manner highlighted on the far right side of the design PDF. While the storage and set-up process is multi-step, it is designed to be user-friendly and should not exceed five minutes. By breaking the ramp into two sections, it should not only store better, but be easier for caregiving staff and family members to lift and manuever.

Conclusions/action items:

This design includes some non-negotiables such as a wheel track for the gait walker over the treadmill, and higher track. The design also addresses the client's storage concerns, and ease-of-use concerns. One item that I wish to investigate further for this design include a front frame-lock system that would remove the need to use the gait trainer's wheel locks. I want to look into this out of a concern about access to these wheel locks with the increased track height. I feel that this could be added to the front portion of the over-treadmill shell, and interact with the lower T-bar of the gait trainer. During the team's home visit on 9/24/2025, I will be evaluating the gait trainer to see if this is a possibility. Moving forward, our team will be evaluating each preliminary design proposal, and will determine which design we will continue on with.

Katelynn Johnson - Sep 19, 2025, 5:36 PM CDT



-

Download

Preliminary_Design.pdf (264 kB)

Katelynn Johnson - Sep 26, 2025, 12:22 AM CDT

Title: Preliminary Design #2

Date: 9/21/2025

Content by: Katelynn

Present: Katelynn

Goals:

1) To improve Preliminary Design #1 in response to team critiques.

2) To incorporate aluminum into the design.

Content:

This design is largely derived from Preliminary Design #1, however, it has been adjusted in response to team critiques, and with the goal of incorporating more aluminum into the ramp structure to decrease weight. The main team critiques from our 9/19 meeting were about the storage system being bulky and potentially unrealistic, in addition to concerns about the weight of the ramp if it was made purely out of wood.

This updated design features a repurposed Silver Spring [1] aluminum ramp that connects to a semi-permanent wood treadmill shell. The wood frame mostly remains consistent with that of Preliminary Design #1, however I did eliminate the interior wheel tracks with the thought of instead narrowing the exterior track to just wider than the gait trainer wheels. By doing this, the caregivers will still have assistance keeping the client walking in a straight line, especially in conjunction with the lateral movement locks on the Rifton Pacer Gait Trainer. This aluminum ramp features a semi-adjustable floor plate, side tracks to prevent wheels from falling off the ramp, and would be fashioned with a movable loading plate to close the gap between the treadmill belt and the ramp, but which could be flipped off of the treadmill belt once the client is fully on the treadmill in order to reduce interference with the treadmill function.

The aluminum ramp would have a central horizontal joint with butt hinges. This would allow for caregiving staff to fold the ramp in an upwards and back motion (See "STORAGE SYSTEM" for a visual description of this movement). This ramp would also feature an option to completely disconnect the ramp from the semi-permanent treadmill shell for secondary storage opportunities.

Similar to Preliminary Design #1, this design makes use of horizontal manual latches to secure the treadmill shell frame and aluminum ramp. I have continued to incorporate these in my designs as I feel that they are incredibly user-friendly. They are intuitive, easy on the fingers, quick to secure, and a sturdy securement option. Another feature from Preliminary Design #1 that has remained consistent is the application of a grippy non-slip material to the ramp. While the client does maintain her balance very well, having the added grip will help the caregivers assist the client better as they will not have to push her up the ramp as much.

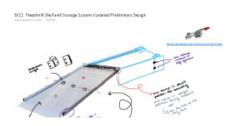
[1] "Silver Spring aluminum wheelchair access ramps | discount ramps," Discount Ramps, https://www.discountramps.com/silver-spring-semi-permanent-wheelchair-ramp/p/SSG/ (accessed Sep. 26, 2025).

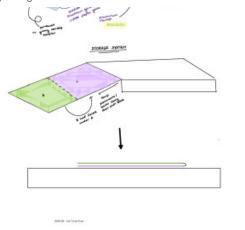
Conclusions/action items:

While this design is easy-to-use, compactable, and lightweight, it is not easily transferred to other treadmills. One work-around for this design could be the implementation of an adjustable brace on the front of the shell that could be adjusted and secured with the use of a power screwdriver. This would only be necessary if a new treadmill was wider than the current treadmill. If the treadmill was slightly smaller, there would be minimal concern about this method not transferring, as the treadmill itself is non-weight-bearing in regards to this design. In the case that a new treadmill would be taller in height, this design would be rendered non-transferable as there are no height adjustment features.

Moving forward, if my design is not chosen, I will continue applicable research to further strengthen the chosen design(s). I will also be researching different material suppliers and comparing their prices and offerings in relation to the chosen projects.

Katelynn Johnson - Sep 25, 2025, 11:54 PM CDT





Download

9.21_Treadmill_Shell_and_Storage_System_Updated_Preliminary_Design.pdf (303 kB)

Katelynn Johnson - Oct 16, 2025, 6:12 PM CDT

Title: Post-Preliminary Design

Date: 10/13/2025

Content by: Katelynn Johnson

Present: Katelynn Johnson

Goals: To design a lightweight aluminum ramp to replace the telescoping (nesting design).

Content:

Context: Our final design (the Telescoping Ramp) has been scrapped after a consultation meeting with the DI Lab staff indicated that this design would not be practical both in function and in fabrication (with our resources and current skills).

This design incorporates the Telescoping Ramp's wooden track base with a light-weight aluminum ramp. In order to maximize load capacity and minimize material weight, this design uses C-shaped 16 gauge (or thicker) aluminum that is similar to aluminum channel but with a width between 2"-4". C-shaped aluminum has a greater load capacity than flat sheet metal, therefore the cost of the metal sheet itself is cheaper in this design as we will need to purchase less aluminum for the same load capacity.

This C-shaped aluminum would have to be manufactured from flat aluminum sheets either with the help of DI Lab staff, or through the help of a local metals shop. Because this design has the possibility of outsourcing for labor, the cost effectiveness of this design is yet to be determined.

This design incorporates 3" high L-shaped aluminum angle for the safety side rails of the ramp. This design would fold underneath itself horizontally for storage, and be secured on the sides of the aluminum angle during use by toggle latches. This design also features an platform extension that is the connecting point for the over-treadmill tracks. This platform extension will help distribute the weight onto the track base, as there are no legs underneath the ramp providing support.

While not illustrated, if this design is chosen, I would like to update this design with a pin-securement system as featured in the National Ramp Freedom folding ramp image.

Conclusions/action items:

I will be presenting this design during our team's 10/13 meeting, as well as the material options outlined in this design and in my recent research. Moving forward, our team would like to have a chosen final design by the end of the week that is vetted by both our advisor, Dr. Ashton, and Design Lab staff.

Katelynn Johnson - Oct 16, 2025, 5:59 PM CDT





Download

10.13_-_Post-Preliminary_Design.pdf (197 kB)

Katelynn Johnson - Oct 16, 2025, 6:25 PM CDT

Title: Lawyer Cabinet (Barrister Door) Design

Date: 10/15/2025

Content by: Katelynn Johnson

Present: Katelynn Johnson

Goals: 1) To design a new ramp and track system that incorporates a pre-manufactured aluminum ramp 2) design a more feasible, and easy to fabricate ramp storage system.

Content:

This design was inspired by Lawyer Cabinets, or more specifically, by their Barrister doors. My research and references for Barrister door design can be found in the Research "Competing Design" folder. This design features an over-the track storage system that maintains the same size as the footprint of the treadmill. This design can be used with a 28"-34" pre-manufactured ramp that is between 4-5 feet, or with a specifically fabricated aluminum or wooden ramp over 5 feet long depending on the severity of the incline and the client's concerns.

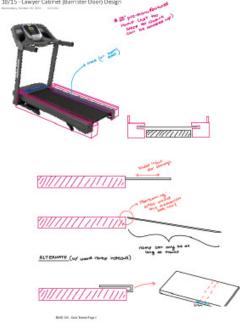
This design's base would be heavy-duty and made out of wood, secured to the treadmill via a toggle-latch system, and have track width's dependent on the width of the ordered aluminum ramp. A flat fabric handle would be secured to the bottom of the ramp for ease of use pulling the ramp out of storage, and pushing it back in.

While I believe that this design is realistic to both our situation and our fabrication skills, I think that there are some points of contention to still be worked out. Namely the concern of friction and how that could affect the ease-of use, the exact mechanism that would attach the ramp to the base, and how to combat the potential unsteadiness of the side tracks seeing as they have to fit over the side of the treadmill (not depicted accurately in my sketch).

Conclusions/action items:

I think that this design is a good starting point in combining a pre-manufactured aluminum ramp with a fabricated wooden base, however there are some areas of refinement that need to be worked on for this design to be an accurate and feasible solution. Moving forward I will be presenting this design at the team meeting on 10/15.

Katelynn Johnson - Oct 16, 2025, 6:13 PM CDT



Download

10.15_-_Lawyer_Cabinet_Barrister_Door_Design.pdf (260 kB)

Katelynn Johnson - Nov 14, 2025, 12:01 AM CST

Title: Track Stabilization Design

Date: 11/13/2025

Content by: Katie

Goals: To design a stabilization solution for the tracks in order to improve the structural integrity of the track base.

Content:

In this proposal I have presented to different designs to improve the structural integrity of the track base. The first design, "Option 1", would require that the team remove part of the inner side walls for the track in order to attach a strong tie (wood or metal) that would have a lego hand shape as the attachment point. After evaluating the images the team took of the client using the track system from the 11/12 home visit, I determined that adding this would not impede her movement.

My second design, "Option 2" is a simpiler system that adds a headboard to the track that extends the entire distance between the two side tracks. This design should be feasible as the images of the client using the track show that the gait trainer does not go past the end of the base track length.

I believe that both options are very feasible, however I lean towards option 2 as it preserves are current progress, has a simple fabrication plan, and will be easy to source materials for.

Conclusions/action items:

Moving forward I will be presenting these two ideas at our team meeting on 11/14.

Katelynn Johnson - Nov 13, 2025, 11:51 PM CST



Male 2011 Grain Trainer Progra

Download

1114_Track_Stabilization_Design.pdf (216 kB)



Design Innovation Lab Training Memberships

Katelynn Johnson - Oct 31, 2025, 9:15 AM

Not Renewable

Not Renewable

N/A

N/A

Title: Design Innovation Lab Training Memberships

Date: 10/31/2025

Content by: Katelynn Johnson

Content:

Certifies successful completion of Machining, Shop Tools, Later Cutter, and Lab Orientation Training courses.



My Memberships					
Membership Type	Start Date	Expiry Date	Renew	Card In	
Machining	Wed, Aug 20 2025	Permanent	Not Renewable	N/A	
Machining - Training Eligible	Wed, Aug 20 2025	Wed, Dec 31 3000	Not Renewable	N/A	
Shop Tools	Tue, Aug 20 2024	Thu, Jan 2 3000	Not Renewable	N/A	
Laser Cutter	Tue, Aug 20 2024	Thu, Jan 2 3000	Not Renewable	N/A	
Lab Orientation	Tue, Aug 20 2024	Wed, Dec 31 3000	Not Renewable	N/A	

Tue, Aug 20 2024

Tue, Aug 20 2024

Profile

Program Registrations

Katelynn Johnson - Nov 06, 2025, 11:47 AM CST

Wed, Dec 31 3000

Wed, Dec 31 3000

Title: Wood Working Training Membership Update

Date: 11/6/2025

Content by: Katie

Content:

Profile

Bookings

Program Registrations

Woods training was completed 11/3/2025 at the DI Lab @ ECB.



My Memberships				
Membership Type	Start Date	Expiry Date	Renew	Card Info
Machining	Wed, Aug 20 2025	Permanent	Not Renewable	N/A
Machining - Training Eligible	Wed, Aug 20 2025	Wed, Dec 31 3000	Not Renewable	N/A
Woodshop Orientation Eligible	Wed, Aug 20 2025	Wed, Dec 31 3000	Not Renewable	N/A
Shop Tools	Tue, Aug 20 2024	Thu, Jan 2 3000	Not Renewable	N/A
Laser Cutter	Tue, Aug 20 2024	Thu, Jan 2 3000	Not Renewable	N/A
Lab Orientation	Tue, Aug 20 2024	Wed, Dec 31 3000	Not Renewable	N/A
Shop Tools - Training Eligible	Tue, Aug 20 2024	Wed, Dec 31 3000	Not Renewable	N/A
Laser Cutter - Training Eligible	Tue, Aug 20 2024	Wed, Dec 31 3000	Not Renewable	N/A

Shop Tools - Training Eligible

Laser Cutter - Training Eligible



Biosafety and Chemical Safety Training Documentation

Katelynn Johnson - Oct 31, 2025, 9:09 Al

Title: Biosafety and Chemical SafetyTraining Completion Certification

Date: 10/30/2025

Content by: Katie

Content: Completion of Biosafety and Chemical Safety Training certification



This certifies that Katelynn Johnson has completed training for the following course(s):

Course	Assignment	Completion	Expiration
Biosafety Required Training	Biosafety Required Training Quiz 2024-2025	10/29/2025	10/29/2028
Chemical Safety: The OSHA Lab Standard	Final Quiz	10/30/2025	

Data Last Imported: 10/31/2025 08:54 AM

^{**}Can find the information here: https://apps.research.wisc.edu/TILT

Katelynn Johnson - Sep 26, 2025, 3:38 PM CDT

Title: BPAG Meeting Notes

Date: 9/26/2025

Content by: Katelynn

Present: Katelynn

Goals: Overview the BPAG role and learn about how to support my team and project.

Content:

(Note: Information slides are available on BME Design website)

• https://bmedesign.engr.wisc.edu/course/resources

Logistics Overview:

- · General avenues:
 - o client makes purchase
 - team makes purchases and then gets reimbursed by client
- · All expenses must be approved by client prior to purchase
- Any purchase over \$1,000 must have departmental approval as well as client approval
- · Keep track of all purchases
 - o all original detailed receipts in notebook
 - table of expenses notebook, progress report, and report

Client and Project Type:

- No UW Affiliation:
 - Rehab project --> Can submit a request for BME funding
 - reqeusts viewed by BME team on Wednesdays
 - Will have to follow UW purchasing rules if funding is given
 - · Anything is fair game
 - best option: client pays
 - less great option: we pay
 - work with client for reinbursment (ideally to one person)

Deisgn Innovation Lab @ Wendt:

- each team gets a \$50 budget Account Name: BMEDesign
- · Other payment:
 - o client fund number (has to set up an account with a funding string)
 - complete the team information excel street for client

Design Innovation Lab @ ECB:

Reimbursement:

- only BPAG should be reimbursed
- · HAVE CLEINT PAY FIRST (reimbursment should be last resort)
- · Non-reimbursable expenses do not ask client to pay:
 - · LabArchives notebookl \$15
 - Poster printing \$50

Accounting Table:

• Use a table with all of the information needed to purchase again

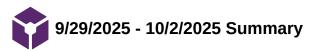
- o shrink links
- o make sure links are clickable
- Put table in
 - o progress reports
 - team part of notebook
 - report
- · Check ineligible vendors list

Gifted items:

- Try before you buy (design closet)
- · Document as much as possible so that the item could be bought again (or rebuilt with given mateirals)

Conclusions/action items:

Because our project is a rehab project not affiliated UW-Madison, I will be pursuing funding from the BME department to help supplement the client's budget. While the client has mentioned that they would consider raising the budget is the design shows promise, our team would like to keep their costs as low as possible, especially considering that they funded this project last year as well. I will also be adding the accounting table to Lab Archives. After attending this information presentation I will be ensuring that all materials (no matter if they were paid for or not) are documented in a way that the design can be easily reproduced.



Katelynn Johnson - Oct 03, 2025, 11:16 AM CDT

Title: 9/29/2025 - 10/3/2025 Weekly Summary

Date: 10/3/2025

Content by: Katelynn

Present: Katelynn

Goals: To recap this week's events and lay out upcoming plans.

Content:

During our 9/24 home visit, we presented our chosen designs for the family and some care team members with the goal that they would report back to our group by 9/27 on feedback from other members of the caregiving team and family about what they would like to see in a final design, and what they liked/disliked from our proposed ideas. Unfortunately, this plan did not work out, so our team met on 10/1 to compose our final design from what feedback we had received in person (see 10/1 meeting notes for a more in-depth summary) and our own opinions about what would be most successful.

This week, the group also focused on composing our preliminary presentation, and began work on our preliminary report. We met twice this week to go over some details for this: 10/1 and 10/3. I am responsible for the introductory slides of the presentation and also the introductory portion of our preliminary report.

Conclusions/action items:

Last week I had the goal of having all Canvas Modules for the required BME 200 shop and safety trainings completed by 10/1 (this past Wednesday). Unfortunately, I was unsuccessful in completing this goal. My overall goal of completing the trainings by 10/24/2025 remains the same, however, I will need to re-center my focus this coming week in order to accomplish this as the timeline is getting very short. My interest in attending a Monday Woodshop Orientation and skills training at ECB remains the same, as I feel this will be beneficial both for my learning and skill set, but also for the team and project. Moving forward, I will also be focusing on completing my section of the preliminary report before Wednesday, 10/8, supporting my other teammates with their work when I can.

Katelynn Johnson - Oct 09, 2025, 4:21 PM CDT

10/3/2025 - 10/9/2025 Summary

Date: 10/9/2025

Content by: Katelynn

Present: Katelynn

Goals: To recap this weeks work and layout upcoming plans.

Content:

10/3/2025:

- · Preliminary presentation for BME advisors and peers.
- Overviewed our teams work so far and presented our final design choice and future work plan.
- I was responsible for introducing our team, our project, and go over some background for our project. I also helped answer student and faculty questions at the end of the presentation.
- At the time of this presentation, we had decided to move forward with a telescoping/nesting final design that combined aspects of the telescoping ramp and the suitcase ramp.

10/4/2025:

· Compeleted the FeedBack Fruits analysis for myself and my teammates.

10/7/2025:

- Sara, Grace, and Julia met with staff at Wendt Innovation Lab to discuss fabrication plans (See the 10/7/25 Fabrication Meeting for more information).
- After meeting with the fabrication staff, our team has since researched commercially manufactured ramps that we could modify for our
 design. This is important because the costs for manufacturing an aluminum ramp independently would exceed \$1000 dollars, which is
 twice as much as our budget.
 - Sierra has found a ramp candidate that meets our strength and dimensional requirements (see Sierra's notes for more information), and also has a height-adjustable feature.
- I referenced my team's preliminary research and earlier PDS and preliminary reports to begin developing the Abstract, Introduction, and Background sections of our preliminary report.
- By the end of the day 10/7, I had completed the Introduction, Client Information, and the majority of the Previous and Competing Designs sections of the preliminary report.

10/8/2025

- I finished editing the Previous and Competing Designs section, and completed the Design Specifications section and Abstract.
- After the team had all completed their respective parts of the preliminary report, I inputted the Table of Contents, did a general editing
 read through of the entire report, and double checked that the references I used were listed correctly in the References section.

10/9/2025

- Due to the projected cost of our project, and the fact that it exceeds our current budget, I submitted a request to the BME department for funding.
 - I anticipate hearing back from the BME department next Thursday, 10/16/2025 about our eligibility and request status.
- Completed the FeedBack Fruits analysis for my personal report.
- Updated the Week 5 progress report.

Conclusions/action items:

This week I have been focused on documentation and the preparation for midterm exams for my other courses. I am finished with my exams on Friday, and anticipate using the rest of that day and the weekend to complete the canvas portion of my BME required trainings. I aim to have all of my in-

person assessments scheduled by Monday (10/13). Moving forward with the fabrication part of our project, I anticipate our group developing a low-cost cardboard model of our design to test the nesting/telescoping features. Depending on the results of my BME funding request, I will reach out to the client to report our anticipated budget needs and develop a rough plan for fund allocation.

Update: approval for BME department funding was granted. I am hoping to submit a formal funding request by Tuesday evening, so that our team can begin ordering supplies.

Katelynn Johnson - Oct 16, 2025, 6:36 PM CDT

Title: 10/10/2025 - 10/16/2025 Summary

Date: 10/16/2025

Content by: Katelynn Johnson

Present: Katelynn Johnson

Goals: To recap this weeks work and layout upcoming plans.

Content:

10/12/2025 - 10/13/2025:

- · Researched materials and different fabrication methods
- · Researched available pre-manufactured aluminum ramps
- · Sketched out a new design based off of research for 10/13 team meeting

10/14/2025 - 10/15/2025:

- Researched available pre-manufactured aluminum ramps for a new design
- · Researched Barrister Doors for design inspiration
- Sketched out a new design based off of research for 10/15 team meeting

10/16/2025:

- · Sourced Preliminary Fabrication Materials
- · Updated Materials and Budget sheets
- · Sought clarification for how to use BME Department Funding
- · Updated all other relevant BPAG documentation, and submitted materials for purchasing approval by client

Conclusions/action items:

While this week has been very busy with trying to design a new final design, and our team was successful in producing a feasible and cost effective design, I was unable to make much progress on my personal goals of completing the BME 200 trainings. These trainings need to be completed in less than 2 weeks, so I am very concerned about my ability to get these done in a timely fashion. In order to make more time in my schedule for fabrication and other work relating to this project (including the required trainings), I have dropped one of my courses so that I have a lighter course load. Hopefully this gives me enough time in these coming two weeks to get both the canvas and in-person part of the trainings completed.

Katelynn Johnson - Oct 23, 2025, 12:27 PM CDT

Title: 10/17/2025 - 10/23/2025 Summary

Date: 10/23/2025

Content by: Katelynn

Present: Katelynn

Goals: To recap this week's events and lay out upcoming plans.

Content:

10/17/2025:

- Design Lab staff consultation meeting (see Team Activities folder for more information)
- During this meeting the DI Lab @ ECB staff helped us improve our design, and walk through a basic fabrication plan.
- We are going to use a V-grove track wheel system instead of the standard caster wheel system we had originally included. This will increase ease-of-use and reduce the amount of seperation between pieces, lending to a more cohesive design.
- Our team also discussed the potential need for a secondary point of securement for the side tracks (in addition to the securement where the ramp is attached), and determined that a front support, or under belt support would be a good addition in order to increase rigidity.
 - This had been a point of concern for me through various design proposals, so I was glad to get a secondary outside opinon
 on this.
- The fabrication plan for the side tracks stayed relatively the same, however the ramp attachment system will require further research and brainstorming.

10/20/2025:

- Our team met today to debrief and expand upon the information we learned during the design consultation.
- We decided to move forward with the alternate legs that were recommended during the design consultation and have found affordable versions on amazon and less affordable versions available online at Home Depot.
- Our team also decided to move forward with the V-grove track wheel system.
- The team is still brainstorming ramp attachment ideas, and are waiting for the ramp to be delivered, and for the start of the side track fabrication for further steps.
- I communicated with Dr. J Puccinelli about our decision to purchase the pre-fabricated ramp, wood for constructing the side tracks, and the adjustable legs (giving him the purchasing choice between the amazon and home depot versions).
- · I also worked on completing the Intro to Machining Canvas Module

10/22/2025:

- Today our team visited home depot to purchase the lumber for the side tracks.
- We were able to find wood that fit our needs and requirements, however we will want to use a dark stain during the finishing process in order to make the tracks look more seamless as we are combining two different wood types.
- I continued to communicate with Dr. Puccinelli about our purchasing updates, their relevency to the project, and future purchasing plans.
- I updated all materials and budgeting documents to reflect the new and anticipated purchases, and to access our future budget needs.
- I also worked on completing the Intro to Machining Canvas Module

Conclusions/action items:

Moving forward I will continue to work on the design training canvas modules, and schedule the in-person lab times ASAP. This week consisted of a lot of communication about purchasing and budgeting information, but thankfully we were able to start procuring materials on Wednesday. Our project has only a few weeks left for fabrication, so it will be all hands on deck moving forward. I hope to help the team during the fabrication of the side tracks, and I will try to faciliate material purchases further in advance so the there is less delay during our fabrication process.

Katelynn Johnson - Oct 30, 2025, 11:24 AM CDT

Title: 10/24/2025 - 10/30/2025 Weekly Summary

Date: 10/30/2025
Content by: Katie

Present: Katie

Goals: To recap this week's events and lay out upcoming plans.

Content:

10/24/2025:

- · Today the team met with Dr. Ashton and updated him on our design's progress.
- The team researched silicone mats that could be used to protect the client's hardwood floors from the aluminum ramp use.
- · I also researched non-skid applications for the track base, and found this option on amazon:
 - 8" x 35ft Heavy Duty Anti Slip Tape 80 grit

10/25/2025:

· Worked on the Intro to Machining Canvas Course

10/26/2025:

• Worked on the Intro to Machining Canvas Course -- finsihed online component.

10/27/2025:

- The team met in the wood shop today and cut and planed our boards to size
- · Team meeting and work in woods shop
- · Worked on the Biosafety Course
- · Updated purchasing information and documentation.

10/28/2025:

- · Completed my Lathe Training for the Intro to Machining Course
- · Worked on the Biosafety Course

10/29/2025:

- Today the team met in the wood shop to make planing adjustments to boards.
- After we made our adjustments, the team had a consultation with Eric from the DI Lab staff about steps moving forward. Eric
 recommended that the team purchase new wood for the side track barriers, as our current material is not durable enough for the
 intended use.
- · Received reimbursement for the 10/22 Home Depot Purchases
- Completed the Biosaftey Course.
- · Constructed a 3D cardboard model of our design for show and tell.

10/30/2025:

- Designed a slideshow to support our 60 second pitch for show and tell on Friday.
- · Worked on the Chemical Safety Course.
- Completed Mill training for the Intro to Maching course, and successfully completed the certification process. Updated my training documentation in Lab Archives.

Conclusions/action items:

Moving forward, I would like to research wood finishing processes, and construct a fabrication plan in order to make sure that the process is efficient. I have a strong desire to complete the wood certification as my favorite fabrication area is wood working, and I would like to support the team better. Therefore, I will be keeping an eye out for when the next training time is released. In the coming week I also hope to source materials for our team's next round of purchasing.

Katelynn Johnson - Nov 06, 2025, 12:04 PM CST

Title: 10/31/2025 - 11/6/2025 Weekly Summary

Date: 11/6/2025

Content by: Katie

Present: Katie

Goals: To recap this week's events and lay out upcoming plans.

Content:

11/2/2025:

- The team traveled to Home Depot to purchase new hardwood for the side rails.
- After some research on the hardwood available at Home Depot, it was decided that we would purchase 1" x 4" x 55" (and 52") Aspen hoards
- The team also purchased two 3" non-marking rigid rubber non-swivel caster wheels
 - upon inspection after returning from purchasing, the team discovered that the plate on the wheels is slightly too small for a good attachment to the ramp.
 - A return and exchange will be made later this week.

11/3/2025:

- The team met at the woodshop today and planed and cut the aspen boards to size. We also pre-drilled, glued, and drilled the aspen boards to the southern yellow pine base boards.
- · After working with the team in the wood shop I completed my in-person wood-shop training for my woodshop membership.
 - Training documentation has been updated.

11/5/2025:

- Due to an exam, I was unable to join the team today, however Sierra was able to return the 3" wheels we had purchased for ones with a
 larger base plate.
- Once I receive the receipts for this, the money and documentation will be updated.

11/6/2025:

- Today I updated the purchasing and documentation as well as my personal documentation.
- I also updated Dr. Puccinelli about our recent purchases at Home Depot.

Conclusions/action items:

Moving forward I am planning on helping Grace stain the track base on Friday (11/7/2025) during open woods hours. I am also going to be researching and sourcing a lacquer for the base. I would like to send a purchase request for our handles and attachment mechanisms by next Wednesday (11/12/2025).

Katelynn Johnson - Nov 11, 2025, 1:02 PM CST

Title: Tong Lecture - Building a Career of Impact with Kristin Myers

Date: 11/7/2025

Content by: Katie

Present: BME Department

Goals:

- · Learn more about engineering's place in healthcare
- · Learn about BME opportunities

Content:

Career Path:

- · Chapter 1 College and early career
 - o focus on developing technical skills
 - Filling patents
 - · Get your footing
 - · Engineering has a tight correlation with bussiness
 - o growing yourself and your skills
- Chapter 2 Climb the growth curve
 - · Growing teams, supporting larger groups of people
 - · Focusing on impact

Healthcare:

- How to make health care great: Quadruple Aim
 - improved provider experience
 - · improved patient outcomes
 - · lower cost of care
 - improved patient experience

Takeaways:

- · Work hard and build range
- · Seek diverse exposure
- · Surround yourself with people you admire
- · Know your values and protect them
 - o define what matters most (family/friends, health, career/impact) and make decisions that align
- embrace challenge and keep growing
- Don't say yes to things in the future that you would not say yes to now or for tomorrow.

Katelynn Johnson - Nov 12, 2025, 2:05 PM CST

Title: 11/7/2025 - 11/13/2025 Weekly Summary

Date: 11/13/2025

Content by: Katie

Goals: To recap this week's events and lay out upcoming plans.

Content:

11/7/2025:

- The team attended the Tong Lecture today (see my "11/7/2025 Tong Lecture" page for more information)
- Today the team met in the wood shop at the DI Lab @ ECB and sanded the wood glue off of the track base before staining the top surface.

11/10/2025:

- Today Sara and I met in the wood shop at the DI Lab @ ECB to sand and stain the remaining side of the track base.
- We also attached the adjustable legs to the track base and set the leg heights to ~7.75 inches.

11/12/2025:

- Today I spent time updating documentation and researching handle designs for our ramp and comparing products from several different vendors. I ultimately decided to go with a model from Amazon due to it's cost-effectiveness and it's intuitive design that meshed nicely with our design.
- After the updates and research I updated Dr.Puccinelli on our recent purchases at Home Depot and requested reimbursement in addition to requesting the purchase of the kayak handles from Amazon.

Conclusions/action items:

Moving forward I will be looking into different attachment mechanisms for the ramp-track base attachment point. I will also review the client and team feedback from the home visit on 11/12 (I am not able to attend myself due to an exam) and will brainstorm ideas if needed. I am curious to see how the current side tracks function in terms of stability, and will brainstorm potential tie-mechanisms in case that is a concern.

Benefits of Treadmill Walking with a Gait Trainer - 9/19/2025

Sara Mlodik - Sep 20, 2025, 12:10 PM CDT

Title: Benefits of Treadmill Walking with a Gait Trainer

Date: 9/19/2025

Content by: Sara Mlodik

Goals: Research why gait trainer assisted walking is beneficial for bone/muscles/nerves

Content:

Defying Gravity: The Importance of Gait Training to Restore Mobility [1]

- · Neuromuscular system benefits
 - When someone is unable to bear weight for long periods, muscles weaken rapidly
 - By engaging in weight-bearing and walking tasks, muscle mass can be preserved
 - o Gait training helps strengthen and maintain the muscles and nervous system
- · Health benefits
 - Upright walking supports better posture, circulation, and balance, reducing risk of falls
- Frequency
 - Regular repetition gives better outcomes
 - It would be beneficial for a person like Nadine to have daily access to a method of gait training,
 like the treadmill in her home

Five Common Gait Training Goals and How to Achieve Them [2]

- People who sit for long periods often develop hip and knee tightness that limits leg extension.
- The pacer gait trainer helps address this by supporting the and raising body so the heels start slightly off the floor
- As the user relaxes, the heels lower, promoting hip and knee extension and allowing the user to take steps
- This applies to Nadine in that Amanda mentioned how walking helps Nadine maintain her ability to be mobile in transferring between her bed, recliner, shower chair, and wheelchair to go out into the community. The benefit is likely due to these factors

The Advantage of Dynamic Movement [3]

- The Dynamic Pacer gait trainer enhances natural walking by allowing:
- Vertical movement (dynamic weight bearing)
- Lateral movement (dynamic weight shifting)
- This supports a more realistic gait patterns than traditional trainers; thus, it is important that we integrate Nadie's current Rifton Dynamic Gait Trainer with the treadmill

Body Weight Supported Treadmill Walking [4]

- Locomotor training, also called assisted treadmill walking, focuses on rebuilding neural pathways through consistent movement patterns and sensory feedback.
- As the feet make contact with the treadmill, signals travel up to the spinal cord, helping activate and strengthen the neural circuits responsible for stepping

Why Dynamic Gait Training? [5]

- Vertical movement: Dynamic support allows one's pelvis to rise and fall naturally, helping with leg clearance and efficient stepping.
- Body-weight support: Consistent unloading keeps the user stable
- Lateral weight-shifting: Side-to-side motion supports proper weight transfer, making stepping easier.
- Dynamic advantage: The Pacer's combined vertical and lateral movement promotes a more natural gait, better endurance, and improved posture.

Improving Mobility and Function: The Power of Gait Training [6]

- Gait training helps people who've had neurological injury (stroke, TBI, Parkinson's, etc.) promote movement
- Gait training improves balance, strength, coordination, endurance, and walking mechanics.
- This can help improve independence, reduce risk of falls, and maintain a high quality of life.

Comparison of training methods to improve walking in persons with chronic spinal cord injury: a randomized clinical trial [7]

- The study compared different gait training strategies to determine which were most effective for improving walking ability in people with chronic spinal cord injury (SCI)
- Participants: Adults with incomplete SCI who had been injured for more than one year (i.e., "chronic")
- Intervention groups:
 - Overground walking training
 - Body-weight-supported treadmill training (BWSTT) *This is what Nadine's system would be
 - Robotic-assisted treadmill training
- Training involved several sessions per week
- Outcomes were measured by gait speed, distance walked, and functional independence
- All groups improved walking performance, showing that intensive gait practice itself is highly beneficial
- No single method was dramatically superior, both manual and robotic treadmill approaches were effective
- The repetition of gait training (stepping, weight-shifting, upright movement) was the most important factor in the participants' improvements
- · Consistency and frequency were critical
 - Regular stepping practice led to neural and muscular gains
- · My comments:
 - Even though the participants had a chronic spinal cord injury (SCI) instead of Nadine's seizure disorder, the BWSTT still improved their outcomes and provided these benefits
 - This source shows that consistent stepping patterns build strength, balance, and coordination, even in chronic conditions
 - This source confirms that the method of walking is less important than the repetition
 - Meaning that a treadmill gait trainer to use in winter is very valuable for Nadine

Conclusions/action items: Use this information to understand the importance of creating a suitable design for Nadine and as background in reports to help others understand the benefits of our accessibility product.

References:

- [1] "Body-weight Support Treadmill Gait Training System," Sunshine Curing. [Online]. Available: https://sunshinecuring.com/gait-training-equipment/body-weight-support-treadmill-gait-training-system.html. [Accessed Sep. 19, 2025].
- [2] L. Bidabe, "Expert Tips for Proper Pacer Positioning (Weight-Bearing & Prompts)," Rifton Education Center. [Online]. Available: https://www.rifton.com/education-center/articles/pacer-positioning-weight-bearing-prompts.[Accessed Sep. 19, 2025].
- [3] Rifton, "The Advantage of Dynamic Movement: Rifton Pacer video 4," Rifton Education Center. [Online]. Available: https://www.rifton.com/education-center/videos/the-advantage-of-dynamic-movement. [Accessed Sep. 19, 2025].
- [4] J. Gilligan, "Body Weight Supported Treadmill Walking," Rifton Education Center, May 2017. [Online]. Available: https://www.rifton.com/education-center/articles/assisted-treadmill-walking-pacer. [Accessed Sep. 19, 2025].
- [5] E. Noble, "Why Dynamic Gait Training?" Rifton Education Center, Oct. 2015. [Online]. Available: https://www.rifton.com/education-center/articles/dynamic-gait-training. [Accessed Sep. 19, 2025].
- [6] S. Giant, "Improving Mobility and Function: The Power of Gait Training," The Summit Physical Therapy, Jun. 17, 2024. [Online]. Available: https://thesummitpt.com/improving-mobility-and-function-the-power-of-gait-training/. [Accessed Sep. 19, 2025].
- [7] N. Alexeeva, C. Sames, P. L. Jacobs, L. Hobday, M. M. Distasio, S. A. Mitchell, and B. Calancie, "Comparison of training methods to improve walking in persons with chronic spinal cord injury: a randomized clinical trial," Journal of Spinal Cord Medicine, vol. 34, no. 4, pp. 362-379, 2011, doi: 10.1179/2045772311Y.0000000018. [Accessed Sep. 20, 2025].

Aspects of the Rifton Gait Trainer - 9/19/2025

Sara Mlodik - Sep 19, 2025, 7:59 AM CDT

Title: Aspects of the Rifton Gait Trainer

Date: 9/19/2025

Content by: Sara Mlodik

Goals: Get a better idea of what a gait trainer is and what parts it has (specifically the model Nadine has: Rifton K640 Large Pacer)

Content:

Guidelines for Functional Use of the Pacer Gait Trainer Part II [1]

- Pacer gait trainer definition: Walking support device used by individuals with disabilities during ambulatory (related to walking) activities
- Pacer Prompts (components):
- Multi Positioning Saddle (MPS)
 - Stabilizes the pelvis for better posture and movement during gait training
 - Promotes weight shifting, stepping, and control of spastic movements while keeping the pelvis aligned
- · Thigh Prompts
 - Assist with leg alignment and adduction control during gait
 - · Help prevent twisting of the body in the Pacer
- · Ankle Prompts
 - Attach under the bottom bar to control foot placement and prevent scissoring
 - Adjustable spring guides allow stride length and step placement control
- Casters
 - Provide precise control of movement with four functions: brake, swivel lock, variable drag, and directional lock
 - Brake
 - Locks the wheel completely so the pacer will not roll
 - Provides stability during transfers or setup
 - Swivel Lock
 - Holds wheels in a straight line
 - Engage all four for straight tracking or just the rear casters to reduce lateral drift and aid steering
 - Helps users who need extra guidance for forward movement
 - Variable Drag
 - Adds resistance to slow uncontrolled gait, build leg strength, or correct veering
 - Directional Lock
 - Prevents backward rolling
 - For users who struggle to maintain forward movement

Most effective when paired with the swivel lock

Conclusion/Action Items: Use this information to help decide which ramp/platform design would be suitable for Nadine and the Rifton K640 Large Pacer (with the utility base)

References:

[1] E. Noble, "Guidelines for Functional Use of the Pacer Gait Trainer Part II," Rifton Education Center, Oct. 2019. [Online]. Available: https://www.rifton.com/education-center/articles/guidelines-functional-use-of-pacer-gait-trainer-2. [Accessed Sep. 19, 2025].



2024 Project Design and Suggested Improvements - 9/11/2025

Sara Mlodik - Sep 16, 2025, 8:23 PM CDT

Title: 2024 Final Project Notes and Applications to our 2025 project

Date: 9/11/2025

Content by: Sara Mlodik

Goals: Go through the 2024 Final Project, take notes on their process, and identify where we can improve

Content:

Design:

- 1. Connected Ramp and Track (1 large piece)
 - Both tracks are connected to the ramp
 - Each track had 2 grooves to fit the size of the gait trainer wheel
 - The entire product was connected to the treadmill with C Clamps



- O Figure [14] C-Clamp Installation
- 2. Disconnected Ramp and Track (2 individual pieces) (This is the idea they chose)
 - o 3 parts: ramp, right track, and left track
 - Each track had 2 grooves to fit the size of the gait trainer wheel
 - The right and left tracks each would have 3 C-Clamps to attach them to the treadmill securely
 - Note: It was mentioned how long it took to put on the C-clamps; another alternative will be needed if we were to use the disconnected ramp and track system
 - The ramp would be detachable and re-attachable using Velcro (they called it a "simple hook and loop system")
 - Note: Velcro does not seem like a suitable or long-term option
 - Note: If we were to choose this design, maybe an interlocking design would be better (sort of like Lincoln Logs?)
- 3. Altered Gait Trainer
 - Make a wider base for the gait trainer that would allow it to go around the treadmill
 - Major safety concerns
 - Would need testing with stability
 - Note: Would it damage the current gait trainer?
 - Note: How stable would it be?
 - note: How would the original base need to be aligned to work?
 - Note: This does not seem like a viable option for the time being

Fabrication/Testing:

- Materials
 - ο ΔCO laheled wood was used for the main ramn and tracks

- Nails, fasteners and bolts were made of either hot-dipped galvanized or stainless steel (since the wood was treated with a copper substance)
- · Additional supports were added onto the bottom of the tracks
 - Note: I am unsure if this was before or after the SOLIDWORKS testing
- SOLIDWORKS Testing
 - In simulations, they used balsa wood material, with a yield strength of 20MPa and elastic modulus of 3GPa
 - They tested how the material held up in SOLIDWORKS, applying a 200lb force at points: the material had a maximum deformation of 0.0035mm between supports
 - Note: Their spacing of supports was successful in handling the necessary load
 - Load distributed load over the 54in tracks resulted in a maximum deformation of 0.063mm (Factor of safety = 560)
 - Their ramp had almost zero deformation with a concentrated 1400 N force (Factor of safety = 24773)
- In-Person Testing
 - They did not do testing on Nadine herself, but they testing moving the gait trainer up the ramp and a nurse simulated the gait of Nadine
 - They tested with the wheels both locked and unlocked

Safety

- · Rubber non-slip mat was installed in the grooves of the tracks
 - This is a great idea
- They used a rubber ramp cover
- Bottom of the ramp and tracks had non-slip silicone tape
 - o This is also a great idea
- Edges were to the side of the ramp to prevent the gait trainer from rolling off
 - This would be great to include in our design
- The tracks had additional railings on the inside and outside

Final Product

- 3 parts: ramp, right track, and left track
- Each track has five support beams
- Each track had 2 grooves to fit the size of the gait trainer wheel
- The right and left tracks each had 3 C-Clamps to attach them to the treadmill securely
- Aluminum sheets allowed for smooth transitions
- Images
 -) 📑

Feedback after completion:

• "If there was more time, perhaps making an easier on/off system with the c-clamps so that caregivers have less work to attach it to the treadmill each time they want to use it" (Pejerski)

Discussion Quotes:

• "Ethical considerations applicable to the design are safety, ease of use for the client, and the variability of the device"

- "Due to the process of attachment of C-Clamps and heavy bases of the ramp and tracks, the design lacks in ease of use"
- "Solely based on the structure of the design, the design can only be used with the Horizon T101 Treadmill"
- "Throughout the fabrication process, the measurements were proven to be inaccurate without taking into account all portions of the treadmill"
- "Due to the slight elevation in the plastics at the end of the treadmill, the tracks were not perfectly aligned with the bottom of the floor. The team cut the end of both tracks down four inches, which lined up perfectly without elevation of the treadmill"
- "Sources of error for this project can be concentrated in testing and measurements"
- "Additionally, a ramp spanning the width of the treadmill and the two tracks which allows for safe entrance onto the treadmill"

Conclusion Quotes:

- "In the future, creating a system that is adjustable in height and attachment would allow the use of the device to be more diverse"
- "Implementation of an adjustable height system could be added to the track to allow for attachment between different treadmills"
- "Additionally, the addition of an emergency unlocking system could be added in case of a seizure"
- "Something such as a lever could be included in the improvements to allow for extra security during a seizure"
- "Creating an easier system of attachment to the treadmill would alleviate extra work that needs to be done currently"
- "To ensure the gait trainer is securely locked into place, adding wedges on both sides of the wheels would restrict additional movement"

Conclusions/action items:

- Ease of Use: The 2024 design relied heavily on C-clamps, which made setup slow and labor-intensive. A faster, more intuitive attachment system is needed.
- **Design Limitations:** The system was treadmill-specific (Horizon T101) and not easily transferable. Our design should aim for greater adjustability
- Safety Successes: Non-slip mats, silicone tape, and side railings were effective. These should be used and potentially enhanced.
- **Testing Gaps:** SOLIDWORKS analysis suggested high safety factors, but in-person testing was limited and did not include the actual client (Nadine)
- Material Choices: ACQ wood and stainless/galvanized fasteners worked, but the product weight was too high
- Potential Improvements: Adjustable height system, emergency unlocking mechanism, and wheel wedges

References:

[1] M. Kaminski, J. Szelagowski, I. Counts, K. Kimmel, and N. Jain, "Final Report: Gait Trainer With Treadmill", Dept. of Biomedical Engineering, University of Wisconsin–Madison, Madison, WI, Dec. 15, 2024.

Final Design Report



Gait Trainer With Treadmill

BME 200/300 University of Winconsin-Madison Department of Biomedical Engineering 11 December 2024

Client: Amarch Pojerski and Nicole Lafforto Advisor: Dr. Megos Settell

Teom Members

Meghan Kuninski (Para Leader) Jacki Szelogowski (Communicator) Bulle Counts (BSAC) Kalob Kimmel (BWIG) Novya Jain (BPAG)

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Final_Report.pdf (12.9 MB)



Other Existing Gait Trainer & Treadmill Combinations - 9/17/2025

Title: Other Existing Gait Trainer & Treadmill Combinations

Date: 9/17/2025 (updated 9/23/2025)

Content by: Sara Mlodik

Goals: Explore other gait trainer and treadmill combinations that are similar to the adaptability our client needs (these ideas will be used in the PDS)

Content:

Rifton Gait Trainer Treadmill Base [1]

1. General Info

- 1. Rifton sells a treadmill base attachment specifically designed for their gait trainers.
- 2. The base is wide enough to fit around the width of a treadmill, allowing treadmill use in a home setting.
- 3. It includes an adjustable lever system that raises and lowers the harness so it can align with the height of the treadmill deck.
- 4. The overall purpose is to make treadmill walking accessible outside of a clinical environment.

2. Benefits and Features

- 1. Designed to work with Rifton gait trainer
- 2. Provides a stable and supportive setup for treadmill walking.
- 3. Adjustable harness height allows for compatibility across different treadmill models.

3. Drawbacks

- 1. Requires the purchase of a new treadmill base
- 2. The wider, heavier base and lever system make the device bulkier and harder to move or store.
- 3. The bulkiness may make it impractical for daily use.
- 4. In practice, a user may need two gait trainers: one for everyday walking and one for treadmill use.
- 5. This is not cost effective



LiteGait for Adults [2]

1. General Info

- 1. LiteGait is an overhead harness system designed for treadmill walking.
- 2. The base is constructed with two beams that span the length of the treadmill, providing stabilization.
- 3. A front cross bar connects the beams and supports a vertical column.
- 4. The vertical column holds both arm supports in front of the user and the overhead harness suspension system.

2. Benefits and Features

- 1. Provides significant body-weight support, which would help Nadine's caregivers
- 2. Arm supports
- 3. Adjustable system accommodates any treadmills

3. Drawbacks

- 1. Intended for clinical and therapeutic use, not for home settings.
- 2. Includes many electronic features beyond what Nadine needs, making it unnecessarily expensive.
- 3. Only useful for treadmill walking.
- 4. Would require the user to transfer from their current gait trainer to the LiteGait system for every treadmill session, which is inconvenient.
- 5. The whole system is quite large and would take up a lot of space in a home



LiteGait for Home [3]

1. General Info

- 1. The LiteGait LG4 Home is an overhead gait training system designed for use with treadmills
- 2. It features a support frame with two longitudinal beams that span the length of the treadmill, a front cross-bar, and a vertical support column for a
- 3. It includes arm supports in front of the user and adjustable harness attachment points to accommodate different user heights and treadmill deck

2. Benefits and Features

- 1. Provides substantial body-weight support which can reduce caregiver effort and risk during treadmill walking
- 2. Arm supports allow the user to have forearm or hand support, helping with balance and posture
- 3. Adjustable sizing (height, arm positions) makes it compatible with many different treadmill models
- 4. Made for home use, presumably making it more suitable than full clinical systems for residential settings

3. Drawbacks

- 1. Still relatively large and likely requires significant space in the home; may be difficult to fold or store away
- 2. Only useful for treadmill walking; doesn't replace her existing gait trainer for other mobility tasks
- 3. Requires transferring out of current gait trainer into the LiteGait system each treadmill session, which could be inconvenient
- 4. The cost may be high relative to simpler ramp/ramp-base solutions



Body-Weight Support Treadmill Gait Training System [4]

1. General Info

- 1. Another overhead harness system designed for treadmill walking.
- 2. The base is constructed with two beams that span the length of the treadmill, providing stabilization.
- 3. Two front cross bars connect the beams and supports a vertical column that has two hooks at the top that hold up the harness.

2. Benefits and Features

- 1. Provides significant body-weight support, which would help Nadine's caregivers
- 2. Adjustable system accommodates any treadmills
- 3. More cost-effective than the LiteGait

3. Drawbacks

- 1. There are no arm supports
 - 1. I will ask if that is something that Nadine needs at the next meeting
- 2. Only useful for treadmill walking.
- 3. Would require the user to transfer from their current gait trainer to the gait trainer treadmill system for every treadmill session, which is inconveni
- 4. The whole system is smaller than the LiteGate, but still would not be able to fold or be stored



HCI Fitness Wheelchair Ramps [5]

1. General Info

- 1. Two-part ramp and platform system designed to provide wheelchair users with access to rehabilitation and exercise equipment.
- 2. Allows wheelchair users to roll up and safely position themselves on the platform at the correct height for the equipment.

2. Benefits and Features

- 1. Simple design consisting of a ramp and platform.
- 2. Sturdy enough to safely support wheelchair users.
- 3. Makes it possible for wheelchair users to directly access specialized rehabilitation machines.

3. Drawbacks

- 1. Lacks guard rails on the sides of both the ramp and the platform, which raises safety concerns.
- 2. The ramp and platform are not level across the entire width. The middle is lower than the sides, which prevents even support for a gait trainer ar
- 3. Specifically designed for HCI products, meaning it may not be compatible with treadmills.
- 4. The ramp and platform are not foldable and take up significant space in a home



Conclusions/action items:

Summarize these ideas and sources in a professional way to put into the PDS

References:

- [1] Rifton, "Treadmill Base: A Solution for Gait Practice," Rifton, [Online]. Available: https://www.rifton.com/education-center/articles/treadmill-gait-training-prices/https://www.rifton.com/education-center/articles/treadmill-gait-training-prices/https://www.rifton.com/education-center/articles/treadmill-gait-training-prices/https://www.rifton.com/education-center/articles/treadmill-gait-training-prices/https://www.rifton.com/education-center/articles/treadmill-gait-training-prices/https://www.rifton.com/education-center/articles/treadmill-gait-training-prices/https://www.rifton.com/education-center/articles/treadmill-gait-training-prices/
- [2] LiteGait, "LiteGait for Adults," LiteGait, [Online]. Available: https://www.litegait.com/product/lg-400-wd. [Accessed: Sep. 17, 2025].
- [3] LiteGait, "LG4 Home Overhead System," LiteGait, [Online]. Available: https://www.litegait.com/product/lg4home. [Accessed: Sep. 23, 2025].
- [4] Sunshine Curing, "Body Weight Support Treadmill Gait Training System," Sunshine Curing, [Online]. Available: https://sunshinecuring.com/gait-training-e
- [5] HealthCare International, "Wheelchair Ramps," *HCI Fitness*, [Online]. Available: https://hcifitness.com/products/wheelchair-ramps?
 variant=51774870454639&country=US¤cy=USD&utm_medium=product_sync&utm_source=google&utm_content=sag_organic&utm_campaign=sag
 [Accessed: Sep. 17, 2025].

Sara Mlodik - Sep 26, 2025, 12:41 PM CDT

Title: Measurements to Assist in Design Planning

Date: 9/18/2025

Content by: Sara Mlodik

Goals: Compile all known measurements to help in planning the design

Content:

Gait Trainer Base [1]

· Base dimensions chart is attached

Treadmill [2]

- T101-03 | TM659 | 2012 (Treadmill Folding)
- Horizon Fitness 2012
- Product Codes: TM659
- · Treadmill parts list pdf is attached

Conclusions/action items: Switch the dimensions to metric in the treadmill measurements

References:

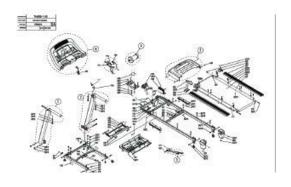
[1] Rifton, "Pacer Gait Trainer: Large (K640)," rifton.com, <a href="https://www.rifton.com/products/pacer-gait-trainers/pacer

(accessed Sep. 18, 2025).

[2] Horizon Fitness, "T101-03 | TM659 | 2012 (Treadmill - Folding)," parts.horizonfitness.com, https://parts.horizonfitness.com/product/detail/932

(accessed Sep. 18, 2025).

Sara Mlodik - Sep 18, 2025, 10:10 AM CDT



Download

resource.pdf (2 MB)

Sara Mlodik - Sep 18, 2025, 10:19 AM CDT

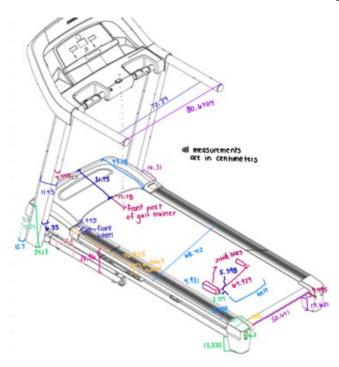
Item Dimensions (inches)	K640 Large Pacer			
Elbow height	32 – 47			
Floor to top of arm prompt	32 - 47			
Floor to top of MPS (not tilted)*	17 – 35			
Overall width	Standard base: 28 Utility base: 32			
Overall length	Standard base: 36 Utility base: 40½			
Frame height	281/5 – 381/5			
Base height (without upper frame)	16.			
Frame weight (lbs)	Standard base: 15½ Utility base: 19¼ Standard upper: 9½ Dynamic upper: 13½			
Dynamic upper movement	Vertical: 2 Horizontal: 2			
Caster diameter	Standard base: 5½ Utility base front casters: 8 Utility base back wheels: 11½			
Maximum working load (b)	200			

^{*}This measurement is taken at the lowest frame and MPS height, and the highest frame and MPS height.

Download

Screenshot_2025-09-18_101841.png (102 kB)

Sara Mlodik - Oct 01, 2025, 3:45 PM CDT



Download

Sara Mlodik - Sep 20, 2025, 6:39 PM CDT

Title: Rolling Ramp with Treadmill Folded

Date: 9/19/2025

Content by: Sara Mlodik

Goals: Create a design with a rolling ramp that can fold with the treadmill to save space

Content:

Attached is my sketch and notes

Background images are from the Horizon Fitness manuals on the Horizon Fitness T101-03 Treadmill website: "TREADMILL OWNER'S MANUAL" and "TREADMILL GUIDE" [1].

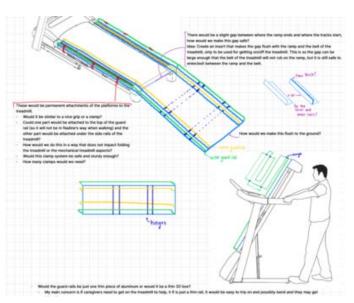
Conclusions/action items: Share this design with the group and brainstorm answers to the questions I have written in the pdf with the sketches

References:

[1] Horizon Fitness, "T101-03 | TM659 | 2012 (Treadmill - Folding)," parts.horizonfitness.com, https://parts.horizonfitness.com/product/detail/932

(accessed Sep. 19, 2025).

Sara Mlodik - Sep 20, 2025, 6:39 PM CDT



inguned.

If it could not up, how would we secure the rolled motal so it would not unnot when not used?

Download

Screenshot_2025-09-20_183827.png (643 kB)

Sara Mlodik - Sep 24, 2025, 6:32 PM CDT

Title: Rolling Ramp with Treadmill Folded

Date: 9/24/2025

Content by: Sara Mlodik

Goals: Refine my preliminary design after the team discussion

Content: (in progress)

Things to consider:

For folding the ramp onto the treadmill, the guard rails will get in the way, how will we address that?

Would the permanent side supports be made of wood or aluminum?

How thick will we have the side guard rail?

- 1. For railings made out of aluminum: Will we fold the metal up once, twice, reinforce it?
- 2. For railings made out of wood: How thick will the wood be? How would we attach it so it is stable on the main structure?

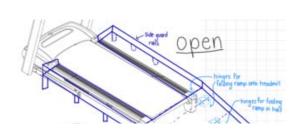
Background images are from the Horizon Fitness manuals on the Horizon Fitness T101-03 Treadmill website: "TREADMILL OWNER'S MANUAL" and "TREADMILL GUIDE" [1].

Conclusions/action items: Show the designs to the client, discuss them with the team, and use the design matrix to find which one to execute

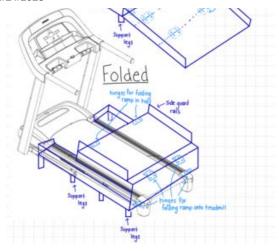
References:

[1] Horizon Fitness, "T101-03 | TM659 | 2012 (Treadmill - Folding)," parts.horizonfitness.com, https://parts.horizonfitness.com/product/detail/932

(accessed Sep. 19, 2025).



Sara Mlodik - Sep 24, 2025, 6:32 PM CDT



Download

Screenshot_2025-09-24_183133.png (709 kB) Preliminary Design #2

Title: Combined Final Design Brainstorm

Date: 10/01/2025

Content by: Sara Mlodik

Present: Step Masters

Goals: Brainstorm a final design, modified from the design matrix

Content:

- A one inch (give or take) flat part before the ramp to make it so there is no angle for the supporting adjustable legs
- Adjustable ramp legs would get rid of the need for telescoping ramp
- Aluminum ramp that would fold up onto the treadmill
- . Toggle latch to connect the ramp and treadmill. The hook part of the latch would be on ramp edge, the latch part would be on the track

Final Ideas:

- · Toggle latch connecting flat part to the tracks
 - o Ramp would be able to be disconnected from the tracks
- · Hinge connecting flat part to telescoping (pull-out) ramp (to allow for angle movement)
- Adjustable legs on the side tracks: https://www.amazon.com/Olldag-Adjustable-Furniture-3-15-4-72-Replacement/dp/B0F8ZM2TCM/ref=sr_1_6?
 crid=39EETVC1XLKSG&dib=eyJ2ljoiMSJ9.Llag3Eks7yGWgtWXpfnMCpJ4iBKkoLBCWil9VBjWaFtpcnc2ml72hEvNg8m4N0KGtxoZpBWB6ctDTkKsbdrmDYB5SVCk6Yor02rQ8EcL7L2C1hbDPZjKIDEGE17lpWek9Gu6T8pZ450s4iaTFRc6DSwbknSeGL5yX5l39tB9CmOUUzqEpjdBsZQZppE1Uqd_C8GXi5uuqzNOs&dib_tag=se&keywords=adjustable%2Bchair%2Blegs&qid=1758754935&sprefix=adjustable%2Bchair%2Bleg%2Caps%2C203&sr=8-6
 - o Would allow the inside part
- Telescoping ramp would nest under (bump-up when going up)
- · Ramp portion made out of aluminum
- · All slides into the top third (or fourth)
- · Maybe add a handle after testing wherever needed

Conclusions/action items:

Draw out the final design and brainstorm fabrication

Sara Mlodik - Oct 12, 2025, 12:58 PM CDT

Title: Design/Material Alternatives after Fabrication Meeting

Date: 10/9/2025

Content by: Sara Mlodik

Goals: Find material and design alternatives after the initial consultation with fabrication

Content:

Material Alternatives



Link to image: https://amramp.com/products/modular-ramps/

"open-mesh surface"

To save on cost and have a lightweight material, we could consider an open-mesh surface such as one one used on this modular ramp.



Link to image: https://expandedmetalsheetmesh.com/product/expanded-metal-mesh-flooring/#inquiry



Link to image: https://www.ryerson.com/store/aluminum/expanded-metal/standard?page=1&view=guided

We would need a message for a quote on price for this specific brand, but materials like this would be possible to use to save on cost and avoid using wood.

Design Alternatives:

We could pair this material (for the walking surface) with the nesting blocks idea to save on weight and avoid using wood. We could add support bars under if needed. We could also pair this with aluminum channel to make the side railings. The mesh would reduce weight and make the design look less bulky. Plus, being able to see through may help with assembly.

Conclusions/action items:

Discuss with the team about this material and research more about pricing and where to get it if we see it as a feasible option.



New Design Post-Fabrication Meeting - 10/12/2025

Sara Mlodik - Oct 12, 2025, 5:21 PM CDT

Title: New Design Post-Fabrication Meeting

Date: 10/12/2025

Content by: Sara Mlodik

Goals: Create a feasible new design

Content:

Track system:

Same as our proposed final design:

- · Made of wood
- Has telescoping legs for outside support
- The inside part of the tracks would sit on top of the treadmill edge

Ramp system:

• More details are in a side view of the design



- Will be made from wood mostly
- · 3 separable parts
- The hinges would be piano hinges



Link to image: https://www.lowes.com/pd/ReliaBilt-N149-900-ReliaBilt-1-1-2-in-x-72-in-Black-Continuous-Hinge/5001640219

- These three parts can be taken apart and stacked on top of one another
- The part with the two sets of legs (in red) would be the widest and the blue would be the narrowest

- This would allow them to be set on top of one another when not in use, on top of the treadmill possibly
- Each part would be connect and secured to the others by a bold or pin that would be put through matching holes on the flat platforms where the two overlap
- Optional: To make it more compact, we could find a way to make the legs fold out like a folding table so the three parts could sit flat on top of one another. Like this method here:



Link to image: https://toplinemfg.com/product/locking-folding-legs/

Conclusions/action items: Talk to the team about this design to see if it is a realistic and feasible option.



Design Innovation Lab Trainings - 10/27/2025

Sara Mlodik - Oct 28, 2025, 9:28 AM CDT

Title: Design Innovation Lab Trainings

Date: 10/27/2025

Content by: Sara Mlodik

Content:

Lab Orientation, Shop Tools, Machining Training, and Woodshop Orientation Completion



My Memberships				
Membership Type	Start Date	Expiry Date	Renew	Card Info
Machining	Wed, Aug 20 2025	Permanent	Not Renewable	N/A
Woodshop Orientation Eligible	Wed, Aug 20 2025	Wed, Dec 31 3000	Not Renewable	N/A
Lab Orientation	Wed, Aug 20 2025	Wed, Dec 31 3000	Not Renewable	N/A
Shop Tools	Wed, Aug 20 2025	Wed, Dec 31 3000	Not Renewable	N/A

Profile

Program Registrations

Bookings

Memberships

Orders

Invoices



Biosafety and Chemical Safety Trainings - 10/27/2025

Sara Mlodik - Oc

Title: Biosafety and Chemical Safety Trainings

Date: 10/27/2025

Content by: Sara Mlodik

Content:

Biosafety Required Training and Chemical Safety: The OSHA Lab Standard Completion



This certifies that Sara Mlodik has completed training for the following course(s):

Course	Assignment	Completion	Ex
Biosafety Required Training	Biosafety Required Training Quiz 2024-2025	8/28/2025	8/2
Chemical Safety: The OSHA Lab Standard	Final Quiz	8/28/2025	

Data Last Imported: 09/11/2025 10:55 AM

CITI Program Safety Trainings - 10/27/2025

Sara Mlodik - Oct 27, 2025, 5:23 PM CDT

Title: CITI Program Safety Trainings

Date: 10/27/2025

Content by: Sara Mlodik

Content:

Basic/Refresher Course - Human Subjects Research and UW Human Subjects Protections Course Completion



Sara Mlodik

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

Basic/Refresher Course - Human Subjects Research

(Curriculum Group)

UW Human Subjects Protections Course

(Course Learner Group)

1 - Level 1

(Stage)

Under requirements set by:

University of Wisconsin - Madison



101 NE 3rd Avenue, Suite 320 Fort Lauderdale, FL 33301 US www.cibprogram.org

Generated on 27-Oct-2025. Verify at www.citiprogram.org/verify/?w239c0251-9d1e-4b80-b476-aaefbf32cf6e-72311140



Preliminary Presentation Speaker Notes Planning - 10/2/2025

Sara Mlodik - Oct 02, 2025, 9:08 AM CDT

Title: Preliminary Presentation Speaker Notes Planning

Date: 10/02/2025

Content by: Sara Mlodik

Goals: Type out what I will say during the Preliminary Presentation

Content:

My Slide 1: Previous and Competing Designs

Simplified for slides:

- Rifton Treadmill Base: Expensive, bulkier
- Body-Weight Support System: Large, expensive, requires transfers
- · HCI Ramps: No guard rails, made for wheelchairs
- Fall 2024: Gait trainer with treadmill: Short guard rails, not user-friendly
- * Include images in the slides

Speaker Notes:

- Now that Katie gave us a background into our project and client, we can look at what other designs are currently available.
- The brand of gait trainer that the patient uses, is currently too narrow to fit around the treadmill. The same brand does offer a treadmill-specific base, but it is very expensive and bulkier than her current gait trainer.
- Another option is a harness system, but it is costly, takes up excess space, and requires transfers into the harness.
- Ramps and platforms are also available, such as those from HCI, but these are only designed for wheelchairs. They also lack guard rails, which poses a safety issue due to the patient's gait pattern.
- Finally, last year a design was created to allow the treadmill and gait trainer to be used together. However, it
 fell short in that the guard rails were not tall enough, the ramp could not be compacted, and the storage was
 not user friendly.
- Our design aims to build upon the ramp and platform style in a way that will allow the patient to safely benefit from at-home supported walks.

My Slide 2: Summary of Product Design Specifications

Full summary of PDS:

- One transfer device compatible with Horizon T101 treadmill and Rifton Pacer Gait Trainer
- Must fit Rifton Pacer K640 wheels (20.32 cm front casters, 29.21 cm rear wheels)
- Must withstand load ≥ 173.6 kg (client: 79.4 kg + caregiver: 79.4 kg + gait trainer: 14.8 kg)
- Device weight of moveable parts ≤ 23 kg (per NIOSH lifting guidelines)
- Width ≥ 34 in (86.36 cm) (treadmill width)

- Guardrails: ≥ 2.54 cm (1–2 in preferred)
- Ramp slope: ≤ 1:12
- Use frequency: up to 7 days/week, 10-15 min sessions
- Assembly/disassembly time ≤ 5 minutes for one caregiver
- Device must be easily maneuverable in small spaces
- · Must have smooth finish, no sharp edges, and slip-resistant
- Cost: \$500 budget (flexible if needed)

Simplified for slides:

- · Physical Characteristics
 - o Fits Horizon T101 treadmill + Rifton Pacer Gait Trainer
 - Load capacity ≥ 173.6 kg
 - Device weight of moveable parts ≤ 23 kg
 - o Guardrails ≥ 2.54 cm
- · Operational Characteristics
 - Setup / storage ≤ 5 minutes
 - Use frequency: up to 7 days/week, 10–15 min sessions
 - Smooth finish, slip-resistant, easy-use locks, and compactable

Speaker notes:

- To create a new design, multiple specifications must be met.
- Physically, our design must accommodate both the Horizon T101 treadmill and the Rifton Pacer Gait Trainer.
 The design will also need to support at least 173.6 kilograms total to account for: the client, a caregiver, and the gait trainer. The weight of any parts that will be lifted need to be under 23 kilograms to follow the NIOSH.
 Another safety measure is having guardrails at least 2.54 centimeters high so the wheels cannot fall over the side of the tracks.
- Operationally, the device must be simple and efficient: set up and storage should take five minutes or less for one caregiver, and it should withstand daily use of 10 to 15 minutes, up to seven days a week. To ensure safety and usability, the finish must be smooth, slip-resistant, with easy-to-use locks, and the overall system should fold or compact for storage.
- With these specifications in place, Sierra will now explain our preliminary design concepts and see how they meet these requirements

Conclusions/action items:

Practice this and possibly edit aspects before the preliminary presentation

Sara Mlodik - Oct 08, 2025, 2:41 PM CDT

Title: Preliminary Report Planning

Date: 10/06/2025

Content by: Sara Mlodik

Goals: Plan out my section of the preliminary report

Content:

I completed the sections as follows by paraphrasing our design matrix and consulting with the team on the exact specification for the proposed final design. I used the Preliminary Report Instructions to guide my writing.

Preliminary Designs

- · Include all designs considered
- Neat and detailed sketches with labels and dimensions
- Written summary of each design

Preliminary Design Evaluation

- Design matrix/matrices (see document on the design matrix)
- Written summary of your design matrix/matrices (be concise)
- Proposed Final Design: design choice based on your matrices and large team meeting after the preliminary presentation (note that when putting this subtitle into your table of contents use: Proposed Final Design, not just Final Design)

Conclusions/action items:

Add what I wrote into the Preliminary Report and get feedback from the team on the sections.

Sara Mlodik - Nov 07, 2025, 12:44 PM CST

Title: Tong Lecture Notes

Date: 11/7/2025

Content by: Sara Mlodik

Goals: Take notes on "Building a Career of Impact"

Content:

- · The Foundation:
 - Being a good engineer, and high achiever with a technical focus
 - UW-Madison Biomedical Engineering
 - Medtronic:
 - Engineering
 - Marketing/Product Launch
 - Technical Sales
 - Harvard MBA
 - Skyline Ventures
 - Investor in healthcare startup
 - Arboretum Ventures
 - Investor in healthcare startup technology
- The Growth Curve:
 - Aetna
 - Chief of Staff to CEO
 - Working for a great leader is a great opportunity
 - o Unified Women's Healthcare
- Build and Transform:
 - Making healthcare affordable, accessible, and with good outcomes
 - Hopscotch Health
 - Care for rural communities
 - o Blue Cross Blue Shield Association
- · Great Healthcare:
 - Improved provider experience
 - Improved patient outcomes
 - Lower cost of care
 - o Improved patient experience
- · Complicated US healthcare
 - In the US, 18% of GDP is healthcare (2x as much as other countries)
 - Misaligned incentives
 - Inequities between zip codes
 - o System is broken because it was never designed to be one system
- Integrated system would be a solution
 - **Healthcare needs better systems**
- Tips

- Choose your people wisely: the people around you shape who you become
- Know and protect your values
- Embrace challenge: growth lives on the edge of discomfort

Conclusions/action items:



9/14/25 Physical Activity and Mental Health

SIERRA LOOSEN - Sep 14, 2025, 5:53 PM CDT

Title: Physical Activity and Mental Health

Date: 9/14/25

Content by: Sierra

Present: N/A

Goals: Do background research on the importance of physical activity

Citation: S. A. Paluska and T. L. Schwenk, "Physical Activity and Mental Health," Sports Medicine, vol. 29, no. 3, pp. 167–180, Sep. 2012, doi:

https://doi.org/10.2165/00007256-200029030-00003.

Content:

This article focus on how important physical activity is in alleviating symptoms of depression and anxiety. Both aerobic training and strength/flexibility training appear equally effective for treating depressive and anxiety symptoms. Physical activity appears as effective as psychotherapy for the treatment of mile-to-moderate depressive symptoms. Physical activity is associated with reduced mortality and extensive health benefits.

Conclusions/action items:

This article focuses on the relationship between mental health and physical activity. This shows the importance of participating in frequent physical activity. The goal of our project is to create a means for our client to engage in frequent physical activity by being able to use her gait trainer throughout the winter on the treadmill in her home. This article indicates that physical activity on the treadmill can contribute to better mental health.

SIERRA LOOSEN - Sep 14, 2025, 1:58 PM CDT

Physical Activity and Mental Health
Current Concepts

Scott A Pritaria* and Thomas L. Schwork*

1 Eas Sports Maderen Institute, Crey, North Carolina, USA

1 University of Hitchigan Medical Center, Department of Parally Medicine, Ann Arbor, Mikhigan, USA

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Download 00007256-200029030-00003.pdf (183 kB)

9/14/25 Bidirectional Association between Physical Activity and Dopamine Across Adulthood--A systematic Review

SIERRA LOOSEN - Sep 14, 2025, 5:52 PM CDT

Title: Bidirectional Association between Physical Activity and Dopamine Across Adulthood -- A systematic Review

Date: 9/14/25

Content by: Sierra

Present: N/A

Goals: Learn more about the importance of exercise and relate it to our project

Citation: A. Marques et al., "Bidirectional Association between Physical Activity and Dopamine across Adulthood—A Systematic Review," Brain Sciences, vol. 11, no. 7, p. 829, Jun. 2021, doi: https://doi.org/10.3390/brainsci11070829.

Content:

- · Dopamine is a monoamine neurotransmitter that is known to be modulated by physical activity and exercise
- · Dopamine has essential roles in regulating motor neurons, spatial memory function, motivation, and reinforcement learning
- · Dopamine also plays a crucial role in maintaining chemical balance in the central nervous system
- Physical activity is known to change the dopamine system in the central nervous system, increasing dopamine receptor availability. This
 association may have positive consequences, such as reducing the severity of symptoms of anxiety, depression, and other mentalrelated issues.
- The mental health benefits of physical activity are well documented. Regular physical activity and exercise contribute to improved mental health through improving cognition, increasing BDNF levels in the brain, and brain plasticity.
- This article basically discussed that physical activity leads to an increased release in dopamine, and therefore improves the state of a
 person's mental health

Conclusions/action items:

This article looked at a variety of studies concerning exercise and the release of dopamine. They concluded that physical exercise leads to an increase dopamine released and can therefore improve mental health. This relates to our project because it shows the importance of physical activity and gives motivation for us to provide a safe and effective way for our client, Nadine, to use her gait trainer on her treadmill even when she can't walk outside due to poor weather conditions.

SIERRA LOOSEN - Sep 14, 2025, 2:12 PM CDT



Download

brainsci-11-00829-v2.pdf (522 kB)



9/25/25 Aluminum Bending 101: A Basic Knowledge Guide

SIERRA LOOSEN - Sep 25, 2025, 9:33 AM CDT

Title: Aluminum Bending 101: A Basic Knowledge Guide

Date: 9/25/25

Content by: Sierra

Present: N/A

Goals: Research how we can fabricate a ramp with aluminum

Link: https://www.mybib.com/tools/ieee-citation-generator

Citation: KDMFAB, "Aluminum Bending 101: A Basic Knowledge Guide," KDM Fabrication, Jan. 09, 2023. https://kdmfab.com/aluminum-bending/

Content:

This article provides lots of information regarding bending aluminum, which we would likely have to do if we choose to use aluminum for portions of our prototype.

- · formability describes aluminum's ability to bend without experiencing any cracks or breakages
- aluminum alloys have good formability, some alloys have better to bend than others, some are more difficult to bend
- · the thickness of the material determines the degree of bending
 - · thicker aluminum and smaller bend radii will require more force
 - o thinner aluminum and larger bend radii will be easier to bend
- 5052 Series Aluminum alloy
 - this version has more magnesium content
 - o stronger than aluminum alloy 3003
 - · makes it suitable for applications that require more rigidity since it can retain its shape after bending
 - is often used for hardware signage, marine tool, medical equipment, and hydraulic tubes
- · methods of bending
 - o brake press
 - roll bending
 - ram/push bending
 - rotary draw bending
 - · three roller bending
 - · compression bending
 - stretch forming
 - · hand bending
 - · we will need to consult with the employees of the D+I labs to determine which methods are available to us

Conclusions/action items:

We likely will have a design consultation with Jesse in the Design and Innovation Lab to discuss the designs we are thinking of making. We also are seeking advice on how we would be able to fabricate these designs, especially since our team doesn't have experience prototyping with metals like aluminum. We also need to see if it is even possible to bending aluminum using the machines in the design and innovation lab. After having a design consultation, we will have a better idea of how we can fabricate the design that we want to move forward with.



9/13/25 Notes From 2024 Final Design

SIERRA LOOSEN - Sep 13, 2025, 10:48 PM CDT

Title: Notes From 2024 Final Design

Date: 9/13/25

Content by: Sierra

Present: N/A

Goals: Read through the final report from the Fall 2024 Gait Trainer group

Content:

- the previous design was built with the intention that it could be used with multiple different brands/types of treadmills in case the treadmill that the client currently has would need to be replaced
 - to make the ramp and rails more stable, we should make our design specifically tailored to fit the treadmill that the client currently has using those specific dimensions
- they have written down that the client weighs 174.9 pounds and the gait trainer weighs 57.9 pounds
 - we will verify these numbers this year to ensure they are still accurate
- they decided to use ACQ labeled wood that had been pressure treated to withstand pressure and time, and because it would provide enough strength and durability to hold the weight of the client and gait trainer
- · they also used nails, fasteners, and bolts that would appropriately work with this wood and wouldn't corrode
- · they used rubber non-slip mats to ensure that the wheels of the gait trainer did not slip
- bottom of the ramp and tracks included a non-slip, silicone tape to provide more safety
- It was noted in their conclusion that "Due to the placement of the C-Clamps, the attachment process is extensive. Creating an easier system of attachment to the treadmill..."
 - this is the main thing reason that the client's nurses and assistants don't like this design, the C-Clamps are very difficult to use and take time to install as there is 3 clamps on each side of the ramp
 - we need to improve the way in which the ramp attaches to the treadmill so that is easier to put on, or create a method to permanently attach a ramp to the treadmill so it doesn't need to be taken on and off





Conclusions/action items:

The design from last year functioned well in the aspect of getting the gait trainer up and onto the treadmill belt. However, the C-Clamps are difficult to use in order to attach the tracks to the treadmill, so this is one of the main aspects that we need to fix in the new design. The ramp on this was also fairly large and heavy, so it made it difficult to move around as there was no handle. We will further discuss with the client and her family about what type of design they would refer we focus on: either a design that can be more easily attached and detached to the treadmill by including a handle on the ramp and easier points of attachment, or by creating a ramp that is attached to the treadmill once and permanently stays there, but could also have a folding ramp as to take up less space in their house.

SIERRA LOOSEN - Sep 14, 2025, 3:18 PM CDT

Title: Portable Ramps

Date: 9/14/25

Content by: Sierra

Present: N/A

Goals: Research designs of portable ramps that are currently on the market

Link: https://www.rehabmart.com/product/stepless-wide-plain-portable-wheelchair-ramps-50867.html? srsltid=AfmBOoqUyUqrbXVKoQONtKWT1ZY5oVrIVcunXetM77n6jFx-cF vnCcL

Citation: Rehabmart.com, "Stepless Wide Portable Wheelchair Ramps," Rehabmart.com, 2024. https://www.rehabmart.com/product/stepless-wide-plain-portable-wheelchair-ramps-50867.html?srsltid=AfmBOoqUyUqrbXVKoQONtKWT1ZY5oVrIVcunXetM77n6jFx-cF_vnCcL Content:

The website provides multiple different designs for portable ramps that can currently be bought. This can help us brainstorm what design we can create to make a ramp that is foldable and easier for the client to move. Some of the styles include telescopic ramps and folding ramps. A file is attached showing the different designs that RehabMart.com offers on their website. The life in service of their ramps is around 15 years. It also says in their user manual that the ramp should not be stored in places where the humidity exceeds 70%.

Conclusions/action items:

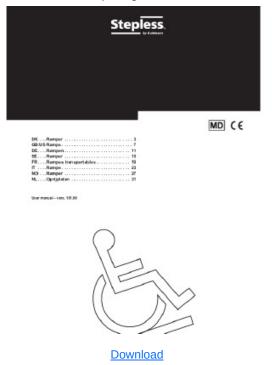
I can use the portable ramp designs from this website to brainstorm how we could create a ramp that is foldable for the client. The clients want something that can fold so it takes up less room in their house while not in use. This website also mentions that their ramps are made out of aluminum, which is one of the materials we were considering using because it is more lightweight than plywood, which is what the previous ramp was made out of.

SIERRA LOOSEN - Sep 14, 2025, 2:58 PM CDT

Portable ramps Stepless Stepless									
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manual_portableramps_2022.pdf (1.81 MB)



SIERRA LOOSEN - Sep 14, 2025, 3:44 PM CDT

Title: Tips for Maintaining Ramps and Other Accessibility Solutions

Date: 9/14/25

Content by: Sierra

Present: N/A

Goals: Research ramps currently available on the market

Link: https://ezaccess.com/blogs/main-blog/tips-for-maintaining-accessibility-solutions? srsltid=AfmBOoonxIAVvJCiWBuB77qeLBcO6FPxwrD4gTMkaq9ASC2yiH1DY1Zk

Citation: Lannum, Ryan. "Tips for Maintaining Ramps and Other Accessibility Solutions." EZ-ACCESS, 22 May 2024, ezaccess.com/blogs/main-blog/tips-for-maintaining-accessibility-solutions?srsltid=AfmBOoonxIAVvJCiWBuB77qeLBcO6FPxwrD4gTMkaq9ASC2yiH1DY1Zk. Accessed 14 Sept. 2025.

Content:

- · This website describes why they make their ramps out of aluminum rather than wood
 - · aluminum generally has a longer lifespan and a greater ability to withstand the elements
 - aluminum has the natural ability to avoid rust, rot, and wear which means the structural integrity of the ramp will remain intact for longer
 - aluminum is also lightweight making it easy to move around

Conclusions/action items:

This website describes the reasons why aluminum would be a better material to use than wood. With aluminum we would be able to improve upon last year's ramp design to make it move lightweight and easier to move, which was one of the requests from the clients.

9/8/2025 ADA Specifications for Ramps

SIERRA LOOSEN - Sep 14, 2025, 5:51 PM CDT

Title: ADA Specifications for Ramps

Date: 9/8/2025

Content by: Sierra

Present: N/A

Goals: Research safe dimensions for a ramp

Citation: U.S. Department of Justice Civil Rights Division, "2010 ADA standards for accessible design," ADA.gov, Sep. 15, 2010.

https://www.ada.gov/law-and-regs/design-standards/2010-stds/

Content:

Section 405 of the 2010 ADA Standards for Accessible Design outlines the rules for ADA compliant ramps

"405.2 Slope. Ramp runs shall have a running slope not steeper than 1:12."

More details about the ramp specifications are located on pages 127-130 of the attached PDF.

Conclusions/action items:

When designing the ramp component, we should try to follow these outlined dimensions to ensure client safety and usability. We need to make sure that for every 1 inch of rise, there is at least 12 inches of run for the ramp so that the client can easily and safely get the gait trainer onto the treadmill.

SIERRA LOOSEN - Sep 08, 2025, 5:28 PM CDT



Download

2010-design-standards_ADA_Ramps_.pdf (4.21 MB)



9/14/25 Design Considerations for Maximum Temperature per IEC Safety Standards

SIERRA LOOSEN - Sep 14, 202

Title: Design Considerations for Maximum Temperature per IEC Safety Standards

Date: 9/14/25
Content by: Sierra
Present: N/A

Goals: Research standards related to the projects

 $\textbf{Link:} \ \ \textbf{https://www.advancedenergy.com/en-us/about/news/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/design-considerations-for-maximum-temperature-per-iec-safety-standards/blog/$

Citation: Mezin, Alexander. "Design Considerations for Maximum Temperature per IEC Safety Standards." Advancedenergy.com, 2021, www.advancedenergy.com/en-us/about/news/blog/desig for-maximum-temperature-per-iec-safety-standards/.

Content:

This provides standards for temperatures of various materials that should not be exceeded related to our project. This information can be included in our PDS and will help to make sure that the while using our ramp and we can make sure that the safe temperatures for use are not exceeded.

	Part	Metal	Vitreous material (glass, ceramics, etc.)	Plastic, rubber	Coated metal (non-
IEC 60950-1	Handles, knobs, grips, etc. continuously in normal use	55°C	65°C	75°C	
	Handles, knobs, grips, etc. Held or touched for short periods	60°C	70°C	85°C	
	external surfaces or parts inside the equipment that may be touched	70°C	80°C	95°C	
61010-1	Handles and knobs held or touched in normal use	55°C	65°C	70°C	70°C
IEC 61	Outer surface of enclosure touched unintentionally	65°C	80°C	85°C	80°C

IEC 61010-1:2010 Table 19 and IEC 60950-1:2005 Table 4C - Touch/surface temperature limits

Conclusions/action items:

We will consider these standards when deciding what material we will make our ramp out of. This will also help ensure that our client is safe while using our product. We want to make sure that I will not exceed these temperatures as high temperatures can cause structural damage to the design.



9/18/25 Preliminary Design Ideas (Individual)

SIERRA LOOSEN - Sep 18, 2025, 3:56 PM CDT

Title: Preliminary Design Ideas (individual)

Date: 9/18/25

Content by: Sierra

Present: N/A

Goals: Individually brainstorm ideas for the ramp and rails design

Content:

Attached below is the picture of my preliminary design idea

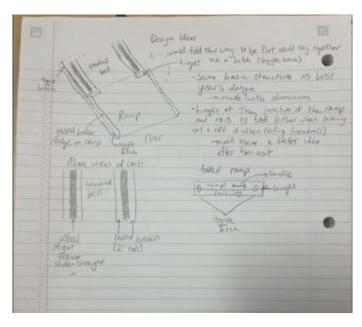
Main points:

- · very similar in structure to last year's ramp, but would be made out of aluminum
- · would have hinges at the junction of the rails and ramp to allow it to be folded
 - still trying to determine if it would be better to permanently attach it to the treadmill, or be able to take it on and off, will have a better idea once we go to the house and see the treadmill
- the ramp would have a raised border on it to ensure safety while walking up the ramp with the gait trainer
- the rails would have raised borders on each side (1.5 to 2 inches), with a channel in between that is just wide enough to fit the wheel of the gait trainer
 - · this will ensure that the wheels can't swivel side to side when walking the gait trainer onto the device
- · the ramp would have toggle latches that would secure it in the folded position when not in use
 - o if the ramp will be detachable, a handle would be installed on the side to make it easier to move around

Conclusions/action items:

My preliminary design closely follows the same basic structure of last year's design, but with some modifications. The ramp portion would be foldable to allow for easier storage, and it would also be made out of aluminum. The side rails would also have higher rails on the edges to ensure client safety. This week at our team meeting, we will share our individual ideas to narrow down what will be included in the design matrix.

SIERRA LOOSEN - Sep 18, 2025, 3:56 PM CDT



Download

SIERRA LOOSEN - Sep 20, 2025, 8:36 PM CDT

Title: Preliminary Design Updated

Date: 9/20/25

Content by: Sierra

Present: N/A

Goals: Refine the individual preliminary design idea

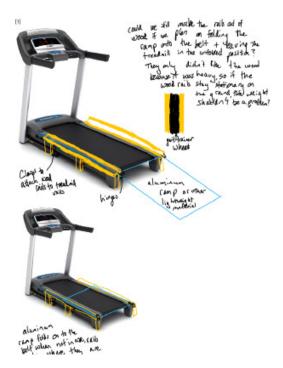
Content:

- The clients are potentially okay treadmill being in the unfolded position, as long as the ramp itself can be folded/taken off (we will clarify this with them this week when we visit Nadine's house)
- If this is the case, I think we should make rails out of wood (like last year's design) that would be stationary on the ground/sides of the treadmill belt and wouldn't be taken on and off
 - making the rails out of wood would be easier to fabricate than making rails out of aluminum, and the wood also seems a bit sturdier, especially since the rails is where the weight of Nadine and her gait trainer will be while the treadmill is actually being used (10-15 minutes) vs weight only being on the ramp for a short period of time when getting on and off the treadmill
- Then the only part of the device that would fold would be the aluminum ramp, which would fold via hinges onto the belt of the treadmill when not in use (as shown in the design drawings attached)
- · Since the rails would stay on the ground, the weight of the wood shouldn't be an issue since that portion would be moved
- the ramp portion would be made out of aluminum or another lightweight material since this part of the device will be folded and needs to be easy for the caretakers to move

Conclusions/action items:

The team will be meeting on Sunday to begin working on our design matrix and narrow down our design ideas. After this, the team will be visiting Nadine's house to meet with her, her family, and Amanda (her therapist) to look at the treadmill and the space that the device will be in. We will also clarify any questions we have with the family and learn if they have any strong preferences about the design before we finalize our design matrix.

SIERRA LOOSEN - Sep 20, 2025, 8:29 PM CDT



Preliminary_Design.pdf (2.37 MB)

SIERRA LOOSEN - Oct 07, 2025, 10:33 PM CDT

Title: Design Alternative Ideas

Date: 10/7/25

Content by: Sierra

Present: N/A

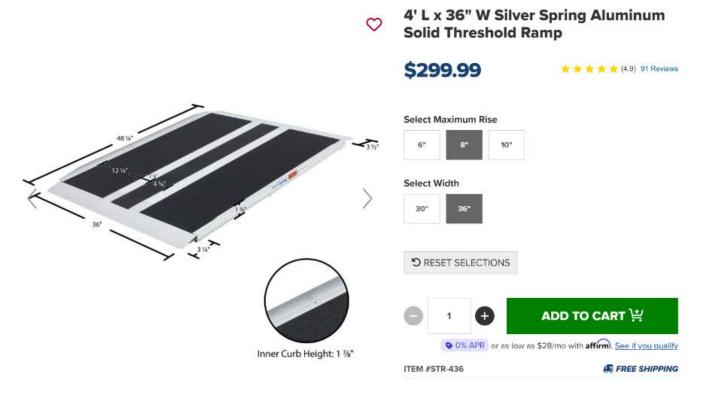
Goals: Brainstorm new ideas for the fabrication of the ramp

Content:

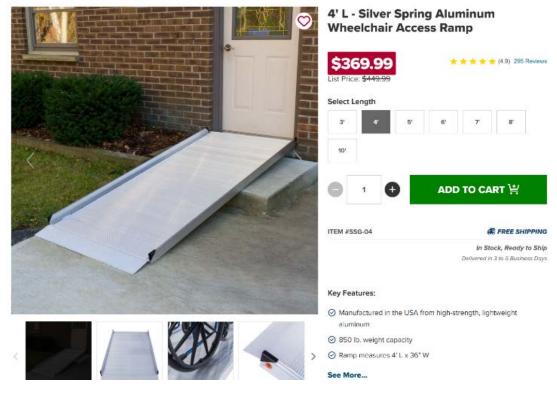
After the team met with fabrication experts in the D+I Lab, it was determined that the fabrication of the telescoping ramp design is not really feasible for the scope of this budget. The aluminum needed would also cost way more than expected since it needs to be thick enough to support a large amount of weight. This means the team needs new ideas for the ramp portion of our design. I was able to find a website that sells prefabricated aluminum ramps, which could be used in our design. This would significantly improve the ease of fabrication, as we would have a premade ramp and would then be able to slightly alter it to fit our design, such as attaching adjustable legs to it. We would then also fabricate the side tracks, still out of wood.

Link to website: https://www.discountramps.com/portable_ramps/c/3110/

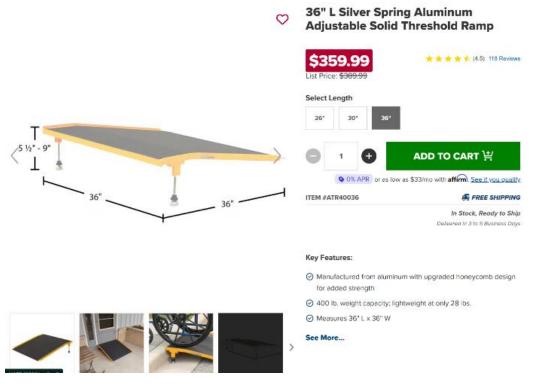
The ramp pictured below can be ordered in a width of 36", which would be the size needed in order to fit the gait trainer. Link to this ramp: https://www.discountramps.com/silver-spring-bariatric-wheelchair-ramp/p/STR-436/



Pictured below is another option. This ramp also is 36" wide, and we would likely need the 4' ramp as the largest rise that can be accomplished with the 4' ramp is 8 inches (which is more than the height of the treadmill). Link for this ramp: https://www.discountramps.com/silver-spring-semi-permanent-wheelchair-ramp/p/SSG-04/



The ramp pictured below comes pre-equipped with adjustable legs, which would make this ramp adjustable to varying treadmill heights. Link for this ramp: https://www.discountramps.com/mobility/wheelchair-ramps/threshold/p/ATR40036/



Conclusions/action items:

Purchasing one of the prefabricated ramps shown above would ease the process of fabrication. This would also ensure that the ramp is extremely sturdy and durable as it has been industrially manufactured. However, purchasing a ramp such as this would take up a large portion of our budget, and we would need to ensure that the rest of the materials would stay under the \$500 budget.

10/14/25 Pre-fabricated Ramp Design

SIERRA LOOSEN - Oct 14, 2025, 7:49 PM CDT

Title: Pre-fabricated ramp design

Date: 10/14/25

Content by: Sierra

Present: N/A

Goals: Come up with a design idea that incorporates a pre-fabricated ramp

Content:

link to ramp: https://www.discountramps.com/silver-spring-bariatric-wheelchair-ramp/p/STR-436/



The design would incorporate this pre-fabricated ramp, which can safely accommodate the width and weight of the gait trainer. A 1x4 piece of wood would be screwed into the under side of the 3.5 inch lip at the top of the ramp. We would then screw the adjustable legs into that piece of wood on the underside, which would allow the height of the ramp to be adjusted. For storage, the ramp would need to be picked up, and could be set on top of the side tracks/treadmill belt. The width of the ramp (36 inches) would be equivalent to the outer width of the side tracks to make it a smooth transition from the ramp to the tracks. In order to make the process of lifting the ramp up and moving it a little easier, we could install some sort of handle to the sides of the ramp.



A handle such as this could be installed on the sides of the ramp to make it easier to pick up and move. We would need to drill holes into the sides of the ramp, and then get short bolts and nuts to secure the handle on the side of the ramp.

Conclusions/action items:

The client and family approved of us using a pre-fabricated ramp. Nadine's brother seemed especially concerned about the possible bowing and ability to support a large amount of weight if we were to fabricate our own ramp. Using a pre-fabricated ramp would ensure that the ramp portion is extremely stable. These ramps are also relatively light since they are made out of aluminum, which would make it easier for the caregivers to move.

SIERRA LOOSEN - Oct 24, 2025, 8:05 PM CDT

Title: CITI Training Documentation

Date: 10/24/25

Content by: Sierra

Present: N/A

Goals: Complete the CITI Human Subjects training course to satisfy training throughout the curriculum requirements

Content:

See attached documentation

Conclusions/action items:

I have successfully completed the CITI human subjects training for training throughout the curriculum. I now know what it means to write an IRB for any research that will utilize human testing. I also learned about more specific research situations, such as testing with children or testing with subjects who don't speak English.

SIERRA LOOSEN - Oct 24, 2025, 8:06 PM CDT



Download

citiCompletionCertificate_15017272_73182203.pdf (77.3 kB)

SIERRA LOOSEN - Oct 24, 2025, 8:06 PM CDT





Download

citiCompletionReport_15017272_73182203.pdf (78.6 kB)

9/10/15 Lecture Notes-BME Career Prep

SIERRA LOOSEN - Sep 10, 2025, 1:52 PM CDT

Title: Lecture 1 Notes-BME Career Prep

Date: 9/10/25

Content by: Sierra

Present: N/A

Goals: Learn about the career fair and job searching

Content:

Job Search Tips

- · Keep track of what you do ECS tracking sheet can be found on their website, under policies and resources page
- · Quality of source matters Hankshake, LinkedIn, the actual website of the company
- · Connect BEFORE you are a candidate
- applying is step 1, following up is required (2-3 weeks)
 - o follow up with who you talked to at the career fair
 - if applying to a job where the company is not at the career fair, find a way to follow up with them (LinkedIn, or ask ECS for help)
- · think beyond the title focus on skills, industry, exposure
- · It takes time, so start early
- · Experience is better than no experience, your internship doesn't need to be in exactly your ideal area

Resume tips

- · tailor your resume to the position (quick changes)
 - · look at keywords that are on the job descriptions, include relevant experiences to that keyword
- create balance, show a full picture of your experience
- ATS proofed resume is do-able
 - o MS Word
 - · No columns, charts, colors
 - design projects WITHOUT years or semester (emphasize what you specifically did)

Cover Letter

- · always based on the job posting
- · custom to each job
- · amplifying your greatest selling points
- clear and concise support (1 page max)
- demonstrate employer knowledge
- · address to person
- Outline BASICS
- 1. Intro: who you are, applying for, where you found it, and "thesis" statement, Ex: "Based on my experience in A and B, I believe I would be able to make a different in the X role at Y company"
- 2. Paragraph about A
- 3. Paragraph about B

Career Fair Advice for BME

- Identify your purpose more than just an internship
 - making connections, exploring options, talk with alumni
- · looking beyond the obvious overlap with other disciplines

- BME overlaps with other types of engineering (Materials Science and Engineering, Mechanical Engineering, Electrical Engineering)
- job postings that say "or related disciplines" may apply to BME since BME relates to other disciplines
- Develop your "value added" statement why you?
- · research the employer

Conclusions/action items:

I will prepare for the career fair by updating my resume. I will also look through the career fair maps and job postings on Handshake to ideally find an internship for next summer.



9/17/25 Lecture Notes-Exploring your leadership style

SIERRA LOOSEN - Sep 17, 2025, 2:01 PM CDT

Title: Exploring your leadership style with Angela Kita

Date: 9/17/25

Content by: Sierra

Present: BME 300 Lecture

Goals: Learn about my leadership strengths and how to apply that to my design project this semester

Content:

- · We discussed with our partners if we consider ourselves a leader, why or why not
 - I consider myself a leader (7/10) because I have been a leader in the past and have experience with it, but I'm not always the most confident when I'm starting out, and am not always the first volunteer to be a leader in a situation
- · Qualities of a good leader
 - · a lot of people oriented skills are important, like effective communication, inclusivity, and respect
- · Anatomy of a good leader
 - o self-awareness understand your strengths and weaknesses
 - · vision provide direction and purpose, set goals
 - o transparent clear processes and open to feedback
 - o communication articulate goals, provide guidance, actively listen
 - empathy
- · Levels of leadership
 - o personal self-awareness and management, competency, goals
 - interpersonal recognizing and responding to others' needs, active listening, building trust, engaging in difficult conversations
 - team facilitate team interactions, support others' development, design and improve team processes, empower others
 - o organizational collaborate beyond individual teams
- · Styles of leadership
 - power
 - being in control is the most important thing
 - hierarchy, authority, command
 - servant
 - being of service to others
 - sharing power
 - listening and understanding
 - empathetic, empowering, shared design making
 - authentic
 - building self esteem and self-awareness
 - emotional intelligence
 - creating authentic relationships
 - transparency, genuineness, honesty
 - we talked about how in situations like clubs or student orgs, the structure might be more like power leadership since there
 is people on the executive board and chairs of committees who get the final say in decisions. We also talked about how in
 our past design groups, it has been mostly servant and authentic leadership where everyone is sharing leadership
 responsibilities
- People Oriented-leader
 - the glue that holds the team together, you get to know everyone as individuals
- Process oriented leader
 - sets the pace for the team, willing to work alongside everyone
- thought-oriented leader
 - sees the big picture and anticipates the future, open to new ideas and innovative approaches

- set the bar high and push for excellent performance, inspire people to follow your cause and mission
- I consider myself a process oriented leader since I like to plan out things to make sure everything gets done when it is supposed to be
- Goal setting
 - This semester, I want to be a more confident leader while also being inclusive within my group. I don't really like to be the
 person to step up and make decisions, so I want to improve upon this during this semester. Success would look like being
 confident in my decisions, but also not making decisions without communicating with the group about them first. This way I
 can still be an inclusive leader, which I feel I am already pretty good at.

Conclusions/action items:

This semester, I will be more reflective about what my strengths are when being a leader and lean into those skills to help my group be successful. I will also take the time to think about my weaknesses, and reflect on how I can improve in those areas. I can also think about how I am doing regarding the goal that I set above.

SIERRA LOOSEN - Sep 17, 2025, 2:02 PM CDT



Download

Loosen-Sierra-ROLE_STUDENTS.pdf (155 kB)



9/24/25 Lecture Notes-Near Peer Mentoring

SIERRA LOOSEN - Sep 24, 2025, 2:07 PM CDT

Title: Lecture Notes-Near Peer Mentoring

Date: 9/24/25

Content by: Sierra

Present: BME 300 Lecture

Goals: Learn how us 300s can be better mentors this semester for our 200s

Content:

Mentoring Lecture with TJP

Why are you mentoring BME 200 students?

- we talked about how they just met progression and are now officially in the BME program, so it's a way for us to welcome them into the BME community and teach them how everything works
- · they can see what we as 300s do and hopefully follow our good practices
- it helps develop our own leadership skills and prepares us for the real world, where there will be experts and people with no experience but you still have to work together to solve a common problem
- · we can relate to them as we just took the class last year, so we know how they are feeling and the questions they might have
- · additional instructional and emotional support for students
- · peer mentors are more approachable, mentees are more willing to ask questions
- share our experiences (courses, co-ops, internships, research, etc.)
- · increases belonging in the BME community
- transferrable skills (resume buzz word)
 - leadership
 - communication
 - active listening
 - study practices
 - self awareness
 - interpersonal skills
- general benefits of mentoring
 - o increased self-esteem/confidence
 - increased patience
 - o build positive habits
 - foster personal growth
 - · help identify gaps in your own knowledge
 - · sense of accomplishment

What does it mean to be a good mentor?

- · being able to delegate tasks so that they actually get hands on experience
- encouraging them to ask questions so they feel comfortable to do so
- sharing knowledge we have, BME related or in general
- · being communicative
- · building trust
- · psychological safety (sharing without fear of being judged)
- · reliability
- support/enthusiasm
- · being available
- · transparent (open and honest)
- · humanizing their challenges be the coach

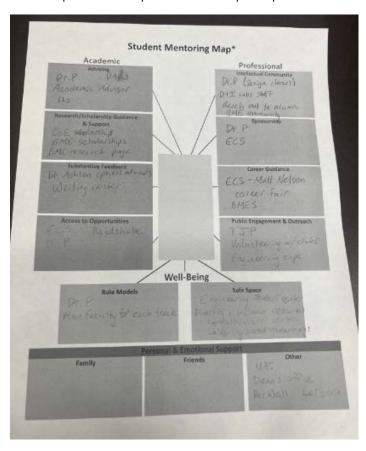
Listening effectively

- · get rid of distractions
- · stop talking
- · act like you're interested
- · look at the other person
- get the main idea
- ask questions
- · check for understanding
- · react to ideas, not to the person
- · avoid hasty judgments

What do you wish you knew in BME 200?

- · things WILL go wrong, no matter how much you plan ahead
- · BME Canvas advising page is absolutely CLUTCH, has so many resources about BME and course offerings

Mentor Map - we then completed a mentor map to help us think about how we can mentor better (picture attached)



Conclusions/action items:

We came up with a mentor map. This includes a lot of resources in different categories/areas that we can talk to our 200s about. This will help them feel more prepared and well equipped with campus resources.

SIERRA LOOSEN - Oct 01, 2025, 1:51 PM CDT

Title: Lecture Notes-Sustainability in BME with Andrea Hicks, Department of Civil and Environmental Engineering

Date: 10/1/25

Content by: Sierra

Present: BME300 lecture

Goals: Learn about how to increase sustainability in BME and our design projects

Content:

Sustainability in BME

- · we've all heard that sustainability is important, but what does this mean for BME, and how do we implement it?
- · circular economy keeping our resources in the economy through being reused and recycling
 - · can be good and efficient for the economy
 - ex: recycling aluminum cans and getting money for it
 - o not efficient for the economy to recycle glass since it weighs so much
- · life cycle assessment looking at the impact on the environment throughout the different life stages of a product
 - · gives us stats like a carbon footprint
 - Ex: regular coffee pot vs. Keurig which has a greater impact on the environment
 - they're about the same, the coffee pot requires a lot of electricity to heat the entire pot which essentially cancels out effect of the plastic Keurig cups
 - getting rid of the paper on the exam tables in doctors offices makes a good environmental impact since you don't need to throw out the paper between every patient, but also saves money
 - Ex: plastic vs metal reusable speculums, you also need to consider the labor, energy, gloves, electricity to clean the metal reusable ones before automatically saying that the metal ones are better for the environment than the single use plastic ones
- reusable vs single use medical equipment relates to BME the reusable devices might seem more economically friendly, but you also
 need to consider the labor and energy it takes to clean them between uses and how that effects the environment
 - o need to think about how easy is it to clean in order to be reused

Conclusions/action items:

We learned about life cycle assessments which look at how a product impacts the environment in different stages of its life cycle. We can implement this in design projects by considering how our product impacts the environment from the time we manufacture it to when it gets used (and potentially gets reused). A very relevant thing relating sustainability to BME is single use vs reusable medical devices and determining in what situations each of those would be better. In some situations, it might actually make more sense to use the single use devices, such as single use hospital gowns because it requires labor and energy to wash reusable ones.

SIERRA LOOSEN - Oct 08, 2025, 1:59 PM CDT

Title: Lecture Notes-Introduction to WARF, IP, Disclosing & Licensing with Jeanine Burmania and Justin Anderson

Date: 10/8/25

Content by: Sierra

Present: BME300 Lecture

Goals: Learn about WARF and IP

Content:

- WARF Wisconsin Alumni Research Foundation
 - · help students and faculty secure intellectual property rights and commercial licenses for inventions
 - · Examples of technology transfer include IP licenses, industry sponsored research, consulting arrangements
- · Intellectual Property Overview
 - o four common types of IP
 - patents
 - a property right, granted by a governmental agency
 - US Patent and Trademark Office (USPTO)
 - no global patent
 - patent holder has right to exclude others from making, using, selling, or importing the claimed invention
 - three types of U.S. patents
 - design 15 year term, limited to ornamental features (the way it looks or feels, not the way it works)
 - plant new variety, 20 year term, asexually reproducing, non-tuber
 - utility provisional or non-provisional
 - most common time is utility non-provisional patents (90%)
 - issued for the invention of a new and useful process, machine, manufacture, or composition of matter
 - also includes new and useful improvements thereof
 - time period is 20 years from date of filing the application
 - often takes 2-5 years to issue the patent after filing, so this time counts against your patent term, it also reveals everything you put in your patent application to the public so others can see what was in your application
 - requirements for patenting
 - eligible; cannot be a product of nature, abstract ideas, or natural phenomenon
 - novel; it must be new
 - non-obvious; it cannot be simple modification of combination of existing concepts
 - enables and described; must provide enough detail to teach others how to make or use the invention
 - patient examiners are scientists hired and trained by the USPTO to review patent applications for these requirements
 - copyrights
 - protection for creative works that are expressed in a tangible medium
 - a wide range of subject matter, including software code
 - not as time sensitive as patenting something
 - trademarks
 - protection for names, marks, logos, dress, etc.
 - requires use in commerce
 - source-identifying function

- can be used to protect anything of value
- protection is good so long as the concept is not generally known
- recipes, list of contacts that you have with others, can be a broad number of things
- o other, WARF IP:
 - biomaterials
 - technique and know how
 - data
- · Disclosing with WARF
 - · describe the innovation
 - o identify advantages and potential applications
 - name contributors (inventors, authors, etc.)
 - o provide funding and public disclosure details
- · Meeting with WARF
 - · discuss the innovation in more detail
 - ask questions about WARF and patenting processes
 - discuss next steps
- · Licensing the IP is the next step in transferring the technology
 - market analysis
 - market status
 - size and type
 - potential licensees
 - · license negotiation
 - type and terms
 - consideration
 - ongoing
 - technology development, enforcement, amendment, termination

Conclusions/action items:

There are many types of intellectual property, but the most common form that WARF deals with are patents. WARF can help BME design groups file patents for their design projects. If we think our project is worthy of IP protection, we are able to meet with WARF and begin discussing the process.



10/15/25 Lecture Notes-Intellectual Property with Andrea Arndt

SIERRA LOOSEN - Oct 15, 2025, 2:09 PM CDT

Title: Lecture Notes-Intellectual Property with Andrea Arndt

Date: 10/15/25

Content by: Sierra

Present: BME 300 Lecture

Goals: Learn more about Dickinson Wright and intellectual property with Andrew Arndt

Content:

- · Andrea Arndt Intellectual Property attorney
- Importance of Intellectual Property for Biomedical Engineers
 - BMEs create life changing solutions, IP protection allows research to safely transfer into products, processes, and/or systems
 - o IP enables investment, partnerships, and ethical considerations
- · Legal career paths for engineers in IP
 - · technical advisor STEM degree
 - search for products that already exist, see if something is new and novel invention
 - o patent agent STEM degree and patent bar
 - like a technical advisor, but can also interact with the patent office
 - patent examiner STEM degree (patent bar eventually)
 - US government job, want to provide as little protection as possible
 - o patent attorney law degree and patent bar
 - try to get as much protection as possible
 - patent bar covers working across the US, law degree bar must be taken for each state you want to work in (can also get reciprocity for some states so you don't have to take the bar)
 - counsel clients, get to choose which clients you want to work with (fortune 500 companies vs startups)
 - o patent litigator law degree
 - working on cases, like suing companies/people for selling a product that is similar to yours
 - IP license attorney law degree
 - negotiating rights
 - o tech transfer manager STEM degree preferred
 - trying to determine which inventions go to market
 - o engineer STEM degree (work with IP lawyers to protect your inventions)
- Transferring skills from engineering to a career in IP
 - · research determine if an invention is truly new
 - o analytical reasoning claim drafting/infringement analysis
 - technical writing translate complex technical concepts into clear, precise language
 - o communication explaining tech to non-experts and patent examiners
 - o creativity problem solving in patents/creating competitive products
 - collaboration cooperate with colleagues and external professionals
 - project management manage resources, meet deadlines, and organize tasks (patent creation process from concept to product launch)
- · Intellectual Property Ownership in the Biomedical Industry
 - · University disclose before publishing; university usually owns IP; possible license opportunities
 - · Company employer typically owns inventions, trademarks, copyrights and other IP; review employee agreements
 - Startup you own IP; file early, use NDAs, document development
- Timing and Publication
 - disclose internally first
 - publishing before filing and offers for sale = lost patent rights abroad and possible loss of rights in the US
 - o posters or abstracts can count as public disclosures

- o first to file system (not first to invent), which is why it is important to file early
- · Legal and ethical duties of engineers
 - o respect others' IP
 - keep invention notebooks
 - · understand inventorship vs. authorship
 - · maintain confidentiality agreements
- Patents
 - o must be new, novel, non-obvious
 - don't need a working prototype to get a patent, can have a good main idea with optional features and still file for a patent even without a working prototype
 - utility patent protect how a product works or is made
 - design patent protect the unique visual appearance of a product
 - even if you get a patent for your product, it could still be infringing on someone else's patented product/IP

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Conclusions/action items:

Patents are important in biomedical engineering in order to protect the ideas and innovations that are created. As biomedical engineers, we can work in the intellectual property field even without getting a law degree. This is another career path to consider for BMEs who are interested in IP, besides the typical industry or med school routes.



10/22/25 Lecture Notes-Post Graduate Planning

SIERRA LOOSEN - Oct 22, 2025, 2:00 PM CDT

Title: Lecture Notes-Post Graduate Planning

Content by: Sierra

Date: 10/22/25

Present: BME 300 Lecture

Goals: Learn about post graduate planning

Content:

- · gain experience while you can, it's easier to do while in school
- · tie the experiences together to create the big picture of who you are
- · do the homework, look into what an ideal career would look like, and what programs have the opportunities you are looking for
- think about letter writers or references early (3 strong ones)
- writing your story
 - o don't just say you will do anything, talk about your specific interests
 - o start with what you want to do thesis statement
 - · then narrow your experiences and how that applies to your broad interest
 - specific to each position or place to which you apply
 - o personal statement: show a reasonable idea of what
- · Graduate school options
 - Masters, MS
 - stepping stone/change directions/gain depth/expand credentials for future
 - industry focused
 - typically one year
 - reasons
 - rewrite your story, can choose a different track from your undergrad
 - MD: need time to prep for MCAT or apply for med schools
 - MS will make you more desirable
 - fill gaps in resume
 - higher level of skills, more lab time with less class time
 - more experiences, teaching, mentoring, research thesis
 - older, more maturity
 - opens doors (credentials and experience)
 - higher starting salary
 - another opportunity for summer internships
 - Research masters (1.5-2 years)
 - can be funded as RA/TA/PA (tuition remission and stipend)
 - thesis required
 - Accelerated Programs (1 year)
 - funding (TA only) stipend only (no tuition remission \$1200/credit)
 - no co-op allowed, internships ok
 - accelerated coursework only, independent study/research is allowed
 - biomedical innovation, design, and entrepreneurship project based, project required (BME design project continuity), partnership with business school
 - applying online for masters
 - apply online, pay fee and submit
 - statement of purpose, why you want to pursue further education in BME
 - still need to input email addresses for references uses Janna's email for all three
 - deadline is 12/15 for the following fall start time
 - automatically admitted to the program with a 3.0 GPA
 - Other meeters entire

- MS in global health
- MS in other engineering department
- MBA
- o Doctoral, PhD
 - desire to be an independent researcher
 - write research grants
 - work in academia
 - lead projects in industry, startups, and consulting
 - network, go to conferences
 - build your resume/CV
 - research is a must
 - apply early, generally need >3.5 GPA and 75% quartile quantitative GRE
- Med school
 - visit with pre health advising center
 - BME curriculum meets most med school requirements for classes
 - research is required
 - volunteer (clinical setting desired)
 - shadow physicians
 - patient contact time
 - build relationships = letter writers
 - use design experiences to connect with physician clients, community clients, etc

Conclusions/action items:

There are many pathways that can be pursued following graduation from undergraduate education. This can include med school, masters, PhD, and industry. It is important to build experiences and build your story during undergrad where the stakes are lower.

SIERRA LOOSEN - Oct 29, 2025, 2:09 PM CDT

Title: Lecture Notes-Regulations with Dr. Kip Ludwig, department of neurological surgery and surgery

Date: 10/29/25

Content by: Sierra

Present: BME300 Lecture

Goals: Learn about regulatory practices

Content:

- FDA does not determine that a device is safe, but determines that the benefits outweigh the risks
- · regulatory pathways, have different classes based on risk level of the device
 - class 1 low risk, Ex: tongue depressor
 - o class 2 moderate/controlled risk, goes through 510(k) pathway
 - predicates are used to compare new devices that are trying to get approvals to a device that was previously approved
 - o class 3 high risk, Ex: pacemaker, needs to go through PMA or HDE
 - · based on the class, you need to go through different pathways before the device can go to market
- FDA did not start regulating medical devices until 1976
 - o pacemakers have been implanted since 1960, which means they were NOT regulated by the FDA at that time
 - in the early stages of pacemakers, many of them didn't last for as long as they were supposed to
 - o The Dalkon Shield incident was the reason the FDA started to regulate devices
 - it was a contraceptive device implanted into a woman's uterus to prevent pregnancy, but post-market revealed that it didn't work, women were still getting pregnant and it was linked to septic pregnancy and maternal death
 - it was decided that a regulatory body was needed that was separate from the device manufacturer to ensure safe devices
 - this lead to the passage of the Medical Device Amendments of 1976, establishing a 3-category, risk based classification system for devices and required post-market adverse events reporting
- Philips CPAP machines were recalled because on of their specific machines caused 500 people to die, but most people didn't hear about
 it, there isn't huge consequences for these companies since most of the market doesn't know that their device was bad and killing people
- · investigational device exemptions for medical device clinical studies are failure mode analysis based
 - FMEA (failure mode effect and analysis) think about every possible way your device could fail and try to prevent that

Conclusions/action items:

The FDA regulates medical devices based on their risk level. It is an ongoing debate about whether the FDA should have more regulation or less regulation over medical devices. More regulation ideally makes sure that the devices are extremely safe before going to market, but it also means it takes a lot longer to get devices to market that could potentially help people.



11/5/25 Lectures Notes-Regulatory Strategy

SIERRA LOOSEN - Nov 05, 2025, 2:09 PM CST

Title: Lecture Notes-Regulatory Strategy: The Framework for Guiding Advanced Therapeutic Product Development

Date: 11/5/25

Content by: Sierra

Present: BME 300 Lecture

Goals: Learn about the regulatory process for therapeutic products

Content:

Objectives

- · understand the overall structure of the FDA
- · understand how these regulations guide product development
- · learn what a "Quality" mindset is

FDA Structure and Advanced Therapeutics

- Device (CDRH)
 - PMA
 - o 510(k)
 - IDE
- Drug (CDER)
 - · NDA (New drug application)
 - · IND (investigation new drug applications), this needs to be approved before you can start doing human testing trials
 - once these get approved, you can market your new drug
- CBER
 - · BLA (biologics license application)
 - IND
- 351 vs 361 products
 - o 351 products are taken from the patient, and put back into the patients, only being minimally manipulated
 - cells/tissues are not for homologous use
 - take longer to get through regulatory process
 - o 361 products that are for homologous use are not as regulated
 - can be used in the clinic right away
 - o homologous use tissue/cells used for the same function
 - o 351 products means the product has risks or safety concerns
- Important to be able to distinguish between studies that are "on the critical path" vs. "good research products"
- Target Product Profile (TPP) is like a PDS but for a therapeutic product
 - · when to use it, why to use it, how to use it
 - · is it medically and commercially compelling
 - patient identification: indication
 - o patient benefits: efficacy profile
 - o patient risks: safety profile
 - Core
 - indication and patients, efficacy, safety, dose and regimen, route of administration, dose form
 - clinical development planning
 - clinical pathway
 - regulatory pathway
 - timelines
 - cost
 - risk
 - CMC

- product attributes
 - purity
 - degradants
 - biocompatibility
- storage
- stability
- container
- · Timeline/stages
 - nonclinical
 - efficacy studies
 - quality
 - clinical
 - regulatory
 - time = money
- Quality management system implementation a system that documents policies, processes, internal rules, procedures, and other records to ensure consistent quality
 - · required in every industry environment

Conclusions/action items:

The regulatory process is slightly different for therapeutic properties as compared to medical devices. However, the FDA must still provide approval and requires different processes to actually get the therapeutic product to market. It is important to understand how to implement quality procedures so that a consistent quality of product is achieved every time.

SIERRA LOOSEN - Nov 07, 2025, 12:44 PM CST

Title: Tong Lecture

Date: 11/7/25

Content by: Sierra

Present: BME Department

Goals: Hear Tong lecture from Kristin Myers, BME Class of 2002

Content:

- Kristin is the COO of Blue Cross Blue Shield
- · Graduated from UW-Madison with a degree in BME in 2002
- · Worked for Medtronic for 5 years after graduating from UW
- · MBA from Harvard
- Skyline Ventures --> investor in healthcare startup
- Arboretum Ventures --> investor in healthcare startup technology
- Aetna Chief of staff to CEO, President student health, president great lakes region commercial and Medicare
- Unified Women's Healthcare President and COO
- · Hopscotch Health founder and CEO, advanced primary care for rural communities
- Blue Cross Blue Shield Association COO, enable access, affordability, outcomes and experience for 1 in 3 Americans
- · The healthcare system
 - o quadruple aim
 - improved provider experience
 - · improved patient outcomes
 - lower cost of care
 - improved patient experience
 - · How do we measure on outcomes, cost, quality, and provider experience?
 - us ranked last on equity, access, and outcomes
 - lower life expectancy
 - Underlying challenges
 - misaligned incentives
 - fragmented financing and regulation (federal, state, employer)
 - data silos and legacy IT
 - Inequities (10-15 year gap between zip codes)
 - what's required to build a better healthcare system?
 - interoperable data infrastructure
 - human centered design
 - aligned incentives and measurement
 - connected care delivery platforms
 - simplified and automated infrastructure
- Work hard and build range take on the hardest projects, classes, and experiences you can find, effort and range are your foundation
- Seek diverse exposure explore different sectors, teams, and geographies, gain perspective and learn how systems connect, not just how parts work
- · Choose your people wisely surround yourself with curious, driven, high-integrity people, they will shape who you become
- Know your values and protect them define what matters most (family/friends, health, career/impact) and make decisions that align
- · embrace challenge and keep growing run towards hard problems, growth lives on the edge of discomfort, where big impact starts

Conclusions/action items:

One of the main ideas that was covered today was to embrace the difficult challenges that are presented to you. Having the determination to get through difficult problems makes you stand out. It also sets you apart from other people. However, it is also important to take care of yourself and give yourself grace.



11/12/25 Lecture Notes-Institutional Review Board

SIERRA LOOSEN - Nov 12, 2025, 2:04 PM CST

Title: Lecture Notes-Institutional Review Board

Date: 11/12/25

Content by: Sierra

Present: BME 300 Lecture

Goals: Intro to research and the IRB

Content:

- · Problematic research in the past has led to the IRB
 - · students purposefully infected with hepatitis
 - Guatemala syphilis experiments black prisoners
 - o vulnerable populations of people were affected in these experiments
- · Ethical Research Frameworks
 - Nuremberg Code, 1947
 - emphasis on voluntary consent
 - · Declaration of Helsinki, 1964
 - focus on medical research
 - o National Research Act, 1974
 - US response to US Public Health Service Untreated Syphilis Study
- · Belmont Report
 - · respect for persons/autonomy
 - o beneficence maximize possible benefits and minimize possible harms
 - justice "Who ought to receive the benefits of research and bear its burdens?"
- · Applying the Belmond principles
 - 1991 department of Health and Human Services (45 CSF 46)
 - common rule
 - criteria for approving research
 - protections for vulnerable groups
 - requirements for IRB operations
 - o 2018 Revised common rule
 - modifications to reduce administrative burden
- · IRB Composition
 - diversity of membership required
 - race, gender, cultural backgrounds
 - scientific expertise
 - MD, PhD, MPH
 - Faculty, clinicians
 - non-scientists
 - · community members
 - IRB staff
- IRB purpose
 - o protect rights and welfare of people enrolled in research
 - participants/subjects
 - · IRBs review human research according to
 - ethical principles
 - Belmont report
 - federal regulations
 - common rule, HIPPA, FERPA
 - state laws

- institutional policies
- · IRB Review requirements
 - UW-Madison requires IRB review of all research involving human subjects, including exempt human subjects research
- · Common rule criteria
 - risks
 - no unnecessary risks, unavoidable risks as low as possible
 - appropriate monitoring to prevent adverse effects or identify adverse outcomes as soon as possible
 - henefits
 - potential direct benefits to participants, or scientific/societal benefits
 - risk/benefit ratio
 - risks reasonable in relation to potential benefits of the research
 - equitable selection of subjects
 - appropriate to answer the research question
 - appropriate recruitment strategies
 - justification and safeguards for vulnerable participants
 - population that bears the burdens of research also benefits from it
 - informed consent
 - participants make an informed choice about taking part in research OR criteria for waiver of consent are met
 - privacy and confidentiality
 - adequate protections for participant privacy
 - adequate protections for data confidentiality
- · Examples of applicable research
 - o drugs, devices, products developed through research in humans
 - · data from surveys, interviews, and observation
 - · employment information
 - etc
- · Examples of non-exempt research
 - surveys of children
 - analysis of identifiable samples
- · Examples of medical devices
 - contact lenses
 - MRI hardware and software
 - · diagnostic software
 - · assay for detecting antibodies in blood
 - bandage adhesive
- IRB Review Process
 - o administrative review checks for required training, pre-IRB ancillary reviews, checks for basic completeness of application
 - IRB Pre-Review identifies applicable regulations, state law, campus policy, checks for consistency, clarity, completeness, helps researchers achieve review-ready applications
 - committee or non-committee review convened IRB or designated IRB member reviews submission, determines if criteria for approval are met, requests modifications if needed, approves when criteria are met
- After approval
 - begin your study using IRB approved documents/processes only
 - · changes of protocol must have approval of the change before implementing the change
 - · reportable events when something unexpected happens
 - noncompliance
 - unanticipated problem
 - new information

Conclusions/action items:

An IRB is needed if you plan to do research involving human testing. The IRB committee reviews your plans to complete your study. They can then either approve it and you can begin your study, or they will provide suggestions for you to implement in your study before you can begin.

SIERRA LOOSEN - Nov 19, 2025, 1:57 PM CST

Title: Lecture Notes - How New Product Development works in the medical device industry with Dr. Russ Johnson

Date: 11/19/25

Content by: Sierra

Present: BME300 Lecture

Goals: Learn about product development in the med device industry

Content:

- · New Product Development (NPD) in the medical device industry is:
 - o highly regulated FDA and other regulatory bodies have a significant impact
 - · expensive requirement for verification and validation is a cost multiplier
 - · resource intense involves sizeable teams to execute projects
 - o competitive competition is fierce; speed-to-market is crucial
- selecting and prioritizing projects
 - · corporate business strategy
 - define how the business will sustain itself over the next 3-5 years
 - product portfolio review
 - define which product categories to develop, to sustain, and to eliminate
 - project review
 - select and prioritize projects to support over next 1-3 years
 - · budgeting and resource allocation
- · types of NPD projects
 - line extensions addition of additional sizes and configurations
 - · product improvements existing product change due to market feedback and/or new customer needs
 - new-to-company product line that is not new to market but that is new for the company
 - o new-to-world innovative products that create completely new markets
- Managing NPD: Stage-Gate process
 - stage 0 ideation
 - stage 1 exploration
 - stage 2 concept development
 - stage 3 design development
 - stage 4 design confirmation
 - tends to be very long, can include clinical testing
 - · stage 5 design transfer and commercialization
- Case study ORwell Fluid Management System
 - goal: provide clinicians with an innovative solution for high fluid volume collection during surgical procedures
 - stage 0 ideation
 - typical activities choose area of opportunity, review market trends and/or competitive threats, conduct primary and secondary market research, identify customer unmet needs, create high-level "back of napkin" ideas
 - automate the fluid collection process, get rid of the smell, and make a process to clean the containers better
 - stage 1 exploration
 - typical activities define problem to be solved and customer requirements, review/refine/screen list of ideas from stage 0, create concepts for 8-10 ideas, develop high-level business case, conduct preliminary technical scouting and intellectual property landscaping\
 - they came up with 8 different designs to improve the design for their containers
 - stage 2 concept definition
 - typical activities based on customer interviews and use case assessments, down select from 8-10 to 2-3, to
 1 leading concept, develop robust business case including market opportunity, initial forecast and projected

- expenses, conduct comprehensive IP examination, next gate review is "go/no go" business decision
- they got down to three designs, all with disposable containers, they chose the design with an on-board vacuum system
- o stage 3 design development
 - typical activities move to functional prototype, continue iterative design process including initial testing and reviews with customers, confirm regulatory pathway, begin formal design control documentation
 - they made a "Frankenstein" prototype of their design
- stage 4 design confirmation
 - typical activities conduct extensive verification and validation testing, finalize product and component drawings/models, accelerate manufacturing process development along with plans for quality control (make vs. buy), "Freeze" design at the end of this stage, submit regulatory documentation (FDA 510(k))
- stage 5 design transfer and commercialization
 - typical activities complete any remaining testing, make final design changes, build molds, assemble/test
 equipment, create instructions for use and user manuals, develop service plan and resources (installation,
 fixing problems, etc), finalize go to market strategy and start limited release (if applicable)
- post-market surveillance
 - typical activities regulatory agencies expect that companies are monitoring and documenting customer complaints and field issues post launch, companies continuously track customer and salesforce feedback via interviews and surveys, on a 4-6 month cadence project teams report out to stakeholders
 - account sales, business and regulatory issues observed, complaints, product and process improvement opportunities
 - case study Stryker launched Neptune 2 shortly after ORwell was introduced to the market, Stryker reduced
 the price of their consumable manifold by 50%, cost of installation and service was unexpectedly high for
 ORwell
 - based on challenging financial outlook, Cardinal Health decided to discontinue marketing and production of ORwell
- Summary
 - o medical device development is an expensive, complex, and highly-collaborative effort
 - having limited resources, most businesses have instituted processes like Stage-Gate, to reduce risk and increase probability of success
 - o good product design and development is necessary for commercial success but not sufficient

Conclusions/action items:

There are many steps to bringing a new product to market in the medical device industry. These steps are very involved, and can be very costly. Because of this, companies often implement a stage-gate process to move through the different stages and have different check points to ensure their product can make it to market in a cost effective manner.



SIERRA LOOSEN - Sep 24, 2025, 1:14 PM CDT

Title: Individual Work on PDS

Date: 9/14/25

Content by: Sierra

Present: N/A

Goals: Complete assigned section of PDS

Content:

I was able to complete my assigned sections of the PDS. This including writing about the shelf life, life in service, and operating environment of the device. Some of this information can be updated to be more detailed in the future after we visit the house and learn more about where the treadmill is. I was able to find some aluminum ramps available on the market that have shelf lives of 15 years, so I used this as a baseline of what we should aim for our shelf life and life in service should be for our prototype. This long life in service will ensure that Nadine can use her treadmill and gait trainer for many years to come, assuming the treadmill operates for that long as well.

Conclusions/action items:

We will receive feedback on our PDS and make any necessary changes to it. Throughout the semester, we will continue to update the PDS with more accurate and up-to-date info, such as information about where the treadmill is located in the house as well as the specific dimensions of it. We will use the information in our PDS to help rank our designs in our design matrix.

SIERRA LOOSEN - Sep 24, 2025, 7:47 PM CDT

Title: Individual Work on Design Matrix

Date: 9/24/25

Content by: Sierra

Present: N/A

Goals: Complete assigned section of the design matrix

Content:

I helped write out a description of our criteria for the design matrix. Our scoring criteria include safety, ease of set up, weight of device, compactability, ease of fabrication, adjustability to other treadmills, and cost. Safety and ease of set up are tied for the most important criteria. We need to ensure that Nadine is safe while using out device. It was also emphasized by the family the the device needs to be easier to set up than the last prototype, which is the whole reason this project is continuing. I wrote descriptions of what the first four criteria mean, and what a high score in that category means. I also helped to finish up any last minute things on the design matrix, such as writing up a paragraph about the winning design.

Conclusions/action items:

The team will work to finish the design matrix with pictures of our three preliminary designs, and descriptions of how each design scored in each of the scoring categories. We will use this, as well as the opinions of the client, family members, and caregivers to determine what the final prototype should be. We are highly considering using aspects from each of our three preliminary designs and merging them into one design, as there are aspects from each design that we, along with the caregiving team, really think would work well for Nadine and the space they have in the home.



10/2/25 Individual Prep for Preliminary Presentation

SIERRA LOOSEN - Oct 02, 2025, 4:14 PM CDT

Title: Individual Work on Preliminary Presentation

Date: 10/2/25

Content by: Sierra

Present: N/A

Goals: Complete assigned slides and prepare for presentation

Content:

- I was able to complete my assigned slides for the preliminary presentation
 - my section of the presentation is describing our three preliminary designs
 - I added pros and cons of each design to the slides along with pictures of each design
 - · I added in dimensions to the design drawings which had previously been drawn by other step master members
- I also went through and added in figure caption numbers, as well as formatted most of the citations

Conclusions/action items:

The team will be meeting tomorrow morning to practice presenting our presentation. After preliminary presentations, we will focus on completing the preliminary report which is due next Wednesday (10/8). Next week we will also focus on sourcing materials for our prototype so we can get those ordered as soon as possible.

SIERRA LOOSEN - Oct 04, 2025, 6:31 PM CDT

Title: Individual Work on Updating PDS

Date: 10/4/25

Content by: Sierra

Present: N/A

Goals: Begin working on my assigned section of the preliminary report and update our PDS to be included on the report

Content:

I was able to go through our PDS and make updates and changes based on the feedback we received from our advisor. This included updating references to be in the correct format, and also deleting duplicate sources. I also went through and added some more specific dimensions to certain sections to make it more specific.

Conclusions/action items:

We will continue to update our PDS throughout the semester. Once we finalize our fabrication plan, we will narrow down the specific dimensions of the device to be included in the document. The PDS will be included as an appendix on the preliminary report.



10/6/25 Individual Work on Preliminary Report

SIERRA LOOSEN - Oct 06, 2025, 2:44 PM CDT

Title: Individual Work on Preliminary Report

Date: 10/6/25

Content by: Sierra

Present: N/A

Goals: Complete assigned section of prelim report

Content:

I was able to complete the discussion and conclusion sections of the preliminary report. This included writing about the limitations of our testing methods, discussing ethical considerations of our product, and talking about how sustainability relates to our project. The conclusion section gave a brief overview of the main points discussed earlier in the report, and discussed the team's future work.

Conclusions/action items:

I completed the discussion and conclusion section of the preliminary report. Once the rest of the team finishes their sections, I will also go through and format any references that are in the report. I will also format the appendices, which will most likely only include our PDS which I have already updated using the advisor feedback.



10/15/25 Work on dimensions and SolidWorks Model

SIERRA LOOSEN - Oct 15, 2025, 7:59 PM CDT

Title: Dimensions and SolidWorks

Date: 10/15/25

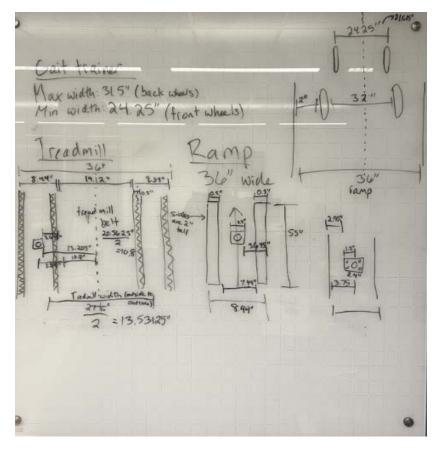
Content by: Sierra

Present: Sierra and Grace

Goals: Work on finalizing dimensions for the side rails and create a solidworks model

Content:

We were able to come up with dimensions for the side rails and create a model in SolidWorks. This will allow us to do stress analysis on the side tracks using the Wizard simulator in SolidWorks. We will then be able to visualize where any failures might happen.



The picture above shows our drawings on the whiteboard to calculate dimensions for the side rails. These dimensions are subject to change throughout the fabrication process, but this gives us preliminary dimensions to use for SolidWorks testing.

Conclusions/action items:

Grace and I were able to calculate preliminary dimensions for the sidetracks that work with the treadmill, and also accommodate the different widths of the wheels on the gait trainer. Grace then created a SolidWorks model based on these dimensions so we could do stress analysis. This revealed that our design is safe enough to hold the weight of the patient, the gait trainer, and a caregiver, and has a factor of safety of over 10.



10/25/25 Work on Side Tracks Fabrication Protocol

SIERRA LOOSEN - Oct 25, 2025, 2:08 PM CDT

Title: Work on side tracks fabrication protocol

Date: 10/25/25

Content by: Sierra

Present: N/A

Goals: Write a rough draft of the fabrication protocol for the side tracks

Content:

This content can be found in the fabrication folder

Conclusions/action items:

I was able to write up a rough draft of how the team will fabricate the side tracks. The group members will review it and make any necessary changes before we start fabricating. We also may need to change this protocol as we are fabricating if any issues arise.



SIERRA LOOSEN - Oct 30, 2025, 5:52 PM CDT

Title:	
Date:	
Content by:	
Present:	
Goals:	
Content:	
Conclusions/action items:	

SIERRA LOOSEN - Sep 12, 2025, 11:49 AM CDT

Title: First BSAC Meeting

Date: 9/12/25

Content by: Sierra

Present: BSAC Committee

Goals: Learn about BSAC and discuss about how the first week of design went

Content:

- -We discussed how the training throughout the curriculum requirements could've been communicated better because not a lot of people understand what the requirements are
- -We also thought it would be a good idea to have a BSAC coursework advising session to have upperclassmen talk about their advise on taking different courses based on your track
- -At our table, we (the juniors) gave advice to the sophomores about what to expect during the semester regarding design
- -Training for BME 300s is the human subjects training
- -Other training throughout the curriculum requirements can be found on Canvas for the 200s
- -These extra trainings/certifications can be things used to boost our professional experience and talk to recruiters about
- -An idea that was brought up by a peer was to be able to sort projects on the selection page by how many active proposals there are
- -building off of that, an idea was to filter project selections by proposal by class to be able to see if it is a 400 or 300 group that has an active proposal
- -It is important to really lock in what the client's requirements are so that we can accurately fill out the PDS

Conclusions/action items:

I will bring the information that was discussed today back to my team, especially regarding the training throughout the curriculum requirements. The next BSAC meeting is in two weeks. The first exec meeting is Friday, September 19th at 11 am. We will be getting info soon about the mentor/mentee program.

SIERRA LOOSEN - Sep 19, 2025, 11:48 AM CDT

Title: BSAC Executive Committee Meeting

Date: 9/19/25

Content by: Sierra

Present: BSAC Exec committee

Goals: Discuss feedback from last week's general BSAC meeting and discuss future topics for next week's meeting with faculty

Content:

- It was emphasized the BSAC members should be communicating with the rest of their team about what happened during the BSAC meeting, since a lot of people still don't know what the training throughout the curriculum is
 - I had mentioned this to my team last week and explained where they could find the training requirements
- For the categories where students can choose to do a new training of their choice, it was mentioned that the list of options was limited and should be opened up to more options of your choosing
 - o potentially opening up a google form for people to submit a request to do a different training that is not on that list
- Should also specifically outline what proof is needed for the training in the design notebook and what needs to be submitted to Canvas
- · Redesign of project selection website to make it faster?
- · Should implement the idea of a break halfway through project selection to give people a chance to look at what projects are left to take
- Regarding standardizing number of notebook entries per week, if it is a 3 credit class, you should be spending 6 hours outside of class working on this class
 - · the notebook entries should reflect that work you did outside of class time
 - could be difficult because there is different amounts of work every week, some weeks with less and some weeks with more so this might not work
- . Dr. P said that there is an email sent out to students when they meet progression with all the resources
 - we talked about how that email should be sent out at a different time because most people won't actually take the time to look at it over the summer
 - · maybe send it out at the beginning of the school year, or closer to when enrollment in classes happens
- · We also introduced the idea for writing proposals of having your first choice proposal, then have a 2nd and 3rd choice
- It was brought up that maybe clients should automatically be scheduled to meet with their team at a schedule time no matter what team
 ends up working on their projects, that way the first client meeting is already scheduled within the first week and don't need to wait 2-3
 weeks to meet with the clients, which makes doing the PDS difficult
 - o potentially scheduling the meeting during the lab time of the second week?

Conclusions/action items:

Next week's BSAC meeting will be a meeting with faculty where we can further discuss some of the topics that were brought up the last two weeks. We need to continue to emphasis the training throughout the curriculum because a lot of people still don't know what it is, or what the requirements are. We will be hearing soon about the mentorship program with freshmen.

SIERRA LOOSEN - Sep 26, 2025, 11:52 AM CDT

Title: BSAC Meeting with Faculty

Date: 9/26/25

Content by: Sierra

Present: BSAC and Faculty

Goals: Discuss topics with peers and faculty

Content:

- · We discussed as a group how everyone's projects are going
 - o talked about PDS progress
 - discussed design matrices and how everyone is planning to move forward in designing
 - o discussed if we are on the same page as our advisors with LabArchives notebooks
- We also talked about the importance of getting students enrolled in the BME Advising Canvas course so they can choose classes for the future
- It was brought up that there is some muddy expectations across advisors regarding notebooks, and the expectations may be different across advisors
- in the advisor meetings, we should be discussing if we met our goals for the previous week, and discuss what we will be doing in the upcoming week
- · As 300s, we should focus on really mentoring the 200s and showing them how to put everything in our notebooks
- Training throughout the curriculum
 - it was brought up that the training throughout the curriculum form should have trainings related to the different tracks
 - o potentially will make a spreadsheet with all of the accepted new trainings through the form

Conclusions/action items:

The ideas that were brought up in today's meeting should be shared with the rest of the team. I will continue to share the info with my team about training throughout the curriculum to make sure everyone gets it done by the due date. The mentor/mentee email was also sent out, so I will meet with my freshmen mentees next week and bring feedback back to BSAC. Preliminary presentations are on October 3, and preliminary reports are due on Wed. October 10.

SIERRA LOOSEN - Oct 03, 2025, 11:14 AM CDT

Title: BSAC Executive Meeting

Date: 10/3/25

Content by: Sierra

Present: BSAC Exec

Goals: Go over the first draft of the training throughout the curriculum request form

Content:

- We looked at the first draft of the training throughout the curriculum request form for students to be able to submit a request to do a training not listed on the original list
 - o name of training
 - · length of training
 - how it applies to you and why you want to do it
- · other ideas talked about
 - updating the 4 year flow chart

Conclusions/action items:

We were able to discuss the things that are on the first draft of the training throughout the curriculum request form. It will be presented at the general BSAC meeting next week. Updating the 4 year flow chart will also be brought up with general BSAC and also with Dr. P.

SIERRA LOOSEN - Oct 17, 2025, 11:27 AM CDT

Title: BSAC Executive Meeting

Date: 10/17/25

Content by: Sierra

Present: BSAC Exec

Goals: Discuss current topics related to improving information about choosing courses

Content:

- · create flow charts for each individual track to show what pre requisites are required for course elective classes
- · we talked about how things are going with mentees
 - o are there any resources to provide them with regarding research opportunities?
 - I mentioned that one of my meetings went well, the other one ghosted me
- We have an account for \$50 with the makerspace -- account name is BMEDesign, so each team has \$50 to spend there
- leadership talk for BME 300 planned for Wednesday during the first week of class (before the project selection on Friday) to prep 300s for being good leaders
- Dr. P says that BME 201 and 200 cannot switch semesters
 - o emphasizes mentorship of 300s to lead 200 members in their first real design project
 - students admitted to BME in January would be screwed since they would have missed 201
 - students can skip 200, but not skip 201
- · topics for next meeting include
 - · simplified flowchart for course selection
 - BME mentor feedback
 - Show and tell?
 - o testing plan?
 - · Course enrollment questions
 - how has ordering materials been

Conclusions/action items:

Next week is a general BSAC meeting. We will discuss how design projects have been going. We will also discuss upcoming enrollment and answer any questions the underclassmen have about enrollment.

SIERRA LOOSEN - Oct 24, 2025, 11:41 AM CDT

Title: BSAC Meeting with Faculty

Date: 10/24/25

Content by: Sierra

Present: BSAC and faculty

Goals: Talk about current topics in BME

Content:

- . I will follow up with my mentees to see if they have any questions about enrolling in classes for next semester
- We discussed where we are in the process of prototyping and how ready we are for show and tell
 - · helpful to come to show and tell with a specific question to ask the peers who are looking at our projects
 - we will likely ask if anyone has any ideas of how we can securely attach our side tracks to our the treadmill to hold it in place while in use
- · The group discussed how ordering is going
 - we are still waiting on most of our products to come in to start prototyping
 - o order materials as soon as possible
 - o decide early on how you will order materials, communicate with the client about that
- Make sure the testing plan gives you results that the client will actually be interested in
- We gave advice to underclassmen about where to look for classes to take based on their tracks, we advised them to really rely on talking to upperclassmen
- We discussed maybe having the design advisors bring up the canvas page during meetings with design groups to make sure everyone is enrolled in it
- the ME department has their own advising day, could BME have something similar?

Conclusions/action items:

I need to follow up with my mentees and will ask them if they have any questions about enrolling in spring classes. We hope to have something fabricated for show and tell, but it might not be very feasible if we don't have all of materials here. We could begin working on side track fabrication with the materials we do have here.

SIERRA LOOSEN - Nov 07, 2025, 11:34 AM CST

Title: BSAC Meeting

Date: 11/7/25

Content by: Sierra

Present: General BSAC

Goals: Talk about current topics in BME and where people are in the design process

Content:

- The form is now complete to submit a request to do a different training for the training throughout the curriculum
- · there is also a spreadsheet that shows what trainings other people have requested so you can choose one to complete
- · we discussed how show and tell went for everyone
- · we also talked about how fabrication was going and what plans for testing are
- prototypes should be done by Thanksgiving break so that posters can be printed early enough for presentations

Conclusions/action items:

People can now submit requests to the form for the training throughout the curriculum. Show and tell went well for most people but a lot of people didn't actually get useful feedback. Most people are in the middle of prototyping and are planning to start testing soon.

SIERRA LOOSEN - Nov 14, 2025, 11:21 AM CST

Title: BSAC Executive Meeting

Date: 11/14/25

Content by: Sierra

Present: BSAC Exec committee

Goals: Discuss previous topics and upcoming topics for meeting with faculty next week

Content:

- · Discuss topics for next week's meeting with faculty
 - how did enrollment go?
 - How has testing and data collection been going?
 - what is your team's plan for the remainder of the semester?
 - Are you ready for final poster presentations?
 - Is your project continuing for next semester?
 - discuss with team and fill our form from Dr. P to decide if the project should continue or not
 - Should there be awards for every semester of BME design rather than just spring?
 - Have you gotten feedback on your preliminary report to implement on your final report?
 - Communication with client? Are they attending the poster presentation?
 - What are expectations for final notebook checks at the end of the semester?

Conclusions/action items:

This was the final BSAC Exec meeting of the semester. Next week is the final BSAC meeting with faculty. After thanksgiving, the poster session is that Friday.

SIERRA LOOSEN - Nov 21, 2025, 11:40 AM CST

Title: BSAC Meeting with Faculty

Date: 11/21/25

Content by: Sierra

Present: BSAC and BME Faculty

Goals: Discuss current topics and how design projects are going

Content:

- . It is important to make sure mentees have access to the BME Canvas course to have access to important BME resources
- CITI training will still be required since it is important for industry, every medical device needs an IRB so having CITI training helps with that
- · We discussed where everyone is in their design project and if everyone is prepared for final presentations
- We discussed how testing is going for teams
- Remember to include the 200s and allow them to learn and participate in the project
- Go back to PDS to look at if those criteria were met in our testing, compare statistics/data against those PDS criteria
- For the makerspace fund, any person from the team can buy things with the \$50
- · We need to remind our client about the poster presentation and invite them

Conclusions/action items:

The poster presentation schedule and map is live. We also need to evaluate three other groups posters while we are at the poster session and it is through feedback fruits. We need to begin preparing for final poster presentations. Print posters by Dec. 3.

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John Puccinelli - Sep 05, 2016, 1:18 PM CDT

Use this as a guide for every entry

- Every text entry of your notebook should have the **bold titles** below.
- Every page/entry should be **named starting with the date** of the entry's first creation/activity, subsequent material from future dates can be added later.

You can create a copy of the blank template by first opening the desired folder, clicking on "New", selecting "Copy Existing Page...", and then select "2014/11/03-Template")

Title: Descriptive title (i.e. Client Meeting)

Date: 9/5/2016

Content by: The one person who wrote the content

Present: Names of those present if more than just you (not necessary for individual work)

Goals: Establish clear goals for all text entries (meetings, individual work, etc.).

Content:

Contains clear and organized notes (also includes any references used)

Conclusions/action items:

Recap only the most significant findings and/or action items resulting from the entry.

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John Puccinelli - Nov 03, 2014, 3:20 PM CST

Title:	
Date:	
Content by:	
Present:	
Goals:	
Content:	
Conclusions/action items:	