

Product Design Specifications:

Design of Durable Wheelchair Foot Rests

Client: Andrea Gehling, Avenues to Community

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Function: Our client at Avenues to Community works with Mark, a 32 year old man with cerebral palsy and an intellectual disability. Mark uses a wheelchair for transportation while in their community. Due to his spasticity he often kicks his legs, so for safety reasons his feet must be strapped in during transport. As a result, he often breaks the foot rests on his wheelchair. A more durable foot rest design is needed for his use.

Client Requirements: New wheelchair footrests must be suitable for the safety needs of Mark and function without breaking.

Design Requirements:

- 1) Physical and Operational Characteristics
 - a) *Performance Requirements:* Must withstand maximum forces during leg kicks due to spasticity from the user, a 32 year old male with cerebral palsy.
 - b) *Safety:* Must safely support and secure the user's legs during wheelchair use, particularly transport. Must prevent injuries such as circulation, restriction, or bruising. Must be able to swing or remove out of the way in order for a lift to be used.
 - c) *Accuracy and Reliability:* Must never break during use.
 - d) *Shelf Life:* Our goal is for our product to work for Mark's lifetime use
 - e) *Operating Environment:* Our product will be used in coordination with an existing wheelchair.
 - f) *Ergonomics:* Foot rests should be comfortable for the user of the wheelchair, keep his ankle at the correct flexion, as well as be easy to use for his support staff.
 - g) *Size:* Should not increase the current amount of space that his wheelchair currently encompasses.
 - h) *Weight:* not an important factor, must be light enough to be removed by Chris, no more than 15 lbs.
 - i) *Materials:* Materials should be as durable as possible without compromising safety, adjustability, and weight.
 - j) *Aesthetics, Appearance, and Finish:* Aesthetics are not a main concern, but the product should look professional.
- 2) Production Characteristics
 - a) *a. Quantity:* At least one set of functioning footrests.
 - i) *Target Product Cost:* As affordable as can be for the family of the user, staying within our design budget of \$200.
- 3) Miscellaneous
 - a) *Patient Related Concerns:*

- (1) Footrests should allow the wheelchair to have easy accessibility and removability
 - (2) The footrests should be completely safe for the patient.
 - (3) Must be intuitive and simple in nature
- b) *Competition:* Composite footrests vs metal footrests; swingaway or elevating, removable or fastened, and footplates