

# Product Design Specifications

## Lower Extremity Rehabilitation Device for the Use in Developing Countries

### Product Design Specification Report

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Product Design Specifications

**Function:** The device will aid the patient in strengthening their lower extremities by allowing the patient to lie on their back with their knees at a ninety-degree angle and feet pressed against a static solid plate. The patient can then move by extending their knees. Six elastic bands will be used to attain increasing resistance, which will aid in strengthening of the lower extremities throughout a patient's treatment plan.

#### Client requirements:

CRILA's requirements for the design include that the device be cost effective, portable within the clinic, and easily replicable in Honduras with local materials. Additionally the design should be constructed in a multiple part assembly for ease of transportation and require low maintenance.

#### Design requirements:

##### 1. Physical and Operational Characteristics

###### a. *Performance requirements:*

The device will be used as part of a treatment plan to strengthen the lower extremities of patients undergoing rehabilitation.

###### b. *Safety:*

The device should not put the patient at risk of injury from the treatment and the

device itself should not cause the patient harm. The height of the device should not exceed two feet and should incorporate a safety belt to secure the patient while the device is in use.

*c. Accuracy and Reliability:*

The device must be able to withstand a high frequency of use by a variety of different patients. Each elastic band on the device should provide the same amount of resistance with each use.

*d. Life in Service:*

Under frequent use and humid conditions, the device itself should last for approximately ten years with the elastic bands lasting for three to five years.

*e. Shelf Life:*

The device must be portable within the clinic and easily replicable in Honduras. The device should be able to withstand a hot and humid environment.

*f. Operating Environment:*

The device will be used in a hot and humid environment and thus must be built of corrosive resistant materials. It must also be compact enough to fit in a small rehabilitation center. Due to high frequency of use by patients of different skill level, the device must be durable.

*g. Ergonomics:*

The device is intended for use by young adults to elderly. It is not intended for use by children, people with back problems, or pregnant women. The device should be solely used for the rehabilitation of lower extremities. For patient comfort the device will include a back cushion and shoulder pads. The device will allow the patient to lie flat with no incline angle, such that the hips and torso are at a 90 degree angle with respect to the knees. In order to accommodate a variety of patients the static plate must be vertically adjustable and include a space at the bottom to allow ankle and calve rehabilitation. For the ease and convenience of the staff working with the patient, the device will be raised to a height not exceeding two feet.

*h. Size:*

The length of the device must be long and wide enough for the average person to comfortably lie back. The dimensions of the device must be X by X feet. The device should be easily portable and assembled within the clinic by two people.

i. *Weight:*

The weight of the device should not exceed 200 pounds. Wheels may be incorporated for ease of transport.

j. *Materials:*

All the materials used to develop the device should be locally available and affordable in Honduras.

k. *Aesthetics, Appearance, and Finish:*

The device should be aesthetically pleasing and if possible include UW Badger reference.

## **2. Production Characteristics**

a. *Quantity:*

One device should be constructed in Madison, WI while the others will be replicated in Honduras.

b. *Target Product Cost:*

The target cost of production needs to be less than \$500.

## **3. Miscellaneous**

a. *Standards and Specifications:*

Currently, there are no standards and regulations in place for the use of the device in Honduras.

b. *Customer:*

The device will be implemented at the CRILA rehabilitation center in Honduras. The customer requires that the device be low cost, portable, replicable, durable, and manufactured with local materials.

c. *Patient-related concerns:*

Due to the low staff to patient ratio, the device must be safely operated by the patient with minimal assistance.